

Brennan and Buchanan's Leviathan Models

MERWAN ENGINEER*
University of Guelph

This article develops Brennan and Buchanan's Leviathan models in a general equilibrium optimal tax framework. A subset of the population called rulers choose the supply of public goods and set tax rates on all goods within the tax base. The tax base is restricted by the subjects in a constitution. The choice of public goods, tax rates and tax base depend critically on the number of rulers and whether rulers reside domestically or abroad and are taxed or untaxed. Usually subjects prefer domestic to foreign rulers, taxed to untaxed rulers and more rulers to less rulers.

Geoffrey Brennan and James Buchanan have developed a body of theory of what could be called "Neo-Hobbesian" public finance.¹ They see government as a revenue-maximizing Leviathan, but depart from the strict Hobbesian perspective by assuming that the Leviathan can be partially constrained by a constitution. This constitution is chosen by subjects rather than rulers and places definite limits upon the tax base. It is in the interest of the subjects to choose an inefficient tax base when they cannot choose tax rates along with the tax base. The analysis appears to describe early constitutional monarchies in England and elsewhere. Brennan and Buchanan believe that their "Tax Constitution for Leviathan" is required to restrict modern monolithic governments which have a propensity to act selfishly within constitutional bounds.

Brennan and Buchanan's approach stands in sharp contrast to the traditional Pigovian public finance in which tax rates and public goods are assumed to be chosen in the interest of all the governed. On that assumption, there would be no reason to restrict the tax base in a constitution because a tax that does not contribute to the maximization of social welfare would never be employed. In fact, the traditional public finance prescription recommends that the tax base should be

*Direct all correspondence to: Merwan Engineer, Department of Economics, University of Guelph, Guelph, Ontario, Canada N1G 2W1. Telephone: (519) 824-4120 ext. 3948.

as wide as possible to minimize tax distortions.² Yet, in most countries the tax base is inefficiently broad, casting doubt on the traditional public finance as a basis for positive analysis.

This article develops Brennan and Buchanan's Leviathan models in a general equilibrium optimal tax framework which includes the conventional utilitarian public finance as a special case. The framework reveals that the distinctive feature of the Leviathan models is that the government acts solely on the behalf of a subset of the population called rulers. Selfish rulers choose the supply of public goods and set tax rates on all goods within the tax base, but cannot choose the tax base. The tax base is established by the subjects in a constitution that rulers are bound to respect. If all goods could be taxed, the rulers would set rates high enough to expropriate the entire wealth of the subjects. They cannot do so when some goods are excluded from the tax base, because high rates on goods within the permitted base provoke subjects to divert expenditures from taxed to untaxed goods. It follows that subjects are better off when the number of goods in the tax base is restricted in a way that enables subjects to substitute away from heavily taxed goods.

The choice of public goods, tax rates and tax base depend on the type of ruling class. I examine three ruler types that are suggested by Brennan and Buchanan's work. They are referred to here as the Untaxed Foreign Rulers, Untaxed Domestic Rulers, and Excise Taxed Domestic Rulers.³ Untaxed Foreign Rulers do not pay excise taxes or benefit from the presence of the public good. Therefore, they want simply to maximize net tax revenues. With a restricted tax base, foreign rulers have an incentive to set tax rates lower than the maximum that would drive their subjects out of the market. The public good is provided only if it stimulates more than enough revenue to pay for itself.⁴ Untaxed Domestic Rulers are assumed to benefit from the presence of the public good and, therefore, provide more public goods than would similarly situated foreign rulers. Their subjects benefit because they consume the public good. Finally, Excise Taxed Domestic Rulers cannot exempt themselves from excise taxation and have an incentive to keep rates relatively low to reduce the excess burden of taxation on themselves. For a given tax base, subjects usually prefer domestic to foreign rulers, taxed to untaxed rulers, and more rulers to less rulers.

The subjects' preferred choice of tax base is also examined. Subjects are usually best off if they limit the number of goods that the rulers can tax so as to leave themselves with some disposable income and the rulers with some revenue with which to provide the public good. In all cases, subjects want to exclude goods with a positive minimal subsistence requirement from the tax base, because subjects can not avoid a tax on such goods. Other things equal, goods that are complements with the public good should be the first to be included in the tax base, for rulers have an incentive to provide more of the public good when it stimulates consumption of private goods in the tax base. Brennan and Buchanan's "Tax Constitution for Leviathan" describes these features of the subject's optimal tax base.

It is difficult to compare the subjects' optimal choice of tax base across ruling classes. Normally, subjects are inclined to grant a larger, more efficient base to domestic than foreign rulers, to taxed than untaxed rulers and to the larger ruling class. However, even a large excise taxed domestic ruling class cannot be trusted

with an unlimited base because it could then extract the full value of each subject's labor power. The standard public finance prescription of an unlimited tax base only applies when the ruling class encompasses the entire population.

The article first details the analytic framework. Then the Rulers' Problem is solved generally before the specific analyses of the different ruler types. The article concludes by summarizing the paper and discussing the arguments in a wider context.

THE MODEL

Class Structure: The population consists of H people, of whom the first R are rulers and the remaining $H-R$ are subjects. Three types of ruling classes are distinguished: Untaxed Foreign Rulers, Untaxed Domestic Rulers, and Excise Taxed Domestic Rulers. All rulers within a ruling class are identical and they form an egalitarian oligarchy. Thus, the choice of policy is unanimous. The optimal policy is that which maximizes the utility of the representative ruler.⁵

Production: Labour time is the only factor of production and is the numeraire. The output per unit of labour of good i is fixed at p_i which is also the producer price of the good. There are I private goods in the economy. The last good is leisure and has a price of unity, $p_I = 1$. There is one nonrivalrous public good, G , that requires p_G units of labour to produce.

