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RICARDIAN EQUIVALENCE: AN EVALUATION OF THEORY AND EVIDENCE

B. Douglas Bernheim

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Ricardian Equivalence:
An Evaluation of Theory and Evidence

ABSTRACT

In evaluating the existing theory and evidence on Ricardian equivalence, it is essential to distinguish between the short run effects of government borrowing (primarily the potential for stimulating aggregate demand) and the long run effects (primarily the potential for depressing capital accumulation). I argue that the theoretical case for long run neutrality is extremely weak, in that it depends upon improbable assumptions that are either directly or indirectly falsified through empirical observation. In contrast, the approximate validity of short run neutrality depends primarily upon assumptions that have at least an aura of plausibility. Nevertheless, even in this case behavioral evidence weighs heavily against the Ricardian view.

Efforts to measure the economic effects of deficits directly through aggregate data confront a number of problems which, taken together, may well be insuperable. It is therefore not at all surprising that this evidence has, by itself, proven inconclusive.

Overall, the existing body of theory and evidence establishes a significant likelihood that deficits have large effects on current consumption, and there is good reason to believe that this would drive up interest rates. In addition, I find a complete lack of either evidence or coherent theoretical argument to dispute the view that sustained deficits significantly depress capital accumulation in the long run.

B. Douglas Bernheim
Department of Economics
Stanford University
Stanford, California 94305
(415) 723-9678

1. Introduction

In recent years, skyrocketting federal deficits have generated widespread concern and fevered debate. Economists' analyses of the deficit problem have focused primarily upon two intellectual benchmarks. One school of thought, typically associated with Keynes, holds that deficit financed tax cuts raise disposable income, thereby stimulating aggregate demand. As a result, deficits lead to high real interest rates, and crowd out private capital formation. If disequilibrium prevails, unemployment may also fall. The second school of thought holds that taxpayers see through the intertemporal veil, and realize that the present discounted value of taxes depends only upon real government spending--not on the timing of taxes. This foresight gives rise to a "Say's law" for deficits: the demand for bonds always rises to match government borrowing. As a result, deficits fail to stimulate aggregate demand, and in fact have no real effects. This second view is typically associated with Ricardo, no doubt much to his posthuminous dismay (see O'Driscoll [1977]).

The notion of "Ricardian equivalence" has come to play an important role in modern economic thought, due in large part to the work of Barro [1974]. In evaluating the existing theory and evidence on Ricardian equivalence, it is essential to distinguish between the short run effects of government borrowing (primarily the potential for stimulating aggregate demand, and its implications for macroeconomic stabilization policy) and the long run effects (primarily the potential for depressing capital accumulation). I argue (section 2) that the

theoretical case for long run neutrality is extremely weak, in that it depends upon improbable assumptions that are either directly or indirectly falsified through empirical observation. In contrast, the approximate validity of short run neutrality depends primarily upon assumptions that have at least an aura of plausibility. Nevertheless, in both cases behavioral evidence weighs heavily against the Ricardian view (section 3).

Efforts to measure the economic effects of deficits directly through aggregate data confront a number of problems which, taken together, may well be insuperable (section 4). It is therefore not at all surprising that this evidence has proven inconclusive. Studies using aggregate time series data almost uniformly support the view that deficits significantly stimulate aggregate demand in the short run, yet they often fail to identify systematic short run relationships between deficits and either interest rates, prices, or other nominal variables. Studies based upon international comparisons (including some new results) find a significant relationship between deficits and aggregate demand (section 5). Few if any studies have attempted to measure long run effects directly.

Taken together, the existing body of theory and evidence does not justify claims that government borrowing has little or no effect on the economy. Rather, I conclude that there is a significant likelihood that deficits have large effects on current consumption, and there is good reason to believe that this would drive up interest rates. In addition, I find a complete lack of either evidence or coherent theoretical

argument to dispute the view that sustained deficits significantly depress capital accumulation in the long run.

2. Theoretical considerations

The central Ricardian observation is that deficits merely postpone taxes. A rational individual should be indifferent between paying $1 in taxes today, and paying $1 plus interest in taxes tomorrow. Since the timing of taxes does not affect an individual's lifetime budget constraint, it cannot alter his consumption decisions.

The relevance of this observation depends upon the length of consumers' planning horizons. If fiscal policy postpones tax collections until after current taxpayers have died, then it may well alter real economic decisions (see Diamond [1965] and Blanchard [1985]). Barro's [1974] central insight was that intergenerational altruism may act to extend planning horizons, thereby reinstating strong versions of Ricardian equivalence.

