

ON THE WELFARE EFFECTS OF TAX LIMITATION*

Paul N. COURANT and Daniel L. RUBINFELD

The University of Michigan, Ann Arbor, MI 48109, USA

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Much recent literature has been devoted to providing theoretical and empirical analysis of the proposition that government is 'too large'. Far less attention has been paid to the issue of whether tax and expenditure limitations, such as those in effect in many U.S. states, are an appropriate remedy to excessive government size. This paper uses conventional tools of welfare economics to analyze the welfare effects of tax limitations in an economy made up of many local governments. The conclusions are mixed: where government charges monopoly prices, tax limitation will reduce welfare; where government provides outputs that exceed those that would be competitively supplied, tax limitation may improve welfare.

1. Introduction

In the past few years a large number of scholars have written an even larger number of papers and books concerned with the question of whether government has become too large. Much of this work has sought to identify the means by which government might reach excessive size. However, there has also been some attention paid to the question of whether there are mechanisms which will tend to limit the growth of government.¹ To the extent that there is a consensus in this literature, it is that the institutions of representative democracy, coupled with the institutions of bureaucracy, make it plausible that the absolute size of government will exceed that predicted by the standard median voter model of public finance. Furthermore, a related empirical literature suggests that the wages of government employees are in many cases higher than would be predicted by the standard human capital model.²

While scholars have been finding theoretical reasons for believing government to be too large, and empirical support for the proposition that

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¹See, for example, Niskanen (1971, 1975); Tullock (1974); Buchanan and Tullock (1974); Romer and Rosenthal (1979); Borcherting (1977); Fiorina and Noll (1978); and Courant, Gramlich and Rubinfeld (1979).

²See Ehrenberg and Goldstein (1975) and Smith (1977).

government employees are too expensive, voters and legislatures in many states of the United States have expressed beliefs consistent with these findings. Measures restricting the growth and/or level of taxing and spending have been made part of the constitutions of a number of states, and have been adopted as statutes in many others.³ Surprisingly, there has been little research into the question of whether statutory or legislative restrictions on taxation and expenditure as a whole are an appropriate policy response when government is 'too large'.⁴ The question is an important one, since it is not obvious that welfare will be enhanced by a broad tax or expenditure limitation, even if the jurisdiction to which such a limitation applies does have a public sector that is superoptimal in size or whose employees earn monopoly rents. At the same time it does seem obvious that tax and expenditure limitation reduces the ability of the fisc to respond to changing needs and tastes.

The purpose of this paper is to apply standard tools of welfare economics in order to determine the circumstances under which tax limitation can be expected to improve or worsen economic welfare *given* that the level of public spending and/or the wages received by public employees are higher than would obtain in a first best optimum. Not surprisingly, we find that the effectiveness of the tax limitation 'cure' depends on the specifics of the 'disease' of too much government. Where the problem is Niskanen-like bureaucratic aggrandizement, tax limitation is likely to improve economic welfare. Where dissatisfaction with government stems from public employees' ability to earn economic rent, on the other hand, tax limitation is likely to decrease economic welfare. Where the ability of public employees to earn rents is positively related to the size of public sector, the effect of tax limitation is ambiguous — it will depend on the details of the way in which the public sector is organized.

In section 2 of the paper we lay out the model in which the preceding results are established. We consider an economy made up of many small jurisdictions, open to both migration and trade, each of which produces both a consumption good and a pure (local) public good. In section 3 we use the model to consider the question (generally not asked in the literature) of whether it is possible for public employees to earn rents in a system that is fully open to trade and migration. We show that under certain conditions (but not all conditions) rents can be earned, since one of the factors of production, land, is immobile.

In section 4 we consider the effects of tax limitation on a central government, by considering the single-jurisdiction fixed population variant of

³The most famous of these measures, and the most restrictive, is California's Proposition 13. But many states have passed legislative restrictions on local government spending since 1970 or have altered their constitutions to limit or curtail state and/or local spending.

⁴An exception is Ladd (1978).

our model. We sketch out the broad conclusion of our paper, namely that tax limitation tends to make the private sector worse off when rent-earning is the cause of the public sector suboptimality, but that the private sector is made better off when public output is 'too large'. These results are clarified and expanded in sections 5 and 6 in which the tax limitation of local government is considered. In section 5 we consider the effects of local tax limitation when public employees have bargaining power over their wages, but the size of the public budget is set by the private sector, while in section 6 we evaluate cases in which public employees have at least some control over public sector size. In both sections 5 and 6 the central government analysis can be viewed as a special case yielding essentially similar results. Section 7 contains some conclusions and suggestions for further research.

Before turning to the formal model a brief digression on the meaning of the assertion that 'government is too large' will be useful. It seems to us that there are three rather distinct cases which are often confused, both in the press and the academic literature on the subject.

Assume that there is a public good G , produced by means of a production function that is strictly increasing in the level of public employment, E_g . Assume further that voters in a jurisdiction have utility functions defined on G and a private consumption good C , that they have incomes Y and face a known tax price P . For simplicity, we also assume that all voters who are not members of the public sector have identical tastes. In this simple context, government can be too large in any or all of the following three ways.

(1) The most analyzed case, first considered in detail by Niskanen (1971), is one in which the level of G provided in the community exceeds that which would be demanded by voters with their given incomes, tastes and tax prices. This is also the case which is closest to that considered by Romer and Rosenthal (1979). The mechanisms which permit excess production of G stem from the ability of bureaucrats to make 'all or nothing' offers (or in the case of Romer and Rosenthal, all or not enough) regarding the level of G . Bureaucrats in these models are assumed to want to have large bureaus and are not particularly concerned with high wages for either themselves or their employees. Thus, in this simplest case government is too large in the very basic sense that there is more public output than would be chosen if voters could purchase public goods on competitive terms, and the agents perceived to be responsible for the excessive level of output are public managers.

(2) The second way in which government might be considered too large is that the wages of public employees are higher than they would be if they were determined competitively, and thus the tax price P facing voters is artificially high. Thus, public budgets are high because rents are earned by public employees. Here the motivation is simple greed on the part of public employees (rather than a desire for bigness for its own sake on the part of public managers) and the mechanisms used to achieve rents are some mix of

collective bargaining and political power on the part of public sector unions. This is the case considered in Courant, Gramlich and Rubinfeld (1979).

(3) A third way in which government may be too large is that it may be inefficient in the sense that government is not on its production frontier. With the exception of Fiorina and Noll (1978), there has been essentially no scholarly literature on the mechanisms by which such inefficiency might arise, although its existence is clearly on the minds of voters according to some survey results we have obtained in other work.⁵ In this case government is perceived to be too large because there is waste, i.e. an inferior technology is being used, or the public sector is simply not on its production frontier. This resembles case 2 in that in both cases the marginal cost of a unit of public output will be higher than is optimal. But, it is conceptually quite distinct in that waste and inefficiency are not the result of an attempt by public employees to earn monopoly rents. The perception of waste in government is also quite different from the perception that there is excessive government output. On the contrary, the perception of waste suggests that there is insufficient government output given the real physical inputs employed.⁶

Unfortunately, we find this third case by far the most difficult to model, in part because there is no one agent whose behavior is obviously responsible for an inefficiency of this type. Thus, our paper focuses solely on the first two cases individually and in combination. We now turn to development of the model which we use to analyze these effects.

