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Fiscal Decentralization with Distortionary Taxation: Tiebout vs. Tax Competition

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Abstract

This paper explores a question that lies at the intersection of two vast literatures. The goal is to gauge whether the good side of fiscal decentralization, as emphasized by the Tiebout literature, dominates the bad side, as studied in the tax-competition literature. The results, which are derived by numerical simulation, show that either answer to this question is possible. Under favorable conditions, where the curvature of the production function and the dispersion of preferences are both high, the gains from Tiebout sorting are likely to outweigh the loss from the capital-tax distortion, so that the good side of fiscal decentralization dominates. If either of these conditions is absent, however, the bad side can win, making decentralization undesirable. When this happens, the lessons of the Tiebout tradition are overturned, with economic efficiency requiring centralized rather than decentralized provision of public goods.

Keywords: Tiebout, tax-competition, decentralization

JEL Code: H1, H2, H7

1. Introduction

With fiscal decentralization, subnational governments gain autonomy in the provision and financing of public goods. Although such autonomy has long been a feature of the fiscal landscape in the United States, many countries have only recently made decentralization a policy objective.[1] The logic of fiscal decentralization draws in part on the classic study of Tiebout (1956). Tiebout argued that, in attempting to attract residents, fiscally autonomous subnational governments will tailor public spending to suit individual preferences, leading consumers to sort across jurisdictions according to their demand for public goods. With each individual able to exactly fulfill his or her demand in some jurisdiction, the economy achieves a market-like outcome in the provision of public goods. Tiebout's idea was developed informally, but it has received modern formalization in the work of Oates (1972), Berglas (1976), Wooders (1978), Berglas and Pines (1980, 1981), Henderson (1985), Scotchmer and Wooders (1986), Hochman, Pines and Thisse (1995), and many others.

While the "good side" of fiscal decentralization has been clearly demonstrated by the Tiebout literature, fiscal decentralization also has a "bad side," which has been the focus of a separate literature on tax competition. In contrast to the Tiebout tradition, the standard tax-competition model has immobile consumers and no demand heterogeneity. In addition, instead of relying on nondistortionary head taxes, competing subnational governments pay for public goods with a tax on capital (i.e., business investment), which is mobile across jurisdictions but fixed in total supply. Because a higher tax rate drives away capital, reducing the local tax base, governments in the model are reluctant to levy high taxes. In a symmetric equilibrium, this reluctance leads to underprovision of public goods. Early contributors to the tax-competition literature include Mintz and Tulkens (1986), Zodrow and Mieszkowski (1986), Wilson (1986, 1991), Wildasin (1988a, b) and Bucovetsky (1991) (see Wilson, 2000, for a complete survey).

The inefficient outcome under tax competition comes from mixing intergovernmental competition with reliance on a distortionary tax. If governments instead were to cooperate, agreeing to set a common tax rate on capital, then jurisdictional tax bases would be unaffected by fiscal decisions, and efficient public-good levels would emerge. The same efficient outcome could be achieved if the fiscal autonomy enjoyed by subnational governments were revoked. The national government would then levy a uniform tax rate on capital, with the proceeds used to provide a common public-good level across the now-powerless subnational jurisdictions. Because a national capital tax functions like a head tax on consumers (who own the capital), the distortion engendered by the tax when jurisdictions compete is eliminated.

This discussion shows that fiscal decentralization is *harmful* in an economy with identical consumers where a distortionary capital tax must be used to finance public goods. By contrast, Tiebout's message is that decentralization is *beneficial* in an economy where consumers are instead heterogeneous and where head taxes are available. These contrasting conclusions raise the following intriguing question, which has not been addressed in the previous literature: *Is fiscal decentralization desirable in a Tiebout-style economy experiencing tax competition? In other words, is decentralization desirable in an economy with mobile, heterogeneous consumers, but where public goods must be financed with a distortionary tax on mobile capital?* On the one hand, decentralization allows public-good levels to be tailored to suit individual preferences, with consumers sorting into demand-homogeneous jurisdictions. On the other hand, the public-good choices in these jurisdictions are distorted because of worries about capital flight. In addition, national output is lower because demand differences inefficiently skew the allocation of capital across jurisdictions. Are the resulting distortions so severe as to nullify the gains from demand articulation? If so, fiscal decentralization is undesirable, and public goods should be provided at the national level using a uniform tax on capital, which functions as a head tax. Otherwise, decentralization is desirable, although its benefits are smaller than in the pure Tiebout case.[2]

The present paper is designed to explore this question, evaluating the welfare effect of fiscal decentralization in a Tiebout-style economy experiencing tax competition. This exploration is noteworthy because it links two vast literatures that have previously been unconnected. The analysis relies on numerical simulation, and the results show that decentralization is desirable in some circumstances and undesirable in others. While general results would be preferable, the use of numerical methods is unavoidable given the impossibility of deriving analytically the sign of the welfare differential between the centralized and decentralized cases.[3]

A key factor affecting the outcome is the dispersion of consumer preferences for public goods. With identical preferences (zero dispersion), fiscal decentralization is undesirable because Tiebout benefits are absent while the capital-tax distortion is triggered. While greater preference dispersion increases the benefits from demand articulation, favoring decentralization, the simulations show that greater dispersion also amplifies the distortion caused by the capital tax, complicating the overall impact. However, because Tiebout benefits rise faster than the distortion as preference dispersion increases, the welfare impact of decentralization eventually becomes positive, provided that the initial distortion is not too large.

The size of that distortion is affected by the degree of curvature of the production function, which determines the magnitude of capital flight in response to a tax increase. If this curvature is high, then the distortion is limited, and fiscal decentralization becomes desirable when preference dispersion is sufficiently great. Conversely, when the production function's curvature is low, the tax distortion is large and Tiebout benefits can never offset it. Decentralization then reduces welfare regardless of the degree of preference dispersion.

For a given dispersion in preferences, the level of public-good demand also matters. The simulations suggest that, by moderating the capital-tax burden, low demand limits the extent of the tax distortion, strengthening the case for fiscal decentralization. A fourth relevant factor is the nature of interaction between subnational governments, which can be perfectly competitive or strategic. The results show that by softening the tax distortion, strategic behavior favors decentralization.

