Theoretical issues in local public economics

An overview

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1. Introduction

This symposium addresses several issues concerning decision-making by independent governments in a system of regions. These regions are variously interpreted as countries or states and localities within countries. A major goal of the theoretical models presented here is to expand the forms of economic interactions that may occur between different regions. These interactions include monopolistic competition in product markets (Henderson and Abdel-Rahman), labor mobility and property taxation (Hoyt), imperfect labor mobility and voting (Brueckner and Joo), regional debt (Jensen and Toma), multiple tax instruments (Bucovetsky and Wilson), and tax competition with endogenous choices between strategic variables (Wildasin). Two other papers tackle imperfectly-understood problems in well-known models: Pines's analysis of the conditions for existence of a 'Tiebout equilibrium', and Wilson's analysis of the relation between regional welfare and regional size under tax competition. Finally, de Bartolome models the optimal design of intergovernmental grants when migration between communities cannot be directly controlled by the provider of these grants.

In this overview, we summarize and to some extent synthesize these papers in a way that draws out some important themes and places the papers within

the context of the existing literature. We first discuss five papers (those by Bucovetsky and Wilson, Jensen and Toma, Hoyt, Wildasin, and Wilson) which all focus on some aspect of tax competition. Section 3 discusses the remaining four papers.

2. Models of fiscal competition

Zodrow and Mieszkowski's (1986) tax competition model provides a useful starting point for our discussion. The Zodrow–Mieszkowski model contains two factors of production, an interregionally mobile factor called 'capital', and an immobile factor which may be thought of as land or labor. Labor mobility is ignored, but the results would not change if the model were amended in the manner suggested by Wilson (1985, sec. 6) to include mobile labor as a third factor. Each region finances local public good expenditures with a property tax, which is modeled as a tax on the capital income earned within the region's boundaries, i.e. a *source-based* tax on capital income. The region chooses its tax and expenditure policy to maximize the well-being of a representative resident. In doing so, it recognizes that a rise in the tax rate creates disincentives for capital investment within the region. For a system of many identical regions with a fixed total stock of capital, Zodrow and Mieszkowski show that the existence of these disincentives causes local governments to choose inefficiently low rates of property taxation. As a result, local public goods are underprovided. Similar conclusions are reached by Wilson (1986) in a model with a more complicated production structure.

The Zodrow–Mieszkowski model can be criticized for failing to explain the use of taxes on mobile capital, since it does not allow regions to use any other types of taxes to finance local public goods. The work of Gordon (1986) suggests that the absence of other taxes is of crucial importance. Unlike the Zodrow–Mieszkowski model, residents in his model make labor leisure decisions and savings decisions. The tax instruments available to regional governments are expanded to include not only a tax on the capital employed in a region, but also a tax on wage income and a tax on the worldwide capital income of the region's residents (a *residence-based* tax on capital income). Gordon demonstrates that regions choose not to use the source-based capital tax when the other two taxes are available, even though these other taxes are distortionary. This result can be understood by observing that the taxes on wage income and worldwide capital income constitute an optimal commodity tax system in this model. Diamond and Mirrlees (1971) demonstrate that aggregate production efficiency is desirable when all commodities can be taxed optimally. The implication of their result for taxation in a small open economy such as the one considered by Gordon is that factor and product trade should not be distorted by the use of source-based factor taxes or tariffs.

However, both local and national governments do typically rely heavily on source-based taxes on capital income, in the form of taxes on property or corporate profits. Indeed, some governments face substantial obstacles to the use of residence-based capital taxes. For example, at the international level, it may be very difficult to verify the amount of capital income a household receives from assets held in other countries. For local governments, a property tax may be much simpler to administer than a personal income tax. This justifies to some extent the use of models that exclude other forms of taxation in order to investigate the use of source-based capital taxes.

Bucovetsky and Wilson's paper is motivated by the difficulties with taxing foreign–source income. They investigate the equilibrium tax and expenditure policies for a system of identical regions which have access to a wage tax and source-based capital tax, but not a residence-based capital tax. The specification of savings and labor–leisure decisions follows Gordon's paper. Several results emerge from the analysis. First, it remains true that source–based capital taxes are not employed in a world where individual regions are price-takers on world capital markets. Thus, the ability to tax the worldwide income of residents is not necessary for the disappearance of source-based capital taxation, although wage taxation alone does not constitute a complete system of optimal commodity taxes. Second, source-based capital taxes reappear if regions possess market power on world capital markets. In either case, however, there is too little reliance on these taxes relative to wage taxation to finance local public goods. Finally, local public goods are underprovided from the viewpoint of world welfare, even in the case of many small regions, for which source-based capital taxes are not employed.

