

Tax Competition and the Nature of Business Taxation

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INTRODUCTION

State and local governments compete by providing packages of taxes and public services that are attractive to households and firms. Although most of the public finance literature has focused on state and local public services provided primarily to households, some public services also directly benefit businesses. This report¹ focuses on the provision of state and local business public services and their financing with different forms of business taxation.

State and local governments face pressure to provide high quality public services to businesses, as such services increase business productivity. Economic models of this process assume that business public services are simply production inputs that, along with capital, labor and any other inputs, are combined in the production process. Such business public services must of course be financed. Public finance economists have long argued that user charges or benefit taxes are the ideal instruments to finance any business public services that are utilized in production processes. From an efficiency standpoint, user charges are desirable because they ensure that businesses pay the full social costs of all inputs into the production process, including business public services—a condition that must be satisfied for markets to efficiently allocate resources, including those allocated to the public sector. From an equity standpoint, a user charge is desirable because it is consistent with the benefit principle of taxation, which

argues that whenever possible, the direct beneficiaries of public services should pay taxes sufficient to cover their cost.

User charges or benefit taxes, however, are often not available—or at least are not utilized—for a variety of technical, administrative, and political reasons. In this case, other taxes, typically including at least some business taxes such as taxes on capital or capital income or on production, must be utilized. The use of such business taxes gives rise to a fundamental governmental dilemma. On the one hand, state and local business taxes lower the returns to capital located within a jurisdiction; since capital is relatively mobile, business taxes tend to drive capital out of the taxing jurisdiction, reducing the productivity of the remaining factors of production, primarily local labor and land. This is known as the “base erosion” effect of business taxes. On the other hand, as long as a business tax is used to finance an increase in the level of business public services, it will increase the marginal productivity of capital used by local businesses. This “capital productivity” effect of the tax and expenditure package increases the return to capital, so that capital flows into the jurisdiction. State and local governments (hereafter simply referred to as “local” governments) must balance these two factors in setting their tax policies.²

The relative magnitudes of the base erosion and capital productivity effects determine whether the local government anticipates an outflow or an inflow of capital as it raises its business taxes. This in turn plays the major role in determining



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whether a business tax increase is desirable and whether it results in underprovision, efficient provision, or overprovision of local business public services. Similarly, the effects of alternative business taxes, such as taxes on capital or capital income or on production, depend critically on whether they result in capital outflows or inflows and how they affect the efficiency of local service provision, which determines which of these business tax alternatives is more appropriate for a given taxing jurisdiction.

With respect to the nature of state and local business taxation, most of the business taxes in the United States that finance business public services (and some services to households) take the form of taxes on capital or capital income. These include local property taxes and state corporate income taxes, as well as retail sales taxes that are assessed on business inputs, rather than taxes on production. For example, Phillips, Sallee and Peak (2017) reports that in 2016, businesses paid \$495.2 billion in state and local property taxes, sales taxes on business inputs, and corporate income taxes, which amounted to roughly 30 percent of total state and local taxes and 68 percent of total state and local taxes paid by businesses (excluding user charges).

By comparison, state and local use of production taxes, such as an origin-based, value-added tax (VAT), are rare. Under a VAT regime, taxes are assessed on the value added by the firm (the difference between sales and input purchases other than labor) at each stage of the production process. Most analyses suggest that the burden of a VAT is ultimately borne by consumers as an increase in the prices of the final products. The tax most closely approximating an origin-based VAT was the Single Business Tax (SBT) in Michigan, which was a significant source of revenue for the state until it was phased out, ending in 2007. In addition, state corporate income taxes sometimes have a production-based component with respect to the income earned by multi-state businesses. In the United States, most states use a formula-apportioned state corporate income tax—a system under which the total

profits of a multi-state firm are allocated to a particular jurisdiction based on the share of the firm's total sales, property, and payroll located in that jurisdiction. However, many states have moved away from using the production-based components of the tax in their allocation formulas. They have instead switched to formulas that put a relatively small or zero weight on the productive factors used by businesses within the taxing jurisdiction (payroll and property) and have instead attached larger or unitary weights on measures of gross sales.