Before proceeding to the analysis, it should be noted that this paper is not the first to recognize potential disadvantages from fiscal decentralization. Oates (1972) argues that, by reducing jurisdiction sizes, decentralization could require a sacrifice of economies of scale in the production of public goods. Although he does not provide an explicit analysis of the resulting trade-off, Alesina and Spoalore (1997) consider a similar problem, where a continuum of consumers must be divided into jurisdictions, each of which entails a fixed cost. They show the optimal number of jurisdictions falls as this cost rises, and that the number increases as preference dispersion grows. Oates (1972) also identifies the failure to internalize public-good spillovers across jurisdictions as a cost of decentralization. Besley and Coate (2000) provide a formal treatment of the induced trade-off, showing that decentralization is desirable only if the extent of spillovers is sufficiently small, with the critical value depending on the dispersion of preferences.[4]

Similar trade-offs emerge in the choice between centralized and decentralized income redistribution. Pauly (1973) argues that decentralized redistribution may be desirable because of differences across jurisdictions in the extent of altruism. But, along with Brown and Oates (1987), he recognizes that mobility of the poor in response to generous transfers may dampen the incentive to redistribute locally, creating a trade-off similar to the one induced by tax competition (see also Wildasin, 1991). When the goal of redistribution is risk sharing in the face of income uncertainty, a different trade-off arises. Centralized redistribution helps smooth regional income shocks, but the policy cannot be tailored to suit the degree of local altruism (see Persson and Tabellini, 1996a,b; Lee, 1998).[5]

The present paper complements all of this earlier work on decentralization by focusing on a different trade-off, that emerging from losses due to tax competition. The plan of the paper is as follows. Section 2 develops the analytical model on which the simulations are based. The model draws on the previous analysis of Brueckner (2000), which showed how Tiebout sorting may occur in an economy with capital taxation and characterized the resulting equilibrium. Section 3 presents the simulation results, which are based on a simple model with two consumer types and tractable forms for utility and production functions. Section 4 offers conclusions. For concreteness, the analysis views subnational jurisdictions as local governments, usually referring to these entities as "communities."

2. The Analytical Model

2.1. The General Framework

The model incorporates many of the elements of the standard tax-competition framework, which are reviewed in the ensuing discussion. Competitive firms in each community produce a numeraire private good using the common, constant-returns production function $F(K_i, N_i)$, where K_i gives the capital input in community i and N_i is the labor input. Each community resident inelastically supplies one unit of labor, so that N_i equals the community population. A tax per unit of capital is levied in each community, with t_i denoting community i's tax rate. Letting ρ denote capital's net-of-tax return, $\rho + t_i$ gives its after-tax cost in community i. Private-good producers equate capital's marginal product to this cost, satisfying $F_K(K_i, N_i) = \rho + t_i$. Letting $f(k_i) \equiv F(k_i, 1)$ denote the intensive form of the production function, which gives output per worker as a function of capital per worker k_i, this first-order condition can be rewritten as

$$f'(k_i) = \rho + t_i. \tag{1}$$

The community's wage, denoted w_i, then satisfies

$$w_i = f(k_i) - k_i f'(k_i). \tag{2}$$

If individual communities are small relative to the economy, then they behave competitively, viewing capital's net-of-tax return as unaffected by their fiscal decisions. In this case, ρ is viewed as parametric. Equations (1) and (2) then determine k_i and w_i as functions of t_i, and differentiation of (1) yields $\partial k_i/\partial t_i = 1/f''(k_i) < 0$, indicating that capital moves out of the community in response to a higher tax rate.

As in the standard model, the public good z is a publicly-produced private good with unitary production cost. Since cost per capita is then equal to z_i in community i, the public-sector budget constraint is written

$$z_i = t_i k_i, \tag{3}$$

where $t_i k_i$ gives tax revenue per capita.

Private-good consumption is equal to the consumer's wage income plus income from capital. The ownership of the economy's fixed stock of capital, denoted $\bar{K}$, is equally shared among the population, with individual capital endowments given by $\bar{k} \equiv \bar{K}/\bar{N}$, where $\bar{N}$ is the economy's total population. Income from capital ownership is then $\rho\bar{k}$ for each consumer type, and adding wage income, private-good consumption for an individual living in community i is

$$x_i = w_i + \rho\bar{k}. \tag{4}$$

Suppose that the economy consists of I distinct taste groups, each with a different utility function defined over private and public consumption. In addition, suppose that the economy is fiscally decentralized and that Tiebout sorting occurs, with the groups separating into homogeneous communities (see below for further discussion). Then, adopting the convention that taste group i lives in community i, the (well-behaved) preferences of its residents can be written $u_i(x_i, z_i)$.

The community maximizes this utility function subject to the various constraints imposed by the model. Eliminating w_i in (4) using (2), and substituting (3), the objective function is then $u_i(f(k_i) - k_i f'(k_i) + \rho\bar{k}, t_i k_i)$. This function is maximized by choice of t_i, taking into account the inverse association between k_i and t_i from above. The first-order condition for this problem is

$$\frac{u_{iz}}{u_{ix}} = \frac{1}{1 + t_i/k_i f''(k_i)}. \tag{5}$$

where the x and z subscripts denote partial derivatives. This standard condition reflects the distortion caused by capital taxation. Rather than equalling the unitary marginal cost of the public good, the MRS is set equal to an expression that exceeds unity. Thus, capital flight in reponse to higher taxes raises the perceived cost of public funds. A different first-order condition applies when communities are large relative to the economy and thus behave strategically (this case is discussed below).

The final equilibrium condition equates the economy's capital usage to the fixed capital stock. Letting η_i denote the fraction of the population residing in community i (equal to taste group i's population share), this condition can be written[6]

$$\sum_{i=1}^{I} \eta_i k_i = \bar{k}. \tag{6}$$

The $2I + 1$ equations consisting of (1), (5) and (6) determine equilibrium values for t_i, k_i and ρ, $i = 1, \ldots, I$, and w_i, z_i, and x_i are then recovered from (2), (3) and (4).

Although, for the purposes of the present analysis, Tiebout sorting is imposed exogenously, Brueckner (2000) offers a model showing how this outcome can emerge in the equilibrium of a heterogeneous economy that relies on capital taxation. Following the approach of the modern Tiebout literature, communities in Brueckner's model are organized by competitive, profit-maximizing developers who levy a capital tax and provide public goods. As in Berglas and Pines (1980) and Scotchmer and Wooders (1986), developers maximize profit subject to a parametric "wage function," which relates the wage in the community to its public-good level. Consumers also optimize subject to the wage function, and markets clear when the communities created by developers (which offer particular w's and z's) match the ones demanded by consumers. In addition, a zero-profit condition for developers must hold. The resulting equilibrium has Tiebout sorting, with consumers self-selecting into homogeneous communities, and it achieves maximal consumer utilities subject to the resource constraints of the model. Therefore, although Tiebout sorting is exogenous in the present analysis, this assumption is defensible given that sorting can be generated as an equilibrium outcome in a decentralized economy with a somewhat richer institutional structure.[7]

As shown by Brueckner (2000), the resulting equilibrium has some striking features not found in tax-competition models with homogeneous consumers. One important feature is a skewed allocation of the stock of capital, which is concentrated in communities inhabited by low public-good demanders. This skewness arises because high-demand communities levy high tax rates in pursuit of high z's, leading to a flight of capital toward low-tax, low-demand jurisdictions. Although high-demand communities secure high z's despite the shrinkage of their tax bases, the lost capital keeps wages low. Low-demand communities, by contrast, enjoy high wages.