This last result shows that the issues of whether there is underprovision of local public goods and whether source-based capital taxes are used should be viewed as distinct from each other. The absence of taxes on mobile capital does not eliminate the possibility that competition between regions for scarce capital leads to inefficiently low levels of public good provision. Correspondingly, however, a later section in the Bucovetsky–Wilson paper shows that the existence of taxes on mobile capital does not necessarily imply underprovision if other taxes are available. This section considers the case where wage income cannot be taxed, but residence- and source-based taxes on capital income are available. Given these tax instruments, the decentralized decision-making of regional governments is shown to be fully efficient. Thus, it is the absence of residence-based taxes on capital income, not taxes on wage income, that is responsible for underprovision of local public goods.

The issue of choices among tax instruments is also addressed by Hoyt's paper, but along quite different lines from the Bucovetsky–Wilson paper. He makes labor mobile across regions and specifies the model in a way that turns the property tax into a distortionary commodity tax. This is done by effectively giving capital two uses in the private sector and making one of the

uses tax-free. Specifically, capital can now be consumed directly by consumers (or, equivalently, it can be transformed directly into an all-purpose consumption good), in which case it is not subject to taxation, or it can be combined with an immobile factor, now called 'land', to produce another final consumption good called 'housing'. The property tax is then defined as an excise tax on housing. The other available tax is a land tax. These taxes are used to finance a local public good that has the attributes of a publicly-provided private good (no scale economies in consumption).

Hoyt investigates the equilibrium tax and expenditure for a system of many identical 'utility-taking' regions. Regional governments are assumed to maximize net land values, an objective that is commonly employed in the local public economics literature. (Section 3 below discusses this and other forms of government behavior). Hoyt shows that regions choose to use only property taxation to finance the local public good. Moreover, the tax rate is set at a level where each resident's tax payments equal his marginal contribution to congestion in public good provision. In other words, the property tax serves the role of a 'user fee' for public services. This is Hamilton's (1975) conclusion, but now this user fee distorts consumption decisions.

These results can be understood by appealing to the Diamond–Mirrlees conclusion that aggregate production efficiency is desirable under optimal commodity taxation. By choosing a property tax, regions effectively tax the land and capital in housing at identical rates. This type of tax leaves the land–capital choices of housing producers undistorted, given the net return on land. By equating property tax payments with congestion costs, an efficient labor allocation is also assured. As a result, each region is characterized by aggregate production efficiency in the sense that each of the (identical) residents receives a consumption vector that lies on the frontier of the region's aggregate production possibility set, defined in per capita terms for a given value of the payments to landowners. The use of property taxation moves the region to the wrong point on this frontier, but the essence of the Diamond–Mirrlees result is that it is better to be at the wrong point rather than inside the frontier.

As in Zodrow–Mieszkowski and Bucovetsky–Wilson, decentralized decision-making by regional governments is inefficient in Hoyt's model. But rather than property tax rates being too *low*, they must be viewed as inefficiently *high* when land taxes are available, at least for the benchmark case of identical regions populated by identical individuals. Specifically, a central planner could raise welfare in all regions by replacing the property tax with a non-distortionary land tax. This uniform change in local tax policy would leave the labor allocation unchanged, but it would eliminate the housing distortion.

The absence of land taxation in Hoyt's model depends critically on the

absence of scale economies in local public good consumption. If these scale economies are present (e.g., a Samuelson public good), then it is still true that property tax payments equal marginal congestion costs in equilibrium, but land taxation will also be employed. A virtue of modeling these scale economies is that it allows us to drop the assumption of a fixed number of regions and examine issues concerning the optimal size of regions, since this size may now be determined by a tradeoff between these scale economies and the diminishing marginal productivity of labor in private production. In contrast to Hoyt, it turns out that the equilibrium for such an economy is fully efficient, at least for the benchmark case where all individuals and regions are identical. Essentially, competition between land-value maximizing developers eliminates any untaxed land rents, which is the source of inefficiency in Hoyt's model. Regions make efficient use of the property tax, because its distortionary effect on housing demand represents a social cost from the viewpoints of both a single region and the entire economy. In Zodrow–Mieszkowski, the property tax is not distortionary from the viewpoint of the entire economy, since the economy's capital stock is fixed in supply.