Recent theoretical work has clarified the set of implicit and explicit assumptions upon which the Ricardian proposition depends. To establish the equivalence of taxes and deficits, one must assume that i) successive generations are linked by altruistically motivated transfers, ii) capital market either are perfect, or fail in specific ways, iii) the postponement of taxes does not redistribute resources within generations, iv) taxes are non-distortionary, v) the use of deficits cannot create value (i.e. through bubbles), vi) consumers are rational and farsighted, and vii) the availability of deficit financing

as a fiscal instrument does not alter the political process.[1] In this section, I elaborate on each of these assumptions.

2.1. Linkages between generations

Under the Ricardian world view, intra-family transfers between members of successive generations are ubiquitous, and motivated solely by altruism. Both components of this hypothesis are theoretically suspect. I will take them in order.

With regard to the first component, one line of criticism argues that, under plausible assumptions about preferences, productivity growth, and income distribution, many parents will bequeath nothing to their children (Andreoni [1986a], Feldstein [1986a], Laitner [1979]). When this occurs, children may well help to support their parents, in which case Ricardian equivalence still prevails for policies that do not alter the pattern of linkages (see Carmichael [1982], or Bernheim and Bagwell [1986] for a more general treatment). The relevant issue therefore concerns the likelihood that transfers flow neither from parents to children, nor from children to parents.

A number of authors have studied models which allow for both gifts (from child to parent) and bequests (from parent to child). Typically, there is a range of parametrizations for which transfers flow in neither direction (Buiter [1979], Carmichael [1982], Weil [1984], Abel [1985a], and Kimball [1986]).[2] In general, I find this subliterature unenlightening. For one thing, I question the wisdom of rejecting certain specifications of preferences, as is the practice of several authors mentioned above, on the basis of criteria such as dynamic

inconsistency (between members of successive generations), or divergence of utility streams. While consistency and convergence are analytically convenient properties, they are unjustifiable as primitive choice axioms. Dynamic inconsistency is simply a manifestation of conflict within families, and I see no reason to rule it out. Similarly, divergence of utility streams simply limits the usefulness of utility functions as representations of primitive preference orderings, and cannot logically invalidate the possibility that altruism is strong.

Furthermore, this entire sub-literature considers a very special subset of preferences, in that direct altruism is generally limited to one's immediate successor and predecessor. If, for example, individuals care directly both about their children and grandchildren ($u_t = u(c_t, u_{t+1}, u_{t+2})$), then positive bequests may prevail in equilibrium even when capital accumulation is inefficiently high (i.e., on the wrong side of the golden rule--see Ray [1987]). One simply cannot rule out the possibility that generations are linked by applying this sort of a priori reasoning.

A second line of criticism spins off of Bernheim and Bagwell's [1987] observation that representative agent models abstract from interconnections between families. They argue that ubiquitous parent-child linkages would embed all (or nearly all) individuals in a single interconnected network. The consumption of each individual would then depend only upon total wealth, and an increment to total wealth would be divided among the entire population. Consequently, in a large dynamic economy, any incremental bequest would be divided between the

recipient's contemporaries, and the resulting increment to the recipient's consumption would be negligable. Accordingly, the donor would prefer to make no bequest at all. In equilibrium, many donors would be driven to corners, so that no large interconnected network would remain.[3/]

A third line of criticism argues that optimal government policy will generally entail driving successive generations to corners (Bernheim [1986]). The reason is simple: when transfers are positive, each donor is indifferent on the margin between his own consumption, and that of the corresponding recipient. If the planner cares directly about the donor and the recipient, he must in general prefer larger transfers--the initial configuration could not have been socially optimal. I have noted in the above reference that one must qualify this conclusion when the planner can precommit himself to particular policies. In addition, note that Ricardian equivalence may still hold in economies where the government fails to act optimally.

I turn next to the second component of the linkage hypothesis--that intergenerational transfers are altruistically motivated. It is important to emphasize that Ricardian equivalence holds under all specifications of altruism in which the utility of each individual is determined as a function of consumption profiles: one need not require that an altruist values only the utility of others, as in Barro [1974] (see Bernheim and Bagwell [1986]). Various authors have suggested alternative motivations, including uncertainty concerning length of life (Davies [1981]), intrafamily exchange (Sussman, Cates, and Smith [1970],

Becker [1974, 1981], Ben-Porath [1978], Adams [1980], Tomes [1981], Kotlikoff and Spivak [1981], and Bernheim, Shleifer and Summers [1985]), and tastes for generosity (Blinder [1974], Andreoni [1986b]). In general, these alternatives do not give rise to neutrality results (see Bernheim, Shleifer, and Summers). Unfortunately, it is very difficult to distinguish between different formulations of preferences on the basis of theoretical reasoning alone. Nevertheless, Bernheim, Shleifer, and Summers make an a priori case for the presence of exchange motives. They argue that Barro's dynastic specification, which portrays families as perfectly harmonious units, is extremely restrictive, and that more generally the preferences of distinct family members will conflict.[4/]

Bernheim and Bagwell [1986] offer an alternative criticism of the Ricardian linkage hypothesis. Building on the observation that ubiquitous parent-child linkages would embed nearly everyone in a single, interconnected network, they show that this hypothesis implies the irrelevance of all redistributional policies, distortionary taxes, and even prices. Indeed, this remains true even when some fraction of the population makes no transfers, or is motivated by considerations other than altruism. Since these results are untenable, they conclude that, in some critical sense, the linkage hypothesis cannot even be approximately valid, and that all policy prescriptions based upon the dynastic framework are therefore suspect.

