Why a Stubborn Conservative Would Run a Deficit: Policy with Time-Inconsistent Preferences

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Working Paper No. 71
January 1987

WHY A STUBBORN CONSERVATIVE WOULD RUN A DEFICIT: POLICY WITH TIME-INCONSISTENT PREFERENCES*

by

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Working Paper No.: 71

January 1987

* This is an abbreviated and revised version of a paper with the title "Checks and Balances on the Government Budget," prepared for the Sapir Conference on Economic Effects of the Government Budget in Tel-Aviv, December 22-24, 1986. Support from NSF Grant No. SES-8605871 is gratefully acknowledged. We have benefitted from comments by participants in seminars at University of Rochester, University of Pennsylvania, Columbia University, and by participants in the Conference, in particular Maurice Obstfeld.

Abstract

Consider a conservative government, meaning a government in favor of a low level of public consumption, which knows that it will be replaced in the future by a more expansionary government in favor of a larger level of public consumption. How does this situation affect the equilibrium level of public consumption and the fiscal policy of the conservative government, compared to a situation when the conservative government remains in power in the future? We show that the resulting level of public consumption is in between the levels the two governments would chose if each were in power both in the present and in the future. In particular, we show that if the conservative government is more stubborn (in a particular sense) than the succeeding government, the conservative government may borrow more than it would if it would remain in power in the future.

1. Introduction

Suppose a government currently in power knows that it will be replaced in the future by a new government with different objectives, for instance a government that is in favor of a larger public sector. How does that affect the current government's behavior? More specifically, what are the implications for the current government's choices between distortionary taxes and borrowing? In particular, will the current government run fiscal deficits when it knows that its successor's choice of public spending will be influenced by the level of public debt that the succesor inherits? These are the questions we attempt to answer in this paper.

We can think of the described situation as one where the two governments have time-inconsistent preferences. As is well known, a time-consistency problem can also arise if governments have time-inconsistent constraints, for instance if ex ante and ex post labor supply functions differ. In order to isolate the problem of time-inconsistent preferences, we will make assumptions such that the problem with time-inconsistent constraints does not occur.[1]

Our work in this paper is, of course, related to the rapidly growing literature on time consistency of government policy — see Barro (1986), Cukierman (1985), Fischer (1986) and Rogoff (1986) for recent surveys. In particular, it is closely related to the papers by Lucas and Stokey (1983), Persson and Svensson (1984), and Persson, Persson and Svensson (1986). Specificly, these papers show that the second-best optimal fiscal and monetary policy under commitment can be enforced under discretionary policy-making, if each government leaves its successor with a particular maturity structure of

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[1] See Persson and Svensson (1986) for an analysis of the case with time-consistent preferences but with different ex ante and ex post labor supply functions, giving rise to time-inconsistent constraints.

the public debt. This result suggests a more general principle: As long as the current government can affect some state variable that enters (in an essential way) in its successor's decision problem, it can affect the policy carried out by the successor.

In this paper the level of the public debt is the state variable that gives the current government an instrument to control the future government. Our main result is that a conservative government, which is stubborn (in a sense to be specified), may borrow more, when it knows that it will be succeeded by a more expansionary government, than when it knows that it will remain in power in the future. We believe our analysis may shed some new light on the US fiscal deficits that have been caused by the current Republican administration. We also believe that the general principle has wider applications, as further discussed in the concluding section.[2,3]

The paper has five sections. Section 2 presents the set-up and consumer behavior. Section 3 derives the equilibrium for time-consistent preferences, that is, for the situation when the same government remains in power both in the current period and in the future. Section 4 derives and discusses the equilibrium with time-inconsistent preferences, that is, when a new government

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2 Alesina and Tabellini (1986) have independently pursued a very interesting analysis of public debt in the complimentary case when different governments have preferences for different kinds of public goods, rather than as in our case preferences for different volumes of the same public good. A comparision with their analysis and results is given in the concluding section.

3 Phelps and Pollak (1968) provide an early analysis of equilibrium savings ratios in a model with time-inconsistent preferences. There are non-overlapping generations, such that each generation lives for only one period, but has preferences over consumption of future generations. Each generation discounts the utility from future generations' consumption in a way that makes generations' preferences time-inconsistent. There is no state variable through which a generation can affect future generations' behavior. Hence the issue of how to affect your successor in an optimal way does not arise.

with more expansionary preferences is in power in the future. Section 5 concludes and mentiones some possible extensions. Some of the mathematical details are collected in an Appendix.

2. The Set-up

We assume a small open economy. There are two periods, 1 and 2. There is one good. The economy can borrow and lend at a given world rate of interest equal to zero. Therefore, present-value prices of the good in the two periods are equal to unity,

(2.1) $$p_1 = p_2 = 1.$$

Goods output in the two periods, y_1 and y_2, are produced with input of labor, ℓ_1 and ℓ_2, according to the linear technology

(2.2) $$y_1 = \ell_1 \text{ and } y_2 = \ell_2.$$

The competitive before-tax wage rate is unity in both periods.

There is a representative consumer with preferences over private consumption of goods, c_1 and c_2, and leisure, x_1 and x_2, in the two periods given by the concave and additively separable utility function

(2.3) $$u(c_1,x_1,c_2,x_2) = f(c_1) + h_1(x_1) + h_2(x_2) + c_2.$$

We assume additive separabality, together with linearity in period 2 consumption, in order to ensure that ex ante and ex post labor supply functions are identical, which in turn will imply that the constraints to be faced by the governments are time consistent.

Consumers' preferences for government (public) consumption may enter in additively separable in the above utility function. The different governments considered below can then be viewed as representing different parts of the population with different preferences for government consumption (but with the same preferences over private consumption of goods and leisure).

Alternatively, we can think of consumers as being indifferent to the level of government consumtion, with the governments having their own preferences over public consumption, independent of consumers' preferences.