The assumption by Hoyt and the other papers that the economy's population is homogeneous is a useful modeling technique for isolating general tendencies in a system of regions towards over- or under-provision of local public goods, or towards over- or under-reliance on particular tax instruments. However, this assumption eliminates potentially important issues concerning the equilibrium sorting of individuals across regions. In fact, a paper in progress by Wilson shows that a heterogeneous population creates problems for both the existence of an equilibrium and, when an equilibrium does exist, for efficiency in the distribution of different types of individuals across regions. The basic problem is that a property tax cannot be used to efficiently price congestion when individual regions contain individuals with different housing demands but identical marginal congestion costs. We therefore get the 'musical suburbs' problem discussed by Epple et al. (1984), where high-income regions must contend with attempts by low-income individuals to enter and obtain under-priced public good supplies.

Another perspective on Hoyt's model is afforded by a recent paper by Krelove (1991), which independently derives the result that a system of a large (but fixed) number of regions employs only property taxation, even when a land tax is also available. His model differs from Hoyt's by not allowing capital in the housing sector to be used in nonhousing production. In other words, the economy contains fixed stocks of 'housing capital' and 'other capital'. If we again consider the benchmark case of identical regions and individuals, this change in the model implies that the property tax is no longer distortionary, because the economy's total supply of housing is now fixed. However, an individual region treats this supply as variable, because it

can engage in interregional trade of housing capital for nonhousing capital. As a result, the region employs an optimality condition for public good provision that contains terms reflecting tax distortions in its housing market. Since there are no such distortions from the viewpoint of the entire economy, regions will therefore fail to provide the efficient public good level. Krelove concludes that the equilibrium level of local public good provision may be greater or less than the efficient level. This result is understandable in light of Atkinson and Stern's (1974) demonstration that the direction in which tax distortions effect the rule for optimal public good provision is ambiguous [see Wilson (1991) for a recent explanation and extension].

If we are to state a single simple lesson from the Hoyt and Krelove models, perhaps it is that the distortions in government behavior that accompany the use of property taxation depend critically on how we model the tax base. Both of their models contain an untaxed sector, but they differ in how this sector is linked to the taxed sector. Of course, the inability of regional governments to tax factors in one sector is an important restriction on government behavior, but Zodrow–Mieszkowski's aggregation of all private production into a single sector also eliminates potentially important forms of government behavior. Using a multisector model, Wilson (1985) shows that an optimal property tax system for individual regions usually does not consist of identical tax rates on capital in different uses, but these tax rates are normally all positive. A useful task for future research would be to incorporate into theoretical models more of the potentially important but complex features that characterize the taxation of mobile capital in practice.

Let us now change the focus of the discussion by considering government debt as an alternative to property tax finance. According to the famous Barro argument (1974), the choice between debt and taxes is irrelevant, since consumers anticipate the future tax burdens made necessary by an increase in debt and adjust their savings behavior in a way that effectively neutralizes the effect of debt on future consumption streams. This argument must obviously be modified when taxes distort behavior. The paper by Jensen and Toma considers the use of debt but raises an altogether different issue: the possibility that governments might use debt to alter their strategic positions in future competition for scarce capital with other regions. We now describe their results.

To analyze debt, Jensen and Toma extend Zodrow and Mieszkowski's single-period model to include two periods. In the first period, local public goods may be financed with either a property tax, modeled as a source-based tax on capital income, or by issuing debt. Property taxation is used in the second period both to finance public good provision and to repay the debt issued in the first period. To focus on strategic interactions between regions, Jensen and Toma assume that only two regions compete for capital. A subgame-perfect equilibrium is considered, where each region chooses its

first-period tax rate and debt level to maximize a representative resident's utility, given the tax rate and debt level chosen by the other region, and given the correctly anticipated effect of these choices on the Nash equilibrium tax rates in the second period. To isolate the strategic use of debt, production and utility functions are assumed to be identical across both regions and periods.