In defense of Ricardian equivalence, one might argue that the linkage hypothesis is a more appropriate approximation in some

circumstances than in others. Specifically, the Bernheim-Bagwell results may depend on much longer chains of linkages than does the neutrality of government borrowing, particularly if the debt will be paid off within a few generations. If some sort of friction exists in each link, this might dissipate the Bernheim-Bagwell effects, without substantially altering the approximate neutrality of certain deficit policies. Yet formal analysis suggests that this line of defense is flawed, and at best leads one to a different set of untenable conclusions (Abel and Bernheim [1986]).[5/]

Recently, several authors have questioned the importance of intergenerational issues in connection with the Ricardian debate (Poterba and Summers [1986], Hubbard and Judd [1986b]).[6/] Poterba and Summers argue that, under a variety of plausible deficit scenarios (including some historical ones), a substantial fraction of the deferred tax burden is not shifted to future generations.[7/] On the other hand, a substantial fraction is shifted forward--is the glass half full or half empty? Furthermore, the current deficit experience is very atypical, and rational consumers might well expect to escape liability for paying off the lion's share of our current outstanding debt.

Both Poterba-Summers and Hubbard-Judd also point out that, because consumers have relatively long horizons, the marginal propensity to consume out of increments to wealth is small, perhaps on the order of .05. They conclude that factors such as liquidity constraints and myopia have a much larger bearing on the Ricardian debate.

The validity of this conclusion depends upon the policy issue that one has in mind. If one is concerned with short run issues, such as stimulation of aggregate demand within a standard Keynesian setting, then Poterba-Summers and Hubbard-Judd are undoubtably correct (although note that 5% of a $200 billion deficit is $10 billion, which constitutes a non-trivial rise in consumption). If, on the other hand, one is concerned with capital accumulation in the medium and long runs, intergenerational issues play the dominant role.[8/] Indeed, simulations show that, under standard life cycle assumptions, plausible deficit policies have enormous effects on medium and long run capital stocks, even though the short run effects may be trivial or even perverse (Auerbach and Kotlikoff [1986]).

2.2. Capital Market Imperfections

When inefficiencies in private capital markets make it difficult or impossible for households to obtain loans, government borrowing may have real effects (Buiter and Tobin [1981]). Hubbard and Judd [1986a,b] emphasize the quantitative importance of liquidity constraints for short run issues. Under the assumption that 20% of the population is liquidity constrained, they show that a $1 deficit-for-taxes swap could well increase current consumption by about 25¢. Clearly, this is far larger than the roughly 5¢ rise in consumption that would follows from a pure wealth effect. In a somewhat different vein, studies by Drazen [1978] and Pogue and Sgontz [1977] establish that, when liquidity constraints bind early in life, policies involving intergenerational transfers alter human capital accumulation, even in the presence of

intergenerational altruism.[9]

Unfortunately, these studies are all somewhat unsatisfactory, in that they take liquidity constraints to be given exogenously. Certainly, the effect of government policy will in general depend upon the nature of the capital market failures which give rise to inefficiencies.

Recent work explains credit rationing as the consequence of asymmetric information (Stiglitz and Weiss [1981], Jaffee and Russell [1976]). These approaches generate liquidity constraints as an endogenous aspect of equilibrium. Using such models, Hayashi [1985] and Yotsuzuka [1986] argue that, in many situations, liquidity constraints adjust in response to government policies, and that the nature of this adjustment restores Ricardian equivalance.[10]

It is, however, apparent that the Hayashi-Yotsuzuka results are highly sensitive to assumptions about the distribution of the future tax burden. While I discuss distributional issues at greater length in the next subsection, it is important to emphasize the particular synergy between liquidity constraints and distribution. Accordingly, I provide a brief analysis of Hayashi's second model, which is based upon the Jaffee-Russell framework. I modify Hayashi's model by dropping the assumption that the government imposes a fixed lump sum tax, and assume instead that taxes rise with earned income.[11] Work effort is fixed, so the tax is non-distortionary. I show that as long as a separating equilibrium prevails, deficits increase the consumption of all consumers, including those who are not liquidity constrained.