The utility function in (2.3) corresponds to an indirect utility function

(2.4) $\varphi(1,w_1,1,w_2,W)$

of goods prices in period 1 and 2 (the first and third arguments), after-tax wage rates, w_1 and w_2, and wealth, W. This indirect utility function gives the consumer's maximum utility level subject to the budget constraint

(2.5) $c_1 + w_1x_1 + c_2 + w_2x_2 = W.$

The consumer has labor endowments equal to unity in both periods. Hence wealth is given by

(2.6) $W = w_1 + w_2,$

and labor supplies in the two periods, ℓ_1 and ℓ_2, equal

(2.7) $\ell_1 = 1 - x_1$ and $\ell_2 = 1 - x_2.$

Consumer behavior is then completely described by the (second level) indirect utility function defined by substitution of the expression for wealth in (2.6) into the indirect utility function (2.4),

(2.8) $U(w_1,w_2) \equiv \varphi(1,w_1,1,w_2,w_1+w_2).$

By Roy's Identity and the assumption that utility is linear in c_2, the partial derivatives of this function with respect to the wage rates in the two periods give the ex ante labor supply functions for the two periods,

(2.9) $L_1(w_1,w_2) \equiv U_1(w_1,w_2)$ and $L_2(w_1,w_2) \equiv U_2(w_1,w_2).$

The ex ante labor supply functions in (2.9) have the property that in general their elasticities differ from the elasticity of the ex post labor supply function. This gives rise to time-inconsistent constraints for the governments. However, since the utility function (2.3) is assumed to be additively separable in leisure in the two periods, the indirect utility function $U(w_1,w_2)$ will also be additively separable. Then labor supply in each period depends only on the wage rate in the same period,[4]

(2.10) $L_1(w_1)$ and $L_2(w_2)$.

This assures that the ex ante and ex post period 2 labor supply functions are identical, which will imply that the constraints facing the governments are indeed time consistent.

The indirect utility function $U(w_1,w_2)$ and the labor supply functions $L_1(w_1)$ and $L_2(w_2)$ summarize consumer behavior. Next we look at government behavior.

3. Time-Consistent Preferences

There will be one government, called government 1, in power in period 1, and another government, called government 2, in power in period 2. First, however, we will need to look at the case when government 1 is in power in both periods, that is, when government preferences are time consistent.

We assume that there is government consumption in period 2 only. Government consumption in period 1 can easily be introduced, and below we shall report results also on that case. Government 1 has preferences over government consumption in period 2, g, according to the utility function

(3.1) $U(w_1,w_2) + v^1(g)$,

the sum of private utility of private consumption and a concave utilitity function $v^1(g)$ of government consumption.

We assume that government consumption can only be financed by taxes on wage incomes. Lumpsum taxes are excluded since otherwise the problem would be trivial. Capital taxes are excluded to avoid more than one source of time-consistency problems. Tax revenues in the two periods are functions of the after-tax wage rates according to

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4 This can of course be seen directly from the relevant first-order conditions, which are $h_{1x}(1-\ell_1) = w_1$ and $h_{2x}(1-\ell_2) = w_2$.

(3.2) $T_1(w_1) \equiv (1-w_1)L_1(w_1)$ and $T_2(w_2) \equiv (1-w_2)L_2(w_2)$.

(Since the before-tax wage rate is unity, the taxes on labor in period 1 and 2 are equal to $1-w_1$ and $1-w_2$.) The intertemporal budget constraint for financing government consumption can be split up into a budget constraint for each period,

(3.3) $T_1(w_1) = -b$ and $T_2(w_2) = b + g$,

where b is net government borrowing in period 1 (absent government consumption in period 1 net borrowing will be negative). It is assumed — although not explained — that the government always honors the debt that it inherits in period 2.

Government 1 would like to choose w_1, w_2, b, and g so as to maximize (3.1) subject to (3.3). It is convenient to separate this decision problem in several steps. <u>First</u>, the after-tax wage rates can be solved as functions of borrowing and government consumption from the budget constraints (3.3),[5]

(3.4) $w_1(b)$ and $w_2(b+g)$.

Substitution of these wage functions into the indirect utility function $U(w_1,w_2)$ results in a new indirect utility function that gives private utility of private consumption as a function of borrowing and government consumption,

(3.5) $V(b,g) \equiv U(w_1(b),w_2(b+g))$.

<u>Second</u>, by choosing the level of borrowing so as to maximize V(b,g) for given government consumption, government 1 determines it preferred borrowing policy. We describe the preferred policy by the <u>preferred-debt function</u> b(g); a function of government consumption defined by the first-order condition

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[5] The solutions to (3.3) need not be unique. If two or more wage rates are solutions to (3.3), the wage functions (3.4) correspond to the largest of these wage rates, which are the wage rates that minimize welfare loss. It is only these wage rates that are the solution to an optimum taxation problem. This is equivalent to being on the relevant side of the Laffer curve.

(3.6) $\qquad V_b(b(g),g) \equiv 0.$

(If the labor supply functions in the two periods are symmetric, the preferred debt function is simply $b(g) = -g/2$. That is, half of government consumption is financed by period 1 taxes, and half by period 2 taxes.) <u>Third</u>, substitution of the preferred-debt function into the indirect utility function $V(b,g)$ results in another indirect utility function giving private utility of privat consumption as a function of government consumption only,

(3.7) $\qquad \bar{V}(g) \equiv V(b(g),g).$

<u>Finally</u>, government 1 chooses government consumption so as to maximize

(3.8) $\qquad \bar{V}(g) + v^1(g).$

We define the ex ante marginal cost of government consumption as

(3.9) $\qquad \bar{\lambda}(g) \equiv -\bar{V}_g(g),$

and we let the marginal utility of government consumption for government 1 be denoted by

(3.10) $\qquad \mu^1(g) \equiv v^1_g(g).$

Then the first-order condition for the maximum of (3.8) can be written

(3.11) $\qquad \bar{\lambda}(g) = \mu^1(g);$

the marginal cost of government consumption should equal the marginal utility of government consumption. The level of government consumption fulfilling (3.11), the preferred (level of) government consumption for government 1, is denoted by $\bar{g}^1$.

An illustration of this is provided in <u>Figure 1</u>. The preferred government consumption for government 1 is given by the intersection between the marginal cost curve $\bar{\lambda}(g)$ and the marginal utility curve $\mu^1(g)$.

As is usual in optimum taxation problems, the second-order conditions are not necessarily fulfilled. The second-order condition here is that the slope of the ex ante marginal cost curve is larger than the slope of the marginal utility curve, (3.12) $\qquad \bar{\lambda}_g > \mu_g^1$.

