THE FAILURE OF RICARDIAN
EQUIVALENCE UNDER
PROGRESSIVE WEALTH TAXATION

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ABSTRACT

Although the Ricardian Equivalence Theorem holds under a linear estate tax schedule, it fails to

hold under a nonlinear estate tax schedule. In a representative consumer economy, a temporary

lump-sum tax increase reduces contemporaneous consumption. If different consumers face different

marginal estate tax rates because they leave bequests of different sizes, a lump-sum tax increase

redistributes resources from consumers in low marginal estate tax brackets to consumers in high

marginal estate tax brackets; aggregate consumption may rise, fall, or remain unchanged. These

departures from Ricardian Equivalence hold more generally under any nonlinear tax on saving,

wealth or income accruing to wealth.

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In a path-breaking paper, Robert Barro (1974) showed that if intergenerational altruism motivates consumers to leave bequests, then changes in the timing of lum-sum taxes are irrelevant for the consumption decisions of individual consumers. The key insight in this demonstration of the Ricardian Equivalence Theorem is that if consumers derive utility from the utility of their heirs, as well as from their own consumption, then each (finitely-lived) consumer in an infinitely-lived family faces an infinite horizon problem when making his consumption and bequest decisions. Therefore, any change in the path of lump-sum taxes which leaves the present value of taxes unchanged does not affect the infinite-horizon intertemporal budget constraint and hence does not affect the optimal path of consumption.

Barro (1974) examined the effects of changes in the timing of lump-sum taxes in the presence of proportional inheritance taxes and concluded that "the existence of taxes on intergenerational transfers makes less likely an interior solution for the transfers, but if these transfers are operative, even if at reduced levels, the marginal effect of [changes in the timing of lump sum taxes] on consumption plans--and, hence, on r-- remains nil." (p. 1109) I will show below that this conclusion is incorrect, unless, as in Barro's formal analysis, the inheritance tax is a linear tax. However, most developed economies have a progressive tax on bequests, and the Ricardian Equivalence Theorem fails to hold in the presence of a nonlinear tax on bequests. Indeed, the presence of a nonlinear tax on any form of wealth, whether it is an intergenerational transfer or an individual's life-cycle saving, will lead to a violation of Ricardian Equivalence.

The literature on the aggregate implications of bequests contains models which display many important characteristics such as the endogeneity of the rate of return on savings (Buiter[1979], Carmichael [1982], Burbidge[1983], Abel [1985b]), the non-negativity constraint on bequests (Weil [1984]) and the uncertainty of the date of death (Abel [1985a,b]); virtually all models in this literature include the overlapping nature of generations. Although each of these features of the economy has important implications which merit study, the model presented below will ignore all of them. The goal of this paper is to demonstrate clearly, in as simple a model as possible, that a

nonlinear tax on inheritances, bequests, wealth or property income destroys the Ricardian

Equivalence result. Furthermore, in a representative consumer framework, the direction of the

departure from Ricardian Equivalence is unambiguous: with increasing marginal tax rates on

inheritances, bequests, wealth or property income, a temporary tax increases reduces

contemporaneous consumption.

The consumer's decision problem is presented in section I and the government budget constraint

is presented in section II. Section III demonstrates that in a representative consumer economy with

increasing marginal estate tax rates, an increase in the lump sum tax leads to a reduction in

aggregate consumption. This effect arises because individual consumers are driven into lower

marginal estate tax brackets and thus face a decrease in the price of their heirs' consumption

relative to their own consumption. This relative price change leads to a decrease in current

consumption. Section IV presents a second channel for the violation of Ricardian Equivalence: the

cross-sectional variation in wealth implies that different consumers leave bequests of different

sizes and hence face different marginal estate tax rates. An increase in the current lump-sum tax

redistributes resources away from consumers in low marginal estate tax brackets to consumers in

high marginal estate tax brackets; the effects on aggregate consumption are discussed in section IV.