The main result of the paper is that regions have an incentive to issue debt under reasonable assumptions about the shapes of second-period reaction curves in tax space. These reaction curves relate each region's tax rate to the other region's tax rate. The idea is simple. If one region increases its debt level, then it will raise its tax rate in the second period to pay off the debt. Thus, debt may be used as a way in which the region can shift out its second-period reaction curve. If the two reaction curves are upward-sloping, then the outward shift of one region's reaction curve will increase the other region's Nash equilibrium tax rate in the second period. The first region then benefits from the additional capital investment that flows into it due to the higher tax rate in the other region. This benefit provides it with an incentive to maintain a positive debt level. On the other hand, negative debt occurs if the reaction curves slope down, which is a possibility.

To illustrate their findings, Jensen and Toma present a numerical example with quadratic production functions. Debt is positive, there is underprovision of the local public good in each period, and utilities are lower than they would be in the absence of debt.

Wildasin's paper complements the Jensen–Toma analysis by considering another form of strategic interaction between regions; namely, the ability of a region to influence the location of the other region's reaction curve. His analysis builds on Wildasin (1988), where the choice between taxes on mobile capital or public expenditure levels as the strategic variables is shown to matter in a fiscal competition game between two regions. This finding raises the question of which variable is chosen in practice. Wildasin tackles this question by constructing a two-stage game, in which regions choose their strategic variable in the first stage and then choose the levels of the chosen variables in the second stage. Under reasonable assumptions, regions choose to play a Nash game in tax rates. The basic idea is that committing to a fixed expenditure level rather than tax rate induces the other region to lower its tax rate. It does so by making the other region's capital supply more tax-elastic. Basically, the other region reasons that any rise in its tax rate will shift capital over to its competitor, thereby allowing the competitor to lower its tax rate, inducing a further flow of capital into the competing region. Since each region wants to induce the other region to maintain a high tax rate, regions opt for tax rates as their strategic variables.

Wildasin's paper also contains a second model, in which a similar two-stage process is used by regions to choose between public expenditure levels

and public good consumption levels. In this model, benefit spillovers between regions undo the fixed relation between these two variables. It turns out to be a dominant strategy for each region to commit to public expenditure levels. These results, along with the Jensen–Toma analysis, highlight the usefulness of considering multistage games between competing regions.

The final paper concerning tax competition between regions is Wilson's analysis of the role of regional size differences. He considers two regions of different sizes which play a Nash game in tax rates on mobile capital. His main finding is that the relatively small region is better off than the large region. Similar conclusions have been reached by Bucovetsky (1991) for the special case of quadratic production functions. Wilson first shows that these results hold under the Zodrow–Mieszkowski assumptions about taxation and production, which include only the usual neoclassical assumptions on production functions. Then he departs from the standard model by demonstrating the same results under the assumption that both the capital tax and a distortionary labor tax are available for financing an exogenously-given level of public expenditures. Again, the benefits of being small emerge. These results can be understood by noting that the relatively small region faces a relatively elastic supply of capital with respect to the tax rate on capital, since more of the tax is passed on to firms in the form of a higher cost of capital. The small region responds to this high elasticity by choosing a relatively low tax rate on capital. The resulting interregional tax differential induces a capital flow from the large region to the small region, leaving the small region better off in the Nash equilibrium. In fact, a sufficiently large difference in the sizes of the two regions will leave the smaller region better off than it would be under a regime with Pareto-efficient taxes and public good levels for the two regions. This finding qualifies the message from the trade literature that being large is advantageous when it comes to 'tariff wars' [e.g., Kennan and Riezman (1988)]. The benefits of largeness apparently depend on the type of interaction that takes place between regions or countries.

3. New directions in models of voting, profit-maximizing developers and intergovernmental grants

A long line of research in local public economics, both theoretical and empirical, has investigated the nature of the process by which collective decisions are made. One branch of this research has used simple majority voting models as a theoretical foundation for empirical studies of the demand for local public goods. Beginning with early work by Barr and Davis (1966), Bergstrom and Goodman (1973), and others, these studies have assumed that rational voting behavior about the level of local public expenditures is based on a comparison of the individual marginal benefits

from local public goods with individual marginal tax-prices. These tax-prices are customarily assumed to be determined by the individual voter's share of the local tax base. In the U.S. local government context, this would typically be the value of the voter's residential property expressed as a proportion of aggregate community property values.