2. The model

Assumption 1. There are N locations in the economy,⁷ indexed by $i = 1, \dots, N$. Each of these locations contains an identical fixed amount of land, l_i , the quantity of which is normalized at unity.

Assumption 2. At each location a consumption good (c) is produced by means of a technology which is homogeneous of degree one in inputs land and labor, twice continuously differentiable, with a diminishing marginal product of each factor.

⁵The survey was administered to 2001 Michigan residents immediately after an election in which three tax limitation type amendments were on the ballot [see Courant, Gramlich and Rubinfeld (1980)]. In the survey respondents were asked whether people in state government waste money. Of all respondents, 49 percent thought there was a lot of waste, while 43 percent thought there was some waste.

⁶We should note that our survey results also make it clear that most voters thought that certain public services ought to be increased while others ought to be decreased. To what extent these opinions are due to beliefs about over and underproduction or waste is unclear, but it would take a more involved model with a multiple output government sector to pursue the issue further.

⁷In the discussion that follows, location, urban area and city are used interchangeably.

Since land is fixed in our analysis it will simplify matters to write the production function for the consumption good solely in terms of labor devoted to production of that good (e_p). Thus,

$$c^i = f(e_p^i) \quad (i = 1, \dots, N), \quad (1)$$

where the superscript denotes the location i , $f' > 0$, and $f'' < 0$ (i.e. $f(\cdot)$ is strictly concave). The price of the consumption good is normalized at unity; thus, all other prices are measured in units of the consumption good.

Assumption 3. At each location a pure public good may be produced by means of a technology which is linear in the amount of labor employed in the public sector. Again to simplify, the output of the public sector is measured by the amount of labor (e_g) devoted to it.

Assumption 4. The total population of the economy is fixed; all individuals have identical endowments of human capital; all individuals supply equal amounts of labor. Thus, the total amount of labor in the economy is fixed at \bar{e} . All labor is employed either in the private or public sector at some location, so that

$$e_p^i + e_g^i = e^i \quad (2)$$

and

$$\sum_{i=1}^N e^i = \bar{e}. \quad (3)$$

Assumption 5. All workers have identical quasi-concave and twice differentiable utility functions, $U(c, e_g)$, monotonically increasing in both the consumption good and the level of public output.

Assumption 6. Both labor and the consumption good are costlessly mobile among locations.

Assumptions 7. The markets for private sector labor, land, and the consumption good are perfectly competitive.

From assumption 7 it follows that

$$w_p^i = f'(e_p^i), \quad (4)$$

where w_p^i is the wage earned by workers in the consumption good industry

at location i . From assumptions 2, 6 and 7, land rental prices, r^i , can be determined as a residual, i.e.

$$r^i = (c^i - e_p^i w_p^i) / l_i. \quad (5)$$

It should be noted explicitly here that income attributable to land must either accrue to absentee landlords who are not blessed with utility functions, or be distributed uniformly to the population. In either case, both private and public sector employees will have identical incomes if the labor market is perfectly competitive at all locations. Explicit assumptions about land income will be made later in the text.

Finally, assumptions 5, 6 and 7 imply that the level of utility achieved by private sector workers must be equal at all locations. Thus, using the subscript p to denote the private sector

$$U(c_p^i, e_g^i) = U(c_p^j, e_g^j) \quad (i, j = 1, \dots, N), \quad (6)$$

where $U(\cdot)$ is the utility function.

Assumption 8. Employees working in the public sector may possess market power such that they can restrict entry and simultaneously raise their wage rate above that of private sector employees in the same location. (This market power will in general be different in different locations.) If they do not possess market power, then assumption 5 implies that their wage in location i , (w_g^i) will be equal to the private sector wage (w_p^i).

Assumption 9. Public expenditures are financed by a head tax,⁸ so that the public budget is balanced at each location. Thus, the tax bill per employee at location i is

$$w_g^i e_g^i / e^i.$$

Later in the paper we will find it convenient to assume the existence of absentee landlords. For the purposes of this section, however, it is important that we consider the behavior of the model when all income accrues to agents with utility functions. Thus we adopt:

Assumption 10. Title to the N units of land in the system is held equally by all members of the labor force, such that each worker owns $1/\bar{e}$ of the land in each location.⁹ Thus, the landholdings of each person are N/\bar{e} .

⁸We use a head tax for analytical convenience. The model yields *similar qualitative* results under a proportional income tax.

⁹Noting that land serves the role of both land and capital in this model, this assumption is equivalent to assuming that each individual diversifies his/her portfolio of holdings among different firms in the same industry.

2.1. Solution in the perfectly competitive case

Stiglitz (1977) has shown that in models of the type considered here there is a nonconvexity in the production set facing society. The nonconvexity arises from the fact that as the population of any city is increased it becomes cheaper (in terms of units of the consumption good per capita) to produce the public good. If tastes for the public good are strong enough, optimal population size will be infinite (and in our model only one city will be inhabited). In addition, there are a number of cases under which equilibria will not be optima, and in which there will be multiple equilibria and/or optima.¹⁰

As a practical matter, the case in which optimal population is infinite is not very interesting. With free migration, there is nothing to prevent $N-1$ cities being uninhabited. The opposite polar case, in which optimal population size is zero, is also uninteresting. (There are, after all, many cities in most developed economies, each providing local public goods.) However, the possibility that there are not enough cities, implying that population will generally be superoptimal, is more serious, although it can be ruled out if it is assumed that in the long run communities may be formed freely.¹¹ Partly as a reflection of reality, and also for analytical tractability, we adopt:

Assumption 11. There exists a finite optimal population size, $e^* = \bar{e}/N$.

Assumption 11 ensures that an equal allocation of population across communities will be an optimum. Because optimality requires that the quantities of e_g and c chosen in each city maximize utility given the city's population, and because the production set for any given population is convex and the utility functions are assumed to be quasi-concave, it follows that with perfect competition the level of e_g (and c) in each city will be the same with a uniform allocation of population. This, in turn, implies that the marginal product of private sector labor (w_p) must be equal everywhere, and the absence of public employee market power under perfect competition implies that w_p must equal w_g .

Assumption 11 also ensures that an equal allocation of population to communities will be an equilibrium. No agent can increase utility by migrating, because the level of utility is the same everywhere. Moreover, if someone did migrate, there would be a (small) loss in utility in both communities involved.

¹⁰It should be noted that these problems do not arise if the goods and services provided publicly are in fact private in character. Empirical work by Bergstrom and Goodman (1973) and Borcharding and Deacon (1972) indicate that indeed this may be the case. If congestion affects the consumption of the publicly provided good in the same way that it affects the consumption of the private good (e.g. if $G = e_g/e$), then the production possibility frontier will be globally convex given the other assumptions made above.

¹¹See Epple, Zelenitz and Visscher (1978) for a model using such an assumption.

Given N identical locations, each with the same initial labor force, we can characterize the behaviour of the system as a whole by looking at public employee behavior at one location. In doing so we drop the use of superscripts and (to simplify) assume competitive public sector behavior at all other locations. At each location each of the \bar{e}/N consumers will have identical wage incomes. Of course that wage level depends on the allocation of labor between the public and private sector, since the wage paid in the private sector must be equal to the value marginal product of labor.