Postponing taxes has real effects in this model because it allows the government to undertake redistributions that could not be achieved through current taxes (due to the existence of private information). Strangely enough, deficit policy is still irrelevant when a pooling equilibrium prevails; indeed, endogenous adjustments neutralize redistributions between individuals, despite the absence of altruistic linkages.

Suppose in particular that there are two types of individuals, H and L. Both have the same first period earned income, w_1. However, in the second period, $w_2^H > w_2^L$. Each individual knows his type, but this is private information. Lenders know only that the fraction p of the population is of type L, and $(1 - p)$ is of type H. Following Hayashi, I assume that default results in the loss of all period 2 resources, and that the marginal utility of period 2 consumption at $c_2 = 0$ is finite. These assumptions are for convenience only.

Suppose for the moment that lenders make no effort to distinguish an individual's type on the basis of his desired loan. Lenders will then be willing to loan up to $w_2^L/(1 + r)$ to each individual at the rate r (where r is the lenders' opportunity cost of funds). Beyond $w_2^L/(1 + r)$, lenders will charge a rate r^* on incremental loans, where

$$1 + r^* = \frac{1 + r}{1 - p} \quad .$$

In figure 1, I have followed Hayashi by illustrating the decisions of L and H consumers on the same diagram. L's origin is at 0^L, while H's is at 0^H. Each type's endowment point is given by E.

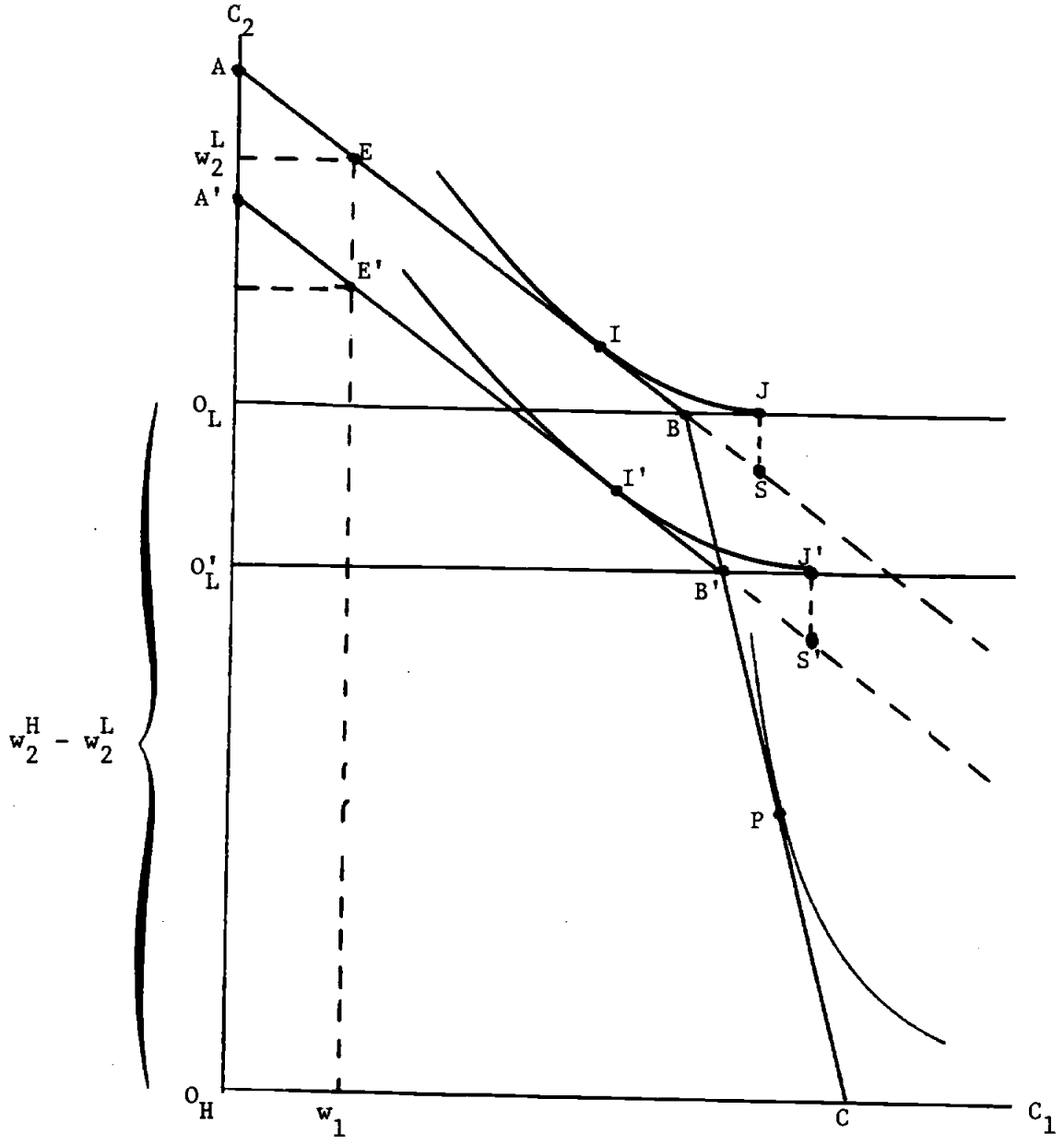

Figure 1 : Endogenous Liquidity Constraints

Under the preceding assumptions, the opportunity locus for a type H individual is ABC.