The marginal utility curve is downward-sloping by the concavity assumption. We assume that the ex ante marginal cost curve is upward-sloping, as in Figure 1,

(3.13) $\qquad \bar{\lambda}_g > 0$.

4. Time-Inconsistent Preferences

Government 1 will not be in power in period 2 to enforce its preferred policy, but will be replaced by government 2, with different preferences. We shall first specify the behavior of government 2, and then specify the behavior of government 1 when it anticipates the behavior of government 2. Government 2 has preferences over government consumption in period 2 that can be expressed as the sum of private utility of private consumption and a utility function $v^2(g)$ that differs from the utility function $v^1(g)$ of government 1,

(4.1) $\qquad u(c_1,x_1,c_2,x_2) + v^2(g)$.

In period 2, consumption and leisure of period 1 are predetermined. We can represent consumer behavior in period 2 with the indirect utility function

(4.2) $\qquad \varphi^2(1,w_2,W^2;c_1,\ell_1)$,

which is, for given period 1 consumption and leisure (hence labor supply), the maximum over period 2 consumption and leisure of the private utility function (2.3) subject to the period 2 budget constraint

(4.3) $\qquad c_2 + w_2x_2 \leq W^2$.

Here wealth in period 2, W^2, consists of period 2 labor endowment and savings from period 1, s,

(4.4) $\qquad W^2 = w_2 + s = w_2 + (w_1\ell_1 - c_1)$.

(The first argument in (4.2) is the price of goods. Recall that $\ell_1 = 1 - x_1$.) Substitution of (4.4) into the indirect utility function (4.2) gives private utility of private consumption in period 2 as a function of after-tax wage rates in the two periods and period 1 labor supply,

$$(4.5) \qquad U^2(w_2, \ell_1; w_1) \equiv \varphi^2(1, w_2, w_2 + w_1\ell_1 - c_1; c_1, \ell_1).$$

(We drop period 1 consumption as an argument since with the additively separable utility function (2.3) period 1 consumption only depends on the goods price which is fixed at unity.) The period 2 indirect utility function (4.5) completely describes consumer behaviour in period 2. By Roy's Identity and the linearity in period 2 consumption, its partial derivative with respect to period 2 after-tax wage rate is the period 2 ex post labor supply function,

$$(4.6) \qquad L^2(w_2) \equiv U^2_w(w_2, \ell_1; w_1).$$

The assumption that the direct utility function (2.3) is additively separable in leisure in the two periods, and the linearity in period 2 consumption, implies that the ex post labor supply function is independent of period 1 labor supply, and the period 1 wage rate, and indeed identical to the ex ante period 2 labor supply function in (2.10),[6]

$$(4.7) \qquad L^2(w_2) \equiv L_2(w_2).$$

We assume that government 2 takes as given the level of debt it has inherited from government 1. By assumption, default does not occur.[7] Government 2 then has to repay the debt it has inherited, as well as to finance its chosen level of government consumption, and it faces the budget constraint

$$(4.8) \qquad T_2(w_2) = b + g.$$

The budget constraint results in the same period 2 wage function $w_2(b+g)$ for

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6 The first-order condition is simply $h_{2x}(1-\ell_2) = w_2$.

7 For the case when there is no government consumption in period 1, the level of debt inherited is negative, and government 2 has no incentive to default on it.

government 2 as for government 1 . Substitution this wage function into the period 2 indirect utility function (4.5) leads to a new period 2 indirect utility function that expresses private utility of private consumption as a function of the sum of debt and government consumption, period 1 labor supply, and period 1 after-tax wage rate,

(4.9) $$V^2(b+g,\ell_1;w_1) \equiv U^2(w_2(b+g),\ell_1;w_1).$$

For a given debt level government 2 chooses government consumption so as to maximize the sum of private utility from private consumption and utility from government consumption,

(4.10) $$V^2(b+g,\ell_1;w_1) + v^2(g).$$

We define the ex post marginal cost of government consumption as

(4.11) $$\lambda^2(b+g) \equiv -V^2_G(b+g).$$

(Since the period 2 indirect utility function (4.9) is additively separable in b+g, the ex post marginal cost will be independent of period 1 labor supply and after-tax wage rate. Total government expenditure in period 2, b+g, is denoted by G.) We let the marginal utility of government consumption for government 2 be denoted by

(4.12) $$\mu^2(g) \equiv v^2_g(g).$$

Then the first-order condition for government 2 can be written

(4.13) $$\lambda^2(b+g) = \mu^2(g);$$

the ex post marginal cost of government consumption should equal the marginal utility of government consumption for government 2. The first order condition defines the optimum level of government consumption for government 2 as a reaction function $g^2(b)$ of the inherited debt level. It will be practical to use the inverse of that function, $\tilde{b}(g)$, called the <u>required-debt function</u>, defined by

(4.14) $$\lambda^2(\tilde{b}(g)+g) \equiv v^2_g(g).$$

The required-debt function gives the level of debt that is required to induce government 2 to choose a particular level of government consumption.

Figure 2 provides an illustration. The ex post marginal cost curve is steeper than the ex ante marginal cost curve. This is because the tax distortion associated with a given increase in g can no longer be spread over two periods. For a given debt level, the intersection between the ex post marginal cost curve with the downward-sloping marginal utility curve for government 2 gives the optimum level of government consumption for government 2. For the debt level $\bar{b}^1 = b(\bar{g}^1)$, the preferred debt level for government 1, the ex post marginal cost curve intersects the marginal utility curve for government 1 at the same point as the ex ante marginal cost curve. If government 1 was in power in period 2, it would choose the level of government consumption $\bar{g}^1$ ex post as well as ex ante (since we have made assumption to ensure that the ex ante and ex post labor supply functions are identical and hence the problem of time-inconsistent constraints does not arise). Under the assumption that government 2 has higher marginal utility for all levels of government consumption, as in Figure 2, government 2 will of course choose a higher level of government consumption than $\bar{g}^1$ if it inherits the level of debt $\bar{b}^1$. The ex post marginal cost curve shifts to the left with increased debt levels. For a particular level of government consumtion g, the required-debt level $\tilde{b}(g)$ shifts the ex post marginal cost curve to intersect the marginal utility curve for government 2 at that particular level of government consumption.