The problem facing any resident is to maximize utility subject to the constraint that expenditures on the consumption good plus expenditures on the public good are equal to the sum of land and labor income. Given that public goods are financed by a head tax, and that land rents are initially equalized everywhere, the budget constraint for those employed in the private sector may be written as:¹²

$$w_p + rN/\bar{e} = c_p + w_g e_g/e \quad (7)$$

or, since $e = \bar{e}/N$, $w_p + r/e = c_p + w_g e_g/e$.

In the case under consideration the subscripts 'p', denoting private sector, are of course superfluous since the relevant variables have the same values for public sector employees. More generally, however, eq. (7) as written is the constraint facing private employees, and the same equation, with 'g' replacing 'p', would be the constraint facing public employees.

Maximization of the utility function (6) subject to (7) yields the familiar condition that the marginal rate of substitution between the two goods must equal the price ratio. Under the head tax, the price of e_g is simply w_g/e ; thus,

$$U_2/U_1 = w_g/e, \quad (8)$$

where the subscripts on the utility function denote the respective partial derivatives. Not surprisingly, rearrangement of (8) yields the familiar condition that $\sum \text{MRS} = \text{MRT}$.

2.2. Utility and outmigration

Given a value of e (in the case under consideration \bar{e}/N), eqs. (1), (2), (4), (5), (6) and (8) determine e_p , e_g , w_p , r , c , and U_0 , the level of utility attained.

Throughout the remainder of this paper we will be considering situations in which public employees exercise market power in location 1, leading to

¹²When land rents vary by location, the condition becomes

$$w_p + \sum_i \frac{r_i}{\bar{e}} = c_p + \frac{w_g e_g}{e}$$

the outmigration of private employees from that location. Since the 'rest of the world' will be assumed to remain completely competitive, any outmigration will be uniformly distributed among the remaining $N - 1$ locations and each of these locations will behave identically to each other. Because there is costless migration, equilibrium will require that private employees in location 1 achieve the same level of utility as private employees in the rest of the economy. If N is large, the loss of individual utility attained in the rest of the world due to migration to city 1 will be negligibly small, as in the familiar open city model. Thus, in analyzing behavior in location 1, we will adopt the standard convention in such models that utility is given as a parameter and that other variables (notably income and prices) must adjust so as to equalize the utility attained by private sector employees, with the adjustment mechanism involving migration and a concave production function for c .

We stress that utility losses are not zero, however, because unequal allocations of population are not optimal by assumption 11. If the production set facing each community were convex, even with variable population (as would be the case if the publicly provided good were a private good) the utility loss for all private employees would be increasing in the level of the population in the $N - 1$ cities which comprise the 'rest of the world', and hence be increasing in the amount of outmigration from city 1. In the context of this model, the nonconvexity in the production sets due to the presence of pure public goods makes it possible that utility will not be monotonically decreasing in outmigration. This possibility can be ruled out, however, if it can be shown that there are no local pessima as a function of population size. In our model [as in Stiglitz (1977)], a sufficient condition for a unique optimum can be characterized in terms of the elasticity of substitution in consumption between c/e and e_g and the elasticity of substitution in the production function. The condition in our model will be met if both elasticities are strictly less than unity.¹³

We assume, then, that for population sizes between \bar{e}/N and $\bar{e}(N - 1)$, that condition (vi) in footnote 13 holds. If utility is further assumed to be a

¹³Define

$$V(e) = \max_{e_g} \left(U \left(\frac{f(e - e_g)}{e}, e_g \right) \right).$$

Using eq. (8) and recalling that with competition $w_g = f'(e - e_g)$,

$$V'(e) = U_1 \left(\frac{f'}{e} - \frac{f}{e^2} \right) = 0, \tag{i}$$

$$V''(e)|_{V'=0} = \frac{U_{11}}{e^2} \left(e f'' \left(1 - \frac{de_g}{de} \right) + f' \frac{de_g}{de} \right). \tag{ii}$$

continuous function of population size, this condition is sufficient to establish.

Lemma 1. The level of utility achievable by each individual, and thus the level of aggregate social welfare, is a positive strictly increasing function of e , the population of location 1,¹⁴ for all $e < \bar{e}/N$.¹⁵

This result will permit us to use the level of outmigration from location 1 as a (negative) utility index in comparing the effects of different assumptions concerning public employee market power and tax limitation.

2.3. Solution of the model with absentee landlords

Assumption 10 was made for the purpose of showing that when a nonoptimal allocation of labor is employed in the system as a whole and all income is returned to workers, utility must fall. The Pareto efficiency of a

The term in brackets will be negative if

$$\frac{de_g}{de} < \frac{-ef''}{f' - ef''} \tag{iii}$$

From the definition of the elasticity of substitution, and from (i),

$$-ef'' = \frac{f' e_g}{\sigma_p (e - e_g)} \tag{iv}$$

where σ_p is the elasticity of substitution in production. Assuming homothetic preferences, the elasticity of substitution between consumption per capita and e_g , at the optimum, is given by

$$\sigma_c = \frac{(e - e_g - e)f'(de_g/de)}{e_g ef'' [1 - (de_g/de)] - f' e_g} \tag{v}$$

Substituting (v) and (iv) into (iii) yields that $V''|_{V=0} < 0$ if

$$\sigma_c (\sigma_p (e - e_g) + 2e_g) < e_g + e \tag{vi}$$

¹⁴See Courant and Rubinfeld (1978) for a more thorough analysis of this result in a somewhat different model.

¹⁵The assumption required to establish the lemma is admittedly somewhat strong. It can be justified on three quite different arguments.

(1) While application of empirical results for such a simple model is to be undertaken with caution, estimates of the two relevant elasticities are generally less than unity.

(2) To the extent that publicly provided goods are not pure public goods, the assumption is not required. If our model were recast with $G = e_g/e$, there would be no convexity problem, the optimality of the uniform allocation, as well as lemma 1, could be established without resort to anything more than 'normal' assumptions about tastes and technology.

(3) The proponents of tax limitation do not base their case on the possible existence of perverse behavior due to nonconvexities in production sets.

Finally, it should be noted that neither assumption 11 nor lemma 1 is required to establish the results presented below in the case of a single central government.

uniform allocation, of course, does not depend upon who holds title to land, although the distributional consequences of different allocations will depend directly on ownership.¹⁶ Dropping assumption 10 and replacing it with the assumption that landlords are absentee permits us to do two things. First, it simplifies consideration of the functional distribution of income among landlords and workers in both location 1 and the rest of the world. Second, it permits us to ignore the effects of land rents on the incomes of workers, thus greatly simplifying the analysis of mobility.

Under the assumption that landlords are absentee, the budget constraint facing a private employee will be¹⁷

$$w_p = c_p + w_g e_g / e, \quad (9)$$

while the constraint facing a public employee will be

$$w_g = c_g + w_g e_g / e. \quad (10)$$

The indirect utility function of the private employees, which will prove useful in the analysis to follow, will be

$$V = V(w_p, w_g e_g / e). \quad (11)$$

Finally, the results of the model obtained when e is equal to \bar{e}/N , $w_g = w_p$, and (6) is maximized subject to (9) and the other constraints of the model will be denoted by an asterisk (*), indicating optimal values.