Section V then argues that violation of Ricardian Equivalence arises more generally under any

nonlinear tax on wealth or capital income. However, a nonlinear tax on labor income does not

necessarily destroy Ricardian Equivalence as demonstrated in section VI. Concluding remarks are

presented in section VII.

I. The Consumption Decision

Consider an economy which lasts for only two periods--denoted as periods 1 and 2. Individual

consumers live for only one period. Each consumer who lives in period 1 has one child and this

child is the consumer's only heir. Each consumer who lives during period i ($i = 1, 2$) receives an

endowment e_i, pays a lump-sum tax T_i, and consumes c_i. Period 1 consumers obtain utility from

the utility of their heirs as well as directly from their own consumption. We specify the utility

function of period 1 consumers to have the additively separable form

$$u(c_1) + \beta u(c_2) \tag{1}$$

where $u(c_i)$ is the utility that a consumer in period i obtains from consumption in period i, and β is a discount factor that a period 1 consumer applies to the utility of his heir.

Let B denote the bequest left by a representative period 1 consumer so that

$$B = e_1 - T_1 - c_1 \tag{2}$$

Let R be the gross rate of return on assets(bequests). For simplicity, R is fixed exogenously. Let I denote the inheritance received by a period 2 consumer. Suppose that an estate tax $t(B)$ is levied on the bequest B and that the marginal tax rate is non-negative, less than one, and is non-decreasing in B (that is, $0 \leq t' < 1$ and $t'' \geq 0$). The inheritance received by the period 2 consumer is $I = R[B-t(B)]$. Because the period 2 consumer has no heirs, he consumes all of his available resources so that

$$c_2 = R[B - t(B)] + e_2 - T_2 \tag{3}$$

A period 1 consumer maximizes the utility function in (1) subject to the budget constraint obtained by substituting (2) into (3). The first-order condition for this maximization problem is

$$u'(c_1) = \beta R u'(c_2)(1-t'(B)) \tag{4}$$

The consumer equates the utility from consuming an extra unit in period 1 with the utility from bequeathing an extra unit, thereby increasing his heir's consumption by $(1-t')R$ units.

II. The Government Budget Constraint

The Ricardian Equivalence Theorem is based on the fact that individual consumers recognize that the government's intertemporal budget constraint implies that any change in current taxes must be offset, in present value, by a change in future taxes.[1] If there are initially no government bonds outstanding, then the government's intertemporal budget constraint can be written as

$$R[T_1 + t(B)] + T_2 = 0 \tag{5}$$

Totally differentiating (5) with respect to T_1, T_2, and B yields

$$R[dT_1 + t'(B)dB] + dT_2 = 0 \qquad (6)$$

In the next section we analyze the effect on consumption of changes in the lump-sum taxes T_1 and T_2 which satisfy (6).

III. The Effect on Consumption of a Change in Lump-Sum Taxes

To calculate the effect of a lump-sum tax change on consumption, first observe from (2) that

$$dc_1 + dB = -dT_1 \qquad (7)$$

Thus either c_1 or B (or both) must fall in response to an increase in the lump-sum tax T_1. Next, observe from (3) that

$$dc_2 = R[dB - t'(B)dB] - dT_2 \qquad (8)$$

Substituting the government budget constraint (6) into (8), and using (7), yields

$$dc_2 = -R\,dc_1 \qquad (9)$$

An individual consumer can, at the margin, increase c_2 and reduce c_1 in the ratio $(1-t'(B))R$; however, in comparing the new equilibrium with the initial equilibrium, c_1 and c_2 change in the ratio R, which is the intertemporal price of c_2 relative to c_1 for the economy as a whole.[2]