The income effects generated by these wage impacts may overturn the usual result on underprovision of public goods, which is familiar from the standard tax-competition model. The benchmark for gauging underprovision is the pure Tiebout case with head-tax finance and an undistorted allocation of capital. Relative to this case, Brueckner (2000) shows that public goods are underprovided in high-demand communities, a consequence of the negative income effect from lost capital combined with the MRS distortion seen in (5). While this conclusion mirrors the usual result, the MRS distortion in low-demand communities is reversed by the positive income effect of extra capital. As a result, the public good could be under- or overprovided in these communities.[8]

The goal of the analysis is to judge whether welfare is higher in this decentralized equilibrium than under centralized provision of the public good. In the centralized case, a national capital tax is levied at a uniform rate t, and a uniform public-good level z is provided to all consumers. With a uniform tax, capital's net-of-tax return is equalized across communities only if capital per worker is the same everywhere, being equal to $\bar{k}$ in each community (see (1)). With identical k values, wages are then equalized across communities, with the common w equal to $f(\bar{k}) - \bar{k}f'(\bar{k})$ (see (2)). Since public-good levels are uniform, wage equalization implies that utility is invariant across communities for members of any given taste group. The implications of this pattern are discussed further below.

To derive the common consumer budget constraint, (1)–(4) are combined to yield $x = w + \rho\bar{k} = f(\bar{k}) - \bar{k}f'(\bar{k}) + (f'(\bar{k}) - t)\bar{k} = f(\bar{k}) - z$, or $x + z = f(\bar{k})$. Note that because workers earn capital income as well as wages, their total income equals the average product $f(\bar{k})$. Moreover, with a consumption outlay equal to $x + z$, payment for the public good is effectively in the form of a head tax. Therefore, as noted above, capital taxation at the national level is equivalent to a head-tax regime.

With preference diversity in the population, a public decision rule is required to determine the level of z in the centralized case. Several alternative rules are used in the simulation analysis. The main results are derived by assuming that the public good is chosen as if by a planner, with the Samuelson condition satisfied. An alternative rule allows one of the taste groups to be decisive in the choice of z.

Two observations regarding the centralized equilibrium are in order. First, in contrast to the decentralized case, where Tiebout sorting puts each taste group into its own community, the community structure in the centralized case is indeterminate. To see this conclusion, note that the model implicitly assumes that the economy contains many potential community "sites," where people can gather to produce and consume. Because land is suppressed, these sites can be viewed as dimensionless. For Tiebout sorting to occur, the number of such sites must be at least as large as the number of taste groups, and the various sites must be able to accommodate the individual taste-group populations.[9] By contrast, with uniform wages and public-good levels, community choice in the centralized case is a matter of indifference to each individual. Moreover, because of the constant-returns property of the model, the sizes of communities are also undetermined. The entire population could be concentrated in one large community (if such a site were available), or people could be scattered in many small communities that could exhibit a variety of mixing patterns. This discussion shows that, under the maintained assumptions, communities in the centralized case become irrelevant.[10] While unrealistic, this conclusion follows directly from the simplifying assumptions of the model.

A second observation is that the analysis would be unaffected if the central and subnational governments had access to different, rather than identical, tax instruments. In particular, if the central government could use head taxes instead of the capital tax, then exactly the same centralized equilibrium would emerge, an obvious consequence of the equivalence of the two taxes at the national level. In either case, the key element is that centralized public spending is financed by a nondistortionary tax.

2.2. Simulation Assumptions

As explained above, gauging the welfare effect of fiscal decentralization requires numerical simulation. This section explains the functional-form assumptions used in the simulations.

First, the economy contains two, equal-size taste groups, a high-demand group denoted h, and a low-demand group denoted l. The groups have quasi-linear preferences of the form $x_i + \alpha_i v(z_i),\ i = h, l$, where $\alpha_h > \alpha_l$ and v is increasing and strictly concave. In the simulations, v equals the natural log function. In addition, the α coefficients are parameterized as $\alpha_h = \theta + \delta$ and $\alpha_l = \theta - \delta$, where θ captures the strength of demand for z and δ measures the extent of preference dispersion between the high and low demanders. Thus, preferences for the two groups can be written

$$u_h = x_h + (\theta + \delta)\log(z_h) \tag{7}$$

$$u_l = x_l + (\theta - \delta)\log(z_l) \tag{8}$$

It should be noted that, because utility is measured in units of x for both groups, social welfare is naturally measured by total utility, or equivalently, by mean utility. This mean utility value is denoted below by $\bar{u}$.

The intensive production function $f(k)$ is assumed to take the quadratic form $\gamma k - \beta k^2/2$, yielding $f'(k) = \gamma - \beta k$ (only the positive range of f' is relevant). The primitive production function is then $F(K, L) = \gamma K - \beta K^2/2L$, which is well behaved over its increasing range. Brueckner (2000) shows that the model's second-order conditions are fulfilled when $f''' \leq 0$, an equality that is satisfied in the quadratic case. By contrast, when F takes a more-familiar form such as Cobb-Douglas, then $f''' > 0$ holds and these conditions may be violated. In addition, the quadratic form for f reliably generates solutions to the equilibrium conditions (solutions usually fail under other functional forms).

As explained in the introduction, the curvature of the production function affects the magnitude of the distortion generated by capital taxation, which in turn affects the desirability of fiscal decentralization. The curvature of f, as measured by f'', is equal to β in the quadratic case. Recalling that $\partial k_i/\partial t_i = 1/f'' = -1/\beta$, it follows that capital flight in response to a higher t_i is larger (making the community more reluctant to raise taxes) the smaller is β. Thus, the expectation is that fiscal decentralization becomes less desirable as β decreases.

Using the above assumptions, it is easy to derive the simultaneous nonlinear equations that determine the equilibrium with fiscal decentralization. The first step is to solve the condition $f'(k_i) = \rho + t_i$ from (1) for k_i. Using the linear form for f', the solution yields $k_i = (\gamma - t_i - \rho)/\beta$. This solution is then substituted into $z_i = t_i k_i$ from (3) to yield a quadratic equation in t_i, conditional on z_i. Since each community must operate on the upward sloping portion of its Laffer curve, the smallest root of this equation is relevant. The root is given by

$$t_i = \frac{(\gamma - \rho) - [(\gamma - \rho)^2 - 4\beta z_i]^{1/2}}{2}, \quad i = h, l. \tag{9}$$

With semi-log preferences, the MRS expressions on the LHS of (5) are given by α_i/z_i. Substituting $f'' = -\beta$ along with the above solution for k_i on the RHS of (5), the first-order conditions for the two groups can be written

$$\frac{\theta + \delta}{z_h} = \frac{1}{1 - t_h/(\gamma - t_h - \rho)} \tag{10}$$

$$\frac{\theta - \delta}{z_l} = \frac{1}{1 - t_l/(\gamma - t_l - \rho)}. \tag{11}$$

Finally, substituting the k_i solutions into (6) and noting $\eta_h = \eta_l = 1/2$, the adding-up condition for capital reduces to

$$2 - 2\rho - t_h - t_l = 2\beta\bar{k}. \tag{12}$$

Equations (9)–(12) yield solutions for $t_h,\ t_l,\ z_h,\ z_l$, and ρ, and the remaining unknowns can be recovered by substitution in the other equations of the model.[11]

The centralized equilibrium is more easily characterized. Under one approach, the common public-good level is chosen according to the Samuelson condition, which equates the mean MRS to the good's per capita cost. The mean MRS is given by $.5(\theta + \delta)/z + .5(\theta - \delta)/z = \theta/z$, which is then equated to the unitary cost of z. Alternatively, when one group is decisive in the choice of z, the individual MRS is set equal to unity.