Nevertheless, several well-known public finance experts have suggested that despite their rarity in the United States, production taxes might be a more appropriate tax instrument for financing business public services than taxes on capital or capital income (Bird 2000; Hines 2003; McLure 2003). The basic argument assumes that the benefits firms receive from business public services are closely related to production levels, so that taxing production results in a “benefit-related” tax that more closely approximates an efficient user charge for the public services than does a tax on capital or capital income.³ Moreover, the mobility of a jurisdiction's tax base is a key factor in determining the relative economic efficiency of a tax, and capital is likely to be significantly more mobile than labor in any given taxing jurisdiction. Thus, a capital tax that focuses solely on mobile capital is likely to be less efficient than a production tax that applies to both mobile capital and relatively immobile labor.

In this report, I discuss two recent papers co-authored with Elisabeth Gugl of the University of Victoria that examine the effects of financing local business public services with local business taxes (Gugl and Zodrow, 2015; Gugl and Zodrow, 2019). These papers focus on two critical and closely related issues: 1) whether such business taxes should be based on capital usage or on production levels, and 2) whether local business public services are underprovided, efficiently provided, or overprovided under these two business tax instruments. This report summarizes both the theoretical arguments and the results

of some numerical simulations contained in those papers. The main conclusions of the analysis are that 1) in most (but not all) cases, it is more efficient to finance business public services with a production tax rather than with a capital tax, and 2) the effects of the two taxes on the level of business public services are ambiguous but depend in a very specific way on how an increase in business public services affects capital productivity.

MODELING BUSINESS TAXES

To examine the relative efficiency of business taxes on capital or capital income (hereafter, simply referred to as “capital taxes”) and taxes on production, Gugl and I constructed a model of interjurisdictional tax competition in business public services financed with business taxes (Gugl and Zodrow 2015; Gugl and Zodrow 2019); this work is an extension of the tax competition model developed by Zodrow and Mieszkowski (1986). The following is an overview of the model’s structure.⁴

We assume the nation is divided into a fixed number of identical subnational jurisdictions, each of which faces a local labor market (labor supply in each jurisdiction is fixed, and residents are immobile). Each jurisdiction perceives itself as a small open economy that faces a fixed national market price for the single consumption good in the model and a fixed rate of return to capital, which is perfectly mobile from the perspective of the taxing jurisdiction but fixed in total supply to the nation. Each resident owns the same amount of labor and the same share of the fixed national capital stock. The government of each jurisdiction sets its tax and expenditure policies to maximize the welfare of its residents, which in this model corresponds to total local consumption. Following most of the local public finance literature, we assume that business public services are publicly provided but have the characteristics of a private good (i.e., there is no jointness in consumption).

We assume a single representative firm in each jurisdiction. Firms produce the single consumption good with capital,

labor, and the business public services, using a production function characterized by constant returns to scale (e.g., a doubling of output requires a doubling of all inputs, private and public).

The key factor in determining the effects of both capital taxes and production taxes in the model is the sensitivity at the margin of the productivity of capital to an increase in the level of business public services. For the production functions considered in the analysis, an increase in business public services increases the marginal productivity of capital—the critical issue is by how much. In intuitive terms, the change in capital productivity in response to an increase in business public services can be “average,” or it can be characterized by “high sensitivity” or “low sensitivity.” This characterization is critical to understanding the results obtained with the model. For example, in the case of low capital sensitivity, an increase in business public services financed with a capital tax increase has a relatively small positive effect on the marginal productivity of capital. As a result, the base erosion effect dominates the capital productivity effect of the tax increase, and the capital tax increase causes an outflow of capital from the taxing jurisdiction, which in turn results in inefficient underprovision of business public services.⁵