To calculate the changes in c_1 and c_2, define $\sigma(c) = -u''(c)/u'(c) > 0$. Logarithmically differentiating both sides of the first-order condition (4) yields

$$\sigma(c_1)dc_1 = \sigma(c_2)dc_2 + [t''/(1-t'(B))]dB \qquad (10)$$

Using (7) to substitue for dB and (9) to substitute for dc_2, equation (10) can be written as

$$-1 < dc_1/dT_1 = -t''/\{(1-t')[\sigma(c_1) + R\sigma(c_2)] + t''\} \leq 0 \qquad (11)$$

where the inequalities in (11) follow from $0 \leq t' < 1$, $t'' \geq 0$ and $\sigma(c) > 0$. It follows from (11) that if the estate tax is linear ($t''=0$), then Ricardian Equivalence holds. However, if the estate tax is characterized by a rising marginal rate, then an increase in the first-period lump-sum tax leads to a decrease in first-period consumption. The direction of the effect of the first-period tax on first-period consumption is the same as would be predicted by a naive application of a "Keynesian"

consumption function relating consumption to contemporaneous disposable income.

The intuition behind the failure of Ricardian Equivalence is straightforward. If Ricardian Equivalence were to hold so that c_1 and c_2 were invariant to the change in T_1, then an increase in T_1 would reduce the bequest B and hence would reduce the marginal tax rate t', if t " > 0. The effect of the decrease in t' is to increase the utility associated with decreasing c_1 by one unit and increasing c_2 by (1-t')R units. Put differently, the effect of the decrease in t' is to reduce the price of the heir's consumption relative to the consumer's own consumption. Hence, the consumer responds to this intertemporal price change by reducing c_1 and increasing c_2.

The reduction in c_1 is smaller than the increase in T_1. To understand this result, suppose that the reduction in c_1 were equal to the increase in T_1. In this case, the bequest B would be unchanged and the intergenerational terms of trade (1-t')R would be unchanged. But if the intergenerational terms of trade are unchanged, and if the present value of taxes is unchanged, then the optimal response of c_1 to the change in T_1 is zero rather one-for-one.

The results implied by equation (11) are derived under the assumption that the estate tax is a twice differentiable function of the bequest. However, actual tax codes generally specify marginal tax rates (t') as step functions of the tax base. Thus, at any given tax base, the slope of the marginal tax function (t") is either zero or is undefined. Therefore, a literal interpretation of (11) may lead one to conclude (incorrectly) that the nonlinearity in actual tax codes does not destroy Ricardian Equivalence. However, Ricardian Equivalence will fail to hold if, by maintaining current consumption unchanged, the representative consumer is driven into a lower (marginal) tax bracket by the lump-sum tax increase. The greater is the increase in the first-period tax, the greater is the likelihood that the representative consumer will be driven into a lower marginal tax bracket.

IV. Cross-Sectional Variation in Initial Wealth

With a nonlinear estate tax schedule, there are two sources of variation in marginal tax rates

which can destroy the irrelevance of lump-sum tax changes. In section III we focussed on the variation in the marginal estate tax rate faced by an individual consumer as the lump-sum taxes are varied. Any change in the marginal estate tax rate faced by a consumer implies a change in the intergenerational terms of trade and thus causes a change in the intergenerational allocation of consumption. Alternatively, in this section we consider the cross-sectional variation in marginal estate tax rates which arises because otherwise identical first-period consumers have different levels of initial wealth or endowments. The presence of cross-sectional variation in marginal estate tax rates implies that a non-discriminatory increase in the first-period lump-sum tax, T_1, induces a redistribution of wealth from families with low marginal tax rates to families with high marginal tax rates. This redistribution arises because the tax T_1 generates a deduction from the taxable estate. The size of the reduction in estate taxes generated by a given increase in T_1 is an increasing function of the marginal estate tax rate so that an intertemporally balanced-budget lump-sum increase in T_1 shifts resources towards families with high marginal estate tax rates.

To keep the analysis simple, we assume that the marginal tax rate schedule is a step function of the size of the bequest. Furthermore, we assume that the bequest left by each consumer is sufficiently far from the next tax bracket, and that the change in the lump-sum tax is sufficiently small, so that no consumers are driven into different tax brackets as a result of the tax change. Formally, these assumptions imply that for the relevant values of the bequests, $t''=0$.