3. Can public employees utilize their market power?

In terms of the coverage of our paper there are two conceptually distinct reasons for considering a tax limitation policy. One reason arises from a model of bureaucratic behavior or voting behavior in which the level of public output is increased beyond the efficient level. The analysis of this case is presented in section 6. A second reason arises when public employees have the potential to raise their wages above the level that would be earned by private employees with equivalent skills. The welfare effects of tax limitation in this case are analyzed in section 5. We do not spend any time on the case in which public employees do not possess market power and output is unaffected by bureaucratic behavior simply because tax limitation in such a case can only constrain choices optimally made, and thus cannot be socially

¹⁶See Courant (1977) for a proof that although total output must fall in a nonoptimal allocation, total returns to either factor (but not both) may rise.

¹⁷For the remainder of the paper, the absence of superscripts implies that we are looking at location 1.

beneficial. However, the analysis in sections 4 and 5 is predicated on the assumption that public employees can earn rents by raising their wage. Thus, before beginning our tax limitation analysis it is necessary to examine carefully the wage determining behavior of the public sector.

Our analysis proceeds in two steps. First, we ask under what conditions it is possible for public employees in one location to improve their welfare by raising the public wage rate, given that private sector mobility is costless. Second, we analyze the case in which the use of such market power can be effective (and thus cause economic inefficiency) asking whether tax limitation will make society better or worse off. At the same time we examine the distributional consequences of a tax limitation policy in terms of (a) how much of the impact is felt within the tax limitation area, and (b) how the gains and losses are distributed among workers in each sector, and landowners both in location 1 and the rest of the world.

Assume that the economy starts at the global optimum, in which $w_g = w_p = w_p^*$, where the asterisk denotes the optimum. Assume also that public employees have some ability to control the wage rate and that their market power is independent of the level of public employment. Because private mobility is costless, there is clearly a limit to the extent to which public wages can be increased. What is less clear is whether *any* increase in the utility of public employees can be attained by such a policy. The reason is that as public wages are increased, private sector outmigration lowers the effective tax base (e , since we are using a head tax). If the rate of decrease in tax base is sufficiently rapid, public employees will make themselves worse off by attempting to earn any rents.

To pursue this matter further, we note that as w_g is increased above w_p^* (for a given e_g), the price of public output rises, and private employees are made worse off. Following the usual 'small open city' assumptions made in section 2, outmigration must then occur until (to a close approximation) the original level of utility is attained by private employees. Since outmigration lowers e , the price of public output will continue to rise. However, from the production function, the decline in e will lower e_p and hence raise the private sector wage. In equilibrium, the private employees will be consuming less e_g and more private goods, but attaining essentially the same level of utility. In other words, some wage increase will be tolerated by the private sector (i.e. will be consistent with spatial equilibrium) simply because private money wages will rise as outmigration from location one occurs.

The result is that there is an inverse relationship between w_g and e due to the mobility of price taking (and utility taking) private employees. With private employees choosing e_g , this relationship serves as a constraint which faces public employees. All points satisfying this relationship are associated with an equilibrium in which private employees attain essentially the same level of utility. (Although, of course, social welfare falls in response to the

increase in w_g .) To obtain the slope of the curve defining this constraint, we need to calculate de/dw_g from the private employees' indirect utility function, the production function for c , and the employees' demand function for e_g . To do so we totally differentiate the indirect utility function, setting $dV=0$ (relying on our open city, competitive assumptions) and utilizing the fact that e_g , the demand for public employment, is equal to $(-V_2/V_1)$.¹⁸ It follows that

$$\frac{dw_p}{dw_g} = -\frac{V_2}{V_1 e} \left[-\frac{w_g}{e} \frac{de}{dw_g} \right] = \frac{e_g}{e} (1 - \theta), \quad (12)$$

where θ is the elasticity of e with respect to w_g .

For the reasons given above, θ must be negative, and in general θ will vary with w_g . The actual value of θ and thus the slope of the constraint facing public employees will depend on how the private wage adjusts to the public employee behavior. In the simple case of a Cobb–Douglas production function and Cobb–Douglas utility function, θ is constant, from which it follows that de_p/dw_g falls in absolute value as the public wage is increased. What is perhaps more interesting from the analysis is that eq. (12) helps us to determine under what conditions it is possible for an increase in public wages to make employees better off. The results are summarized in theorems 1 and 2.

Theorem 1. A necessary condition for public employees to increase utility (or earn additional rents) by increasing w_g above any initial level is that

$$\theta > (1 - e/e_g).$$

Proof (by contradiction). If $\theta \leq (1 - e/e_g)$, then from eq. (12), $dw_p/dw_g \geq 1$, implying that private wages rise more than w_g as w_g rises. But since (12) is derived on the assumption that V_0 (private utility) is constant, and both groups receive the same e_g at the same price, public employee utility cannot be improved unless public wages rise by more than private wages.

Theorem 2. The condition stated in theorem 1 is also sufficient if the initial level of w_g is w_p .

Proof. If $dw_p/dw_g|_{w_p=w_g} < 1$ so that public wages increase more than private wages, then although public employees do not consume their most desired level of e_g after raising w_g , they do consume the same amount as do private employees, and at the same price. Thus, in order to spend their greater income, they must consume more of the consumption good than do private

¹⁸From Roy's Identity. See, for example, Diamond and McFadden (1974).

employees. Since private employee utility is unchanged, public employee utility must rise.

*Corollary 1. When outmigration is not possible, public employees can always earn rents.*¹⁹

We now restrict our consideration to models for whose parameter values rent-earning is possible when $w_g = w^* = w_p$. We attempt to characterize the level of w_g which would maximize public sector utility. If e_g is assumed fixed, the optimal wage can be determined explicitly by maximizing public sector consumption of c at the given level of e_g — here $c_g = w_g - w_g e_g / e$. The first-order condition is as follows:²⁰

$$\frac{e_g}{e} = \frac{1}{1-\theta} \quad \text{or} \quad \frac{de}{dw_g} = \frac{e_g - e^2}{e w_g e_g} \tag{13}$$

This condition for maximization overstates the desired wage, however, because it does not account for the fact that as w_g rises (and falls) *private employees* will choose ever lower levels of e_g .²² This result is stated and proved in the following theorem and corollary.

Theorem 3. The optimum public wage when private sector adjustments in public output are accounted for is the wage rate which satisfies the following condition:

$$\frac{U_2}{U_1} = \frac{w_g}{e} + \frac{dw_g}{de_g} \left[\frac{e_g}{e} (1-\theta) - 1 \right], \tag{14}$$

¹⁹When the production function ($c_p = e_p^\alpha / 1 - \alpha$) and utility function ($U = e_g^\beta c^{1-\beta}$) are Cobb-Douglas, the necessary and sufficient condition for public employees to increase their utility by raising w_g is that

$$\frac{dw_p}{dw_g} = K_1 [\beta + K_2 w_p^{K_2 - 1}]^{-1} < 1,$$

where

$$K_1 = V_0 \beta^{-\beta} (1-\beta)^{-(1-\beta)},$$

$$K_2 = \frac{\alpha + \beta - 1}{(\alpha - 1)\beta},$$

and V_0 is the level of utility attained by the private sector. We might note that one necessary condition for the corollary to hold is that $K_2 > 1$, or solving, $\alpha(1-\beta) + 2\beta < 1$ which does hold for reasonable values of α and β (e.g. $\alpha = 0.7, \beta = 0.1$; these values are also sufficient).

