

Fiscal decentralization, governance, and economic performance: a reconsideration

In countries with tax sharing systems, assigning local governments a large share of locally-generated tax revenues is often thought to motivate them to promote economic development. The more local officials benefit from local economic activity, so the argument goes, the more supportive of business—and the less corrupt—they should be, leading to higher economic output. Some scholars attribute China's rapid growth to its high local tax retention rates and Russia's stagnation in the 1990s to the predatory clawback of local revenues. I show that such arguments ignore a crucial actor in the game—the central government. If increasing the local tax share improves incentives for local officials, it usually worsens them for their central counterparts. The net effect on economic output is indeterminate.

Keywords: fiscal decentralization, corruption, incentives.

JEL H11, H30, H71, H77

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March 2006

Published in *Economics and Politics*, July 2006, 18, 2, pp.219-35.

I am grateful to Hongbin Cai, J.R. DeShazo, Stephan Haggard, Andrei Shleifer, Michel Treisman, Yi Zhang, anonymous referees, and participants in the 2003 American Political Science Association annual meeting for valuable comments. I thank the UCLA Academic Senate, the John Simon Guggenheim Foundation, and the German Marshall Fund of the US for support.

1 Introduction

A growing body of literature relates countries' economic performance to incentives created by the way fiscal authority is divided between levels of government. Some have studied how competition between local and central governments to tax or regulate the same base can lead to inefficiently high tax or regulatory burdens.¹ Others have explored how factor mobility might constrain local governments in desirable or undesirable ways.² Still other work has examined how subnational governments might exploit a pre-commitment advantage to extract bailouts from higher levels.³

Another common argument—which I address in this paper—concerns incentives in a system of tax sharing. In such systems, governments at two or more levels each receive a share of the revenues from taxes collected in a given jurisdiction. Tax sharing systems are extremely widespread. A very partial list of countries where at least one level of subnational government got more than half its tax revenues from interlevel tax sharing as of the late 1990s would include Austria, Belgium, Germany, Norway, Spain, Turkey, Mexico, Bolivia, Nigeria, Hungary, the Czech Republic, Poland, Romania, Bulgaria, Albania, Croatia, Estonia, Latvia, Lithuania, Russia, Ukraine, Armenia, Belarus, Georgia, Kazakhstan, Moldova, and Tajikistan.⁴ In many other countries, tax sharing exists in a less pronounced form. Even where tax sharing does not occur *de jure*, if central governments provide fiscal transfers to local budgets that vary with local performance, then a kind of tax sharing often exists *de facto*.

In such systems, assigning larger shares of revenue to local governments is often thought to

¹ This is the literature on “vertical fiscal externalities”. For a recent analytical survey, see Keen (1998). Contributions include Flowers (1988), Dahlby (1996), Boadway and Keen (1996), Boadway, Marchand, and Vigneault (1998), Wrede (1999), and Dahlby and Wilson (2003).

² Classic cites include Tiebout (1956) on mobility of residents and Brennan and Buchanan (1980) on mobility of capital. Wildasin and Wilson (2004) review the literature.

³ See analyses of “soft budget constraints” in federal finance; for instance, Wildasin (1997), Bordignon et al. (2001), Rodden et al. (2003).

⁴ See OECD (1999), Dabla-Norris and Wade (2002, p.28), Ebel and Yilmaz (2002, p.8), Ter-Minassian (1997), Turkish State Institute of Statistics (1999, p.624).

promote more business-friendly local policies, and consequently better economic performance.⁵ If local governments get to keep a large share of marginal revenues generated in their jurisdiction, they should be more eager to invest in business-promoting infrastructure, to limit costly regulations, and—where corruption is rampant—to curb their demand for bribes. On the other hand, if most of the marginal dollar of locally-generated revenues is siphoned off to higher level budgets, local officials will place lower priority on stimulating economic activity, and more on other objectives such as lining their own pockets.

This argument has been applied to a variety of countries. In China, some scholars contend that the high—and increasingly secure—share of revenues retained by subnational governments helps explain the country’s phenomenal growth in the 1980s and 1990s (Jin, Qian, and Weingast 2005). According to Roland (2000, p.281), China’s “fiscal decentralization has helped to align the incentives of government authorities with economic efficiency.” By contrast, a low ex post share of revenue locally retained is seen as one reason Russia stagnated in the 1990s (Zhuravskaya 2000; Blanchard and Shleifer 2000). Similar arguments are often made about other developing countries. Kisubi (1999, p. 123) credits revenue decentralization in Uganda with reducing the incentives for district level corruption. In Pakistan, inadequate revenue decentralization is said to have discouraged provincial governments from fully developing their own tax bases (Shah 1998, p.141, Ahmad and Wasti 2003, pp.196-8). In the industrialized world as well, this argument sometimes surfaces in policy debates. *The Economist* recently attributed Britain’s relatively sluggish post-war performance in part to over-centralization of tax revenues, which weakens incentives for local governments to grant planning permission to firms that wish to expand. “The state of the local economy ... makes little difference to local government coffers, so in the balance between growth and beauty, growth does not get much of a say” (*The Economist* 2001, p.20).