Feasible Government Policy: The government raises revenues through excise taxation on a given tax base and uses the proceeds to purchase the public good and make nonnegative lump-sum payments to individuals. Of the I goods in the model, the first $B \leq I$ goods are included in the excise tax base and the remaining $I - B$ goods are exempt from taxation. The excise tax vector is $\mathbf{t} = (t_1, \dots, t_i, \dots, t_B)$. Taxation is distortionary unless all I goods are included in the tax base.

Rulers' Taxation: Rulers choose a set of excise taxes, \mathbf{t} , and the public good, G . Three possibilities are suggested by Brennan and Buchanan's work. Untaxed Foreign Rulers neither pay excise taxes nor consume the public good. Untaxed Domestic Rulers do not pay the excise taxes but consume the public good. Excise Taxed Domestic Rulers both face the excise tax and consume the public good. The three types of rulers can be distinguished by the policy variables that enter into their indirect utility functions. An untaxed foreign ruler, indicated by the superscript f , has an indirect utility function which can be written $V^f(m^f)$, where m^f is the payment to each foreign ruler. Producer prices and the labour endowment are fixed and therefore need not be specified explicitly in the indirect utility functions. An untaxed domestic ruler has an indirect utility function $V^d(m^d, G)$. An excise taxed domestic ruler has all three policy arguments in his indirect utility function, $V^e(\mathbf{t}, m^e, G)$.

Behavior of Subjects: All subjects are assumed to have the same endowment of labour and the same primal utility function as domestic rulers. Subjects face the excise tax \mathbf{t} , and consume the public good, G . Denote the indirect utility function of a subject as $V^s(\mathbf{t}, G)$. Since it is never in the interests of rulers to give subjects a positive lump-sum payment, subjects can never be better off than domestic rulers.

The Constitution: As in Brennan and Buchanan, the tax base B is chosen by

subjects in a prior constitutional period. Subjects are assumed to know what rulers they will have in the post-constitutional period. The ruler's problem is to set \mathbf{t} and G given the already predetermined tax base B .⁶

THE RULERS' PROBLEM

All three rulers' problems are represented by a common format below where the superscript r in the indirect utility of rulers, becomes f in the Untaxed Foreign Rulers' Problem, d in the Untaxed Domestic Rulers' problem, and e in the Excise Taxed Domestic Rulers' problem. The rulers' problem is

$$\max_{\mathbf{t}, m^r, G} V^r \quad s.t. \quad R \sum_{i=1}^B \delta^r t_i x_i^r + (H-R) \sum_{i=1}^B t_i x_i^s(\mathbf{t}, G) = Rm^r + p_G G$$

$$t_i \geq 0 \quad \forall i \leq B; m^r \geq 0; G \geq 0$$

The variable B is the number of taxable goods, the variables x_i and $x_i(\mathbf{t}, G)$ are respectively the rulers and subjects demand functions for good i , and δ^r is a dummy variable which is zero if the ruler is untaxed and one if the ruler is taxed. For the untaxed foreign ruler, $V^r = V^f(m^f)$ and $\delta^r = \delta^f = 0$. For the untaxed domestic ruler, $V^r = V^d(m^d, G)$ and $\delta^r = \delta^d = 0$. For the taxed domestic ruler, $V^r = V^e(\mathbf{t}, m^e, G)$, $x_i = x_i^e(\mathbf{t}, m^e, G)$, and $\delta^r = \delta^e = 1$.

The first constraint is the government budget constraint. Government expenditures on the public good and payments to rulers exhaust tax revenues. The second set of equations rules out the policy variables from being negative. As in the Brennan and Buchanan analysis, I concentrate on internal solutions to the problems.

The maximization problem is solved by the standard method of Lagrange. The Lagrangian and first-order necessary conditions for the three cases can also be conveniently represented in a general form regardless of whether r is f , d or e .

$$L^r = RV^r + \lambda^r [R \sum_{i=1}^B \delta^r t_i x_i^r + (H-R) \sum_{i=1}^B t_i x_i^s(\mathbf{t}, G) - Rm^r - p_G G]$$

$$\frac{\partial L^r}{\partial t_j} = R \frac{\partial V^r}{\partial t_j} + \lambda^r [R \delta^r (x_j^r + \sum_{i=1}^B t_i \frac{\partial x_i^r}{\partial t_j})$$

$$+ (H-R)(x_j^s + \sum_{i=1}^B t_i \frac{\partial x_i^s(\mathbf{t}, G)}{\partial t_j})] = 0 \quad \forall j \leq B$$

$$\frac{\partial L^r}{\partial m^r} = R [\frac{\partial V^r}{\partial m^r} + \lambda^r (\delta^r \sum_{i=1}^B t_i \frac{\partial x_i^r}{\partial m^r} - 1)] = 0$$

$$\frac{\partial L^r}{\partial G} = R \frac{\partial V^r}{\partial G} + \lambda^r [R \delta^r \sum_{i=1}^B t_i \frac{\partial x_i^r}{\partial G} + (H-R) \sum_{i=1}^B t_i \frac{\partial x_i^s(\mathbf{t}, B)}{\partial G} - p_G] = 0$$

where $\frac{\partial V^r}{\partial t_j} = 0$ for $r = f$ and d . The Lagrangian has been multiplied by R making λ^r the value of a marginal increase in government revenues in terms of the utility of the representative ruler. As is evident from equation [2], if the rulers are untaxed ($\delta^r = 0$), there is no divergence between the government's valuation of income and an individual ruler's valuation of income, $\lambda^r = \frac{\partial V^r}{\partial m^r}$. We now consider the three types of rulers, one by one.