Finally, with only two taste groups (and hence two communities), the assumption of competitive community behavior, with ρ viewed as parametric, may seem inappropriate. One response is to assume that even though communities are small in number, they nevertheless ignore the effect of their decisions on ρ. More appropriately, it could be assumed that, rather than being concentrated in a single community, members of each taste group are spread among a large number of smaller, homogeneous communities, making competitive behavior plausible. Because community size is immaterial in the model, these two approaches are equivalent.

3. Simulation Results

In all of the simulations, the stock of capital per worker ($\bar{k}$) is fixed at unity, and the production function parameter γ, which gives the intercept of $f'(\bar{k})$, is fixed at 100. Changes in these parameter values have no effect on the qualitative properties of the simulation results.

The first and second sets of results are designed to show the roles of preference dispersion and the curvature of the production function in determining the welfare effect of fiscal decentralization. In the first set of results, reported in Table 1, β is set at 50, generating a high curvature for f, and the preference parameter θ is set at 20, a relatively high value. Then, the dispersion parameter δ is increased in steps from zero up to 19, and the effects of fiscal decentralization are computed for each case. The second second set of results, reported in Table 2, shows a low curvature case, with β reduced to 5. The effects of decentralization are again computed under the same variation in preference parameters. The results in both Tables assume that, under fiscal centralization, the public good is chosen to satisfy the Samuelson condition. The effects of alternate decision rules are discussed below.

Table 1. High-demand, high-curvature case ($\theta = 20,\ \beta = 50$).

		$\delta = 0$	$\delta = 6$	$\delta = 12$	$\delta = 19$
Centralized case	z^{cent}	20	20	20	20
	x^{cent}	55	55	55	55
	$\bar{u}^{\text{cent}}$	114.92	114.92	114.92	114.92
Decentralized case	z_h	14.29	16.25	17.21	17.30
	z_l	14.29	11.25	7.12	0.99
	x_h	60.71	57.66	55.53	54.18
	x_l	60.71	64.60	69.21	75.30
	MRS_h	1.40	1.60	1.86	2.25
	MRS_l	1.40	1.25	1.12	1.01
	$\bar{u}$	113.90	114.32	115.75	120.33
Utility differential	$\frac{\bar{u}-\bar{u}^{\text{cent}}}{\bar{u}^{\text{cent}}}$	−0.88%	−0.52%	0.72%	4.71%
Taxes, capital allocation	t_h	14.29	17.46	19.94	21.94
	t_l	14.29	10.52	6.26	0.81
	k_h	1.00	0.93	0.86	0.79
	k_l	1.00	1.07	1.14	1.21
	ρ	35.71	36.01	36.90	38.62
Output differential	$\frac{y-y^{\text{cent}}}{y^{\text{cent}}}$	0%	−0.16%	−0.62%	−1.5%
Tiebout benchmark case	z_h^{tieb}	20	26	32	39
	z_l^{tieb}	20	14	8	1
	$\bar{u}^{\text{tieb}}$	114.92	115.83	118.77	126.44
Utility differentials	$\frac{\bar{u}^{\text{tieb}}-\bar{u}^{\text{cent}}}{\bar{u}^{\text{cent}}}$	0%	0.80%	3.35%	10.03%
	$\frac{\bar{u}-\bar{u}^{\text{tieb}}}{\bar{u}^{\text{tieb}}}$	−0.88%	−1.31%	−2.54%	−4.84%

3.1. The High-Demand, High-Curvature Case

Turning to Table 1, the first column shows the zero-dispersion case, where $\delta = 0$ and preferences are identical. The first three entries show the values for z, x, and mean utility $\bar{u}$ under fiscal centralization (these values are indicated by the "cent" superscript). Note that when preferences are identical, mean utility equals the common individual utility level. The next group of entries shows the solutions for the key variables under fiscal decentralization. Note that without preference dispersion, there is no difference between the type-h and type-l communities, which then have the same solution values.

Comparing the centralized and decentralized solutions when $\delta = 0$, the familiar results of the standard tax-competition model are evident. The centralized equilibrium, which is efficient given identical preferences, has a larger public-good level than the decentralized equilibrium (20 vs. 14.29) and lower x consumption (55 vs. 60.71). This difference is caused by the capital-tax distortion, as can be seen in the MRS values shown in the table. Under decentralization, the common MRS is equal to 1.4, far exceeding the unitary marginal cost of z. This discrepancy, which arises because captal flight raises the perceived cost of public funds, leads to underprovision of z and excessive consumption of x.

Reflecting the impact of the capital-tax distortion, mean utility under fiscal decentralization (denoted by the unsuperscripted $\bar{u}$) falls short of the value reached under centralization (113.90 vs. 114.92). The difference corresponds to a welfare reduction from decentralization of -0.88% relative to the centralized case. This welfare loss, while not inconsequential in magnitude, is relatively small because the high curvature of the production limits the size of the capital-tax distortion.

The next entries in column 1 show the level of taxes and the capital allocation. The k and t values are the same across communities, with capital per worker equal to the unitary $\bar{k}$ value and the common tax rates equal to 14.29, which is the value of the common z. Capital's net-of-tax return ρ equals 35.71. The subsequent entry gives the reduction in the economy's per capita output (denoted y) as a result of fiscal decentralization. Because capital is symmetrically distributed in the absence of preference dispersion, output per capita is unaffected by decentralization, as seen in the table.

The remaining entries in column 1 provide a benchmark for evaluating the shift from centralization to decentralization. These entries pertain to the Tiebout case, where consumers are sorted into homogeneous communities but where the public good is financed by head taxes rather than a capital tax. Since the Tiebout case is identical to the centralized case when preferences are the same, the z^{tieb} values match the centralized value of 20, as does the mean utility level.

Using the Tiebout case as a benchmark, the last two entries decompose the change in mean utility between the centralized and decentralized cases into two components. The first is the percentage utility gain in moving from the centralized to the Tiebout case, which captures the pure benefits from Tiebout sorting, uncontaminated by the capital-tax distortion. Since the centralized and Tiebout cases coincide when preferences are identical, this gain is zero in column 1. The second component is the percentage utility loss in moving from the Tiebout case to the decentralized case with capital taxation. This loss captures the welfare reduction from the capital-tax distortion under decentralization, while netting out the gains from Tiebout sorting. Since the first component is zero in column 1, this welfare loss equals the 0.88% overall loss from decentralization.