Another branch of research, somewhat more theoretically oriented, emphasizes that the benefits and costs of local public expenditure depend crucially on the extent to which local residents are mobile. While an immobile household would rationally compare the marginal benefits and tax-prices of local public goods in deciding how to vote, the same need not be true of a freely mobile household. Consider, for example, a world where households are costlessly mobile and where each locality is small relative to the whole economy. In this case, any one locality's policies would have only a negligible impact on the welfare of mobile households, qua consumers of local public goods. If a locality makes 'good' decisions (those that would tend to raise welfare), it will become a more attractive place to reside; the opposite would occur if decisions are taken which would tend to lower welfare. Ensuing population flows result in spatial arbitrage which competes away any utility differentials between localities. But then, if the locality is small, and if existing residents are unable to create barriers to entry, its policies really cannot affect the welfare of its existing residents. They would therefore be indifferent as to the choice of local policy.

But if mobile households are indifferent to local public policy, how are local decisions made? The logic of costless mobility models points to the owners of locationally-fixed commodities as the interested parties who ultimately stand to gain or lose from local policy. If 'good' policies attract residents, their competition to enter a jurisdiction will drive up the value of property (land, house values, etc.) or perhaps drive down local wages, increasing the wealth of owners of locationally-fixed factors. The welfare of these landowners does depend on local policy, and, to the extent that they influence decision making, they will do so in such a way as to raise the value of their assets. Thus, in contrast to median-voter models, the analysis of models of small jurisdictions with mobile residents suggests that local policies would be set in such a way as to maximize land or property values. The papers by Hoyt and Krelove discussed above use this assumption (among many others in the literature). One can also view Pines's model of profit-maximizing developers as a model of land-value-maximizing property owners.

If the median voter model describes the process of decision making about local public policy in the case where households are completely immobile and land-value-maximization describes how policy is determined when households are costlessly mobile, what can one say about the intermediate cases where households may be mobile, but not at zero cost? Brueckner and

Joo's paper presents an initial analysis of this issue. Brueckner and Joo explore the voting behavior of an individual household who expects to reside in a given jurisdiction for some period of time but not indefinitely, reflecting both the possibility and the costliness of migration. They show that the voter's preferred policies will strike a natural balance between individual marginal benefit/marginal tax-price considerations of the sort found in traditional median-voter models, on the one hand, and the land-value maximization criterion that emerges in the literature on small, utility-taking jurisdictions on the other hand. Other things the same, land-value maximization weighs more heavily in the voting behavior of households that expect to leave the jurisdiction relatively soon.

Brueckner and Joo point out that this analysis can explain some otherwise paradoxical empirical results. For example, some studies have found that older individuals have a higher demand for education. Brueckner and Joo suggest that this observation might not reflect a stronger personal preference for education on the part of the elderly. Rather, it might better be attributed to the fact that many aged individuals may be planning to sell their houses relatively soon, and to their expectation that higher levels of education may raise property values.

The Brueckner and Joo analysis stops short of providing a full general equilibrium analysis of voting and migration with imperfect mobility. Such an analysis might attempt to explain the migration of households endogenously, perhaps partly as a result of life-cycle considerations. Households might be assumed to enter a locality at some point in time as part of a planned lifetime path of locational choices, expecting to leave the community at some future date. Their voting behavior over time might then be determined as in Brueckner and Joo's model, with voters in the community as a whole thus generating some time path of local public expenditures and taxation. To close the model, this equilibrium path would be correctly anticipated by all households, so that locational decisions are made on the basis of rational expectations. Such an equilibrium model might be used to explore such issues as the efficiency of local policy. Previous literature suggests that local policies would be chosen efficiently by small utility-taking jurisdictions when mobility is costless. What could be said, however, in the more realistic case where migration is costly?

As noted above, Pines's paper, like much of the literature, assumes that local governments set policies according to a profit-maximization or land-value maximization rule. Previous studies have explored the efficiency properties of policies that are chosen in this way. Provided that local governments (or the profit-maximizing developers) have adequate fiscal or other instruments available to them, it is typically the case that these policies are efficient. That is, profit- or land-value maximization by small open jurisdictions leads to efficient levels of public expenditures and to efficient

systems of local taxation. These positive results on the efficiency of equilibria with local governments could be viewed as vindicating the original Tiebout intuition (though not in a way directly anticipated by Tiebout). However, much of the literature has taken the question of *existence* of equilibrium for granted. Of course, existence is crucial: it is small satisfaction to know that a land-value-maximization equilibrium is efficient if it does not exist. Pines focuses attention on precisely this issue.