Untaxed Foreign Rulers: $V^r = V^f(m^f)$, $\delta^r = 0$

Foreign rulers do not pay the excise taxes and do not consume the domestic public good. Since they are selfish their objective is simply to maximize net tax revenues for transfer to themselves.⁷

Rulers who face an unrestricted excise tax base, ($B = I$), can always extract the full value of each subject's endowment by imposing a uniform tax rate of one on all goods. This is demonstrated using Figure 1, Panel 1, for a two good economy where the subscript c refers to a composite good and the subscript I refers to leisure. A uniform tax rate, τ , on both the composite good and leisure shifts each subject's after tax budget line in a parallel fashion toward the origin. Like a lump-sum tax, a uniform tax on all goods is nondistortionary in that it does not alter relative prices. Subjects cannot substitute into untaxed goods. A uniform tax rate of one shifts the subject's after tax budget line to the origin, leaving the subject with no disposable income to purchase goods and the government with the value of the subject's full endowment.⁸ Each foreign ruler receives an equal share of the total tax revenues through his transfer payment, $m^r = (H-R)\bar{x}_i/R$. Since rulers are only interested in tax revenues, none of the public good is provided.

Brennan and Buchanan demonstrate that distortionary restrictions on the tax base ($B < I$), can improve the welfare of subjects. A subject who faces a revenue-maximizing excise tax on the first good only, consumes the bundle $x^{s1} > 0$ and achieves a higher utility of U^{s1} . Subject's are better off and rulers are worse off because each subject is successfully able to substitute away from the taxed into the untaxed good.⁹ The rulers do not to raise the tax because tax revenues would fall as illustrated by the Laffer curve.¹⁰

When there are many taxed goods, equation [1] becomes¹¹

$$x_j^s + \sum_{i=1}^{B-1} t_i \frac{\partial x_i^s(\mathbf{t}, G)}{\partial t_j} = 0 \quad \forall j \leq B \tag{1f}$$

which signifies that the marginal gain from an extra dollar of tax on any good j is just equal to the marginal revenue loss from the reduction in consumption of all taxed goods. If all goods are zero gross substitutes, the optimum tax on the j th good corresponds to the demand for the j th good being unit elastic with respect to the tax. This is the case illustrated in Figure 1, Panel 2. Brennan and Buchanan point out that, like any monopolists, the rulers maximize rents by setting the after tax price to maximize net revenues in excess of producer prices.

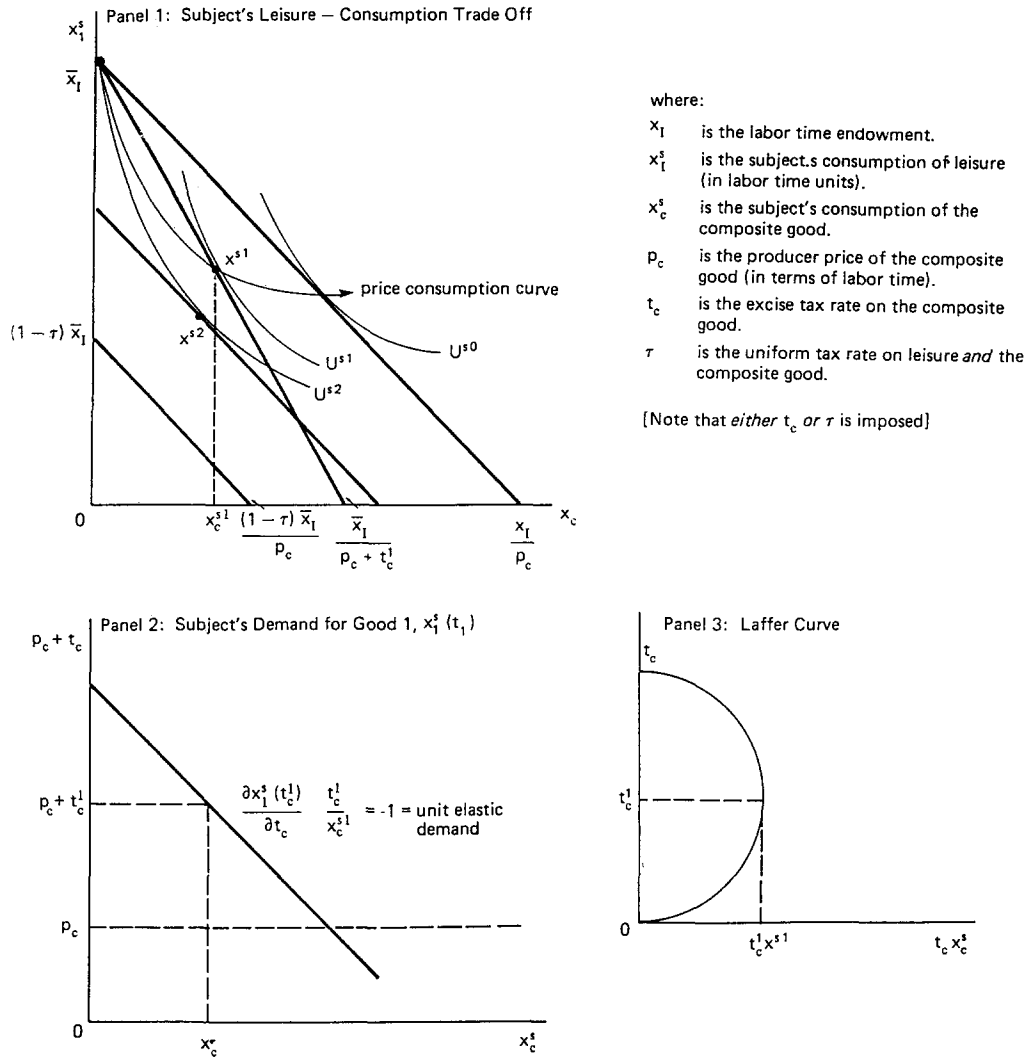


Figure 1 The subject's price consumption curve, demand curve for the taxed good and Laffer curve with no minimal subsistence requirement.