The required-debt function $\tilde{b}(g)$ summarizes the behavior of government 2. It implies an additional constraint, an incentive-compatibility constraint, on government 1. Government 1, anticipating the behavior of government 2, cannot choose its preferred borrowing policy b(g) defined by (2.18) but has to choose its level of borrowing according to the required-debt function $\tilde{b}(g)$ defined by (4.14). The private utility of private consumption is then given by the indirect utility function

(4.15) $\hat{V}(g) \equiv V(\tilde{b}(g),g)$.

Government 1 chooses government consumption (or more precisely, chooses a level of borrowing that induces government 2 to choose a level of government consumption) so as to maximize $\hat{V}(g) + v^1(g)$. Let us define the time-consistent marginal cost of government consumption as

(4.16) $\hat{\lambda}(g) \equiv -\hat{V}_g(g)$.

Then the first-order condition for a maximum of $\hat{V}(g) + v^1(g)$ can be written

(4.17) $\hat{\lambda}(g) = \mu^1(g)$;

the time-consistent marginal cost of government consumption should equal the marginal utility of government consumption for government 1. This first-order condition defines the time-consistent level of government consumption $\hat{g}$.

The equilibrium is illustrated in Figure 3. The ex ante marginal cost curve $\bar{\lambda}(g)$ intersects the marginal utility curve for government 2 for the level of government consumption $\bar{g}^2$. This is the level of government consumption that government 2 would prefer if it would be in power in both periods. The time-consistent marginal cost curve $\hat{\lambda}(g)$ intersects the marginal utility curve at the same level of government consumption. The ex post marginal cost curve $\lambda^2(b+g)$ also intersects the marginal utility curve, for the debt level given by $b = \bar{b}^2 = b(\bar{g}^2)$, the debt level government 2 would choose if it would be in power in both periods. The time-consistent curve $\hat{\lambda}(g)$ is at least as steep as the ex post marginal cost curve $\lambda^2(\bar{b}^2+g)$ — see the derivation of inequality (A.20) in the Appendix.

Government 1 induces government 2 to choose the level of government consumption $\hat{g}$, given by the intersection of the time-consistent marginal cost curve with the marginal utility curve for government 1, $\mu^1(g)$. It does this by choosing the debt level $\hat{b} = \tilde{b}(\hat{g})$. This is the debt level that shifts the ex post marginal cost curve to intersect the government 2 marginal utility curve for the level of goverment consumption $\hat{g}$, vertically above the intersection between the time-consistent marginal cost curve and the government 1 marginal utility curve.

It follows from Figure 3 that the time-consistent level of government consumption (i) exceeds the level of government consumption that government 1 prefers (the level that government 1 would choose if it were in power in both periods), and (ii) falls short of the level of government consumption that government 2 prefers (the level that government 2 would choose if it were in power in both periods). That is,

(4.18) $\qquad \bar{g}^1 < \hat{g} < \bar{g}^2.$

It also follows that government 1 induces government 2 to choose a lower level of government consumption by leaving government 2 with a higher level of debt than government 2 prefers. That is,

(4.19) $\qquad \hat{b} > \bar{b}^2.$

This is obvious since the ex post marginal cost curve that intersects the government 2 marginal utility curve for the level of government consumtion $\hat{g}$ lies to the left of the ex post marginal cost curve that intersects the government 2 marginal utility curve for the level of government consumtion $\bar{g}^2$. Equivalently, it follows since the required-debt function $\tilde{b}(g)$ is decreasing.

It is also obvious that the level of debt $\bar{b}^1$ that government 1 prefers exceeds the level of debt $\bar{b}^2$ that government 2 prefers,

(4.20) $\qquad \bar{b}^1 > \bar{b}^2.$

But, is the time-consistent level of borrowing $\hat{b}$ larger or smaller than the preferred level of borrowing $\bar{b}^1$? This is not obvious. It depends on whether the ex post marginal cost curve for $\hat{b}$, $\lambda^2(\hat{b}+g)$, that intersects the government 2 marginal utility curve for $\hat{g}$, lies to the right or to the left of the ex post marginal cost curve for $\bar{b}^1$, $\lambda^2(\bar{b}^1+g)$, that intersects the government 1 marginal utility curve for $\bar{g}^1$. If the ex post marginal cost curve for $\hat{b}$ lies to the left, $\hat{b}$ exceeds $\bar{b}^1$; if it lies to the right, $\hat{b}$ falls short of $\bar{b}^1$. Numerical examples demonstrates that both cases can occur. We cannot expect to find general global results, since the curves in Figure 2 may have a variety of shapes.

A local result can however be derived in the following way. Consider a parametrization of government 2 such that the parameter γ in its utility function $v^2(g,\gamma)$ denotes how expansionary it is, in the sense that an increase in γ shifts up the marginal utility curve $\mu^2(g,\gamma)$, that is, μ^2_γ is positive. We call γ the expansion index. It follows that the level of government consumption if government 2 is in power in both periods will be an increasing function $\bar{g}^2(\gamma)$ of the expansion index. The time-consistent level of government consumption will also be an increasing function $\hat{g}(\gamma)$ of the expansion index. Choose the parametrization such that

$$\hat{g}(0) = \bar{g}^2(0) = \bar{g}^1. \tag{4.21}$$

That is, when the expansion index is zero, the two governments would prefer the same level of government consumption, which then of course coincides with the time-consistent level of government consumption. The time-consistent level of borrowing is a function $\hat{b}(\gamma)$ of the expansion index. When the expansion index is zero, the time-consistent level of borrowing will coincide with the preferred level of borrowing of government 1 and government 2 (the level of borrowing each of them would choose if each were in power in both periods),

$$\hat{b}(0) = \bar{b}^1 = \bar{b}^2(0). \tag{4.22}$$

Now consider a small increase in the expansion index. Whether the time-consistent borrowing increases above, or decreases below the level of borrowing $\bar{b}^1$, is determined by the sign of the derivative $\hat{b}_\gamma(\gamma)$ for $\gamma = 0$. In the Appendix it is shown that, under the assumption that the period 1 and period 2 labor supply functions are identical, the sign of the derivative is positive or negative depending upon whether the marginal utility curve for government 1 is steeper of flatter than the marginal utility curve for government 2. That is, for small positive levels of the expansion index γ, we have

(4.23) $\quad \hat{b}(\gamma) \gtrless \bar{b}^1$ if and only if $-\mu_g^1 \gtrless -\mu_g^2$.