THEORETICAL RESULTS

Our theoretical results are summarized in Table 1. The results are clearest in the case of the production tax. Consider first the case in which the production function is characterized by average sensitivity of the marginal productivity of capital to increases in business public services. In this special case, the base erosion effect and the capital productivity effect are exactly offsetting, which implies the production tax is efficient—it is precisely a “benefit related” tax in that it has the same effects as a user charge or benefit tax, and thus results in the efficient provision of business public services. By comparison, with low capital sensitivity, the increase in the marginal productivity of capital with increased public

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TABLE 1 — SUMMARY OF THEORETICAL RESULTS

Capital sensitivity	Public services under production tax	Public services under capital tax	Relatively more efficient tax
Low	Underprovision	Underprovision	Underprovision
Average	Efficient provision	Underprovision	Underprovision
High	Overprovision	Ambiguous	Ambiguous

NOTE Capital sensitivity refers to an increase in marginal productivity of capital with respect to an increase in business public services.

SOURCE Author's analysis

services is relatively small, so that the base erosion effect is relatively more important than the capital productivity effect. In this case, local governments are sufficiently concerned that taxes will drive out mobile capital that business public services are underprovided. The opposite result is obtained in the high capital sensitivity case, as the capital productivity effect dominates the base erosion effect and public services are overprovided.

Recall that the production tax is effectively imposed uniformly on both immobile labor and mobile capital since it applies to all production inputs, while with a capital tax the entire burden of the business tax is imposed on mobile capital. As a result, the base erosion effect tends to be larger than the capital productivity effect with a capital tax, and inefficient underprovision of public services is more likely. For example, the capital tax unambiguously leads to underprovision when the production function is characterized by either low or average capital sensitivity. Indeed, underprovision occurs even in cases of high capital sensitivity as long as this sensitivity is not too far above average. Only in cases where capital sensitivity is sufficiently higher than average does overprovision of business public services occur.

Finally, the fact that the capital tax imposes its full burden on highly mobile capital while the production tax imposes an equal burden on mobile capital and immobile labor also implies that it is more likely to be the more distortionary and thus more inefficient tax. Indeed, the production tax is unambiguously more

efficient than the capital tax for both the low and average capital sensitivity cases. However, the relative efficiency of the two taxes is theoretically ambiguous in the high capital sensitivity case, as the production tax results in ever-increasing overprovision of business public services as the capital sensitivity increases, while the capital tax moves from underprovision to efficient provision and then to overprovision of local business services.

SIMULATION RESULTS

I turn next to the results of our simulations of the model. We assume a constant elasticity of substitution (CES) production function, where the elasticity of substitution (σ) reflects the ease with which production inputs can be substituted for one another as relative factor prices change. In addition, the elasticity of substitution is a measure of the sensitivity of the marginal product of capital with respect to increases in business public services, with $\sigma = 1$ corresponding to average capital sensitivity and $\sigma > 1$ ($\sigma < 1$) corresponding to low (high) capital sensitivity. Empirical evidence on the elasticity of public services and private capital is limited. Many studies assume that $\sigma = 1$, but Munnell (1990) and Eisner (1991) provide evidence suggesting that public and private capital are highly substitutable. They suggest private capital could relatively easily substitute for water supply infrastructure, public transportation, police protection (surveillance and other security systems), and fire protection (sprinkler and monitoring systems and more fire retardant construction materials). On the other hand, the CES production function we use requires that the elasticity of substitution between public and private capital equals the elasticity of substitution between capital and labor. Although many studies again assume $\sigma = 1$,⁶ Chirinko and Mallick (2017) argue for a much lower value, on the order of $\sigma = 0.40$. Given this uncertainty, we perform our simulations for a large range of values of σ . For further details on our simulation methodology,

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including all parameter values, as well as more simulation results, see Gugl and Zodrow (2015). For purposes of this report, we focus on the extent of inefficient provision of business public services under the production tax and capital tax options for our benchmark simulation.⁷