It is now possible to illustrate both separating and pooling equilibria. In a separating equilibrium, lenders offer two contracts, denoted I and S. Type L individuals would default on S (actual consumption would then be given by J), but not on I. Given this observation, they are indifferent between the two contracts--we resolve this indifference in favor of I. Type H consumers strictly prefer S. With this pattern of self-selection, both contracts earn zero profits. In a pooling equilibrium, lenders offer one contract, denoted P. Type L individuals default on the contract, and, as a result, it yields zero profits. A pooling equilibrium prevails if and only if type H individuals prefer P to S; otherwise, a separating equilibrium prevails.

Hayashi argues as follows. Suppose that the government cuts taxes on each individual by x, and raised them by $x(1 + r)$ in period 2. Then the endowment point merely shifts along the line AB. Since the locus ABC is unchanged, both separating and pooling equilibria are unaltered.

Now suppose that taxes are positively related to earned income. A tax cut in period 1 will affect after tax earned income equally for both types. However, the attendant increase in taxes in period 2 will fall more heavily on type H individuals.

What is the effect of this tax cut on consumption? Note that we can decompose the policy into two components: the deferral of a fixed,

lump-sum tax, and a period 2 redistribution from type H to type L individuals. Hayashi's analysis demonstrates that the first component has no real effects. I therefore focus on the second component.

Suppose that we reduce w_2^H by x, and raise w_2^L by $x(1 - p)/p$, so that total resources are unchanged. $w_2^H - w_2^L$ falls, so that O_L shifts downward to O_L'. They key analytic point is that ABC shifts downward to A'B'C. To verify this, one shows that B' lies on BC. Note that the point B' is given by the consumption vector

$$C_1 = w_1 + (w_2^L + x(1 - p)/p)/(1 + r)$$

$$C_2 = w_2^H - x - (w_2^L + x(1 - p)/p) \quad .$$

This can be rewritten as

$$C_1 = w_1 + w_2^L/(1 + r) + z/(1 + r^*)$$

$$C_2 = w_2^H - w_2^L - z \quad ,$$

where $z \equiv x/p$, from which the desired conclusion is immediate.

Now suppose that a separating equilibrium prevails. Subsequent to the redistribution, the new equilibrium is given by the contracts I' and S'. Since type L's endowment has risen, I' will ordinarily be to the right of I (as long as C_1 is normal), and S' must be to the right of S (since J' lies to the right of J). Thus, deficits raise current consumption for both types of individuals. Intuitively, the redistribution of second period resources to type L individuals relaxes the incentive compatability constraint on type H individuals.

Type L individuals were not liquidity constrained to begin with, and so consume more in both periods. Type H individuals were liquidity constrained in period 1, and so increase first period consumption as much as possible, despite the loss of lifetime resources. In fact, one can show that when utility is time separable, type H individuals will increase period 1 consumption by more than the present value of lost resources in period 2. The quantitative significance of this effect may therefore be quite large.

Suppose finally that a pooling equilibrium prevails. Note that as long as the redistribution is not too large, P remains a pooling equilibrium. Thus, redistributions between different types of individuals in period 2 are completely neutralized, despite the absence of altruistic linkages. This result is reminiscent of Bernheim and Bagwell's analysis (although it holds for much different reasons), and should, consequently, generate some skepticism about neutrality results based upon models of this type.

2.3. Redistribution

Even if individuals are infinite lived and capital markets are perfect, the deferral of taxes through deficits may alter the pattern of incidence. Simply put, different people may bear a larger share of the tax burden at different points in time. In effect, all the real effects of debt described so far arise from redistributions of this sort, either between successive generations, or between separate incarnations of the same individual in distinct periods.

A redistributional policy can significantly alter current

aggregate consumption only when two conditions are satisfied. First, the relevant parties must not be linked through chains of altruistically motivated transfers (I do not give to or receive from my children; I do not save for or borrow against my future). Second, these parties must have different propensities to consume resources in the current period (I consume today, but my children do not, and neither do my future incarnations). For redistributions other than those considered in subsections 2.1 and 2.2 it is very easy to argue that the first condition holds, but very difficult to establish the second in a convincing way. As a result, there is a common presumption that, ignoring intergenerational issues and liquidity constraints, the distributional consequences of postponing taxes are of second order importance.