This result can be illustrated in <u>Figure 4</u>. First, consider an equilibrium when government 1 has the marginal utility curve $\mu^1(g)$, the time-consistent level of government consumption is $\hat{g}(\gamma)$, and the time-consistent level of borrowing $\hat{b}(\gamma)$ coincides with the level of borrowing $\bar{b}^1$ (the ex post marginal cost curve for $b = \hat{b}(\gamma)$ intersects the marginal utility curve $\mu^1(g)$ at $g = \bar{g}^1$). Second, consider the time-consistent equilibrium when government 1 has a steeper marginal utility curve $\mu^{1}{}'(g)$, that still intersects the ex ante marginal cost curve for $g = \bar{g}^1$, so that the level of borrowing $\bar{b}^1$ remains the same. The time-consistent level of government consumption falls from $\hat{g}(\gamma)$ to $\hat{g}'(\gamma)$. In order to induce government 2 to choose this lower level of government consumption, government 1 must shift the ex post marginal cost curve to the left by increasing its borrowing to $\hat{b}'(\gamma)$, above the level $\bar{b}^1$ that it would choose if it were in power both periods. Hence, when government 1 has a steeper marginal utility curve, it is more inclined to increase its borrowing above what it would have chosen if it were in power both periods.

We can understand this result in the following way. If government 1 would choose the debt level $\bar{b}^2$, the level preferred by government 2, the resulting level of public consumption would be $\bar{g}^2$. The level of debt then coincides with the preferred level of debt for government consumption $\bar{g}^2$, since $\bar{b}^2 = b(\bar{g}^2)$. Then there would be no distortion of relative tax levels, since the tax rates in the two periods are those that minimize the welfare loss of financing government consumption $\bar{g}^2$. However, from the point of view of government 1, there is a distortion of the level of government consumption. The level of government consumption is too large, since the marginal cost of government consumption exceeds the marginal utility of government consumption for government 1. In order to decrease the level of government consumption, government 1 chooses to distort the relative tax levels in the two periods, by increasing its borrowing above the level preferred by government 2, and thereby allowing the period 1 tax rate to be too low relative to the period 2 tax rate. For the time-consistent level of government consumption $\hat{g}$, the distortion of relative tax levels balances the distortion of the level of government consumption. How far government 1 is prepared to distort the relative tax levels, that is how much more than $\bar{b}^2$ government 1 is prepared to borrow, depends on how important it is for it to decrease government consumption below the level $\bar{g}^2$. The steeper its marginal utility curve, the more important it is for government 1 to decrease the level of government consumption below $\bar{g}^2$. If its marginal utility curve is sufficiently steep, government 1 is prepared to distort relative tax levels and borrow so much more than $\bar{b}^2$, that it even borrows more than the level $\bar{b}^1$ which it would choose if it were in power in both periods.[8]

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[8] Alternatively, we can interpret our result (4.23) in the following way. Suppose government 1 would choose its preferred level debt $\bar{b}^1$, when it is succeeded by government 2. Government 2 will increase period 2 taxes and government consumption above the levels preferred by government 1, thus causing (from the point of view of government 1) a distortion of relative tax levels as well as of the level of government consumption. Whether the two distortions balance each other depends on the steepness of the marginal

We can interpret steepness of the marginal utility curve as indicating the degree of "stubborness" of a government, in the sense of indicating the degree of importance it assigns to decreasing the level of government consumption towards its preferred level. Consequently, we may interprete the result (4.23) as stating, that a (relatively) stubborn conservative government will run a (larger net) deficit when it knows that it will be succeeded by a more expansionary government than when it knows that it will remain in power.

Let us finally comment on the situation when there is government consumption also in period 1. Think of government 1 as having preferences over government consumption g_1 and g_2 in period 1 and 2 according to

$$(4.24) \qquad u(c_1,x_1,c_2,x_2) + v_1^1(g_1) + v_2^1(g_2).$$

If government 1 would be in power in both periods it would choose optimum levels of government consumption, $\bar{g}_1^1$ and $\bar{g}_2^1$, say, and an optimum level of borrowing $\bar{b}^1$. In the time-consistent equilibrium when government 1 is replaced by government 2 i period 2, would the time-consistent level of government consumption in period 1, $\hat{g}_1$, fall short of or exceed $\bar{g}_1^1$? This is a relatively easy question. The answer is that the time-consistent level of government consumption in period 1 is larger or smaller depending upon whether the time-consistent level of borrowing is larger or smaller than the level when government 1 is in power in both periods,

$$(4.25) \qquad \hat{g}_1 \gtrless \bar{g}_1^1 \text{ if and only if } \hat{b} \gtrless \bar{b}^1.$$

---

utility curve of government 1. The steeper the marginal utility curve is relative to that of government 2, the more likely it is that the distortion of the level of government consumption is worse than that of relative taxes, and that government 1 prefers to increase its borrowing above the level $\bar{b}^1$, to make the distortions balance.

The reason is that if borrowing is larger, for a constant level of period 1 government consumption, the period 1 tax rate on labor is smaller, and the level of tax distortion in period 1 is lower. This makes the marginal cost of period 1 government consumption lower, and allows an expansion of period 1 government consumption.[9]

5. Conclusions and Possible Extensions

We have shown how a government can exert some influence over the future level of government consumption when preferences over government consumption are time inconsistent. A government, which is conservative in the sense of being less expansionary than its (liberal) successor, will collect less taxes and leave more public debt than what the successor would prefer. This makes the time-consistent level of government consumption somewhere in between what each of the two governments would prefer if they would rule on their own. Especially, if the conservative government is relatively stubborn, it may end up borrowing more when it knows that it will be succeded by the liberal government, compared to when it knows that it will remain in power. Stubborness here refers to the weight the government attaches to reach its preferred level of government consumption relative to the welfare cost of distorted relative tax rates between periods.