To put the parameter assumptions underlying these results in better perspective, consider first the implied value of the elasticity of capital with respect to the gross rate of return, $(\partial k_i/\partial(\rho + t_i))(\rho + t_i)/k_i = -(1/\beta)(\rho + t_i)/k_i$. Since $\beta = 50$, this elasiticity equals $-(14.29 + 35.71)/50 = -1.00$ at the equilibrium shown in column 1. Also, as can be seen from the results, the θ value of 20 yields a reasonable public-good budget share of $20/(20 + 55) = 0.27$ under the centralized solution.

Turning to the solutions with preference dispersion, consider the results in column 2, where $\delta = 6$. Note first that since the increase in δ has no effect on mean preferences, which enter the Samuelson condition, the results for the centralized case are the same as in column 1. However, reflecting preference dispersion, the public-good levels in type-h and type-l communities diverge, with z_h rising to 16.25 and z_l falling to 11.25. Consumption levels for x diverge in the opposite directions, with x_h falling and x_l rising relative to column 1. The increase in z in type-h communities is financed through a higher t_h, which rises to 17.46, while t_l falls to 10.52. The resulting tax-rate differential skews the allocation of capital across communities, with k_h falling to 0.93 and k_l rising to 1.07. This skewed capital allocation reduces the economy's output per capita y by 0.16%. Given the reallocation of capital and the changes in tax rates, capital's net-of-tax return rises to 36.01.[12]

As in column 1, the welfare effect of fiscal decentralization is still negative, with decentralization reducing mean utility by 0.52%. To decompose this change, observe that the gain from Tiebout sorting raises welfare by 0.80%, but that the loss from the capital-tax distortion reduces welfare by 1.31%. The bad side of fiscal decentralization thus dominates the outcome, with the loss from the tax distortion eclipsing the Tiebout gain. Therefore, despite the heterogeneity of preferences, decentralization reduces welfare.[13]

Another feature of the decentralized solution is underprovision of public goods in both communities. Both z_h and z_l fall short of the efficient Tiebout z levels, which equal 26 and 14 for the two groups. This outcome, which need not hold in general, is ensured by the assumption of quasi-linear preferences. Because income effects on z are absent under such preferences, the possibility of overprovision for the low-demand group, as discussed above, is ruled out. With quasi-linearity, an MRS above unity ensures underprovision of z in type-l communities even though their income is enhanced by a capital inflow.

The remaining columns of Table 1 show the effects of further dispersion in preferences. When δ increases to 12, the values of z, t, k and x diverge further between the type-h and type-l communities. The per capita output loss grows to 0.62%, and ρ rises further. However, fiscal decentralization now leads to a slight increase in welfare, with mean utility rising by 0.72% between the centralized and decentralized cases. The reason is that the good side of decentralization now wins, with the welfare gain from Tiebout sorting, equal to 3.35%, dominating the 2.54% loss from the tax distortion.

Further divergence in preferences solidifies this outcome. When $\delta = 19$, the spread between the type-h and type-l solutions is wider yet, and the output loss from decentralization is greater (at 1.5%). Moreover, fiscal decentralization now generates a solid 4.71% welfare gain, a consequence of the greater dominance of Tiebout benefits, which yield a 10.03% gain vs. a 4.84% loss from the tax distortion. Note, however, that in this most-favorable case, fiscal decentralization generates only about half the welfare gain that would be realized under a nondistortionary head-tax regime. Note also the severe distortion in public-good consumption in the type-h community, where the z_h level of 17.3 is less than half of the efficient level of 39.

As seen in Table 1, the verdict on fiscal decentralization changes from negative to positive as preference dispersion grows. The reason for this outcome can be seen by scanning across the last two rows of the Table. The numbers show that, while the gain from Tiebout sorting and the loss from the capital-tax distortion both increase as preferences diverge, the gain increases faster, overtaking the loss when preference dispersion is high.

Although the increase in the Tiebout gain as δ rises comes as no surprise, the rising loss from the capital-tax distortion is worthy of comment. The increasing skewness of the capital allocation, which raises the output loss as δ increases, is one reason for this pattern. But a more important reason is the consumption distortion caused by the capital tax, which is magnified as preferences diverge. To see why this happens, observe that with t_h/k_h rising and t_l/k_l falling as δ increases (and f'' constant), the wedge in (5) between the MRS and the unitary cost of z rises in type-h communities and falls in type-l communities, a pattern that can be seen in Table 1. But since the rise in δ puts more relative weight on type-h preferences in the computation of mean utility, the escalating type-h distortion dominates the declining type-l distortion as preferences diverge, raising the overall distortion.[14]

This pattern is intimately connected to the chosen parameterization of preferences and the adoption of a utilitarian welfare measure. Moreover, the fact that the overall distortion increases more slowly than the Tiebout gain as preferences diverge is also tied to these assumptions. Under any set of assumptions, however, the degree of preference dispersion will play a key role in determining the desirability of fiscal decentralization, a consequence of the intimate link between Tiebout gains and the extent of dispersion. The capital-tax distortion will tend to offset these gains, although the particular pattern by which this occurs could be different under another parameterization.

3.2. The High-Demand, Low-Curvature Case

As explained above, a reduction in the curvature of the production function may weaken the case for fiscal decentralization by amplifying the capital-tax distortion. This possibility is explored in Table 2, which presents simulation results for a low-curvature case, where $\beta = 5$, using the previous values for the preference parameters. The first column again shows the zero-dispersion solution, where only the tax distortion is operative. As can be seen, the distortion is much more serious than in Table 1. The common z levels, which equal 4, are only one-fifth as large as the efficient levels of 20. The mean utility reduction from decentralization, which was less than 1% in Table 1, is now 11.78%. Note that lower curvature greatly increases capital's elasticity with respect to the gross rate of return, which now equals $-(91 + 4)/\beta = -19$. However, the public-good budget share, equal to 0.21, is similar to the value in the high-curvature case.

As preference dispersion increases, some of the patterns seen in Table 1 are again evident. Output per capita in the economy decreases as capital shifts toward type-l communities, although the decline is very slight given the low curvature of the production function. While

Table 2. High-demand, low-curvature case ($\theta = 20,\ \beta = 5$).