Suppose that all first-period consumers are identical in all respects except for the initial endowment e_1. Suppose that there are J possible values of the first-period endowment e_{j1}, $j = 1,...,J$. We will refer to a consumer who receives an endowment e_{j1} as a type j consumer. Let s_j denote the fraction of first-period consumers who are of type j, so that $\Sigma_j s_j = 1$. Equation (10) in section III holds for each type of consumer. Setting $t'' = 0$, dividing (10) by $\varnothing(c_{j2})$ and using (7) and (8) to substitute for dc_2 yields

$$[\varnothing(c_{j1})/\varnothing(c_{j2}) + R]dc_{j1} = -\{R[dT_1 + t'(B_j)dB_j] + dT_2\} \qquad (12)$$

where the subscript j denotes that a variable pertains to a type j consumer. Note that the

lump-sum taxes T_1 and T_2 are not subscripted by j because we are confining our attention to lump-sum tax policies which do not discriminate across consumers of different types.

The government's budget constraint in (5) must be modified to take account of the different estate tax payments by different types of consumers

$$R[T_1 + \Sigma_j s_j t(B_j)] + T_2 = 0 \tag{13}$$

Totally differentiating the government budget constraint (13) with respect to T_1, T_2, and B_j, and using the fact that $\Sigma s_j = 1$, yields

$$\Sigma s_j \{R[dT_1 + t'(B_j)dB_j] + dT_2\} = 0 \tag{14}$$

Let $dC_1 = \Sigma s_j dc_{j1}$ be the change in aggregate first-period consumption. It follows immediately from (12) that

$$dC_1 = -\Sigma s_j \{R[dT_1 + t'(B_j)dB_j] + dT_2\} / [\mathit{ø}(c_{j1})/\mathit{ø}(c_{j2}) + R] \tag{15}$$

If $\mathit{ø}(c)$ is constant, then it follows from (15) and the government budget constraint (14) that $dC_1 = 0$. Although aggregate consumption is unchanged when $\mathit{ø}(c)$ is constant, the Ricardian Equivalence Theorem does not hold because an increase in T_1 and the associated reduction in T_2 redistribute resources from families with low marginal estate tax rates to families with high marginal estate tax rates. Therefore, consumers with high marginal tax rates increase their consumption and consumers with low marginal tax rates decrease their consumption.

In general, aggregate first-period consumption changes in response to a change in lump-sum taxes which obeys the government budget constraint. Since the coefficient of dc_{j1} on the left hand side of (12) is positive, the sign of the right hand side of (12) is the same as the sign of dc_{j1}. Substituting (7) into (12) we obtain

$$[\mathit{ø}(c_{j1})/\mathit{ø}(c_{j2}) + (1-t_j')R] dc_{j1} = -\{R(1-t_j')dT_1 + dT_2\} \tag{16}$$

If $dT_1 > 0$, then the right hand side of (16) is increasing in t_j'. Therefore, there exists a $j*$ such that

$$dc_{j1} \leq 0 \quad \text{and} \quad -R[dT_1 + t'(B_j)dB_j] + dT_2 \leq 0 \quad \text{if } t_j' \leq t_j'* \tag{17a}$$

$$dc_{j1} > 0 \quad \text{and} \quad -R[dT_1 + t'(B_j)dB_j] + dT_2 > 0 \quad \text{if } t_j' > t_j'* \tag{17b}$$