Technically, the problem we have dealt with is a principal-agent problem, with government 1 being the principal and government 2 being the agent. The

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[9] With the distortion of relative tax rates in the time-consistent equilibrium, the marginal cost of increasing period 1 taxes is not equal to but falls short of the marginal cost of increasing period 2 taxes. Since period 1 labor supply depends only on the period 1 wage, we know that increased borrowing is equivalent to decreased period 1 taxes and a decreased marginal cost of increasing period 1 taxes. In equilibrium the marginal cost of increased period 1 taxes must equal the marginal utility of period 1 government consumption.

behavior of government 2 enters as an incentive-compatibility constraint in the decision problem of government 1.

There are several extensions of our analysis which may be worth pursuing. We have simplified the problem to a two-period perfect-foresight framework, where the current government knows with certainty that it will be succeeded by a more expansionary government. This framework may still be rather realistic when it refers to a president in his second term, with the consitution prohibiting reelection.[10] Nevertheless, it is clearly desirable to extend the analysis to one with several periods, and to one where there is uncertainty about the nature of succeeding governments, because of uncertainty of an election, say. Such an analysis has independently been provided in a recent very interesting paper by Alesina and Tabellini (1986). They consider a situation with two governments that have different preferences such that the governments prefer different <u>kinds</u> of public goods, rather than different <u>levels</u> of the same public good as in our model. There is uncertainty in each period about whether the current government will remain in power or will be succeeded by the other government.[11] Since each current government knows that with some probability it will be succeeded in the next period by a government that will spend taxes on a kind of public good that the current government does not like, it perceives a low expected marginal utility of next period's

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[10] Another interpretation is that there is uncertainty about the preferences of the successor, that the probability distribution over preferences is one-dimensional (conservative-liberal) and has a finate support, and that the current government is extreme in the sense of being at the conservative end of the support. Then any succeeding government, and the expected succeeding government, is more liberal than the current one.

[11] Exogenous uncertainty about the composition of the electorate creates uncertainty about election outcomes, when voters vote for the government whose preferences are most similar to the voters' own preferences.

public consumption. This provides an incentive to restrict next period's public consumption by borrowing more in the current period, compared to a situation when the current government would remain in power next period with certainty. Both governments perceive the same incentive to borrow more, hence there will be a bias towards larger public debt levels. Thus Alesina and Tabellini (1986) demonstrate that when two governments have preferences for similar levels but different kinds of public consumption, uncertainty about the nature of the succeeding government implies a bias towards higher debt levels for both governments. As mentioned, our analysis refers to a situation when two governments have preferences for different levels of but the same kind of public good. Our analysis allows for the distinction between more and less expansionary (conservative and liberal) governments, and we have thus been able to compare the policy of a conservative government when it knows that it will have a liberal successor to the policy when it knows that it will remain in power. We intend to extend our analysis to a situation with uncertainty and many periods, but we conjecture that uncertainty about whether the current conservative government is succeeded or remains in power would not fundamentally change the behavior we have derived under perfect foresight.

Another very interesting extension, although as far as we can see a very complicated one, would be to make the probability of being reelected depend upon the policy pursued. Additional extensions include the consideration of other state variables than public debt. For instance, if public goods can be produced only after previous investment in a public capital stock, the level and perhaps the composition of that public capital stock becomes an obvious state variable through which a government can affect its successor.[12]

As already mentioned, the idea that a government can influence its successor by affecting the constraints of the successor is a very general one, and extends far beyond fiscal policy. Recent examples include the privatization policy of the Thatcher government in Britain, or the settlements policy of previous Likud governments in Israel, both of which policies will change (or have already changed) the constraints for succeeding governments with possibly very different preferences. "Creating facts" for your successor is a fact of life. In our view, this general idea sets an exciting agenda for future research.

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[12] Maurice Obstfeld has showed us that the following somewhat different set-up leads to very similar formal results, although in an even easier way. Consider a two-period small open exchange economy. Governments have access to in power in period 1, and a more expansionary government is in power in period 2. Then it is easy to derive analogs of our results.

In our mind, the set-up we use, with the distortion originating in income taxation, allows for a more relevant and interesting interpretation of the results.

Appendix: Derivation of (4.23)

Let $\hat{b}(\gamma) \equiv \tilde{b}(\hat{g}(\gamma),\gamma)$, where

(A.1) $$\lambda^2(\tilde{b}(g,\gamma)+g) = \mu^2(g,\gamma),$$

(A.2) $$\hat{\lambda}(g,\gamma) \equiv - L_1[w_1(\tilde{b}(g,\gamma)]w_{1b}(\tilde{b}(g,\gamma))\tilde{b}_g(g,\gamma) - - L_2[w_2(\tilde{b}(g,\gamma)+g)]w_{2G}(\tilde{b}(g,\gamma)+g)(\tilde{b}_g(g,\gamma)+1)$$ and

(A.3) $$\hat{\lambda}(\hat{g}(\gamma),\gamma) = \mu^1(\hat{g}(\gamma)).$$

The expression for $\hat{\lambda}(g,\gamma)$ in (A.2) follows since $\hat{\lambda} = -\hat{V}_g$ and

(A.4) $$d\hat{V} = dV = \ell_1 dw_1 + \ell_2 dw_2.$$

Similarly,

(A.5) $$\lambda^2(b+g) = - L_2[w_2(b+g)]w_{2G}(b+g),$$ since

(A.6) $$dV^2 = \ell_2 dw_2.$$

For $\gamma = 0$ we have

(A.7) $$\hat{g}(0) = \bar{g}^1 \text{ and } \hat{b}(0) = \bar{b}^1.$$

We asume that $L_1(w_1)$ and $L_2(w_2)$ are identical, that is, that the utility function (2.3) is symmetric in x_1 and x_2. Let $\bar{w}_1 = w_1(\bar{b}^1)$ and $\bar{w}_2 = w_2(\bar{b}^1+\bar{g}^1)$. Then