²⁰This condition is similar to the one found in Courant, Gramlich and Rubinfeld (1979).

²¹This condition is consistent with eq. (12). There we found that when $e_g/e < 1(1-\theta)$ there are still rents to be earned on the margin. Here we see that when the equality holds there will be no additional rents to be earned and total rents will be maximized.

²²This must be true. With their utility fixed private employees are on a compensated demand curve and the price of e_g rises.

where U_2 and U_1 are the partial derivatives of the public sector employee's utility function.²³

Proof. In the public employee utility function, $U(c_g, e_g) = U(w_g - w_g e_g/e, e_g)$, since consumption c_g is determined as a residual after the public output head tax is paid. Differentiating with respect to w_g and solving we find that

$$\frac{dU}{dw_g} = U_1 \left[1 - \frac{e_g}{e} (1 - \theta) - \frac{w_g}{e} \frac{de_g}{dw_g} \right] + U_2 \frac{de_g}{dw_g}. \quad (15)$$

At the optimum $dU/dw_g = 0$. Using the fact that $dU/dw_g = 0$, we solve to obtain the desired result.

Corollary 2. *The public wage set under the assumption that e_g remains fixed is higher than the wage which is set when e_g varies negatively with w_g .*

Proof. Since public employees face the same price as private employees and have higher incomes when $w_g > w_p$, their desired public output must exceed the level actually provided. It follows that $U_2/U_1 > w_g/e$. In addition, we have seen from (13) that $e_g/e = [1/(1-\theta)]$ when changes in e_g are not accounted for. Substituting into (15), it follows that

$$\frac{dU}{dw_g} = U_1 \left(\frac{de_g}{dw_g} \right) \left[\frac{U_2}{U_1} - \frac{w_g}{e} \right]. \quad (16)$$

Clearly dU/dw_g is negative since the term in brackets is positive and de_g/dw_g is negative. Furthermore, the greater is θ [from (14)] the more negative will be (16) and hence the more limited will be the ability of the public sector to exploit its market power.

The results of theorems 1, 2 and 3, and the associated corollaries may be summarized as follows.

(1) Even in a perfectly mobile world, a public sector union which possesses market power in one locality may be able to increase its utility by setting its wage above the competitive wage. Whether this is possible or not depends on the form of the utility and production functions. We should note that the simultaneous attempt of unions with market power in all jurisdictions to achieve their objectives will tend to reduce the likelihood that any one will get an improvement. Of course, the actual outcome in such a case depends

²³Eq. (14) is easily interpreted. The term w_g/e is the average cost of e_g facing private employees, while the last set of terms on the right-hand side accounts for the fact that due to mobility of the private sector, marginal cost exceeds average cost.

upon the particular choice of game theoretic assumption that one makes. But we should note that even when all governments have such market power the collectivity of local public governments will still be able to earn rents [see Epple and Zelenitz (1980)].

(2) When it is possible for a public sector union to increase its utility through wage increases, the ability of such a union to exploit market power is limited by the mobility of the private sector. The more responsive the private sector population is to w_g , the less the public sector employees will be able to raise their utility by increasing w_g .

4. Tax limitation of a central unified government

While most tax limitation amendments currently in force in the United States apply to state and/or local governments, a move to restrict the spending of the national government has also been in progress. Therefore, it seems worthwhile to consider the normative analysis of the national government case before proceeding to consider the more complex case of local tax limitation in a world with many jurisdictions and household mobility.

To treat the central case we need make only a few minor adjustments in the model, by assuming that there is only 1 location in the economy and that total population is therefore fixed. It remains true that the allocation of resources under perfect competition will be optimal, but lemma 1 is no longer relevant. As outlined at the beginning of section 3 we consider first the case in which public employees earn rents through their use of market power over wages, and then the case in which output is too large because of Niskanen-like bureaucratic effects.

As in section 3, to treat the market power case, we must first ask whether it is possible for public employees to improve their welfare by raising their wage, and the answer is yes, as expected. Thus, for $\theta=0$ in theorem 1, the necessary condition holds for all $e > e_g$ (see footnote 19). Likewise, the optimum public wage is given by eq. (14), again when θ is set equal to zero. Here, the only limitation on the desire of public employees to raise the wage is the lower public output that private employees will choose as the public output price rises.

Assuming for the moment that market power is independent of public sector size, what happens when a tax limitation amendment is put into effect? Unfortunately, the elementary nature of our model does not allow us to discuss the comparative properties of a series of tax and expenditure limitation structures. Rather, we consider the effect of limiting total expenditure, $w_g e_g$, along the lines of a recently suggested U.S. constitutional amendment. We assume also that $w_g e_g$ is constrained to be less than the current level of spending prior to the enactment of the amendment. With

market power unaffected by the amendment, the constraint will be met by a reduction in output e_g . This clearly makes public employees worse off because they were initially consuming fewer public services than they wanted at their wage w_g . However, it also makes private employees worse off because they are constrained so that they can no longer operate on their demand curve, receiving less public output and more private consumption than would be optimal. A similar result holds when market power is a positive function of the size of the public sector. In this case both w_g and e_g will fall to satisfy the limitation, making public employees worse off. Despite the fall in w_g , however, private sector employees will still be made worse off. While not nearly so direct, this latter result follows because private employees could have limited w_g by choosing a lower e_g themselves, and opted *not* to do so. Both of these market power results are clarified and expanded upon implicitly in section 5 which follows. One need simply interpret the central government case as a special case of the model with many jurisdictions with all outmigration parameters set equal to zero. All of the essential theorems apply when the limitation applies to a national or to a local government.

Noe consider the effect of a limitation on $w_g e_g$ when public employees actually set the level of public employment e_g , assuming for the moment that public employees have no market power over wages. We also assume that because of taste differences, public employees opt for a higher level of e_g than that desired by the private sector. In such a case it is immediately clear that an expenditure limitation is beneficial to the class of private employees, since it brings the level of e_g provided in line with their demand. Finally, when both w_g and e_g are controlled by the public sector, the limitation has an ambiguous effect on the welfare of the private sector, as one might expect given our discussion of the two individual cases. However, the details surrounding the fixed w_g case, and the more complicated case in which both w_g and e_g are controlled by the public sector are best left to section 6 where they are treated in detail. Once again the central case can be seen as a special case of the multiple jurisdiction model.

5. Local tax limitation when public wages exceed private wages

In this section we consider the effects of tax limitation when public employees are able to set w_g greater than w_p .²⁴ First, we analyze the case in which the degree of market power is independent of the level of e_g . This is admittedly a special case, but it serves to make our conclusions clear and

²⁴One might expect that the political and bargaining power of public sector unions would be greatest when e_g is large. However, as e_g increases, $1 - e/e_g$ becomes less negative and the condition for rent-earning in theorem 1 becomes more difficult to meet. With private employees setting e_g , then, public employee market power is likely to be quite weak, while according to

direct. Second, following Tullock (1974) and others²⁵ we consider a case in which bargaining power increases with the size of public sector, so that the level of w_g is an increasing function of e_g . In both cases we assume that the level of e_g is set by the private sector, and that public employees do not achieve condition (14); i.e. they will always use any additional market power for the purpose of increasing w_g .²⁶

The elementary nature of this model does not allow us to discuss the comparative properties of a series of tax and expenditure limitation structures. Rather, we consider the effect of a public spending limitation of the sort now in effect in several states²⁷ in which total expenditures, $w_g e_g$ are limited, i.e. in which $w_g e_g$ as specified by the limitation is less than the level of public spending before its enactment.