If $\emptyset(c_{j1})/\emptyset(c_{j2})$ is decreasing (increasing) in $t_j{}'$, then the weight $[\emptyset(c_{j1})/\emptyset(c_{j2}) +R]^{-1}$ in the weighted sum (15) is increasing (decreasing) in $t_j{}'$ so that, from (17a,b) the positive values of $-R[dT_1 + t'(B_j)dB_j] + dT_2$ receive larger (smaller) weights and hence the value of dC_1 in (15) is positive (negative). As an example, consider the isoelastic utility function $u(c) = c^{1-a}/(1-a)$ for $a > 0$. In this case, $\emptyset(c_{j1})/\emptyset(c_{j2}) = c_{j2}/c_{j1}$. It follows from the first-order condition (4) that $c_{j2}/c_{j1} = [\beta R(1-t'_j)]^{1/a}$ so that $\emptyset(c_{j1})/\emptyset(c_{j2}) = [\beta R(1-t'_j)]^{1/a}$ is a decreasing function of t'_j. Therefore, an increase in T_1 leads to an increase in aggregate first-period consumption. This result contradicts both the Ricardian Equivalence Theorem and the prediction from a straightforward application of a "Keynesian" consumption function.

V. Extensions to Progressive Wealth and Capital Income Taxes

The literature on the effects of changes in lump-sum tax and transfer policy has focussed on the role of, and motivation for, voluntary private intergenerational transfers. The reason for this focus can be traced to Diamond's (1965) seminal paper with finitely-lived consumers who do not leave bequests. The Diamond model provided a coherent general equilibrium framework with maximizing firms and consumers in which lump-sum changes in the government's financial policy have real effects. Subsequently, Barro(1974) showed that if consumers have operative bequest motives arising from intergenerational altruism, then lump-sum changes in the goverment's financial policy are irrelevant. Since the appearance of Barro's paper, the question of Ricardian equivalence has revolved largely around the role of intergenerational transfers.[3] It is in keeping with the spirit of this literature that I interpreted the model presented above in terms of a nonlinear tax on bequests. However, it is not the tax on bequests *per se* which leads to the effects of intertemporally balanced-budget changes in lump-sum taxes. The model presented above could alternatively be interpreted as applying to an economy in which all consumers live for two periods and leave no bequests. In this case, the tax $t(B)$ is to be interpreted as a tax on wealth or saving.

If we interpret the model presented above as applying to consumers who live for two periods,

then it may be more relevant to interpret the results as applying to an economy with a nonlinear property income tax rather than a wealth tax. In this case, the variable B would be interpreted as saving at the end of the first period, and $(R-1)B$ is property income. Letting $t*((R-1)B)$ be the property income tax, the first-order condition (4) must be amended to

$$u'(c_1) = \beta[R-(R-1)t*']u'(c_2) \qquad (18)$$

Logarithmically differentiating (18) with respect to c_1, c_2, and B yields

$$\emptyset(c_1)dc_1 = \emptyset(c_2)dc_2 + \Omega(B)dB \qquad (19a)$$

where $\qquad \Omega(B) = [(R-1)^2t*'']/[R-(R-1)t*'] \qquad (19b)$

Using (9) to eliminate dc_2 and (7) to eliminate dB, we obtain[4]

$$\{\emptyset(c_1) + R\emptyset(c_2) + \Omega(B)\}dc_1 = -\Omega(B)dT_1 \qquad (20)$$

Recalling that $0 \le t*' < 1$ and that $t*'' \ge 0$, it follows from (19b) that $\Omega(B) \ge 0$ with strict inequality if $t*'' > 0$. Therefore, (20) implies that $-1 < dc_1/dT_1 \le 0$, with strict inequality if $t*'' > 0$. Thus, for an economy with a representative consumer, the effects of lump-sum tax changes in the presence of a nonlinear property income tax are qualitatively the same as the effects in the presence of a nonlinear estate tax as derived in section III.