When the tax base is distortionary, Untaxed Foreign Rulers may be able to raise additional revenues by providing the public good. The first-order condition with respect to the public good becomes:

$$(H-R) \sum_{i=1}^{B-1} t_i \frac{\partial x_i^s(t, G)}{\partial G} = p_G. \quad [3f]$$

The public good is provided only if it is a sufficiently strong complement with the taxed goods that it generates enough revenue to pay for itself. This is illustrated in Figure 2. Additional consumption of the taxed good is stimulated at a diminishing

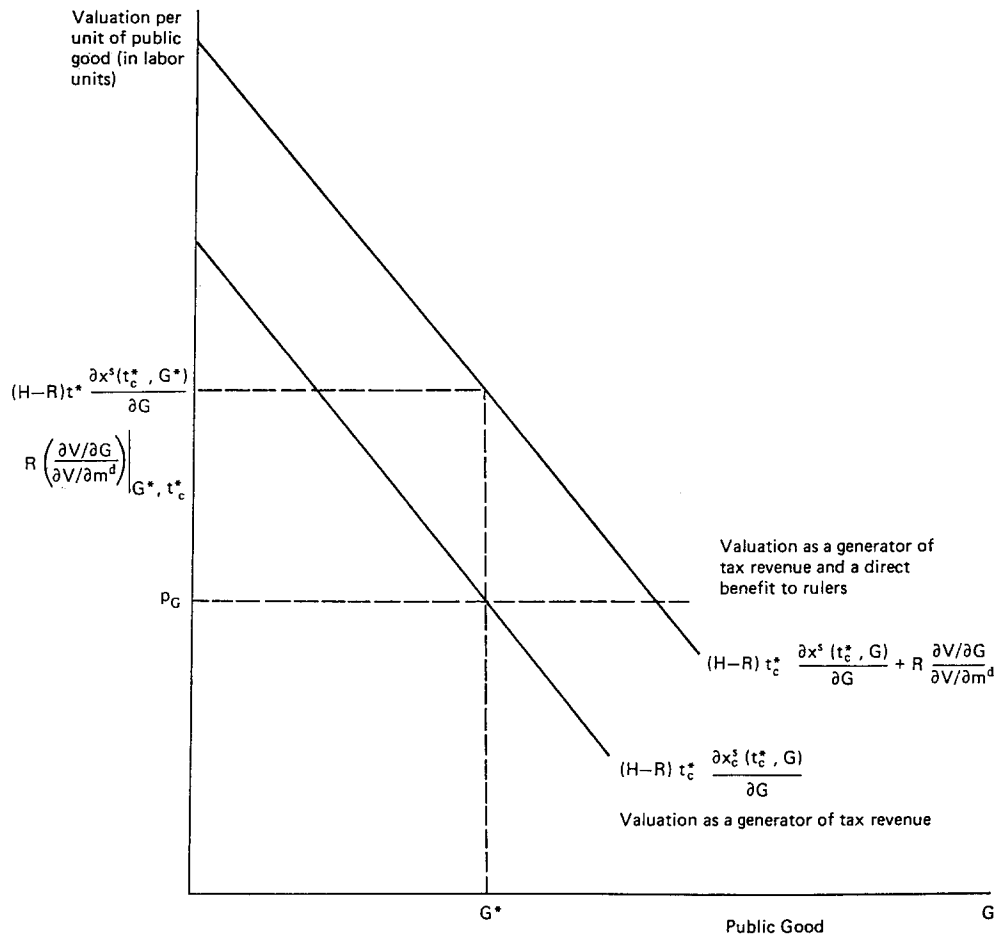


Figure 2 The Rulers' Marginal Valuation of the Public Good as (i) a generator of tax revenue and (ii) a direct source of benefit to the rulers.

rate from a fairly high initial rate until the marginal revenues equal the price of the public good. Brennan and Buchanan argue that only goods with a strong complementarity to the public good should be "earmarked" for the tax base. A gasoline tax is a good example. The Leviathan will build roads if they lead to substantially higher gasoline consumption which he can tax.

Untaxed Domestic Rulers: $V^r = V^d(m^d, G)$, $\delta^r = 0$

The Untaxed Domestic Rulers differ from foreign rulers in that they derive utility from the local public good. The tax and transfer first-order conditions have the same general form as before. Only, the first-order condition with respect to the public good needs to be altered to include an additional term which reflects the ruler's consumption of the public good.

$$R \frac{\partial V^d / \partial G}{\partial V^d / \partial m^d} + (H-R) \sum_{i=1}^B t_i \frac{\partial x_i^d(t, G)}{\partial G} = p_G G \quad [3d]$$

With an unrestricted excise tax base ($B = I$), Untaxed Domestic Rulers can tax each subject of his full endowment irrespective of the public good. The second term in equation [3d] will therefore equal zero, leaving a modified Samuelson rule:¹²

$$R \frac{\partial V^d / \partial G}{\partial V^d / \partial m^d} = p_G. \quad [3d']$$

The Untaxed Domestic Rulers effectively provide for the public good out of their after transfer income. The larger is the rulers' marginal rate of substitution between the public good and income, the larger is their provision of the public good.

With a restricted tax base ($B < I$), additional amounts of the public good may generate extra tax revenues. Suppose only the first good is taxed and that the rate is somehow fixed at f . In this case, the Untaxed Domestic Rulers will provide more of the public good than would be provided by an Untaxed Foreign Rulers since their direct valuation of it is positive. This is the case illustrated in Figure 2. I show in an appendix (available by request) that subjects are usually better off with a domestic ruling class than with a foreign ruling class.