In general, such a constraint may be met by reducing either or both of w_g and e_g . Where public employee market power is independent of e_g and the other assumptions of this section hold, however, the constraint will be met by a reduction in e_g alone, because public employees' market power is unaffected and public employees will not choose to reduce w_g . Under these conditions it is easy to prove:

Theorem 4. With a fixed public wage rate, tax limitation is socially inefficient (in the sense of lemma 1), and makes private sector employees worse off.

Proof. The result follows directly from our earlier analysis. First, public employees were already underconsuming public output before tax limitation was put into place, so that the further reduction must make them worse off. Second, the level of e_g chosen by the private sector was optimal for the given wage level w_g . The fall in e_g due to tax limitation, then, will force private sector employees to underconsume e_g at the tax price given at the pre-limitation level of e . But our open-city competitive assumptions require that private employees receive the same level utility as other private employees in the rest of the world. This in turn requires an increase in w_p which can only be achieved through a reduction in e . By lemma 1, the decline in e must

theorem 1 the opportunity for rent-earning on the margin will be relatively large. This can be seen directly from the necessary condition for rent-earning given in the Cobb–Douglas example in footnote 19. When β is greater than or equal to 0.5 (e_g is at least half of e), the necessary condition for rent-earning is never met. Thus, the political conditions for a public employee union to set its desired wage (large e_g) are such that the desired wage itself is likely to be quite low. For completeness, however, we consider the case where public employees are able to achieve (14) through market power at the end of this section.

²⁵See Courant, Gramlich and Rubinfeld (1979) for an extended bibliography.

²⁶This last assumption is especially plausible in light of theorem 1.

²⁷The Headlee amendment, recently passed in Michigan, is of this form. Under that provision, total expenditures are fixed at a fraction of nominal personal income.

reduce social welfare. And, by the concavity of the production functions, it clearly reduces the utility of private sector workers throughout the world.

Intuitively, as long as the noncompetitive public sector wage is fixed, and the system acts competitively so as to find a second-best solution given that wage, all that tax limitation can do is move the system from second best to third best, by adding yet another constraint.

Endogeneity of the ability of public sector workers to set w_g higher than w_p does not alter the preceding analysis substantially. If it is again assumed that public employees could always make use of additional market power at the margin, then we are in a situation very similar to that dealt with in theorem 4. In particular, tax limitation, although it will now lower both e_g and w_g , simply adds a constraint which will serve to prevent private employees from behaving efficiently. We summarize the result in the following corollary.

*Corollary 3. With public wages an increasing function of e_g , tax limitation is socially inefficient, and public employee utility cannot increase.*²⁸

Corollary 4. With a fixed public wage rate, tax limitation of a centralized unified government makes private and public employees worse off.

The most important aspect of theorem 4 and its corollaries is that under the stated assumptions tax limitation has an unambiguously deleterious effect on welfare. The key assumptions leading to that result are that the public sector's market power only affects the level of public wages and that the degree to which they possess that power is less than they could profitably

²⁸Assume that the level of w_g is an increasing function of e_g , i.e.

$$w_g = \alpha(e_g); \quad \alpha'(e_g) > 0; \quad w_g \geq w_p^*.$$

Without tax limitation, private employees will maximize their utility function subject to setting the marginal rate of substitution between c_p and e_g equal to the relevant marginal price ratio, which is

$$\frac{w_g + \alpha'(e_g)e_g}{e}$$

That public employees are made no better off is now clear. Had some point on the function $\alpha(e_g)$ yielded higher utility than that chosen before tax limitation, they could have attained such a point by setting the value of w_g appropriately. The argument that e must fall is essentially identical to that given in the proof of theorem 4. The level of w_g chosen by public employees prior to the implementation of tax limitation was that which maximized utility subject to the function $\alpha(e_g)$. By adding another binding constraint, tax limitation forces private employees to underconsume e_g . In order to compensate them for this, w_p must rise, which necessitates a reduction in e_p . As e_g is already falling along $\alpha(e_g)$, e must fall, and by lemma 1, utility must fall. Furthermore, private employee utility falls (somewhat) worldwide, since the increase in w_p in the location under consideration implies that w_p must fall everywhere else.

use. In section 6 we will consider situations in which neither of these conditions holds, with the result that tax limitation may improve welfare.

Another important result obtained in this section is that almost all of the costs of public sector power over wages are borne by landlords in the city where such power is exercised, and workers in the world as a whole. Outmigration may only lead to small changes in the level of utility attainable in the system, but it can have large distributional consequences. In particular, reductions in e_p , the mechanism by which private sector workers' utilities are equalized when w_g exceeds w_p , must lead (given the production function for c) to reductions in r . In the rest of the world, on the other hand, w_p^i falls and r^i rises. Thus, landlords in the rest of the world clearly gain from outmigration from location 1, and landlords in location 1 lose. Workers in the rest of the world also lose, as potential output per person at any e_g^i falls.

Tax limitation, while it further reduces social welfare, also has distributional effects. Again, as outmigration increases due to the tax limitation, landlords in location 1 lose, while landlords elsewhere gain and workers elsewhere lose. The net effect on landlords as a class is indeterminate, although it can be proved that if the production function for c is Cobb–Douglas, outmigration from location 1 will reduce aggregate landlord income.²⁹ But in all of these cases the most important point is that the efficiency costs imposed on workers by both public sector market power over wages and by inefficient tax limitation are borne very broadly. The costs imposed on landlords, on the other hand, fall completely on those who hold title to the land in the location under consideration. Indeed, landlords elsewhere achieve small gains.

It should be emphasized that the preceding results depend on the assumption that public employees will not choose to cut their wages in response to tax limitation. For reasons given above, we find this case to be far more plausible than its opposite — one in which public employees, with no control over e_g , are able to attain their optimal wage as given in eq. (14). To be complete, however, we now consider what happens if eq. (14) holds prior to the enactment of tax limitation.

In this case it is possible that public employees would find it beneficial to lower the public wage rate in response to tax limitation. The lower wage means a loss of money income, but it also lowers the price of public output, making private employees better off, and the resulting increase in e lowers the price even further. Thus, the result is that private employees will demand more e_g and at least some of this demand may be accommodated within the tax limitation constraint. Whether such a response will occur depends upon the extent to which public employees were underconsuming e_g initially, and upon the willingness of private employees to increase e_g . For the 'right'

²⁹See Courant (1977) for a proof.

parameter values, however, public employees may choose to cut w_g enough so that e will increase, and hence tax limitation will be of benefit to consumers. However, it is also possible that the public sector response will be just the opposite. Public employees could choose to increase w_g in response to limitation, causing an additional outmigration, and raising the tax-price of public services such that e_g falls even more. In this case the secondary adjustment makes tax limitation more harmful than the initial effect.