The intuition, based on an analogy to agency problems in corporate finance, is appealing. Equity given to a company executive helps to align his interests with those of other share-holders. He should therefore strive to increase the company’s profits. In a similar way, assigning a local government a larger share of revenue from locally-originating taxes might be expected to encourage that government to

⁵ I use “local” in this paper to refer to all levels of subnational government.

support growth of its tax base, resulting in higher output.

However, the context is different in one crucial respect. The argument applied to fiscal federalism ignores one important actor in the game—the central government. Increasing the marginal revenue shares of local governments may indeed improve their incentives. But such reforms simultaneously weaken incentives for the central government by reducing its stake in economic development. Any positive effect on the behavior of local officials should be accompanied by a negative effect on central government behavior. If equilibrium output is much more sensitive to local than to central government predation, the local effect might dominate. But in most cases interventions by both levels of government influence economic activity, and there is no general reason to think one effect will be stronger than the other. Indeed, in certain plausible formulations the two effects exactly cancel each other out: decentralizing revenues merely shifts predation or inefficiency from one level of government to the other, without changing output. As a basis for generalizations or policy recommendations, the fiscal incentives argument thus seems highly questionable.⁶

That changing the division of revenues will usually have opposite effects on central and local governments is obvious once recognized, but it challenges a widely held intuition that has been used to argue for decentralization reforms. I demonstrate the point in a simple model of tax sharing similar to those used in previous treatments, first ignoring the central government and then including it as a strategic actor. The result is robust to a variety of reformulations and changes of modeling assumptions. As I show in a working paper version of this article (Author 2005), the incentive effect on output is indeterminate whether governments intervene in negative ways (by extracting bribes) or in positive ones (providing infrastructure), whether bribes are proportional to firms' revenues or lump-sum, whether governments are

⁶ In a related paper, Gordon and Li (1997) argue that governments whose revenue comes from taxing private firms will be more supportive of private markets than those that tax state enterprises. They note the heavy dependence of Chinese local governments on taxing non-state firms, and suggest that this may help explain why China's economy performed better in the 1990s than East European economies. This might, indeed, explain why local governments support non-state business in China. But to draw conclusions about countries' relative performance, one would need to compare also the incentives for *central* governments in China and Eastern Europe. If the Chinese central government were more dependent than East European central governments on taxing state enterprises, it would likely be less friendly toward private business, and the net effect on performance would be unclear.

purely predatory or provide public goods, whether local governments are more or less accountable than central government, whether governments prefer bribes to tax revenues or vice versa, whether or not bribery is more costly than taxation (for instance, because of secrecy), whether local or central governments provide infrastructure more effectively, and whether or not local governments are constrained by capital mobility.

The argument that I address in this paper assumes a system of interlevel tax sharing, or some functional equivalent. My goal here is to challenge the view that decentralizing revenues *within such a system* leads to higher output. Of course, many economists would argue for eliminating tax sharing entirely. Assigning separate tax bases to different levels of government should give each a strong incentive to conserve and grow its own base. However, separating tax bases completely is not usually feasible. Policies of governments at one level almost always affect the tax bases of other levels (whether via effects of infrastructure investments, changes in demand, regulations, or bribery). I examine such cases in Section 3 and illustrate how, in the presence of such externalities, assigning separate tax bases to different levels can at times make things worse.

To be clear, I do not pretend to offer here a fully specified model of the fiscal interactions between a central and local governments from which general results can be derived. Rather, I address one common and influential argument that has informed academic analyses and policy discussions.⁷ The relevant question to ask about the models I present is, therefore, not whether they accurately represent the world, in all its complexity, but whether they accurately represent the argument about incentives in a system of tax sharing that I am addressing. Since versions of the model without a central government are virtually identical to those presented by proponents of this argument (Zhuravskaya 2000, Jin et al. 2005), this would seem to be the case. I also do not deny that the standard incentive argument may help to explain particular cases. Where output is more sensitive to local than to central policy, the conventional expectation may be right. Zhuravskaya and Jin et al. present considerable empirical evidence that “good”

⁷ For an excellent review of many other arguments about fiscal decentralization and the quality of government, see Oates (1999).

fiscal incentives motivated Chinese provincial governments to support growth in the 1980s and that “bad” incentives led to poorer governance in Russian cities in the 1990s. I argue only that there is no theoretical basis to derive general expectations or policy recommendations from the outcomes of these cases.