Certain considerations suggest that debt (Abel [1986]) and social security (Abel [1985b]) may stimulate aggregate consumption by redistributing resources towards individuals with higher marginal propensities to consume. These policies also tend to favor families with few children, and this may affect fertility, thereby altering consumption indirectly (Becker and Barro [1985], Wildasin [1985]). It is, however, difficult to guage the quantitative importance of these effects.

A separate set of issues arises when the distribution of future taxes is not known with certainty (Buiter and Tobin [1981]). To the extent consumers save more as a precaution against uncertainty, deficits may actually "crowd in" investment (Chan [1983]), although once again it is difficult to assess to quantitative significance of this factor. I find this argument implausible. If the world was otherwise Ricardian,

then one would never expect to observe deficits since the electorate would universally oppose the gratuitous introduction of uncertainty. Rather, huge current surpluses would result from the public's desire to resolve uncertainty as quickly as possible.

Future taxes may also be uncertain because they are related to income, which is itself random. In this case, postponement of taxes may result in a reduction of future net income risk, thereby inducing a rise in consumption (Barsky, Mankiw, and Zeldes [1986]). I find this observation unsatisfactory, in that the absence of relevant insurance markets is never explained. Hayashi's analysis of liquidity constraints certainly drives home the point that it is dangerous to discuss the effects of government policy in the presence of market failures without modelling the failures explicitly. Indeed, in the Barsky et. al. world, the government should intervene in insurance markets, and help to pool risks associated with future income. Risk pooling should in no way depend directly upon the timing of taxes. Note that a similar objection also applies to the "crowding in" view, mentioned above.

2.4. Distortionary Taxation

The timing of taxes may be quite important if taxes distort behavior, and if marginal future taxes depend upon different decisions than marginal current taxes.[12/] This observation is especially relevant to the current discussion when deficits are used to postpone capital income taxes, since a reduction in marginal capital income tax rates may cause individuals to save more, and consume less. Auerbach and Kotlikoff [1986] argue that this effect could dominate the net wealth effect in

the short run, even in a life cycle world. The plausibility of this outcome depends in large part on intertemporal substitution elasticities. Measurement of these elasticities is a dicey problem, and well beyond the scope of this paper. However, in evaluating the macroeconomic evidence discussed in sections 3 and 4, the reader should bear in mind that deficits may substantially depress the long run capital stock even when the short run effect is to crowd-in investment.

A more general treatment of deficit financing in a world with distortionary taxes gives rise to the theory of tax smoothing. This theory suggests that tax rates should be kept relatively constant even when output fluctuates. Intuitively, since the deadweight loss of taxation rises (approximately) with the square of the tax rate, a constant rate minimizes the average distortion (Barro [1979], Prescott [1977], Lucas and Stokey [1983], Kingston [1984]).[13/] While tax smoothing is an important normative concept, this theory does not appear to generate any clear positive implications concerning the link between deficits and aggregate consumption.

2.5. Permanent Postponement

Feldstein [1976] criticized Barro's analysis of fiscal policy by arguing that, when the growth rate of the economy exceeds the interest rate, the government can roll over deficits indefinitely. As a result, no generation need ever actually pay any portion of the postponed taxes. Barro [1976] responded that intergenerational linkages might actually prevent the economy from accumulating an inefficiently large amount of capital. This exchange spawned a separate sub-literature

which focused on the relationships between gifts, bequests, and capital over-accumulation. I have already referred to many of these papers in subsection 2.1. While I do not think one can draw any conclusions about the form of intergenerational altruism or the pervasiveness of intergenerational linkages from this literature, I am convinced that two points are now well-established. First, contrary to Barro's conjecture, intergenerational altruism does not rule out dynamically inefficient outcomes. Indeed, for certain specifications of preferences it is possible to obtain inefficient equilibria with either positive gifts (Weil [1984], Abel [1985]) or positive bequests (Ray [1987]). Second, even when the economy over-accumulates capital, Ricardian equivalence still holds as long as successive generations are operatively linked (Carmichael [1982], Bernheim and Bagwell [1986]). The key to this second result is that the government cannot, in the absence of other market failures, alter the aggregate opportunity set of the private sector through borrowing. If voluntary transfers are operative, then individual families could mimic a policy of rolling over deficits indefinitely by cutting the bequests (or increasing the gifts) of every generation.[14/]

Despite the fact that cases of dynamic inefficiency have recieved a large amount of attention, it is not obvious that this work is of any practical relevance. Few if any economists today believe that the U.S. capital stock is inefficiently large. Permanent deferral of taxes may simply be infeasible.