6. Local tax limitation when public employees set the level of public output

In this section we consider the possible effects of tax limitation when public employees actually set the level of public employment e_g . We first analyze such behavior when public employees have no market power over wages. Then, we assume that the public wage may be greater than or equal to the private wage. The literature on bureaucratic aggrandizement (e.g. Niskanen, Romer and Rosenthal, etc.) suggests that public managers have a positive preference for large government. In the context of our model, it is difficult to introduce a public managerial class. In our model the assumption that public employees prefer more public output serves as a simple means of introducing that bias into the analysis. The assumption of two sets of utility functions makes welfare analysis substantially more complex, however.³⁰ Since the concern of most analysts lies in the impact on private sector employees, we choose to restrict our welfare analysis to that group. We thus implicitly view the managers of the public 'union' as outside the model.³¹

6.1. Tax limitation without market power over wages

Our primary result is given in theorem 5.

Theorem 5. If public output is larger than the private sector optimum in a model without public control over wages, tax limitation (on the margin) will benefit private employees while making public employees worse off. Landowners in the directly affected area gain, while landowners at other locations lose.

Proof. Assume first that public employees have no market power over wages, so that $w_g = w_p$ at any level of public output. To simplify, we can

³⁰For a more detailed discussion of this issue in a somewhat different context, see Gramlich and Rubinfeld (1980).

³¹This set of assumptions also allows us to avoid the difficulties arising when an employee changes employment sectors. Formally, the employee would change utility functions, thereby confounding conventional welfare analysis.

approximate this assumption by fixing $w_g = w_p^*$ ³². Recall that we have assumed that public utility functions differ from private, with public employees demanding more public output. If public employees choose e_g , they will choose a value greater than the original social optimum, so e_p falls and w_p rises. However, private employees are clearly worse off, since they could have selected this allocation initially and chose not to. As a result, population e falls and the wage w_p increases further until the level of private utility reaches its initial level. With $e < e^*$ and $w_g = w_p > w_p^*$, private employees are clearly facing a higher tax price for public output and thus are overconsuming public output.³³

Corollary 5. Under the conditions of theorem 5, tax limitation of a central unified government increases (on the margin) the welfare of private employees.

In such a case the effect of tax limitation is clear. The level of public output must fall in response to the limitation and at least for small decreases in output, e must rise with a corresponding gain in the welfare of private employees.³⁴ Since the initial increase in e_g beyond the optimal private sector level must have decreased local land values, but increased land values at other locations, the converse must occur when tax limitation is put into effect.

6.2. Tax limitation with market power over wages

The analysis is quite similar if we generalize the previous model by allowing for a public wage rate that is greater than the private wage w_p^* . However, we keep the analysis simple by assuming that the public wage rate does not adjust with changes in local policy. (In the language of section 3, condition (14) is not met — hence w_g is always as high as public employees can make it.) From section 3 we have already seen that in the process of raising public wages (when rent-earning is possible), private employees face a higher tax price for public output, and thus choose to consume less e_g . If we now allow public employees to enforce a higher-level of e_g due to their bureaucratic power, the private employees will be overconsuming public output given the higher tax price that they face. As a result, further outmigration will occur, with the usual consequences. The effects of tax limitation are then quite clear. When e_g falls due to tax limitation, private employees are made better off, while public employees are made worse off. Summarizing,

³²If utility functions are identical, the optimal level of e_g will be chosen. In this case a tax limitation amendment which lowers $w_g e_g$ will clearly harm both public and private employees.

³³Public employees will be enjoying a higher money wage w_g , but will be earning no rents, since $w_g = w_p$.

³⁴Of course if the tax limitation amendment is too stringent, and the public sector becomes too small, society can be worse off.

Theorem 6. If public employees have market power over wages such that the public wage is fixed and exceeds the private wage, and if public employees control the level of public output, tax limitation (on the margin) makes private employees better off, while public employees are made worse off.

Corollary 6. Under the conditions of theorem 6, tax limitation of a central unified government (on the margin) improves the welfare of private employees.

Now we consider the behavior of the model when public employees possess sufficient market power so that they can optimize fully with respect to both w_g and e_g , and choose the levels of both variables subject to the constraints imposed by private sector mobility. If we totally differentiate the public employees' direct utility function $U(w_g - w_g e_g / e, e_g)$ and solve we find that the public sector optimum occurs when

$$\frac{U_2}{U_1} = \left(\frac{w_g}{e_g} \right) \left(\frac{1 - \mu}{1 - \theta} \right), \tag{17}$$

where

$$\mu = \frac{de}{de_g} \frac{e_g}{e} \quad \text{and} \quad \theta = \frac{de}{dw_g} \frac{w_g}{e}.$$

Since U_2/U_1 measures (except for a negative sign) the marginal rate of substitution between public output and private consumption, eq. (17) tells us that (a) the greater the rate of private outmigration in response to an increase in e_g the lower the level of public output selected, and (b) the greater the rate of outmigration in response to a wage increase the greater the chosen level of e_g , and implicitly the lower the chosen wage increase.

In order to evaluate the possible effects of tax limitation, fig. 1 will be of value. Curve *A-B* depicts the private sector constraint boundary, representing all possible combinations of w_g and e_g which keep private utility constant. We have drawn the curve to be downward sloping and bounding a convex set to simplify the analysis, but other relationships are possible. Curve *C-D* describes the 'locally' determined public sector 'indifference' curves, in which public wages and public output are traded off, holding e constant. These indifference curves differ from standard indifference curves, first because wages rather than the private good are traded off against public output, and second because the whole set of indifference curves shifts or changes as we move from point to point in the figure, since e , total population, and the tax-price also change. To examine the slope of such indifference curves, we differentiate the public employee direct utility

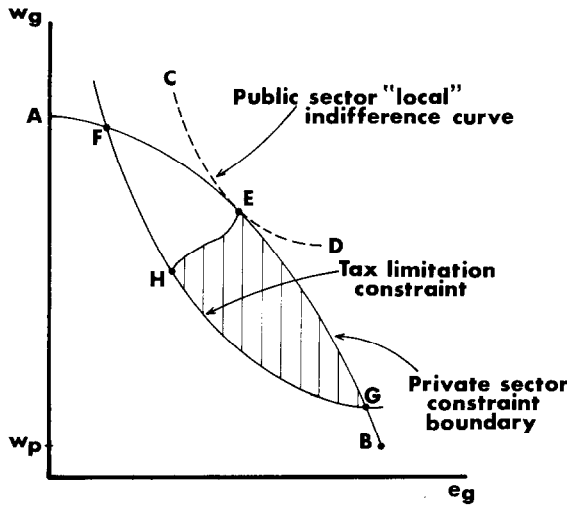


Fig. 1.

function, keeping e constant. The slope is given as follows:

$$\frac{dw_g}{de_g} = \frac{(w_g/e - U_2/U_1)}{(1 - e_g/e)} \tag{18}$$

This slope is always negative in the neighborhood of the optimum, because $U_2/U_1 > w_g/e$.³⁵ We should point out, however, that the indifference curves need not be convex as shown.