2 Fiscal decentralization under tax sharing

2.1 The standard argument

I begin with a simple formalization of the intuition that increasing local governments’ revenue shares motivates those governments in ways that improve economic performance. Consider a two-level state, and focus on a single locality, containing a single citizen with a productive business. Output—and income—in the locality is Y . There is no interregional trade or investment, so all income accrues to this citizen. A single tax is levied on output, at a fixed rate $t \in (0,1)$.⁸ The revenue is divided between the local and central governments, the local government receiving a share $r \in (0,1)$, and the center receiving a share $1-r$. Since the argument is about comparative statics of r , I also take this as fixed.⁹

Various types of government intervention might affect economic performance. Suppose here that governments extract bribes from business, proportional to output. (I show in Author (2005) that similar results hold for lump-sum bribes or for interventions to provide infrastructure.) The local government chooses a bribe rate on output, $0 \leq b_l \leq 1-t$.¹⁰ One might think of the local officials as demanding a share of the business’s output in return for waiving some costly regulation.¹¹ To model the argument that

⁸ In Author (2005), I consider endogenizing the tax rate and show that this will not usually change the main result.

⁹ Of course, the determinants of r are interesting in themselves. I return to this briefly in the Conclusion.

¹⁰ As is customary, I assume here a form of bribery with direct distortionary effects. If the government’s intervention is not distortionary, motivating local governments to intervene less will not improve economic performance. I assume throughout that bribe rates are set *after* the tax rate is fixed. This seems reasonable since tax rates are usually set by government in an annual law that is hard to change, whereas bribe rates can be altered by local government officials at their discretion.

¹¹ Although strict proportionality may not occur, it seems reasonable to think the size of bribe demanded might change with the size of the business.

decentralization reduces output-depleting government interventions, we must assume that at least some interventions deplete output. Thus, I assume that output in this locality, Y , decreases in b_l : $Y = f(t, b_l)$ where $f_2 < 0$ if $b_l > 0$ and $f(0,0) > 0$.¹²

As in previous treatments, I start by assuming the government maximizes its total revenues from taxation and bribery. Given t and r , the local government sets b_l to maximize $R_l = (tr + b_l)f(t, b_l)$.

Solving the model is straightforward. The first order condition yields:

$$b_l^* = -\frac{f(t, b_l^*)}{f_2(t, b_l^*)} - tr \quad (1)$$

where asterisks indicate equilibrium values. Now this might or might not represent a unique, interior maximum. However, to make the standard argument that higher r reduces b_l^* we must assume that it does. If, by contrast, the only equilibrium were a corner solution, then the bribe rate in this corner solution would be independent of r . If there were multiple equilibria, then it would be unclear how to draw any conclusions from comparative statics. I therefore follow the literature in assuming that $f(t, b_l)$ is a continuous, twice differentiable, concave, decreasing function of t and b_l , and that $(tr + b_l)f(t, b_l)$ has a maximum at $0 < b_l^* < 1 - t$ (see Zhuravskaya 2000, Jin et al. 2005).¹³

From (1), it is clear that increasing r increases equilibrium f . Totally differentiating (1) with regard to r , we get: $\frac{\partial b_l^*(t, r)}{\partial r} = -t \frac{f_2^2}{2f_2^2 - ff_{22}} < 0$. So $\frac{\partial f}{\partial b_l} \frac{\partial b_l^*}{\partial r} > 0$. This is the standard argument in a nutshell. Increasing r decreases the local government's equilibrium bribe rate, which increases equilibrium output. Fiscal decentralization, by strengthening the incentives for local governments to support local business, improves economic performance.

¹² In reality, output might not be continuous in b_l , in which case there might be no equilibrium. This would be another reason to doubt the generality of the argument I am critiquing. Subscripts on functions denote derivatives.

¹³ The second order condition is $2f_2 + (tr + b_l^*)f_{22} \leq 0$, which is always met given that f is decreasing and concave.

2.2 Adding a central government

However, the model makes one key omission: it does not include a strategic central government. Suppose instead that the central government can also extract a rate of bribes, $0 \leq b_c \leq 1 - t$, from local business and that it acts strategically. To maintain the parallel as strictly as possible, suppose output in the locality, $Y = f(t, b_l, b_c)$, decreases concavely in both the central and local bribe rates, and that the central government also seeks to maximize its total revenues, $R_c = (t(1 - r) + b_c) f(t, b_l, b_c)$. The local government's maximand is now $R_l = (tr + b_l) f(t, b_l, b_c)$. It is most realistic to suppose the two governments set their bribe rates simultaneously—otherwise we would have to believe one could commit to a particular bribe rate, which given the verification difficulties seems unlikely—and so the appropriate solution concept is Cournot-Nash. It seems reasonable to assume that if $b_c + b_l + t \geq 1, f = 0$ (i.e., if governments together extract 100 percent of output, no one will produce), so this will never be the case in equilibrium. The first order conditions become

$$b_l^* = -\frac{f(t, b_l^*, b_c)}{f_2(t, b_l^*, b_c)} - tr \quad \text{and} \quad b_c^* = -\frac{f(t, b_l, b_c^*)}{f_3(t, b_l, b_c^*)} - t(1 - r) \quad (2)$$