Also, in an appendix (available by request) I show that as the number of Untaxed Domestic Rulers increases, the remaining subjects become better or worse off depending on the assumed preferences. A useful benchmark is the case when all utility functions are separable. Separability implies that there is zero cross effects between the public good and consumption. Therefore, the optimal tax is independent of the number of rulers. The public good is provided until the sum of the rulers' valuations of the public good is equal to its price. If rulers have constant marginal utility of income, the sum of the valuations of the public good must go up with the number of rulers. Thus more of the public good is provided. Since taxation is unchanged, subjects are better off. If the rulers have diminishing marginal utility of income, each ruler's valuation of the public good goes down with decreases in their payments resulting from an increase in the number of rulers. This reduction in the individual ruler's valuation does not reduce the sum of the valuations over the larger number of rulers as long as the elasticity of the marginal utility of income is less than or equal to one. If the elasticity of the marginal utility of income is sufficiently large, less of the public good is provided with an increase in the number of rulers making the remaining subjects worse off.

Excised Taxed Domestic Rulers: $V^r = V^e(t, m^e, G)$, $\delta^r = 1$

With an unrestricted tax base ($B = I$), the government, as before, can use a uniform tax rate of one on all goods to extract each subject's full endowment. The same amount of the public good is provided as implied by [3d]. The nondistortionary excise taxation of the rulers at the same rate as subjects does not change the tax rule, because taxes paid by rulers are fully compensated by payments to rulers.¹³

With a distortionary tax base ($B < I$), the taxation of the rulers usually imposes a

deadweight loss on them. Only when the rulers coordinate their consumption with government policy is there no deadweight loss. For instance, a lone ruler ($R = 1$) incurs no excess burden, because he chooses government policy and his consumption bundle together.¹⁴ When there is more than one ruler and no social compulsion to consume goods according to their producer price ratios, individual rulers will find it optimal to “free-ride” by substituting away from taxed goods. With relatively large numbers of identical rulers it is reasonable to assume that individual rulers treat the government choice variables as independent of their individual consumption decisions. This standard “small agent assumption” is used in the following analysis.¹⁵

The Excise Taxed Domestic Rulers first-order conditions for optimal excise taxes, payments and provision of the public good are as follows:

$$\frac{\partial V^e / \partial m^e}{\lambda^e} = 1 + \frac{1}{x_j^e(\mathbf{t}, m^e, G)} \sum_{i=1}^B t_i \frac{\partial x_i^e(\mathbf{t}, m^e, G)}{\partial t_j} + \frac{(H-R)}{R} \frac{x_j^s(\mathbf{t}, G)}{x_j^e(\mathbf{t}, m^e, G)} \left\{ 1 + \frac{1}{x_j^s(\mathbf{t}, G)} \sum_{i=1}^B t_i \frac{\partial x_i^s(\mathbf{t}, G)}{\partial t_j} \right\} \forall j \leq B \quad [1e]$$

$$\frac{\partial V^e / \partial m^e}{\lambda^e} = 1 - \sum_{i=1}^B t_i \frac{\partial x_i^e(\mathbf{t}, m^e, G)}{\partial m^e} \quad [2e]$$

$$R \frac{(\partial V^e / \partial G)}{(\partial V^e / \partial m^e)} = \frac{\lambda^e}{(\partial V^e / \partial m^e)} [p_G - R \sum_{i=1}^B t_i \frac{\partial x_i^e(\mathbf{t}, m^e, G)}{\partial G} - (H-R) \sum_{i=1}^B t_i \frac{\partial x_i^s(\mathbf{t}, G)}{\partial G}] \quad [3e]$$

where λ^e is the value of an incremental increase in the government's revenues in terms of the utility of the representative excise taxed domestic ruler.

Condition [3e] describes a modified Samuelson rule for the provision of the public good. The government provides the public good up to the point when the rulers' marginal valuation of the public good is equal to its marginal cost. The direct cost of the government of the last unit of the public good consists of the price of the public good less the extra tax revenues generated by the public good. More tax revenues will be generated the greater is the complementarity between the public good and taxed goods for subjects as well as rulers. The greater is the complementarity the less are the direct costs, encouraging the provision of the public good. The direct cost of the public good is weighted by the rulers' opportunity cost of funds which is the ratio of the government's marginal utility of income to the individual ruler's marginal utility of income, $\lambda^e / \frac{\partial V^e}{\partial m^e}$. The opportunity cost of funds increases the greater is the deadweight loss on rulers, discouraging the provision of the public good.

An important special case is when everybody is a ruler ($R = H$). Then the Excise Taxed Rulers' Problem becomes the conventional *Utilitarian Planner's Problem* in the Pigovian public finance tradition, and the first order conditions boil down to the

well-known conditions for a social optimum as developed by Anthony Atkinson and Nicholas Stern.¹⁶ An utilitarian planner never chooses to make lump-sum payments. The reason is that to make such payments it must raise tax rates which would impose a deadweight loss on the people beyond the additional revenue raised. Instead, the planner applies all tax revenues to provide for the public good according to [3e], and tax rates are chosen to minimize the opportunity cost of funds according to [1e]. Since in the utilitarian case the planner maximizes the utility of all the governed, there is no reason for the people to restrict the tax base if they know with certainty that taxing powers will not be abused. As broad a tax base as possible will be employed to lower the opportunity cost of raising funds to provide the public good.