What effect will tax limitation have in such a case? Represented in $w_g - e_g$ space, the tax limitation constraint is a hyperbola such as the one which passes through points F and G . The effect of the constraint is to alter the private sector constraint boundary from curve $A-B$, to curve $A-F-H-G-B$. The public sector is forced to alter w_g and e_g so as to reach a point on this boundary. Any move from the old boundary ($A-B$) will make the public sector worse off, so the problem becomes one of minimizing the utility loss involved. To consider some of the possibilities, note first that if w_g remains fixed and e_g falls, the private sector is clearly worse off and e must fall to allow for compensation. On the other hand, if w_g falls and e_g is fixed, the private sector is clearly better off, and e rises. There is therefore some

³⁵The reason follows from the argument in section 3, namely that w_g/e represents the average rather than the marginal cost of public output. For small changes in e_g , the price that the public sector faces is higher than w_g/e because of the private sector response that occurs, i.e.

$$U_2/U_1 = w_g/e + d(w_g/e)/de_g > w_g/e.$$

combination of lower w_g and e_g which maintains e fixed, which we have drawn as occurring along curve $E-H$. Thus, all points within the shaded area and on the boundary EHG represent resource allocations in which private employee welfare is increased. Thus, in order to find the effect of tax limitation on social welfare, we need only to find whether the point chosen constraint on $A-F-H-G-B$ lies to the left or right of H .

A careful look at the maximization decision of public employees makes it clear, however, that either possibility can occur. In fact, there is nothing inherent in the shape of the local indifference curves that disallows corner solutions at either F or G . One way to get some intuition about the conditions that allow for these possibilities is to compare eq. (18) to the slope of the tax limitation constraint, i.e.

$$\frac{dw_g}{de_g} = \frac{-w_g}{e_g} \tag{19}$$

By comparing the slope of the indifference curve at H to the slope given in (19) we can tell whether private employees will be made better or worse off. For example, if the slope of the indifference curve is steeper (more negative) at H , we know that public employees will opt to move towards G , resulting in an increase in private employee utility. On the other hand, comparing (18) and (19) we note that an indifference curve less negative than (19) will cause public employees to prefer points to the left of H , implying outmigration and a decrease in private employee welfare. Equating (18) and (19) makes it clear that an improvement in private employee welfare occurs when

$$\frac{w_g/e_g - U_2/U_1}{1 - e_g/e} > 0 \tag{20}$$

or when $w_g/e_g > U_2/U_1$. Note that when $U_2/U_1 = w_g/e$, the numerator is unambiguously positive. However, because $U_2/U_1 > w_g/e$, a negative result is possible. To examine this somewhat differently, we might re-examine (17), the conditions for optimality. Clearly, whether $w_g/e_g > U_2/U_1$ depends upon the relative values of μ and θ . Either outcome is possible.³⁶ The result is that tax limitation can be socially beneficial or harmful depending upon the nature of the constraints on public behavior to private mobility and upon the nature of the public sector response, a function of the tastes of public employees.

³⁶Briefly consider how the analysis changes when $w_g = \alpha(e_g)w_p$, where $\alpha(0) = 1$, $\alpha' > 0$. A typical situation is drawn in fig. 2. At low levels of e_g public employees have no market power, so that the only wage possible is close to w_p . As e_g increases, the ability to control w_g also increases. However, the threat of outmigration by private employees necessitates that the level of w_g chosen actually falls for sufficiently large levels of e_g . The modified constraint facing public employees is given by curve $A-B$. We expect the optimum to be at a point E to the right of the peak. From the point of view of public employees, points such as D are always dominated by C since the move from D to C involves an increase in income and public output with the price of

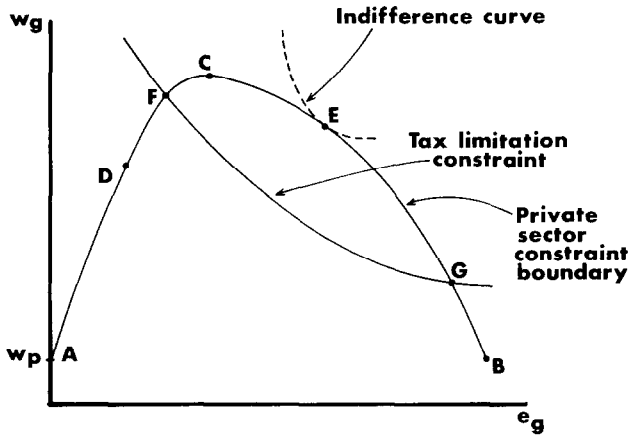


Fig. 2.

7. Concluding remarks

The major conclusion that can be drawn from the preceding analysis is a cautionary one: even if it is known that the total resources devoted to a local public sector exceed those that would be competitively chosen, economic welfare will be enhanced by tax limitation only under certain circumstances. Furthermore, the question of whether tax limitation will be appropriate public policy does not turn simply on the extent to which public employee organizations possess market and political power. Rather, it depends upon the objectives of such organizations and the way in which they utilize their market power. This result holds even in the extreme (and highly unlikely) case in which a public sector union can set both the public wage and the level of public output subject only to the constraint that private employees are mobile.

The bulk of the analysis in this paper has been devoted to two conceptually quite distinct ways in which government can be too large. If government is too large in the sense that wages are higher than they would be in competitive markets, it was found that tax limitation would be unambiguously harmful when the level of output was set by informed and rational private sector voters. On the other hand, if government is too large because public managers are able to set output at higher levels than would

the private good fixed by assumption. Note that in comparison to the optimum achieved without variable market power, the public wage is likely to be lower and public output higher.

Now consider the effect of a tax limitation constraint, given by the curve which passes through points *F* and *G*. Our previous analysis makes it clear that the public sector will clearly be made worse off, but the private sector may gain or lose depending upon the nature of the public sector response. Points *F* and *G* and all points in between are all feasible outcomes, so that consumers as a class may be made worse off by the limitation constraint.

be chosen competitively, tax limitation was shown to be unambiguously helpful (from the private perspective) provided that the limitation is not too stringent.³⁷

The paper did not consider formally what might be termed a mixed case, in which public employees are able to exercise market power and achieve some rents, and public managers are able to exercise bureaucratic power to achieve higher levels of output than would be chosen at prevailing tax prices. To the extent that such a mixed case applies in reality, the welfare effects of tax limitation will turn on the effect of such a policy on the intra-public sector division of market power. If the limitation tends to weaken the position of public employees vis-à-vis managers, rents earned by individual public employees could be expected to fall, but the size of public employment could increase. The welfare effects here are ambiguous. If the position of managers is weakened, e_g would fall, but w_g could rise, and the effects are again ambiguous. If both parties maintain their positions with regard to each other, we would expect to observe decreases in both e_g and w_g . As before, welfare would be increased to the extent that the limitation was not excessively stringent. In any event, the issue of the relationship between employment maximizing managers and income maximizing public employees deserves more consideration in the literature, which has usually focused on the relationship between only one of these parties and private sector voters. Thus, a more extensive policy analysis than ours needs a formal model which captures both of these potential causes of excessive government size, and the interaction between them.

This last conclusion strengthens what is perhaps the major result of this paper — that there is no simple test for discovering whether tax limitation will be harmful or helpful, even given that local government is too large. This result, combined with the obvious costs in lost flexibility and responsiveness associated with tax limitation should motivate a search for other mechanisms to ‘control’ local government, at least until we are able to design, develop and calibrate models that permit empirically useful predictions of the welfare effects of tax limitation.

³⁷It should be noted that this could be a real problem in practice. Even if one were certain that w_g was competitively set and that e_g was too high, one would have to design a limitation such that the limited level of e_g was not too low. This would require detailed and accurate knowledge of demand functions for public services.

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