These define the reaction functions of the two governments, $b_l^*(b_c, t, r)$ and $b_c^*(b_l, t, r)$.¹⁴ To avoid the trivial cases in which one government's intervention drives the other completely out of the bribe "market" or in which both wish to increase their interventions without bound, I make certain technical assumptions common in similar problems in industrial organization: $0 < b_l^*(0; t, r) < b_c^{*-1}(0; t, r)$; $0 < b_c^*(0; t, r) < b_l^{*-1}(0; t, r)$; $|f_2 f_3 - ff_{23}| < 2f_2^2 - ff_{22}$; and $|f_2 f_3 - ff_{23}| < 2f_3^2 - ff_{33}$. The first two state that the bribe rate one government would set if its rival set a rate of zero is positive and lower than the rate it would have to set to drive its rival down to a zero bribe rate. The second two require that

¹⁴ Since f is concavely decreasing in both b_l and b_c , the second order conditions, $2f_2 + (tr + b_l^*) f_{22} \leq 0$ and $2f_3 + (t(1 - r) + b_c^*) f_{33} \leq 0$, are also met.

the slopes (in absolute value) of the two reaction curves are less than one.¹⁵ These also ensure that the interior Nash equilibrium defined by the intersection of the reaction curves is unique.

How do the equilibrium bribe rates, b_l^* and b_c^* , respond to changes in r ? One way to answer this would be to totally differentiate both the first order conditions in (2) with regard to r , and then solve for the derivatives, db_l^*/dr and db_c^*/dr . An alternative method, which helps to develop intuitions, is to derive the partial derivatives $\partial b_l^*(b_c; t, r)/\partial r$ and $\partial b_c^*(b_l; t, r)/\partial r$ from (2), holding the other government's bribe rate constant. These partial derivatives reveal how the reaction curves shift in response to changes in r . One can then examine—and demonstrate graphically—how the implied shifts would affect the values of b_l^* and b_c^* , which are defined by the intersection of the reaction curves.¹⁶

Differentiating the reaction curves with respect to r , we get:

$\partial b_l^*(b_c; t, r)/\partial r = -tf_2^2 / (2f_2^2 - ff_{22}) < 0$ and $\partial b_c^*(b_l; t, r)/\partial r = tf_3^2 / (2f_3^2 - ff_{33}) > 0$. So, the local government's reaction curve, $b_l^*(b_c; t, r)$, shifts down in response to an increase in r , while the central government's reaction curve, $b_c^*(b_l; t, r)$, shifts up. The effect on equilibrium bribery then depends on whether central and local bribery are strategic substitutes or complements, as well as the curvature of f .

If central and local bribery are strategic substitutes (the reaction curves slope down, and $f_2f_3 - ff_{23} > 0$), increasing r has opposite effects on b_l^* and b_c^* : it reduces the equilibrium local bribe rate, but simultaneously *increases* the central bribe rate (see Figure 1a). The net effect on output is indeterminate. If, by contrast, central and local bribery are strategic complements, we cannot say much in general about how equilibrium bribe rates would change in response to a change in r : the only

¹⁵ This also rules out unstable equilibria. If the absolute value slopes of the reaction curves are greater than one, unstable equilibria may still exist. I discuss these in Author (2005) and argue there that the net effect of changing r will still be indeterminate.

¹⁶ This also permits analogies to reaction curve analysis in industrial organization.

combination of changes that is ruled out is an increase in b_l^* and a decrease in b_c^* (see Figure 1b).

Equilibrium output might either rise, fall, or stay the same.¹⁷

In short, without specifying more about the output function, there is no reason to think the incentive effects of fiscal decentralization would generally decrease, rather than increase, the aggregate bribe burden. Indeed, in one interesting and quite plausible special case, the effects of fiscal decentralization on central government behavior precisely offset the effects on local governments. So far I have assumed the reduced form output function $Y = f(t, b_l, b_c)$, following the previous literature.