VI. Labor Income Taxes

It is well-known that changes in the structure of distortionary (non-lump-sum) taxes will affect the allocation of consumption. For example, Carmichael (1982) and Burbidge (1983) have each shown that if labor supply is a choice variable of individual consumers, then changes in the tax rate on labor income affect the allocation of consumption and output. The implication drawn by Burbidge (1983) is that government "debt is not neutral once one permits a labor-leisure choice to the young who pay taxes on their earnings." (p.226) However, if tax revenue is raised by both lump sum taxes and labor income taxes, then Burbidge's result must be modified: If the government finances a current tax cut by issuing bonds, then government debt will be neutral if the labor income tax schedule is unchanged. That is, changes in the timing of lump sum taxes have no effect on the allocation of consumption if the only other tax is a labor income tax. This result holds

whether the labor income tax is linear or nonlinear.

To establish the modification of Burbidge's result, let L_i be the labor supply of an individual in period i, and let w_i be the (exogenous) pre-tax real wage rate in period i so that $w_i L_i$ is labor income in period i. Then, letting $t_L(wL)$ be the labor income tax, and assuming that the only other tax is a head tax, we can modify equations (1) - (4) to write the maximization problem of a period 1 consumer as

$$\max u^*(c_1, L_1) + \beta u^*(c_2, L_2) \tag{21}$$

$$\text{s.t.} \quad c_2 = R[e_1 + w_1 L_1 - t_L(w_1 L_1) - T_1 - c_1] + e_2 + w_2 L_2 - t_L(w_2 L_2) - T_2$$

The first-order conditions are

$$-u^*_{Li}/u^*_{ci} = [1 - t'_L(w_i L_i)]w_i \qquad i = 1, 2 \tag{22a}$$

$$u^*_{c1} = \beta R u^*_{c2} \tag{22b}$$

The government budget constraint is

$$R[T_1 + t_L(w_1 L_1)] + T_2 + t_L(w_2 L_2) = 0. \tag{23}$$

If $RdT_1 + dT_2 = 0$, then it is both feasible and optimal for consumers to maintain the initial values of c_i and L_i. Because consumers continue to earn the same labor income and pay the same labor income taxes, the government budget constraint will be satisfied.

The analysis in this section illustrates that Ricardian Equivalence is not necessarily destroyed by the existence of (linear or nonlinear) labor income taxes if the government also has access to lump sum taxes. This finding is to be contrasted with the results in previous sections in which the existence of a nonlinear tax on wealth, saving, property income, inheritances or bequests leads to a violation of Ricardian Equivalence. The difference in the results is due to the fact that Ricardian Equivalence requires consumers to change their path of wealth accumulation to maintain unchanged consumption in the face of a tax change. If there is a nonlinear tax on wealth or income accruing to wealth, then changes in wealth accumulation will change intertemporal prices and render the initial allocation of consumption suboptimal. However, changes in the pattern of wealth accumulation have no effect on the price of leisure implied by the labor income tax.

VII. Conclusion

This paper has explored the implications of increasing marginal tax rates on bequests,

inheritances, property income and wealth for the efficacy of lump-sum tax and transfer policies.

We demonstrated that the Ricardian Equivalence Theorem fails to hold in the presence of nonlinear

taxes on bequests, inheritances, property income or wealth. It is important to note that the

breakdown of Ricardian Equivalence results from the nonlinearity in the estate tax; with a constant

marginal tax rate, Ricardian Equivalence is preserved under the standard set of assumptions. There

are two channels by which lump-sum tax and transfer policies are effective in the presence of a

nonlinear tax. First, the marginal tax rate can vary for an individual as his wealth varies. Second,

the marginal tax rate can vary cross-sectionally across consumers with different levels of wealth.

In an economy with identical consumers, the only source of variation in the marginal estate tax

rate is variation in the wealth of the representative consumer. If the Ricardian Equivalence

Theorem were to hold in such an economy, then a lump-sum tax increase would reduce

contemporaneous savings as consumers maintained an unchanged allocation of consumption over

time. However, the reduction in savings implies a reduction in the consumer's estate and hence a

reduction in the marginal estate tax rate. This reduction in the marginal estate tax rate reduces the

price of the consumer's heir's consumption relative to the price of the consumer's own

consumption. Thus, the consumer is induced to increase his bequest at the expensive of reducing his

own consumption. This result is qualitatively the same as predicted by a simple Keynesian

consumption fucntion relating consumption to contemporaneous disposable income.