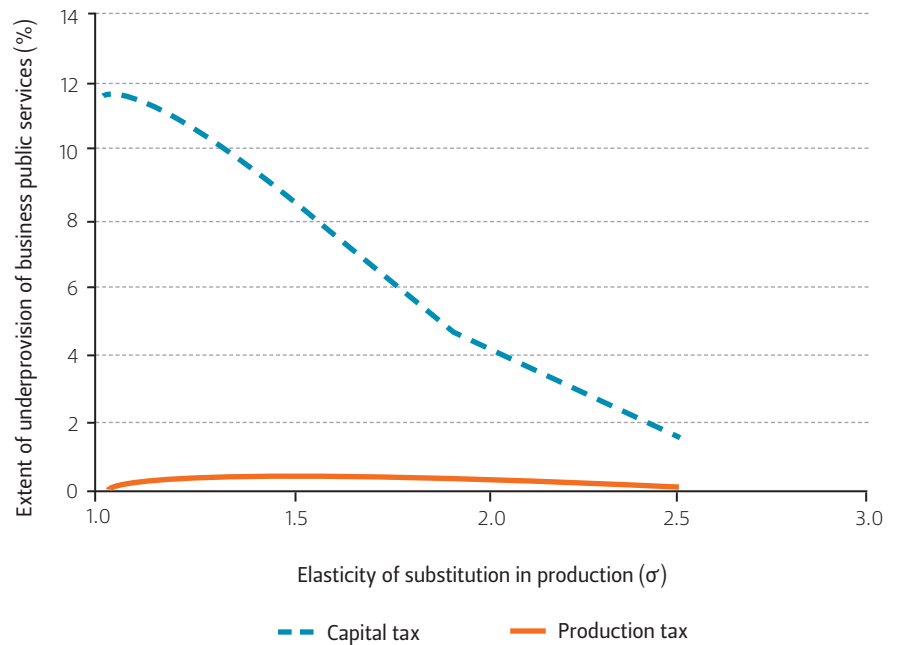
Low or Average Capital Sensitivity

Consider first the cases of low capital sensitivity ($\sigma > 1$) or average capital sensitivity ($\sigma = 1$), illustrated in Figure 1. As noted above, with average capital sensitivity, the production tax is efficient, while with low capital sensitivity it results in inefficient underprovision of public services. The extent of underprovision under the production tax, however, is quite low, ranging from 0.04% to 0.41%. By comparison, the capital tax is always less efficient than the production tax in these two cases, with the degree of underprovision as high as nearly 12%. Note that as the elasticity of substitution in production increases, the extent of public service underprovision declines, even though one might expect the base erosion effect to become relatively more important in this case. This occurs because with higher substitutability between capital and public services, the optimal capital tax rate and the optimal level of public services fall so that the deviation between the actual and optimal amount of public services declines. In addition (not shown in the figure), capital tax rates always exceed production tax rates, which is expected given the much broader base of the production tax. Finally, note that similar results are obtained when the same simulation is run using a production function with a smaller share of capital and a larger share of public services⁸—and thus higher production and capital tax rates. In particular, the extent of underprovision of public services is still under 1% in all cases under the production tax, but ranges from roughly 9% to 25% under the capital tax.

High Capital Sensitivity

Consider next the case of high sensitivity of the marginal productivity of capital to additional business public services, which arises when $\sigma < 1$. In this case, as shown in