		$\delta = 0$	$\delta = 6$	$\delta = 12$	$\delta = 19$
Centralized case	z^{cent}	20	20	20	20
	x^{cent}	77.50	77.50	77.50	77.50
	$\bar{u}^{\text{cent}}$	137.42	137.42	137.42	137.42
Decentralized case	z_h	4.00	3.95	3.67	2.49
	z_l	4.00	3.87	3.41	0.89
	x_h	93.50	93.41	93.49	94.27
	x_l	93.50	93.76	94.39	96.98
	MRS_h	5.00	6.58	8.73	15.68
	MRS_l	5.00	3.61	2.35	1.12
	$\bar{u}$	121.23	120.92	119.63	113.33
Utility differential	$\frac{\bar{u}-\bar{u}^{\text{cent}}}{\bar{u}^{\text{cent}}}$	−11.78%	−12.00%	−12.94%	−17.53%
Taxes, capital allocation	t_h	4.00	4.09	4.03	3.41
	t_l	4.00	3.74	3.13	0.70
	k_h	1.00	0.97	0.91	0.73
	k_l	1.00	1.03	1.09	1.27
	ρ	91.00	91.08	91.42	92.94
Output differential	$\frac{y - y^{\text{cent}}}{y^{\text{cent}}}$	0%	−0.0031%	−0.021%	−0.19%
Tiebout benchmark case	z_h^{tieb}	20	26	32	39
	z_l^{tieb}	20	14	8	1
	$\bar{u}^{\text{tieb}}$	137.42	138.33	141.27	148.94
Utility differentials	$\frac{\bar{u}^{\text{tieb}} - \bar{u}^{\text{cent}}}{\bar{u}^{\text{cent}}}$	0%	0.67%	2.81%	8.39%
	$\frac{\bar{u} - \bar{u}^{\text{tieb}}}{\bar{u}^{\text{tieb}}}$	−11.78%	−12.58%	−15.32%	−23.91%

z_l falls and x_l rises as dispersion grows, following the pattern of Table 1, consumption levels in type-h communities now mimic this pattern (with z_h falling and x_h rising) rather than showing the opposite trends. The reason is that the growing tax distortion overwhelms the rising type-h demand for z, causing public consumption to fall rather than increase as preference dispersion grows. Given the decline in z_h, the tax rate t_h falls eventually (after an initial increase) as preferences diverge.

The notable feature of Table 2 is that, in contrast to Table 1, the welfare effect of fiscal decentralization remains negative as preferences diverge. In fact, decentralization is even less desirable when $\delta = 19$ than in the zero-dispersion case, with the percentage reduction in mean utility rising to 17.53%. The reason for this pattern can be seen in the last two rows of the Table. As before, the Tiebout gain from decentralization increases rapidly as preferences diverge, rising to 8.39% from its initial level of zero once δ has reached 19. As before, the loss from the tax distortion rises with δ, and the rate of increase is again relatively slow, with the percentage loss only doubling as preferences diverge. However, because of the large magnitude of the loss, the Tiebout gain can never overtake it despite the gain's faster rate of increase. Indeed, the gap between the loss and the gain widens as δ rises.

The implication of Table 2 is that the bad side of fiscal decentralization can overwhelm the good side under certain conditions. Under these conditions, the widely-recognized lessons of the Tiebout tradition are invalid, with economic efficiency requiring *centralized* provision of public goods rather than fiscal decentralization. It is difficult, of course, to know whether the gains or losses from decentralization dominate in any particular real world context. However, when the tax bases of subnational governments are mobile, as in the case of capital taxation, fiscal decentralization may have a significant downside that must be recognized.

3.3. The Effect of a Political Decision Rule

As an addendum to the discussion of Tables 1 and 2, it is useful to consider the effect of replacing the Samuelson condition with a political decision rule in the centralized case. Since a voting equilibrium is indeterminate with equal-size taste groups, suppose that the political outcome is determined by chance, with type-h and type-l voters each having a 50% chance of setting the public-good level. Expected utility for a type-h individual is then $f(\bar{k}) - \theta + (\theta + \delta)[\log(\theta + \delta) + \log(\theta - \delta)]/2$. Given the concavity of the log function, this expression is smaller than $f(\bar{k}) - \theta + (\theta + \delta)\log(\theta)$, the type-$h$ utility reached by following the Samuelson condition. Since an analogous conclusion holds for the l-types, mean utility in the centralized case is lower under the political decision rule, making decentralization more attractive.

This conclusion is validated by repeating the simulations from Tables 1 and 2. For the high-curvature case of Table 1, decentralization is now welfare-improving for each of the positive δ values. The gain in mean utility ranges from 0.30% when $\delta = 6$ to 31.31% when $\delta = 19$. However, decentralization is still undesirable in the low-curvature case. Under the assumptions of Table 2, mean utility declines with decentralization for each δ value, with the utility loss equal to 11.39% when $\delta = 6$, 10.02% when $\delta = 12$, and 0.70% when $\delta = 19$. Note that the latter outcome is much better than in Table 2, where the welfare loss in the high-dispersion case is over 17%.

These results reinforce the cautionary conclusion reached above. The results show that, even when centralized provision of public goods makes use of an inefficient decision rule, fiscal decentralization may still be welfare-reducing.

3.4. The Effect of Lower Demand

Table 3 explores another area of the parameter space by considering the effect of a lower level of demand for the public good. The high-curvature assumption is reinstated, with $\beta = 50$, but the parameter θ, which determines the level of demand for z, is set at values of 10 and 5. In each case, the effect of preference dispersion is again explored, assuming that centralized choice follows the Samuelson condition.

The first two columns of Table 3 show solutions for the $\theta = 10$ case. As can be seen, fiscal decentralization becomes desirable once a moderate degree of preference dispersion

Table 3. Lower-demand, high-curvature cases ($\beta = 50$).

		$\theta = 10$ $\delta = 3$	$\theta = 10$ $\delta = 9$	$\theta = 5$ $\delta = 1$	$\theta = 5$ $\delta = 4$
Centralized case	z^{cent}	10	10	5	5
	x^{cent}	65	65	70	70
	$\bar{u}^{\text{cent}}$	88.03	88.03	78.05	78.05
Decentralized case	z_h	10.11	12.58	5.34	7.45
	z_l	6.21	0.98	3.71	0.98
	x_h	64.45	60.89	69.57	67.11
	x_l	69.12	74.60	71.36	74.21
	MRS_h	1.29	1.51	1.12	1.21
	MRS_l	1.13	1.02	1.08	1.02
	$\bar{u}$	88.21	91.79	78.11	79.69
Utility differential	$\frac{\bar{u} - \bar{u}^{\text{cent}}}{\bar{u}^{\text{cent}}}$	0.21%	4.28%	0.086%	2.10%
Taxes, capital allocation	t_h	10.60	14.58	5.43	8.02
	t_l	5.93	0.87	3.65	0.92
	k_h	0.95	0.86	0.98	0.93
	k_l	1.05	1.14	1.02	1.07
	ρ	41.73	42.28	45.46	45.53
Output differential	$\frac{y - y^{\text{cent}}}{y^{\text{cent}}}$	−0.073%	−0.63%	−0.011%	−0.17%
Tiebout benchmark case	z_h^{tieb}	13	19	6	9
	z_l^{tieb}	7	1	4	1
	$\bar{u}^{\text{tieb}}$	88.48	92.97	78.15	79.89
Utility differentials	$\frac{\bar{u}^{\text{tieb}} - \bar{u}^{\text{cent}}}{\bar{u}^{\text{cent}}}$	0.52%	5.62%	0.13%	2.36%
	$\frac{\bar{u} - \bar{u}^{\text{tieb}}}{\bar{u}^{\text{tieb}}}$	−0.30%	−1.27%	−0.042%	−0.25%

is reached, with decentralization leading to a 0.21% gain in mean utility when $\delta = 3$. In Table 1, by contrast, decentralization generates a welfare loss under the same degree of dispersion ($\delta = 6$; recall that the previous θ was twice as large). While the 4.28% welfare gain under maximal dispersion ($\delta = 9$) is similar in magnitude to that in Table 1 when $\delta = 19$, a notable difference is that this gain represents three-quarters, rather than half, of the Tiebout gain (which equals 5.62%).