However, it is worth considering an example with a little more structure. Suppose output is a concavely increasing function of the labor supplied by the locality's resident: $Y = f(l); f' > 0, f'' < 0$. As before, the governments share revenues from a tax on output with fixed rate, t , and each can extract bribes proportional to output. The resident consumes the remaining output. Taking the tax and bribe rates as given, the resident allocates a fixed time budget, normalized to one, between labor and leisure to

maximize his utility: $U = (1 - (t + b_l + b_c)) f(l) + v(1 - l)$, where $(1 - (t + b_l + b_c)) f(l)$ is the

resident's consumption and $v(\cdot)$ is a concavely increasing function measuring the value he places on

leisure. The first order condition $(1 - (t + b_l + b_c)) f'(l^*) - v'(1 - l^*) = 0$ implicitly defines equilibrium

labor supply, $l^*(T)$, as a decreasing function of the sum of the bribe and tax rates, $T \equiv t + b_l + b_c$.¹⁸ The

respective governments simultaneously choose bribe rates to maximize $R_c = (t(1 - r) + b_c) f(l^*(T))$

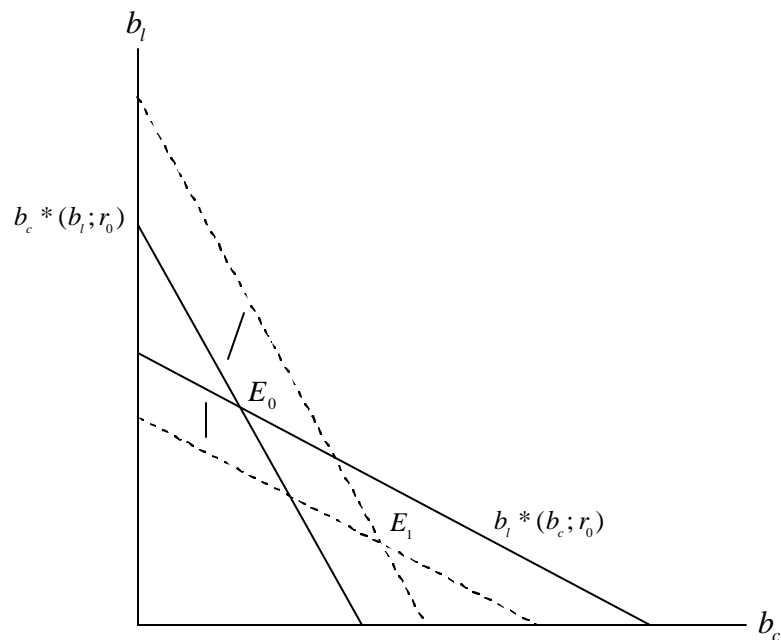
and $R_l = (tr + b_l) f(l^*(T))$. Their first order conditions are: $f(l^*) + (tr + b_l) f'(l^*) l^{*'}(T) = 0$ and

$f(l^*) + (t(1 - r) + b_c) f'(l^*) l^{*'}(T) = 0$, which when combined define the equilibrium total tax and

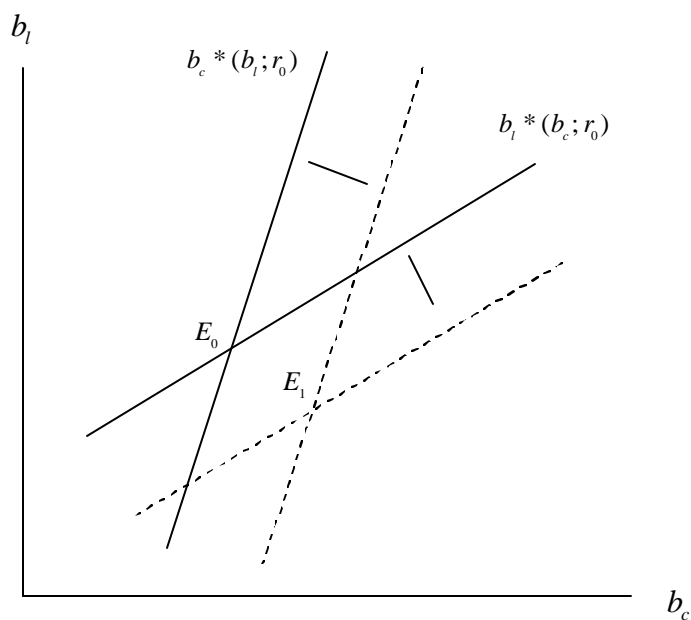
¹⁷ The two governments' actions are likely to be strategic substitutes when, as in this example, the governments intervene by extracting bribes. An increase in b_c will decrease f for a given b_l , which one would expect to increase $|\partial f / \partial b_l|$, implying $f_{23} < 0$, and therefore $f_2 f_3 - f f_{23} > 0$, the condition for downward sloping reaction curves. However, if governments intervene by providing infrastructure, the governments' actions are likely to be strategic complements if central and local infrastructure are complementary.

¹⁸ It is easy to see the second order condition will always be met.

Figure 1: Effects of fiscal decentralization on local and central bribe rates



1a. Strategic Substitutes: b_l^* decreases, b_c^* increases



1b. Strategic Complements:
 b_l^* , b_c^* may increase, decrease, or stay the same

bribe rate, T^* , in a way that is independent of r : $T^* l'(T^*) = -2 f(l(T^*)) / f'(l(T^*))$. Thus equilibrium labor supply and output are also independent of r . The effect of r on the local government's bribe rate is precisely offset by its effect on the central government's rate.