Using similar arguments to Atkinson and Stern,¹⁷ I examine in an appendix (available by request) some general properties of the model as the number of rulers varies. Interestingly, if the number of rulers becomes sufficiently large (that is R approaches H), the model yields the same results as in the utilitarian case where the tax base is restricted ($B < I$). Rulers spend all tax revenues on the public good. They make no transfers to themselves ($m^e = 0$) because that would involve raising tax rates. Though raising tax rates generates additional revenues from subjects it imposes a larger deadweight loss on the Excise Taxed Domestic Rulers. Thus, universally applied inefficient excise taxes protect a minority from being exploited by a majority.¹⁸

Though a society with a large ruling class ($R < H$) may not appear to have a Leviathan, the Leviathan is actually latent. A broadening of the tax base will result in the emergence of the Leviathan. The reason is that broadening the tax base reduces the deadweight loss of raising tax rates. In the limit when the tax base includes all goods ($B = I$), the deadweight loss from increasing taxes is zero and the rulers will raise tax rates to capture the full value of each subject's labor power. The lesson here is simply that some taxing powers can be granted to rulers without exploitative taxation, but granting unlimited taxing power to rulers results in the abuse of the taxing powers.

Societies with a small ruling class are generally more prone to despotism. As the number of rulers decreases the deadweight loss from increasing taxes falls and the revenues from subjects increases (for a given restricted tax base). Eventually, a small number is reached where rulers find it in their interest to make payments ($m^e > 0$) to themselves even though the tax base is severely restricted.¹⁹ As shown above, in the limit when there is only one ruler, that ruler acts like he is untaxed. Because fewer rulers tend to be more exploitative, subjects are usually best off choosing a smaller tax base and never choose a larger tax base.

CONCLUSION

The central feature of the analysis in this paper is that the Leviathan is a genus rather than a species, a bestiality rather than a beast. There are at least three main types which are called the Untaxed Foreign Rulers, Untaxed Domestic Rulers, and Excise Taxed Domestic Rulers. All three would prefer to have the tax base unconstrained, while subjects always prefer a restricted base, the size of which

depends on the type of ruling class and the number of rulers to subjects in the population. Generally, subjects prefer domestic to foreign rulers, taxed to untaxed rulers, and more rulers to less rulers. However, even a large excise taxed domestic ruling class can not be trusted with an unlimited base. The standard public finance prescription that the tax base should be as broad as possible is only applicable when the ruling class encompasses the entire population.

The Leviathan models and the convention utilitarian public finance are analyzed in a common framework. The framework reveals that in the Leviathan models government acts on the behalf of a proper subset of the population; whereas, in the convention utilitarian public finance government acts on the behalf of everybody. Thus, the convention public finance is a polar case on a spectrum with the Untaxed Foreign Rulers at the other extreme.

Which is the appropriate model for positive analysis: the benevolent government utilitarian model or some version of the Leviathan model? Clearly, throughout most of history some version of the Leviathan model would appear to be appropriate. Even in our own time the Leviathan model (with modifications as outlined below) may be more appropriate for the analysis of some developing and communist countries. Brennan and Buchanan go further and argue that the common presumption that the government is benevolent is wrong and can lead to serious policy errors. They argue that the Leviathan model is a better basis upon which to design policy in western countries.

Unfortunately, only a few empirical studies touch on which public choice model is appropriate for western countries. Perry Shapiro and Jon Sonstelie analyze the growth of the California state government in the pre and post Proposition 13 periods.²⁰ They find government growth in excess of public demand for government services in both periods and, ironically, conclude that Proposition 13 did not slay Leviathan. Wallace Oates²¹ tests one of Brennan and Buchanan's hypotheses about their public finance of federalism. Brennan and Buchanan argue that the size of government and the degree of decentralization of fiscal powers is inversely related because decentralized governments foster a competition among regions for subjects and, hence, lower tax rates.²² However, Oates finds no significant relationship between government size and centralization in either cross country or cross regional data. In a recent study, James Yunker estimates a simple general equilibrium model for the United States to test the hypothesis the government maximizes utilitarian welfare.²³ Surprisingly, Yunker finds that the average tax rate that the government ought to use is very close to the actual average tax rate. Yunker cautiously concludes that the social welfare maximizing model cannot be ruled out as inappropriate for positive analysis.²⁴

The model in this article suggests that we should be wary of Leviathan even if there is no direct evidence of exploitative taxation in the data. The Leviathan model only predicts tax base restrictions and does not necessarily predict high taxes or large governments. The analysis of the Excise Taxed Rulers' Problem demonstrated that with substantial tax base restrictions a large ruling class behaves like a utilitarian government. Then the only test of whether a Leviathan is present is to remove the inefficient tax base restrictions. If the government is benevolent, utility goes up. However, if a Leviathan is present, taxes go up and subjects' utility goes

down. Brennan and Buchanan warn that constraints on government are in place to guard against Leviathan.

This article has formalized some of Brennan and Buchanan's Neo-Hobbesian public finance in the confines of a general equilibrium excise tax model. While the model may appear narrow, it can with some modifications be applied to other settings. For example, the identical analysis applies where the government controls the output and proceeds of a large sector of the economy. The reason is that by controlling output the government can effectively impose any excise tax it chooses.²⁵ Thus, centrally planned economies also can be analyzed using the Leviathan model. In such economies, transfers to rulers may be modelled as taking indirect forms such as preferential access to government provided consumption goods. Also, the analysis is not essentially altered if the Leviathan only occurs with some positive probability in the post constitutional period. In this case, tax base restrictions are employed as insurance against the contingency of Leviathan.²⁶ Thus, the framework developed in this paper can be generalized to other interesting environments.

NOTES

*The author would like to thank Russell Krelve and David Robinson for their helpful comments; and would especially like to thank Dan Usher for his helpful suggestions.