In particular, Pines asks whether existence of equilibrium depends critically on the *replicability* of jurisdictions. Imagine an economy where there is a large amount of land that has been divided into units of equal size, each unit representing a potential jurisdiction. Suppose that developers can buy these units of land and develop them, selling or renting the land and providing local public goods to residents. There is an efficient scale for each jurisdiction that reflects a balancing of economies of scale in local public good provision against decreasing returns in private good production. Pines considers two cases. The first case, *perfect replicability*, refers to the case where there is so much land available in the economy relative to the population that it is possible for all households to reside in jurisdictions of efficient scale and still have some vacant land left over. In this case, Pines shows that a competitive equilibrium is achieved in which each city operates at the efficient scale. In this equilibrium, land rents, net of the cost of local public good provision, are driven to zero – the well-known 'Henry George Theorem'.

In the second case, *non-replicability*, land is sufficiently scarce that jurisdictions must operate at more than the efficient scale. Pines again explores the existence issue and finds that equilibria may or may not exist. Existence hinges on the shape of a 'surplus function', which in turn depends on the underlying preferences and technology. In particular, if this function is globally concave, an equilibrium definitely exists. However, this concavity assumption need not always be satisfied. In fact, Pines presents a sufficient condition, and a simple example satisfying this condition, under which an equilibrium does not exist. Pines concludes that when the existence of profit-maximizing equilibrium fails, some other decision-making procedure – 'politics' – must take over. This suggests several further questions that might be investigated. For example, what exactly does 'politics' entail, and how does it solve the problem of existence? How does a good theory of local politics with small open jurisdictions differ from the hypothesis that local governments choose policies that maximize land values? Pines's analysis also suggests that the non-existence problem can be traced to the inability of jurisdictions to operate at efficient scale – in particular, they may end up with populations that are larger than optimal. One might view this problem as a failure of institutional arrangements. For instance, would it be possible to solve the non-existence problem by allowing jurisdictions to vary their boundaries in such a way as to achieve efficient scales? If land could be

traded among jurisdictions, would there be incentives for such trade to occur? If so, would this restore the existence of equilibrium? Would the equilibrium be efficient?

The paper by Henderson and Abdel-Rahman, like that of Pines, considers the possibility that urban policies are set in a profit-maximizing fashion. In Henderson and Abdel-Rahman, however, local policy does not involve the provision of local public goods to consumers, at least explicitly. Rather, Henderson and Abdel-Rahman suppose that there are indivisibilities, in the form of fixed costs, in the production of private goods. These indivisibilities could take a variety of forms, and might, but need not, involve 'public' goods. For example, production might entail a classic indivisibility such as minimum plant size. Alternatively, the fixed cost could correspond to transportation facilities or other infrastructure traditionally provided by the public sector. In any event, the scale economies resulting from the indivisibility provide a rationale for each city to specialize in the production of a particular private good. [In this respect, the model differs from that of Abdel-Rahman and Fujita (1990), in which many goods are produced in each city by a monopolistically-competitive service industry.]

After characterizing the Pareto efficient allocation for this economy, they consider two cases. First, they follow Dixit and Stiglitz (1977) by assuming that firms act like price-takers on the labor market and take the marginal costs of production as given. In this 'unregulated equilibrium', the fixed costs of production are covered only from the revenue received in the sale of output. Profits are driven to zero by free entry, but the agglomeration economies in each city generate positive land rents. Henderson and Abdel-Rahman argue that the presence of these rents, and the ability of residents to capture them, precludes the equilibrium from being Pareto efficient. Specifically, cities are too large and product diversity is too small.

In the second case, Henderson and Abdel-Rahman depart from Dixit and Stiglitz by effectively allowing firms to recognize that they possess 'market power' in the setting of compensation levels, since an increase in a city's population level drives up transportation costs and thereby increases the incomes workers must obtain to be willing to reside there. This power is exercised through the use of 'head taxes', which enter the definition of profits. These taxes effectively provide firms access to the land rents distributed to workers. Henderson and Abdel-Rahman refer to this case as the 'autonomous local government' case. In contrast to the first case, they prove that the equilibrium is now fully efficient.