2.6 Myopia

For Ricardian equivalence to hold, it is clearly essential for consumers to be both highly rational and farsighted. While the rational expectations hypothesis is much in vogue, one should be aware that alternative behavioral hypotheses have very different implications (see e.g. Shefrin and Thaler [1985]). For example, consumers may simply choose consumption heuristically on the basis of current disposable income, and may fail completely to appreciate the link between current deficits and future taxes. If so, then the more traditional Keynesian view of deficits (see e.g. Blinder and Solow [1973]) is appropriate.

2.7 Political Processes

Government expenditures may depend critically upon sources of finance. Politicians may generally support various costly programs, but oppose current tax increases. When it is possible to run deficits, these two positions are at least logically consistent. Thus, the availability of deficit financing may profoundly affect the size and composition of government (Buchanan and Wagner [1977], Bohn [1985], Alesina and Tabellini [1987]).

Of course, it is difficult to explain such behavior on the part of politicians without attributing appropriate views to the electorate. One is therefore naturally led back to the issues raised in the preceding subsections (e.g. non-neutrality in Alesina and Tabellini [1987] results from the absence of non-distortionary taxes). It is nevertheless important to bear in mind the potential endogeneity of government expenditures, and to acknowledge that the political process

may amplify the effects of fiscal policies.

3. Indirect Evidence

In this section, I evaluate the available empirical evidence on several of the assumptions discussed in section 2. Section 3.1 concerns the intergenerational linkage hypothesis; section 3.2 focuses on liquidity constraints and myopia.

3.1 Intergenerational Transfers

I will organize my discussion of the linkage hypothesis around three questions: Are significant intergenerational transfers common? If so, are they intentional? Finally, are they motivated by altruism?

(i) Are significant intergenerational transfers common?

To begin with it is important to clarify the meaning of an intergenerational transfer. For our purposes, feeding one's child does not qualify. The reasons are evident: children are not generally regarded as rational economic planners, and even if they were, they would typically face liquidity constraints. For concreteness, consider an individual who plans to feed and cloth his ten year old child until age 18, at which point he expects the child to achieve full independence. Suppose the government raises taxes on this individual, and announces that it will decrease taxes commensurately on his child 30 years in the future. If the child is a rational agent with access to perfect capital markets, the parent could simply feed him less; the child would respond by borrowing to cover the cost of his food, and Ricardian equivalence

would hold. However, if the child is unable to form sensible economic plans or to borrow against his future earnings, the parent has few options: if he feeds his child less, the child will eat less. Consequently, the deficit policy will have real consequences. This example establishes a general point: the Ricardian equivalence proposition requires the existence of operative intergenerational linkages during a period of life in which children can form rational economic plans, and are linked to their own futures through borrowing or saving.

Some recent evidence suggests that intergenerational transfers play a very important role in the U.S. economy. In a well-known paper, Kotlikoff and Summers [1981] calculated historical patterns of life cycle saving, and concluded that standard models could account for only one fifth of aggregate capital accumulation.[15/] They attributed the residual stock to intergenerational transfers, and presented some direct evidence on gifts and bequests to support this inference (see Darby [1979] for similar findings). Modigliani [1985] has since disputed these results. Unfortunately, studies of this sort can at best shed light on the aggregate size of gifts and bequests, and provide no clue as to the fraction of the population engaged in such transfers.

Surprisingly, it is very difficult to obtain good microeconomic evidence on gifts and bequests. Data on gifts seem particularly poor. Analysis of many data sets, such as the Retirement History Survey, suggest that <u>intra vivos</u> transfers to relatives and children living outside the home are quite small, ranging from $39 to $60 on average,

depending upon the sample year (Hurd [1986a]). This suggests that gifts are highly concentrated among the very wealthy (who, no doubt, significantly underreport the size of their transfers). In contrast, Kurz [1984] reports that approximately 18% of a sample drawn from a survey conducted by the President's Commission on Pension Policy received gifts averaging more than $2000, while 16% made them (he did not report the degree of overlap between these groups). Since the PCPP survey collected extremely detailed and dissaggregated information about transfers, it may well provide more reliable data. Nevertheless, Kurz's findings may exagerate the importance of intra vivos transfers, for two reasons. First, an unknown fraction of the observed transfers were intragenerational (e.g. between brothers).[16/] Second, the PCPP survey classified all persons above the age of 18 as distinct family units, even if they lived with their parents; unmarried children were designated "single head families." Since Kurz reports that more than 75% of those receiving transfers were single head families, these results may in fact be consistent with those based on other surveys. To the extent one believes that children over 18 living at home tend to be liquidity constrained, one is led to the conclusion that intra vivos transfers generally play a small role in determining the effects of fiscal policies.