1. The key references are Brennan and Buchanan, "Towards a Tax Constitution for Leviathan", *Journal of Public Economics*, 8 (1977), pp. 255-274; Brennan and Buchanan, "Tax Instruments as Constraints on the Disposition of Public Revenues", *Journal of Public Economics*, 9 (1978), pp. 301-318; Brennan and Buchanan, *The Power to Tax*. (Cambridge: Cambridge University Press, 1980); Brennan and Buchanan, *The Reason of Rules*. (Cambridge: Cambridge University Press 1985).
2. An efficient tax base usually involves taxing all goods including leisure. A broad tax limits the distortion from households substituting toward untaxed goods or activities. An alternative efficient tax is a head tax. Head taxes have been removed in almost all countries.
3. The Untaxed Foreign Rulers case subsumes Brennan and Buchanan's treatment of "government as a revenue-maximizer" when provision of the public good is fixed. See Brennan and Buchanan, "Towards a Tax Constitution for Leviathan", and *The Power to Tax*, pp. 34-54. The Untaxed Foreign Rulers' problem also subsumes Brennan and Buchanan's treatment of government as a "surplus-maximizer" when the public good is variably provided. See Brennan and Buchanan, "Tax Instruments as Constraints on the Disposition of Public Revenues", and *The Power to Tax*, pp. 55-82, 135-152. Brennan and Buchanan, "Tax Instruments as Constraints on the Disposition of Public Revenues", and *The Power to Tax*, pp. 135-152, model a king who consumes the public good directly as a "nonsurplus-maximizer". This corresponds to the Untaxed Domestic Rulers case. Brennan and Buchanan, *The Power to Tax*, pp. 153-157 also look at the choice of tax rates under majority rule which corresponds to the Excise Taxed Domestic Rulers' case.
4. The reader who wants a quick intuitive explanation of Brennan and Buchanan's basic arguments should read Section I.C., where the Untaxed Foreign Rulers' problem is explained.
5. The rulers face no agency problem. If bureaucrats are thought to control the government, they should in this framework be specified as the rulers. The role of the rulers

will be kept undefined for generality. This begs deeper questions of how that class rose to completely dominate government and the role that history might have in the subsequent weighting. Models of revolutions where successful revolutionaries are rewarded with a positive weighting in the new regime's objective function are developed by John Romer, "Rationalizing Revolutionary Ideology", *Econometrica*, 53 (1985), pp. 85-109, and Dan Usher and Merwan Engineer, "The Distribution of Income in a Despotic Society", *Public Choice*, 54 (1987), pp. 261-276.

6. In game-theoretic terms, the subjects are the Stackelberg-leader and the rulers are the Stackelberg-follower. The leader makes decisions that are logically prior to the follower and is assumed to know the complete form of the follower's decision problem. These models are solved recursively. First the follower's decision problem is solved for any possible choice of variables that the leader might choose. Then the leader's problem can be solved using the solution to the follower's problem. For a standard treatment of Stackelberg games see, for example, Eric Rasumussen, *Games and Information*, (New York: Blackwell, 1989).
7. This case may also be thought to be applicable to an untaxed domestic ruling class which receives no spillover benefits from providing their subjects with a public good. If the rulers actually live abroad, tax revenues could be sold for foreign exchange.

8. This can also be demonstrated using the subject's budget constraint, $\sum_{i=1}^1 (p_i + t_i)$

$x_i^s(\mathbf{t}, G) = \bar{x}_i$. If all tax rates, $\tau_i = t_i(p_i + t_i)$, are the same, the budget constraint can be expressed as follows: $\sum_{i=1}^1 p_i x_i^s(\mathbf{t}, G) = (1 - \tau)\bar{x}_1$. A tax rate of one leaves the subject with no disposable income and the government with the value of the subject's full endowment.

9. Brennan and Buchanan's argument is more general. If only the first good can be taxed, the individual can always achieve a utility of at least U^{s2} . With distortionary taxation, the Leviathan does best for himself with a regressive tax structure in which the tax rate at every level of x_1^s is equal to the slope of the U^{s2} indifference curve. Allowing the taxpayer a slight cut in the tax rate at x^{s2} ensures the maximum revenue for the Leviathan. Thus in this example, distortionary taxation is preferred to nondistortionary taxation.

Brennan and Buchanan, *The Power to Tax*, and James Buchanan and Roger Congleton, "Proportional and Progressive Income Taxation with Utility-Maximizing Governments", *Public Choice*, 34 (1979), pp. 217-230, heuristically analyze the constitutional choice of a nonlinear taxation schedule when faced with a revenue-maximizing Leviathan. They make convincing arguments that the subjects would prefer a progressive tax schedule. This would appear to be an interesting line of research for the analysis of income taxation.

10. As the diagrams are drawn in Figure 1, the subject is better off because he can escape the tax by substituting away from the taxed good. This is not the case, for example, if there is a positive subsistence level of the taxed good. Then the rulers' can tax a subject of everything but his subsistence requirement by imposing a tax such that the subject has no disposable income after purchasing the subsistence level. If such a "salt" tax exists, distortionary taxation offers no protection from "exploitative" taxation.
11. A linear approximation of the deadweight losses each subject bears can be derived. First, equation [1] can be decomposed into substitution and income terms as follows:

$$x_i^s + \sum_{i=1}^B t_i (S_i^s - x_i) \frac{\partial x_i^s(\mathbf{t}, G)}{\partial \bar{x}_1} = 0 \text{ where } S_i^s \text{ is the compensated substitution term.}$$

Multiplying by $\frac{1}{2} t_j$ and summing over all j taxed goods yields:

$$\frac{1}{2} \sum_{i=1}^B \sum_{j=1}^B t_j S_{ij}^i = - \frac{1}{2} \left(1 - \sum_{i=1}^B t_i \frac{\partial x_i^s(\mathbf{t}, \mathbf{G})}{\partial m^s} \right) \sum_{i=1}^B t_i x_i^s.$$

The lefthand side of the expression is the total deadweight loss a subject bears. It is equal to one-half of the revenues he pays times a term which accounts for the income effect. Brennan and Buchanan, *The Power to Tax*, pp. 80–82, derive a similar formula ignoring the income effect. In the partial equilibrium case—zero income and gross substitution effects—with a linear demand curve as drawn in Figure 1 Panel 2, the subjects' deadweight loss associated with the revenue-maximizing tax is one-half the tax revenues.