The source of these positive results can be seen in the last line of Table 3, which shows relatively small losses from the capital-tax distortion. Evidently, by reducing required tax rates, a low level of public-good demand moderates the effect of the distortion, strengthening the case for fiscal decentralization. Of course, the tax distortion could be re-intensified by decreasing the curvature of the production function, so that negative conclusions like those in Table 2 could emerge even with low demand.

The effect of a further reduction in demand is shown in the last two columns of Table 3, where θ is set at 5. Now, fiscal decentralization is desirable with only a small degree of preference dispersion, with a slight utility gain of 0.086% emerging when $\delta = 1$. Moreover, with substantial dispersion ($\delta = 4$), decentralization captures nearly all of the Tiebout gain, a consequence of a very small loss from the tax distortion (0.25%).

3.5. The Effect of Strategic Behavior

So far, competitive behavior on the part of communities has been assumed. However, the implications of strategic community behavior have been a major focus of the tax-competition literature, and it is useful to explore the effect of such behavior in the present model. Under the second interpretation of the competitive case outlined above, where each taste group is divided into a large number homogeneous communities, moving to the strategic case would require gathering all the individuals of a given type into a single community. The result would be two homogeneous communities, one for each taste type, with each community recognizing its market power.[15]

In the strategic case, community i chooses its capital-tax rate to maximize utility, taking into account the impacts of its choice on both k_i and ρ. These impacts are found by totally differentiating (1) and (6), which yields $\partial k_i/\partial t_i = 1/[f''(k_h) + f''(k_l)] = -1/2\beta$ and $\partial \rho/\partial t_i = -1/2,\ i = k, l$, when f is quadratic. The fact that ρ declines as a community's tax rate rises means that less capital needs to relocate, relative to the competitive case, to equalize net-of-tax returns. This outcome is reflected in the smaller absolute value of $\partial k_i/\partial t_i$, which is only half as large as in the competitive case. With capital flight in response to higher taxes attentuated, the capital-tax distortion is softened.

With strategic behavior and a quadratic f, the first-order condition for choice of t_i is given by

$$\frac{u_{iz}}{u_{ix}} = \frac{1 - (k_i - \bar{k})/2k_i}{1 - t_i/2\beta k_i}. \tag{13}$$

As is well known, this condition yields a more complex message regarding underprovision of z than in the standard competitive case. If community i is a net exporter of capital (with $k_i < \bar{k}$), then the MRS in (13) exceeds unity, implying underprovision of z with quasi-linear preferences. However, the magnitude of the MRS is ambiguous for the capital-importing community, making overprovision a possible outcome.[16]

Table 4 shows the simulation results for the strategic case, using the same parameter assumptions as in Table 1. The results show that, by softening the tax distortion, strategic behavior strengthens the case for fiscal decentralization. Note first that, for the given values of δ, z_h and z_l are both larger than the corresponding magnitudes in Table 1, testifying to a softer distortion. This outcome is also reflected in the last row of the Table, which shows smaller welfare losses from the distortion than in Table 1. Since the Tiebout gains are the same as in Table 1, the overall welfare effect of decentralization is more favorable. The previous welfare loss for the $\delta = 6$ case turns into a 0.11% gain, and the gain for the $\delta = 19$ case is now larger, at 5.52%. Thus, it appears that the good side of fiscal decentralization has a better chance of dominating under strategic behavior.[17]

Observe also that the reduced reluctance to raise taxes ends up generating more capital relocation than in Table 1, with capital stocks diverging to $k_h = 0.73$ and $k_l = 1.27$ when

Table 4. Strategic high-demand, high-curvature case ($\theta = 20$, $\beta = 50$).

		$\delta = 6$	$\delta = 19$
Centralized case	z^{cent}	20	20
	x^{cent}	55	55
	$\bar{u}^{\text{cent}}$	114.92	114.92
Decentralized case	z_h	19.06	20.35
	z_l	13.01	1.11
	x_h	54.25	48.95
	x_l	63.27	75.95
	MRS_h	1.36	1.92
	MRS_l	1.08	0.90
	$\bar{u}$	115.04	121.25
Utility differential	$\frac{\bar{u} - \bar{u}^{\text{cent}}}{\bar{u}^{\text{cent}}}$	0.11%	5.52%
Taxes, capital allocation	t_h	20.96	27.87
	t_l	11.93	0.87
	k_h	0.91	0.73
	k_l	1.09	1.27
	ρ	33.56	35.63
Output differential	$\frac{y - y^{\text{cent}}}{y^{\text{cent}}}$	−0.27%	−2.43%
Tiebout benchmark case	z_h^{tieb}	26	39
	z_l^{tieb}	14	1
	$\bar{u}^{\text{tieb}}$	115.83	126.44
Utility differentials	$\frac{\bar{u}^{\text{tieb}} - \bar{u}^{\text{cent}}}{\bar{u}^{\text{cent}}}$	0.80%	10.03%
	$\frac{\bar{u} - \bar{u}^{\text{tieb}}}{\bar{u}^{\text{tieb}}}$	−0.68%	−4.10%

$\delta = 19$. The increased skewness of the capital allocation leads, in turn, to a larger output reduction than in Table 1, with output under decentralization lower by 2.43% when $\delta = 19$.

Finally, while z_h and z_l are underprovided when $\delta = 6$, the public good is *overprovided* in the type-l community when $\delta = 19$ (z_l is 1.11, when the efficient level is unity). Since the type-l community is the capital importer, this outcome is fully consistent with the theory.[18]

3.6. Tax Harmonization

It is well known that welfare in the standard tax competition model can be improved if communities agree to harmonize their tax rates, setting a rate that is uniform across jurisdictions. Consequently, it is interesting to explore the question of harmonization in the present model. With heterogeneity, imposition of a uniform tax rate would be undesirable, but partial harmonization in the form of a minimum rate could be welfare improving. To explore this issue, consider the case shown in the column 3 of Table 1, where $t_h = 19.94$

and $t_l = 6.26$, and suppose that the communities were to impose a minimum tax rate of 7. Under this restriction, z_h and z_l rise, respectively, to 17.35 and 7.90, appreciably reducing the extent of underprovision in the type-*l* community, and t_h falls slightly to 19.92. Mean utility rises slightly to 115.88, reflecting an improvement in utilities in both communities. Note that although the minimum tax rate does a good job of raising z_l, it has little effect on the extent of underprovision of z_h and on the misallocation of capital (the type-*h* community gains only 0.01 units of capital).