One way to understand this efficiency result is to observe that firms effectively remain perfect competitors in the national labor market, since each worker can always obtain an exogenously-given utility level by moving elsewhere. Indeed, in a certain sense, firms do not act like perfect competitors in the unregulated case, since their wage-taking behavior effectively implies

that they treat their labor-supply curves as downward-sloping when defined in terms of utility levels, given the higher transportation costs that accompany an expansion in a city's population. Viewed this way, Henderson and Abdel-Rahman's efficiency result is consistent with Dixit and Stiglitz finding that monopolistically-competitive firms choose efficient levels of production. The corresponding result here is that city sizes are efficient, and this result implies an efficient number of cities.

Thus, the Henderson–Abdel-Rahman efficiency result indicates the importance of competitive constraints on factor market conditions, in the form of utility-taking behavior by firms. On the other hand, it is important to recognize that both this result and the Dixit–Stiglitz result depends importantly on special properties of the model, particularly the assumption that all differentiated commodities enter the utility function in a symmetrical way. Henderson and Abdel-Rahman later consider what happens when, in addition to the monopolistically-competitive sector, there is also a competitively-produced commodity whose technology does not entail any indivisibilities. In this case, examples show that full optimality is not achieved in equilibrium, even in the autonomous local government case. However, the allocation in this case can be preferable to centralized policies such as exogenously-imposed marginal cost pricing or average cost pricing for all producers.

The paper by de Bartolome raises issues of perennial importance to local government finance. Fiscal federalism, as practiced in the U.S. and most other countries, is not characterized by a neat separation of fiscal activities between higher- and lower-level governments. Many functions of state and local governments – education, income redistribution, health care, and transportation all provide important examples – are supported by grants from higher-level governments. These grants can take several forms, and there is ongoing discussion in the literature both of the fundamental rationale for grants and of optimal grant policy. Certainly one major function of grants from state to local governments in the U.S. is to support local public education in an equitable manner. Indeed, in many states, court decisions have in effect declared that exclusive reliance on own-source financing of local schools, for example through the local property tax, violates state constitutional requirements because of the inequality in assessed valuation across school districts and the resulting inequality of property tax rates that would be required to achieve any given uniform level of educational expenditures per pupil. However, the ability of state governments to achieve distributional objectives through grants to local governments is limited. In particular, as de Bartolome points out, an attempt to provide high levels of grant support to poor school districts may create adverse locational incentives.

In de Bartolome's analysis, there are two types of individuals, the rich and the poor. They have different demands for local public goods, and if they

inhabit the same communities there will be welfare losses because they must then share the same level of public good provision. Imagine, then, that the rich and the poor live in different jurisdictions. Suppose further that a higher-level state government wishes to redistribute in favor of low-income households through grant support for public good provision in low-income jurisdictions. The problem that such a grant program may confront is that by supporting the low-income jurisdiction, high-income households may be induced to migrate there. But this will preclude welfare-improving differentia-tion of the level of public good provision between rich and poor. How, then, can a grant policy be devised which achieves desired redistributive goals (embodied, in de Bartolome's analysis, in a utilitarian social welfare function) without the efficiency losses resulting from a breakdown of stratification by income class?

Borrowing from the tools of optimal income taxation, de Bartolome derives an implicit characterization of optimal grant policy by imposing an incentive compatibility constraint on the policymaker that insures that the rich do not find it advantageous to move to the poor jurisdiction. The optimal policy is one which conditions grant aid to the poor jurisdiction on a number of community attributes – such as the level of local public expenditures and on the level of housing per capita. The basic intuition is that policy instruments in the poor jurisdiction should be distorted away from what would otherwise be optimal in order to make the jurisdiction less attractive to the rich, thus easing the incentive compatibility constraint and making it possible to carry out more redistribution in favor of the poor.

This analysis differs from previous literature on grant policy in that it allows for a very general structure of grant policy. Most previous analyses have assumed that grants take a relatively simple form, for instance, a linear matching component coupled with a per capita allowance. The analysis by de Bartolome implies that such restrictions may not be optimal. Moreover, donor governments may actually use more complicated grant forms in practice, as de Bartolome explains for the case of New York state. An interesting question is whether and how a donor government can assemble the information required to implement an optimal grant structure such as that analyzed by de Bartolome. In practice, a central government might find it difficult to know what sorts of grants would or would not be consistent with the free-migration self-selection constraint.

Ultimately, better access to information by local governments provides one of the basic rationales for decentralization of government structure. A valuable task for future research would be to address these informational issues explicitly not only to understand better the role of intergovernmental grants but to establish a better foundation for all aspects of the positive and normative analysis of local public economics.

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