12. Paul Samuelson, "The Pure Theory of Public Expenditure", *Review of Economics and Statistics*, 36 (1954), 387–399, shows that with a utilitarian welfare function the optimal provision of the public good requires that the sum of individual's marginal valuation of the public good across all people equal the marginal price of the public good. The modified Samuelson rule above only sums across the rulers' valuations of the public good.

Differentiating a subject's budget constraint with respect to G yields:

$$\sum_{i=1}^1 p_i \frac{\partial x_i^s(\mathbf{t}, \mathbf{G})}{\partial G} + \sum_{i=1}^1 t_i \frac{\partial x_i^s(\mathbf{t}, \mathbf{G})}{\partial G} = 0. \text{ In note 8 it is shown that a uniform tax of one on all goods implies that } \sum_{i=1}^1 p_i \frac{\partial x_i^s(\mathbf{t}, \mathbf{G})}{\partial G} = 0. \text{ Accordingly, } \sum_{i=1}^1 t_i \frac{\partial x_i^s(\mathbf{t}, \mathbf{G})}{\partial G}$$

= 0 when revenues are maximized. Therefore, [3d] reduces to [3d'].

13. With a uniform tax rate on all goods, each individual's disposable income is $\sum_{i=1}^1$ -

$p_i x_i^s = (1 - \tau)(\bar{x}_i + m^h)$ for $h = e$ or s , where $m^s = 0$. Excise tax revenues from subjects and rulers will equal the transfers to the rulers (ignoring the public good): (H-R) $\tau \bar{x}_i + R\tau(\bar{x}_i + m^e) = Rm^e$. The budget constraint for a ruler can therefore

be expressed as $\sum_{i=1}^1 p_i x_i^s = (1 - \tau)\bar{x}_i + \frac{H\tau\bar{x}_i}{R}$. Now in the limit as $\tau \rightarrow 1$, the ruler's disposable income will go to $\frac{H\bar{x}_i}{R}$, implying a net transfer of $\frac{(H-R)\bar{x}_i}{R}$.

The gross transfer in this case goes to infinity as the tax rate goes to one.

14. Merwan Engineer, "Taxes, Public Goods and the Ruling Class: An Exploration of the Territory Between Brennan and Buchanan's Leviathan and Conventional Public Finance", *Public Finance*, 44 (1989), pp. 19–30, examines this case. A selfish King acts like an untaxed domestic ruling class where $R = 1$.
15. The intermediate case of a few rulers with partial free-riding is not treated because of the game-theoretic complications involved. As far as I know, optimal taxation with few agents has not been examined in the tax literature.
16. Atkinson and Stern, "Pigou, Taxation and Public Goods", *Review of Economic Studies*, 41 (1974): pp. 119–128.
17. Ibid
18. Engineer, "Taxes, Public Goods and the Ruling Class: An Exploration of the Territory Between Brennan and Buchanan's Leviathan and Conventional Public Finance", provides a numerical example where a majority ruling class acts like an utilitarian planner if the tax base is restricted. In the example Rulers consist of half the population and there are 100 goods. As long as the tax base consists of less than 34 goods, the rulers are well behaved and do not raise taxes and transfers.

19. Larger payments are made if rulers do not value the public good highly.
20. Shapiro and Sonstelie, "Did Proposition 13 Slay Leviathan?", *American Economic Review: Papers and Proceedings*, 72 (1982): pp. 184–190.
21. Oates, "Searching for Leviathan: An Empirical Study", *American Economic Review*, 75 (1985): pp. 748–758.
22. Brennan and Buchanan, *Power to Tax* pp. 168–186. Brennan and Buchanan do not formally derive this hypothesis. It seems to me that the hypothesis is consistent with the model in this paper for governments that are not constitutionally constrained. An unconstrained centralized government is the most exploitative because subjects are not able to escape taxation. On the other hand, if a centralized government is broken up into uncoordinated regional governments, a competition for subjects ensues. To prevent their subjects from fleeing to other regions, local governments must lower taxation to remain competitive.
 However, the opposite result may occur if the centralized government is initially constrained. In this constitution the subjects may impose severe constraints to control a centralized government, reducing its size. A decentralized system of governments may be bigger in aggregate for the reason that subjects are willing to endure more taxation in a system where they know that more of their money goes toward providing the public good which they value.
23. Yunder, "Some Empirical Evidence on the Social Welfare Maximization Hypothesis", *Public Finance*, 44, (1989): pp. 110–134.
24. Yunder's, "Some Empirical Evidence on the Social Welfare Maximization Hypothesis", model performs similarly to larger calibrated models. Yunder shows that under a utilitarian criterion government should set an average tax rate of 39% which is fairly close to the actual average tax incidence. However, as Yunder points out this cannot be considered to be strong evidence for the social maximization hypothesis because of the complexity and sensitivity of general equilibrium models. Yunder's model is not a direct test of the model in this paper because it does not include the tax base or a public good.
25. Think of a simple partial equilibrium model where supply is perfectly elastic and demand is downward sloping. The imposition of an excise tax will shift up the supply curve increasing the equilibrium price and reducing equilibrium quantity. The government can effectively impose the same excise tax by limiting the supply of the good to the equilibrium quantity that would have prevailed with an excise tax.
26. An example where a Leviathan occurs with 10 per cent probability is outlined in Engineer, "Taxes, Public Goods and the Ruling Class: An Exploration of the Territory Between Brennan and Buchanan's Leviathan and Conventional Public Finance", p. 29. The subjects' optimal tax base encompasses 85 per cent of all goods. The example demonstrates that even a small chance of a Leviathan appearing can lead to substantial tax base restrictions.