The cross-sectional variation in marginal estate tax rates which arises from cross-sectional

variation in wealth implies that changes in the timing of lump-sum taxes will induce

redistributions of resources across families with different marginal estate tax rates. In

particular, an increase in the current lump-sum tax will fall more heavily on families with low

marginal tax rates than on families with high marginal tax rates. This redistribution of resources

will undoubtedly affect the cross-sectional allocation of consumption. Whether aggregate

consumption is affected by a contemporaneous change in the lump-sum tax depends on the utility functions of consumers. If the instantaneous utility function displays constant absolute risk aversion, and if the tax change is small enough so that all consumers remain in their initial estate tax brackets, then aggregate consumption is unaffected by the lump-sum tax change. However, this finding should not be viewed as a vindication of the Ricardian Equivalence Theorem, because the zero change in aggregate consumption masks changes in the consumption of individual consumers. More generally, aggregate consumption as well as the cross-sectional allocation of consumption will change in response to a change in lump-sum taxes.

As explained in section V, the historical development of the literature has led to a strong link between Ricardian Equivalence and the existence of bequests motivated by intergenerational altruism. We have shown that the presence of a nonlinear tax on bequests destroys the Ricardian Equivalence Theorem. Moreover, it is not the nonlinear tax on bequests *per se* which is important; Ricardian Equivalence will fail to hold whenever there is a nonlinear tax on saving or the income accruing to saving. The key question is whether a change in the timing of lump-sum taxes leads to an optimal intertemporal reallocation of consumption within the consumer's family. If there is such an optimal reallocation, then Ricardian Equivalence is violated regardless of whether the reallocation is across different generations of the family or across different periods of a consumer's life.

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Footnotes

1. It is possible in an infinite-horizon model for the government to reduce current taxes without having to increase future taxes at any date if the interest rate is smaller than the population growth rate. (See Barro(1976), Feldstein(1976) and Carmichael(1982)). This consideration does not arise in the two-period economy in this paper.

2. We have assumed that all consumers know the government budget constraint and correctly anticipate the second-period tax T_2. However, we assume that individual consumers behave atomistically: in choosing B, individual consumers take T_1 and T_2 as parametrically given since no consumer is large enough to affect per capita revenues by his actions alone. If there were only one consumer in the economy, then his behavior would affect T_1 and T_2. In this case, substituting the government budget constraint (5) into the consumer's budget constraint (from (2) and (3)) would yield $c_2 = R(e_1 - c_1) + e_2$, and Ricardian Equivalence would hold in this case with a single consumer.

Alternatively, the Ricardian Equivalence Theorem would hold in the presence of lump-sum taxes if all families were effectively linked to one another by operative intergenerational transfers. Bernheim and Bagwell (1984) have argued that such linkages will be important because people from different families marry and have children. However, if one takes the Bernheim-Bagwell results seriously, then not only are lump-sum taxes irrelevant, but the price system is also irrelevant. The implication which Bernheim and Bagwell draw from these overly strong results is that bequests must be generated by motives other than (possibly in addition to) altruism.

3. Barsky, Mankiw, and Zeldes (1984) is an interesting exception.

4. Equation (9) holds under a property income tax as well as under an estate tax. With a property income tax, the budget constraint of an individual consumer implies

$$dc_2 = [R - (R-1)t^{*'}]dB - dT_2 . \qquad (f4.1)$$

The government budget constraint is $R T_1 + t^*((R-1)B) + T_2 = 0$, which can be totally differentiated with respect to T_1, T_2 and B to yield

$$R dT_1 + (R-1)t^{*'} dB + dT_2 = 0 . \qquad (f4.2)$$

Combining equations (f4.1) and (f4.2) and using (7) yields (9).