4. Conclusion

This paper has explored a question that lies at the intersection of two vast literatures. The goal has been to gauge whether the good side of fiscal decentralization, as emphasized by the Tiebout literature, dominates the bad side, as studied in the tax-competition literature. The results, which are derived by numerical simulation, show that either answer to this question is possible. Under favorable conditions, where the curvature of the production function and the dispersion of preferences are both high, the gains from Tiebout sorting are likely to outweigh the loss from the capital-tax distortion, so that the good side of fiscal decentralization dominates. If either of these conditions is absent, however, the bad side can win, making decentralization undesirable. When this happens, the lessons of the Tiebout tradition are overturned, with economic efficiency requiring centralized rather than decentralized provision of public goods.

Although the analysis is abstract, it has policy relevance. The reason is that fiscal decentralization, which is second nature to U.S. residents, is a current policy objective in many previously centralized countries around world. By highlighting the potential downside of fiscal decentralization, the analysis offers a cautionary message. It shows that when subnational governments must rely on a mobile tax base to raise revenue, decentralization has significant costs that may offset its benefits. Policy measures intended to circumvent these costs, such as tax exemption of the most-mobile subnational tax bases, would strengthen the case for fiscal decentralization.

A potentially interesting topic for future research concerns the question of the optimal *number* of communities in the decentralized case, an issue that has not been considered in the analysis. To understand this issue, start with the competitive case, where the high and low demanders are divided into many homogeneous communities, each of which has negligible market power. The question is then whether a reduction in the number of communities, which would move the economy from the competitive to the strategic case, is desirable. In the simulation results, the answer is affirmative: mean utility is higher in Table 4 than in Table 1 at the δ values that appear in both tables. This outcome recapitulates the results of Hoyt (1991b), who showed that consumer welfare rises in a homogeneous-consumer model as the number of communities falls, a consequence of softer competition for capital. Given the numerical results, this same conclusion appears to hold in a heterogeneous model, although a proof would require a more-general analysis.

It is conceivable that this consolidation force could even overturn the Tiebout structure of the model in a world with a larger number of taste types. In particular, if the gain from softer competition is large enough, then further consolidation of the population into partially mixed communities may be desirable. Such consolidation would proceed until the gains from softer competition balance the losses from the compromise on public-good provision in hetergeneous communities. An analysis of these issues might represent fertile ground for future research.

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Notes

1. The movement toward decentralization is a recent phenomenon even in advanced countries such as Japan and France. For discussion and evaluation of the worldwide trend toward decentralization, see Tanzi (1996), Litvack, Ahmad and Bird (1998) and Ter-Minassian (1997) (the last reference contains individual case studies for more than 20 countries).
2. Bucovetsky, Marchand and Pestieau (1998) analyze a tax competition model where the demand for public goods differs across communities. However, their goal is to characterize the design of an optimal federal grant system when the public-good demands are private information.
3. In common with much of the tax-competition literature, the analysis does not explain why the economy must rely on a distortionary capital tax to provide public goods. In other words, the existence of this tax is taken as given, with no explanation as to why a nondistortionary tax is not used instead. While a number of authors have explored motivations for capital taxation in the context of more-complex models (see Hoyt, 1991a; Henderson; 1994, 1995; Wilson, 1995, 1997), it can be argued that such a tax should be a component of any realistic inquiry into fiscal decentralization. This conclusion follows because, in countries with notable local autonomy (the U.S., Canada, the United Kingdom), substantial local revenue is raised by the property tax, which closely approximates the model's capital tax.
4. Besley and Coate's main interest lies elsewhere, however. They analyze a model where political forces lead the central government to allocate public goods unequally across jurisdictions. The choice between decentralization and centralization is then explored under several different political rules for determining the centralized outcome.
5. Ellingsen (1998) considers the choice between centralization and decentralization in a model where the public good is nonexcludable, with public consumption in the decentralized case equal to the *sum* of public-good levels across all jurisdictions.
6. To derive (6), note that the adding-up condition on capital can be written $\sum_{i=1}^{I} N_i k_i = \bar{K}$, where N_i is community i's population. Dividing by $\bar{N}$ yields (6).
7. For an analysis of sorting in a model where consumers are described by a continuum rather than a set of discrete types, see Epple and Romer (1991).
8. A different notion of efficiency in public-good provision makes efficiency conditional on the allocation of capital. Under this definition, public goods are underprovided as long as the MRS is greater than one, which indicates that utility could be raised by increasing z, holding a community's capital stock (and hence its budget constraint) fixed. See Brueckner (2000) for further discussion. In the ensuing simulation analysis, however, the difference between these two definitions is immaterial. The reason is that preferences are assumed to be quasi-linear, eliminating the income effect on z. As a result, if MRS > 1 holds in equilibrium, making z underprovided under the second definition, then this same inequality would hold at the given z value on either a higher or lower budget constraint, as would be generated by the uniform (as opposed to skewed) allocation of capital under a Tiebout head-tax regime. With MRS > 1 holding at the given z on the Tiebout budget constraint, it follows that a larger z would be chosen in the Tiebout case, yielding underprovision according to the first definition.

9. Land could be added to the model without consequence under special assumptions. Each consumer would occupy a fixed amount of residential land, and each community site would contain more than enough residential land to fully house any of the consumer taste groups. With the number of sites at least as large as the number of groups, the economy then has surplus land, generating a zero land rent. In this situation, the role of land can be ignored.
10. Note that with the public good no longer provided locally, there is no role for community developers in the centralized case.
11. Rearrangement shows that (9) and (10) give t_i as a decreasing function of $z_i,\ i = h, l$. Substituting these solutions on the LHS of (8), and noting that the RHS is increasing in z_i, it follows that (8) yields a unique solution for z_i, and thus a unique $t_i,\ i = h, l$.
12. Note that, because t and k values in the two communities diverge as δ increases, the tax elasticities of capital diverge as well, rising in the type-h community and falling in the type-l community.
13. In viewing these numbers, note that since the percentage loss uses a higher base than the Tiebout gain ($\bar{u}^{\text{tieb}}$ vs. $\bar{u}^{\text{cent}}$), the net percentage change of -0.52% is only approximately equal to the sum of the component percentages.
14. Even though consumption is distorted by the capital tax, the positive income effect in type-l communities can generate a welfare gain relative to the pure Tiebout case. The simulations show that such a gain indeed emerges for type-l consumers once preference dispersion becomes large enough. This finding is anticipated by the analysis of Brueckner (2000).
15. It should be noted that the literature has not analyzed the mechanism of Tiebout sorting in a world with strategic community behavior (there is no analog to the competitive analysis of Brueckner (2000)). As a result, the Tiebout-sorting assumption for the strategic model does not enjoy the same microfoundations as in the competitive case.
16. For the capital importer, the lower ρ caused by a higher t is beneficial, which increases the community's willingness to raise taxes.
17. While this claim is supported by the results, its generality is not clear.
18. It is interesting to ask whether, starting from the Tiebout case where communities levy head taxes, an incentive exists to impose a capital tax. Because capital is uniformly distributed under the head-tax regime, each community neither imports nor exports capital, which means that no community can gain by a tax-induced change in ρ. As a result, no incentive to levy a capital tax is present.

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