In general, increasing the local tax share will only reduce the aggregate bribe burden and increase output if $|\partial b_l^*(b_c; t, r) / \partial r| = t f_2^2 / (2 f_2^2 - f f_{22})$ is large relative to $\partial b_c^*(b_l; t, r) / \partial r = t f_3^2 / (2 f_3^2 - f f_{33})$, which implies that $-f_{22} / f_2^2$ must be small relative to $-f_{33} / f_3^2$. So if in the initial equilibrium output is more sensitive to local than to central bribery and less concave in the local than in the central bribe rate, increasing the local tax share will increase output.

The basic indeterminacy turns out to be robust to a variety of reformulations and changes of assumptions (Author 2005). First, governments might intervene in different ways, extracting bribes from firms (discouraging production), or providing business infrastructure (encouraging it). They might demand lump-sum bribes, the same for all, or payments proportional to the firm's revenues.¹⁹ They might provide public goods or consume all revenues themselves. In all these variations, the effect of fiscal decentralization remains indeterminate. Second, one might model governments with a variety of objectives—from predatory revenue maximization to pure benevolence. For ease of exposition, I model governments here as Leviathans, maximizing their revenues. But I show in Author (2005) that the indeterminacy remains even if governments are considered partially—or, under some assumptions, wholly—benevolent, providing public goods at rates demanded by their residents. Local governments might be more accountable than central ones because fewer issues are bundled together in a local election or because yardstick competition facilitates efficiency comparisons (Bardhan and Mookherjee 2000, Seabright 1996, Besley and Case 1995). Government payoffs might weight bribes more or less highly than tax revenues. (Bribe revenues, since unrecorded, can be spent with greater discretion; on the other hand, they come with a risk of detection and prosecution.) Varying the governments' preferences in these

¹⁹ One must assume lump-sum bribes are distortionary, or the argument that reducing bribery increases output makes no sense. Although lump-sum levies are often thought non-distortionary, paying a lump-sum bribe might impose indirect costs if it requires firms to engage in secretive behavior (Shleifer and Vishny 1993).

ways also does not change the result.

Third, different types of government intervention might have different economic effects. Bribery may be more harmful than taxation because of the costly secrecy it requires (Shleifer and Vishny 1993). Local governments might be able to invest in infrastructure more productively than central government because of local knowledge or other local advantages. Since I assume only that output decreases concavely in the tax and the bribe rates and increases concavely in both local and central infrastructure, this would not affect the conclusions. I assume an exogenously fixed tax rate, but endogenizing this will not necessarily remove the indeterminacy. Finally, local governments may be more constrained by fear of losing mobile capital than central governments (Brennan and Buchanan 1980, Qian and Roland 1998). I show that even assuming this, the effect of a larger local revenue share on output remains unclear.²⁰

3 Tax sharing versus tax assignment

Some scholars have argued that fewer incentive problems arise if different levels of government are assigned separate tax bases rather than receiving a share of a joint tax (e.g., Shleifer and Treisman 2000, Lavrov et al. 2000). If a government holds exclusive rights to a particular tax base, it will simply set its most preferred tax rate and have no need for bribery. If collection and enforcement are perfect, and policies of each level of government affect only that government's tax base, this will, indeed, eliminate the problems this paper addresses. A perhaps more interesting question concerns settings where enforcement is imperfect or effects of policies "spill over". Will assigning separate tax bases *in toto* to different governments lead to better incentives and economic performance when governments can regulate or extract bribes from each other's tax-payers or when policies have indirect effects?

In practice, such overlap seems hard to avoid. Export duties may accrue to the federal budget. But the regulations of regional governments—on labor conditions, the environment, minimum wages, and so

²⁰ Some suggest that central governments may suffer from greater agency problems in monitoring and motivating bureaucrats (Bardhan and Mookherjee 2000). Such agency problems may indeed be important. To focus on the fiscal incentives argument, I abstract from this one here.

on—will affect the profitability of exports in numerous ways. Thus, exporters will have an incentive to bribe or lobby regional governments to waive requirements. Residential real estate taxes may be assigned entirely to local governments. But federal laws—on everything from discrimination to mortgages—affect the price that house sellers can get. While overlapping taxation and bribery may mostly be a problem in developing countries, overlapping effects of infrastructure investments may play an analogous role in developed ones. Central and local government infrastructure investments are both likely to affect many tax bases, regardless of which level of government has the right to tax them.