(A.8) $$\bar{w}_1 = \bar{w}_2 = \bar{w},$$

and for $w_1 = w_2 = \bar{w}$ we have

(A.9) $$\ell_1 = \ell_2,\ L_{11} = L_{22},\ w_{1b} = -w_{2G} \text{ and } w_{1bb} = w_{2GG}.$$

Differentiation of (A.2) with respect to g for $\gamma = 0$ and use of (A.9) yields

(A.10) $$\hat{\lambda}_g(\bar{g}^1,0) = [-L_{22}(w_{2G})^2 - \ell_2 w_{2GG}][(\tilde{b}_g)^2 + (\tilde{b}_g+1)^2].$$

Differentiation of (A.5) gives

(A.11) $$\lambda^2_G(\bar{b}^1+\bar{g}^1) = -L_{22}(w_{2G})^2 - \ell_2 w_{2GG}.$$

Together (A.10) and (A.11) imply that for $\gamma = 0$

(A.12) $$\hat{\lambda}_g = \lambda^2_G[(\tilde{b}_g)^2 + (\tilde{b}_g+1)^2].$$

Similarly, differentiating (A.2) with respect to γ at $\gamma = 0$, we obtain

(A.13) $\hat{\lambda}_\gamma = \lambda_G^2 \,(2\tilde{b}_g + 1)\, \tilde{b}_\gamma.$

From (A.1) we get

(A.14) $\tilde{b}_g = -(\lambda_G^2 - \mu_g^2)/\lambda_G^2 \leq -1$ and

(A.15) $\tilde{b}_\gamma = \mu_\gamma^2/\lambda_G^2 > 0,$

and from (A.3)

(A.16) $\hat{g}_\gamma = -\hat{\lambda}_\gamma/(\hat{\lambda}_g - \mu_g^1).$

Finally, from (A.1) we have

(A.17) $\hat{b}_\gamma = \tilde{b}_g \hat{g}_\gamma + \tilde{b}_\gamma.$

We can use the results in (A.12)-(A.14) and (A.16) to evaluate $\hat{b}_\gamma$ as expressed in (A.17). We carry out the substitutions and manipulate the resulting expression to get

(A.18) $\hat{b}_\gamma = \tilde{b}_\gamma(\mu_g^2 - \mu_g^1)/[(\tilde{b}_g)^2 + (\tilde{b}_g+1)^2 - \mu_g^1/\lambda_G^2].$

The denominator is positive, and by (A.15) $\tilde{b}_\gamma > 0.$

It follows that

(A.19) $\text{sign } \hat{b}_\gamma = \text{sign } [-\mu_g^1 - (-\mu_g^2)].$

Note that (A.12) and (A.14) imply that

(A.20) $\hat{\lambda}_g \geq \lambda_G^2.$

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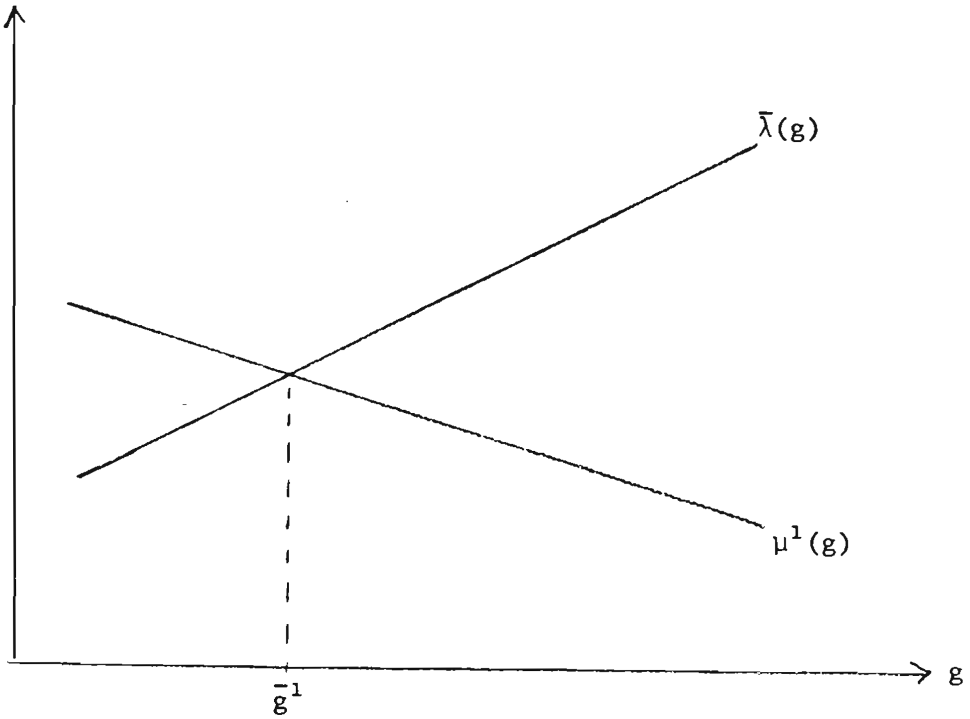
Figure 1



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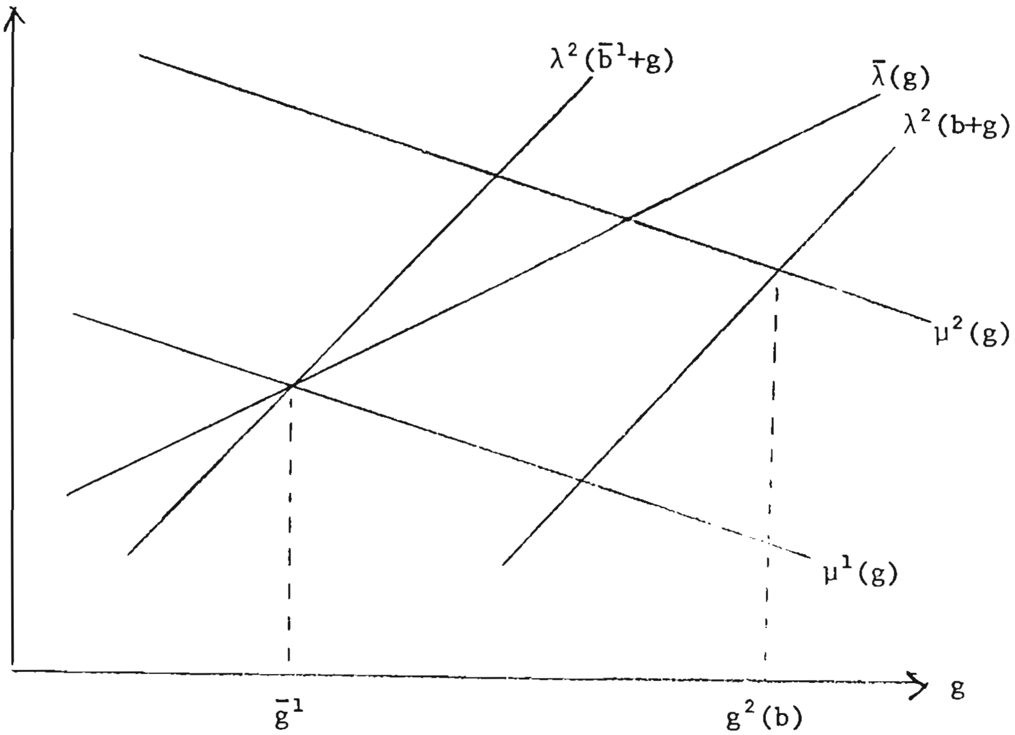