FIGURE 1



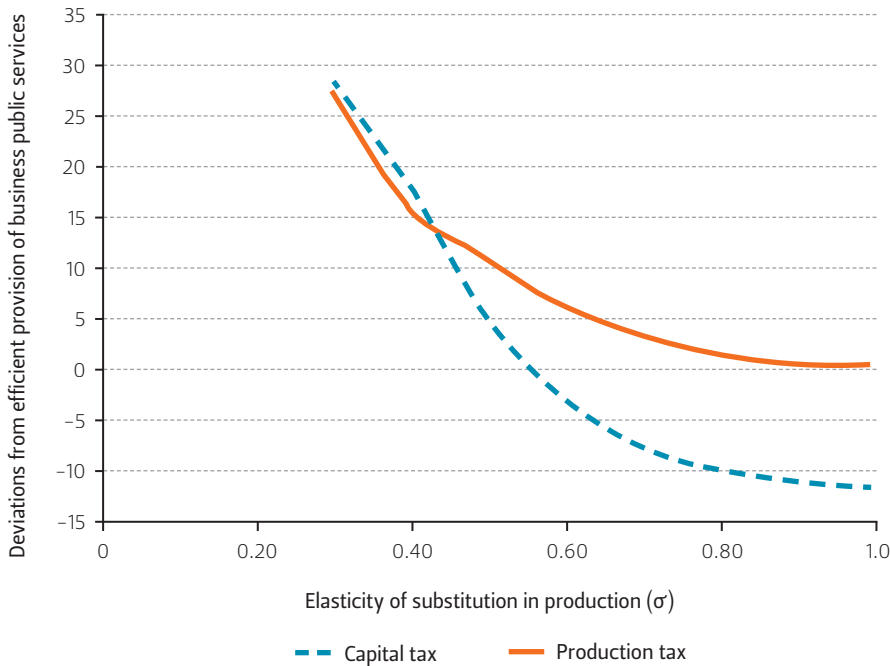
Extent of Underprovision of Business Public Services (%) under Production and Capital Taxes with a CES Production Function with Average ($\sigma = 1$) or Low ($\sigma > 1$) Capital Sensitivity

SOURCE Author’s analysis

Figure 2, the production tax always leads to overprovision of business public services, with the extent of overprovision ranging from approximately zero when the degree of capital sensitivity is only slightly above average and σ is nearly 1.0, to roughly 27% when $\sigma = 0.30$. By comparison, the capital tax results in underprovision when capital sensitivity is only somewhat greater than average, moves toward efficiency as capital sensitivity increases (the elasticity of substitution in production declines toward $\sigma = 0.53$ where the capital productivity effect just offsets the base erosion effect and efficient provision of public services occurs), and eventually results in overprovision when capital sensitivity is sufficiently larger than average ($\sigma < 0.53$). However, while the capital tax is more efficient for substitution elasticities in the neighborhood of $(0.30 < \sigma < 0.40)$, the production tax outperforms the capital tax for a large range of elasticities.

Figure 2 illustrates the theoretical ambiguity noted above regarding the relative efficiency of production and capital

FIGURE 2



Deviations from Efficient Provision of Business Public Services (%) under Production and Capital Taxes with a CES Production Function with High ($\sigma < 1$) Capital Sensitivity

SOURCE Author's analysis

Because a capital tax applies its entire burden to mobile capital, it tends to result in a larger base erosion effect and more inefficient underprovision of public services.

taxes. When capital sensitivity is near average levels (σ is in the neighborhood of 1.00), the production tax is clearly more efficient than the capital tax and the differences between the two taxes are significant. However, this difference declines as capital sensitivity increases (σ declines), and for values of $\sigma < 0.4$, the capital tax may be more efficient. Thus, the production tax is the more efficient tax instrument only if the capital sensitivity is sufficiently large—which may be the case, given our earlier discussion of the empirical evidence on the elasticity of substitution between public services and private capital. In any case, even when the capital tax is the more efficient tax option, the differences in efficiency between the two taxes are quite small. Also, as in the low capital sensitivity case, the much broader base of the production tax implies that capital tax rates exceed production tax rates in all the simulations. Note that similar results are obtained when the same simulation is run using a production function with a smaller share of capital and a larger share of

public services and thus higher production and capital tax rates. In particular, the production tax is significantly more efficient than the capital tax for average capital sensitivity and, although the capital tax can be the relatively more efficient tax option at sufficiently high capital sensitivities (low substitution elasticities), the differences in efficiency between the two taxes is not particularly large in such cases.⁹

Additional Results

We also examine the effects of altering other parameters in the model, holding the degree of capital sensitivity constant. Specifically, we assume an average level of capital sensitivity ($\sigma = 1.0$) and vary the capital share parameter in the production function between 0.25 and 0.40 and the public services share parameter from 0.05 to 0.20. In these simulations, the production tax rate ranges from 5% to 20% and the capital tax rate ranges from 17% to 44%. Although the production tax is always efficient in this case, the capital tax results in underprovision of public services of between 12% and 52%. As expected, the magnitude of the inefficiency under the capital tax regime increases as the share of public services increases since relatively more public services must be purchased. In addition, the magnitude of the inefficiency under the capital tax declines as the capital share increases, since more revenue is raised with a given capital tax rate.