In such cases, assigning particular tax bases to different levels of government will not avoid the externalities that render tax sharing problematic. Consider a simple example with externalities in infrastructure investment rather than bribery. Suppose a given locality contains two non-overlapping, immobile tax bases, \mathbf{a} and \mathbf{b} . One might think of these as stocks of fixed capital tied to particular sectors—say, automobile factories and farmland. Under *tax assignment*, the central government has the right to tax output produced using \mathbf{a} , and keeps all the revenue, while the local government taxes—and keeps all revenue from—output produced using \mathbf{b} . Denote the center’s tax rate t_a and the local government’s rate t_b . Central and local governments can also make infrastructure investments, I_c and I_l respectively, in, say, interregional and local roads.

I assume that output produced with each tax base decreases concavely in the tax rate and increases concavely in the levels of both local and central infrastructure investment (better roads increase the productivity of both automobile production and farming.) Output subject to central taxation is

$Y_c = \mathbf{a} f(t_a, I_l, I_c)$ and output subject to local taxation is $Y_l = \mathbf{b} g(t_b, I_l, I_c)$, where

$f_1, f_{11}, f_{22}, f_{33}, g_1, g_{11}, g_{22}, g_{33} < 0; f_2, f_3, g_2, g_3 > 0; f_{11}f_{33} - f_{13}^2 \geq 0; g_{11}g_{33} - g_{13}^2 \geq 0$. I assume

that both tax bases are fully employed each period. As before, I suppose that the two governments set their tax and infrastructure investment rates simultaneously, and look for Nash equilibria.

Under tax assignment, the central government sets t_a and I_c to maximize $t_a \mathbf{a} f(t_a, I_l, I_c) - I_c$.

The local government sets t_b and I_l to maximize $t_b \mathbf{b} g(t_b, I_l, I_c) - I_l$. Obviously, infrastructure investments will be set below the level that would maximize the sum of the two governments' objectives.²¹ This joint optimum is described by the first order conditions for infrastructure investments:

$$\begin{aligned} \text{Joint optimum:} \quad I_l &: t_a \mathbf{a} f_2(t_a, I_l^j, I_c) + t_b \mathbf{b} g_2(t_b, I_l^j, I_c) = 1 \\ I_c &: t_a \mathbf{a} f_3(t_a, I_l, I_c^j) + t_b \mathbf{b} g_3(t_b, I_l, I_c^j) = 1 \end{aligned}$$

where the superscripts stand for "joint optimum". Under tax assignment, when governments set their infrastructure investments non-cooperatively, the corresponding first order conditions are:

$$\begin{aligned} \text{Tax assignment} \quad I_l &: t_b \mathbf{b} g_2(t_b, I_l^a, I_c) = 1 \\ I_c &: t_a \mathbf{a} f_3(t_a, I_l, I_c^a) = 1 \end{aligned}$$

where the superscripts stand for "assignment". Clearly, for given tax rates, $I_c^a < I_c^j$ and $I_l^a < I_l^j$. To compare these outcomes to those under tax sharing, suppose now that a tax rate t_a is levied on output produced with base \mathbf{a} , a tax rate t_b is levied on output produced with base \mathbf{b} , and revenues are divided so that the local government receives a share r . Now the local government chooses I_l to maximize $r[t_a \mathbf{a} f(t_a, I_l, I_c) + t_b \mathbf{b} g(t_b, I_l, I_c)] - I_l$, and the central government chooses I_c to maximize $(1-r)[t_a \mathbf{a} f(t_a, I_l, I_c) + t_b \mathbf{b} g(t_b, I_l, I_c)] - I_c$. First order conditions for infrastructure investments are:

$$\begin{aligned} \text{Tax sharing} \quad I_l &: t_a \mathbf{a} f_2(t_a, I_l^s, I_c) + t_b \mathbf{b} g_2(t_b, I_l^s, I_c) = 1/r \\ I_c &: t_a \mathbf{a} f_3(t_a, I_l, I_c^s) + t_b \mathbf{b} g_3(t_b, I_l, I_c^s) = 1/(1-r) \end{aligned}$$

where the superscripts stand for "sharing". We see two effects. First, under tax sharing the left-hand side of each equation has one more term than under tax assignment, which in this case creates an incentive for higher infrastructure investment. Because both governments have some stake in both tax bases, this inclines them to invest more in infrastructure than if they only benefited from one. This effect pushes the

²¹ And the revenue-maximizing level of infrastructure investment is itself below the social optimum, since the government in this simple model ignores the effect of infrastructure on private incomes.

outcome under tax sharing closer to the joint optimum. However, the second effect pulls in the opposite direction. The right-hand side of both equations is smaller under tax sharing than tax assignment. Because each government gets only a fraction of the benefit from its infrastructure investment, this creates an incentive to invest less. Putting the two effects together, under tax sharing, a government that gets a large revenue share is likely to invest more in infrastructure than it would under tax assignment. But a government that gets a small share will tend to invest less.²² Given such externalities, it is not possible to say in general whether tax assignment will lead to a higher or lower level of total infrastructure. Depending on the particular output functions, either may occur. A similar model can be used to make the same point in the context of bribery. Although there may be other reasons to favor tax assignment, given the difficulty of isolating tax bases in practice it is not clear that this will generally improve incentives.