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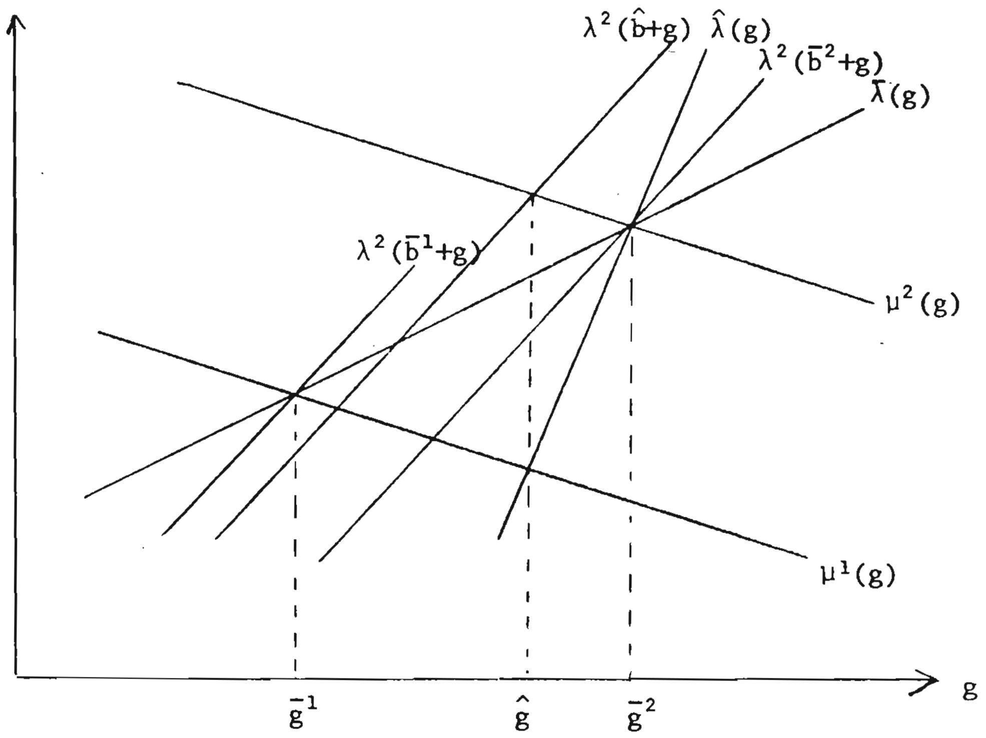
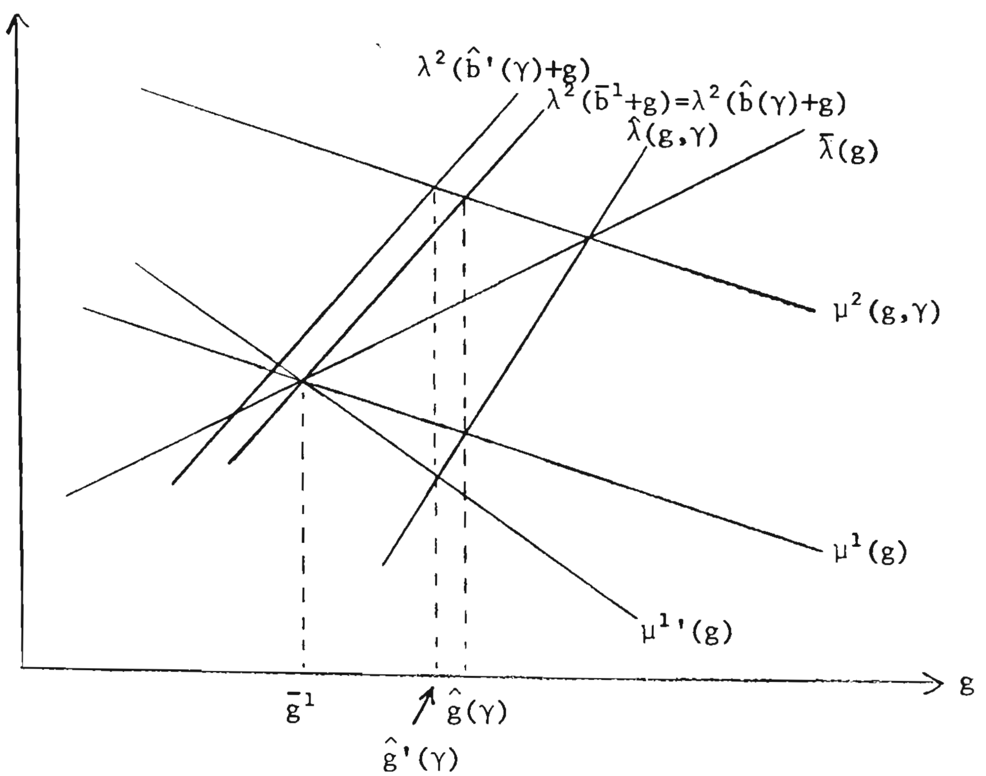


Figure 4



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