CONCLUSION

Although financing business public services with taxes on capital is a far more common practice in the United States than doing so with taxes on production, several prominent observers have suggested that production taxes may be a superior alternative because they are a “benefit-related” tax—that is, they more closely approximate an efficient user charge or benefit tax for the public services enjoyed by businesses. This report summarizes the results of two recent papers (Gugl and Zodrow 2015; Gugl and Zodrow 2019) that examine the relative efficiency properties of the two taxes, which depend

on which tax best balances the benefits of tax-induced increases in business public services (the capital productivity effect) against the cost of tax-induced outflows of mobile capital (the base erosion effect). This in turn depends primarily on the sensitivity of the marginal productivity of capital to increases in business public services. We show that in one special case—which we describe as “average” capital sensitivity—the capital productivity effect and the base erosion effect of the production tax exactly offset each other and the production tax functions precisely as a benefit tax or user charge and business public services are provided efficiently. By comparison, for low capital sensitivity, the production tax results in underprovision of business public services as the base erosion effect dominates the capital productivity effect. The opposite results are obtained in the high capital sensitivity case.

Because a capital tax applies its entire burden to mobile capital, it tends to result in a larger base erosion effect and more inefficient underprovision of public services. Indeed, we show that for average and low capital sensitivity, the production tax is always more efficient than the capital tax, and the differences in public service provision can be relatively large. The results are more ambiguous in the case of high capital sensitivity. If capital sensitivity is only somewhat above average, the production tax is still more efficient than the capital tax and the differences in public service provision can be large. However, for sufficiently large capital sensitivity, the capital tax can be more efficient than the production tax. However, in these cases, the differences in efficiency in public service provision are rather modest. These results suggest that under many circumstances a production tax is a superior alternative to the capital taxes that are much more often used in the United States, which in turn suggests that further consideration of production-based taxes—perhaps in the form of a state-level value-added tax—is warranted.

ENDNOTES

1. This report summarizes research done in collaboration with Professor Elisabeth Gugl, University of Victoria. I would like to thank Elizabeth Rasich for excellent research assistance.

2. For example, the tax competition literature shows that for services provided to households, governmental concern about the base erosion effect tends to lead to lower taxes and the underprovision of local public services (Zodrow and Mieszkowski 1986). However, the issue is more complicated when business taxes are used to finance business public services, since the capital productivity effect tends to offset the base erosion effect.

3. In marked contrast, however, a tax on capital would more closely approximate a benefit tax if the benefits of a public service were closely tied to the use of capital rather than to total production levels (Oates and Schwab 1991). Bird (2000) argues that is not likely to be the case.

4. See Gugl and Zodrow (2015) and Gugl and Zodrow (2019) for complete descriptions.

5. More precisely, average (high, low) capital sensitivity to increases in business public services occurs with production functions that are log modular (log supermodular, log submodular) in capital and public services, which in turn is the case if the elasticity of the marginal productivity of capital with respect to business public services is equal to (greater than, less than) the elasticity of output with respect to public services. Also, note that the relationship described above is symmetric: high capital sensitivity also implies that the increase in the marginal productivity of government services in response to an increase in capital is disproportionately large.

6. This case corresponds to the often-used Cobb–Douglas production function, which is characterized by a unitary elasticity of substitution between all pairs of inputs.

7. In the benchmark case, the production function is characterized by a capital share parameter of 0.40 and a public services share parameter of 0.05.

8. In this case, the production function is characterized by a capital share parameter of 0.35 and a public services share parameter of 0.10.

9. In this case, the capital tax results in an efficient level of business public services when $\sigma = 0.46$ and overprovision for smaller elasticities of substitution in production.

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