4 Conclusion

That government predation and corruption are major obstacles to growth in developing countries is widely recognized. Recent literature suggests a growing appreciation of the dangers of such predation at local and regional levels (Bardhan and Mookerjee 2000, Tanzi 1995, Prud'homme 1995). Fiscal decentralization in tax sharing systems has seemed to some a way to reduce the appetite of local governments for bribes and embezzled funds and to motivate them to invest in public infrastructure. The large share of marginal tax revenues retained by subnational governments in China is said to explain why its economic performance has in the past compared so favorably to that of Russia.

On examination, however, there is no clear theoretical foundation to expect that decentralizing revenues in this way will generally improve economic performance. Increasing the marginal revenue share retained by local governments may render them less predatory. But once the responses of the central government are taken into account, the net effect might be negative rather than positive. As incentives

²² It is straightforward to show that whether under tax sharing the tax rates are set by the local government, the central government, or by agreement between the two, they will be set at the revenue-maximizing levels that are also chosen under tax assignment.

improve in the localities, they deteriorate at the center. Even if local governments are assumed to be more accountable, honest, constrained by competition, or efficient at providing infrastructure, decentralization has no determinate net effect. There are certainly cases in which a higher local tax share leads to higher output; but these are special cases, which depend upon particular parameter values or functional forms. They are not a valid basis for general conclusions or policy recommendations.

It might be possible to rediscover desirable incentive effects of larger local tax shares in a dynamic setting, but it is not obvious how. The same issue of mutually offsetting local and central behaviors should still arise. It is definitely possible to regenerate a decentralization benefit by means of ad hoc assumptions. If central officials are assumed to be constrained from responding to fiscal incentives, then decentralization may have positive net effects. But why would central officials be non-strategic or unable to respond to fiscal incentives? To date, no compelling reason has been suggested.²³

That theory does not yield general predictions does not, of course, mean that the standard argument about fiscal incentives cannot help to account for particular empirical cases. It may be true that provincial tax retention rates in China help explain why some provinces grew faster than others in the 1980s (although the system changed in 1994 from one based on fiscal contracts to one based mostly on tax sharing with no clear drop-off in market-friendly provincial policies or growth.) It may also be that weak fiscal incentives help explain Russia's economic depression in the 1990s (although growth has surged since 1999, largely fueled by high oil prices, despite continuing tax sharing and weak local incentives.) The papers by Jin et al. (2005) and Zhuravskaya (2000) are primarily empirical, and they provide considerable evidence for the claims they make. However, both suggest that broader lessons can be derived from the cases they examine. Jin et al. (2005, p.1740) argue that their "perspective yields an important insight about how federalism works in promoting economic development; namely, there exists a positive relationship between the strength of fiscal incentives faced by lower-level governments and local economic performance. Countries with strong fiscal incentives for local governments are expected

²³ Some might argue that corruption is a greater problem at the local level because face-to-face interactions with local officials are more common. Even if this were true—which is open to question—it would not change the result (see Author (2005) for a fuller demonstration).

to experience healthier local business development while those with low fiscal incentives are expected to experience the opposite.” Zhuravskaya (2000, pp.338, 365) contends that her “conclusions also have implications for the theory of decentralization” and that “In a system with stronger local fiscal incentives, one should observe more benign regulation, and higher growth compared to a system with weaker fiscal incentives.” Neither of these generalizations holds up if one takes into account the likely responses of central government as well as local governments.

The models examined here are extremely sparse. Several assumptions, reproduced here because they are common to the literature, would be interesting to relax. One perhaps questionable feature is the treatment of governments as unitary actors. In fact, disorganization or checks-and-balances within governments at each level may also affect corruption. A second feature worth note is the treatment of r , the division of revenues between levels, as exogenous. One might endogenize this in various ways. The formal division of revenues might be modeled as the outcome of bargaining between local and central governments, or as the result of decisionmaking in a legislature (in which case much would depend on the rules of procedure). However, the actual division of revenues may differ from the formal division because of tax evasion. If local governments collude with local tax-payers to conceal income that would otherwise be taxed by the central authorities, the actual division may even be a function of the formal sharing rate. Finally, it is important to reiterate that this paper evaluates only one argument about decentralization, and that others might be more persuasive. I do not address here the arguments that competition between local governments reduces bribery, embezzlement, and waste, or that decentralization enables governments to better match bundles of public goods to citizen demands or to monitor bureaucrats more effectively. Many arguments for and against different types of decentralization exist besides the one examined here.

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