Direct data on transfers at death are available through estate tax returns and probate records. Unfortunately, these data sources only contain information on sufficiently wealthy testators, and therefore cannot be used to draw inferences about the distribution of bequests for

the entire population.

One can, however, in principle recover the distribution of bequests by examining age-wealth profiles, and rates of resource depletion after retirement. Early studies, including those using interview surveys of saving (Lydall [1955], Projector [1968], Mulanaphy [1974]), cross-section surveys of assets (Lydall [1955], Projector and Weiss [1966], Smith [1975], Mirer [1979], and King and Dicks-Mireaux [1982]), and estate data (Atkinson [1971], Atkinson and Harrison [1978], Brittain [1978], Shorrocks [1975] and Menchik and David [1983]) have with relatively few exceptions found that wealth does not decline significantly, and perhaps even slightly increases, after retirement. Elsewhere (Bernheim [1987a]), I have criticized these studies, and have argued that one requires panel data to resolve these issues properly. All recent studies employing panel data (Bernheim [1987a], Diamond and Hausman [1984], and Hurd [1986a]) conclude that asset holdings decline significantly after retirement (by perhaps 30% over a ten year period). While this pattern is suggestive of life cycle motives, the average individual nevertheless still expects to make a substantial bequest.

The dispersion of bequests is also quite important. Diamond and Hausman [1984] and King and Dicks-Mireaux [1982] both find that a substantial fraction of individuals (roughly 20%) reach retirement with essentially no property or financial resources. In evaluating these findings, it is essential to bear in mind that survey responses to questions about assets are notoriously unreliable. For example, Ferber

et.al. [1969] described the results of a validation study, which revealed that individuals undereport assets by as much as 50%. Furthermore, one would naturally expect enormous variance in the reliability of responses within any sample. Bernheim [1987b] reports some evidence that corroborates this conjecture. Specifically, he finds that if one follows the same individual through successive waves of the Retirement History Survey, reported pension and/or social security income varies by 50% or more in consecutive years for a disturbingly large fraction of the total population, and it is not uncommon to find individuals who report no pension and/or social security income at all between two survey years in which they reported positive benefits. It is therefore very difficult to distinguish low asset holdings at retirement from measurement error.

(ii) Are bequests intentional?

A number of authors have attempted to distinguish between intentional and accidental bequests (i.e. those caused by uncertainty concerning length of life, coupled with failure of annuity markets) through detailed analysis of age-wealth profiles. Both Blinder, Gordon, and Wise [1980] and Hurd [1986b] estimate optimizing models of asset accumulation using data drawn from the Retirement History Survey. Their findings are extremely sensitive to functional specification. Blinder, Gordon, and Wise's estimates of bequest motive parameters are essentially uninformative. Hurd finds no evidence to indicate the presence of a bequest motive, but this conclusion may be driven by his

specification of utility, which is linear in bequests. Quasi-linearity implies that the marginal propensity to bequeath out of lifetime resources is zero up to some threshold, beyond which it jumps discontinuously to unity (this is true regardless of parameter values). As a result, if the actual marginal propensity is closer to zero than to unity, one might well expect to fit a very high threshold value, or equivalently, a very small bequest motive.

Bernheim [1987a] argued that one must be very careful about interpretting age-wealth profiles when individuals hold a substantial fraction of their assets as annuities (social security, pensions). Previous authors had suggested that the inclusion of annuities would accentuate the hump-shaped age-wealth profile, since the actuarial value of survival contingent claims falls with age (Mirer [1979]). Indeed, Dicks-Mireaux and King [1984] found evidence of "a clear life-cycle pattern" when the actuarial value of annuity claims was included in measures of net worth. Bernheim pointed out that actuarial valuation is inappropriate if one wishes to judge the plausibility of life cycle motives, and showed instead that the simple discounted value of future benefits (ignoring the possibility of death) is ordinarily a good approximation to the relevant notion of annuity value. His analysis reversed the findings of Dicks-Mireaux and King: the proper inclusion of annuities generates wealth profiles that decline very little if at all after retirement. Apparently, this point is not yet well appreciated (see e.g. Modigliani [1986]).

Bernheim also examined the response of rates of asset decumulation

to changes in levels of annuitization. Theory predicts that annuities should accelerate decumulation under the life cycle hypothesis, and slow it in the presence of bequest motives. The evidence supports the latter pattern, but not overwhelmingly.

Hurd [1986a] examined differences between the age-wealth profiles of individuals with and without children, and found that those with children tend to dissave slightly more rapidly than those without children (unfortunately, his test of the hypothesis of equality between the dissaving rates for these groups is nonparametric and does not yield a confidence interval on the difference, so that one cannot judge the power of his tests against interesting alternatives). He views this as a contradiction of the bequest motive hypothesis. It is, however, consistent with two-way altruism. A parent may dissave less rapidly because he cares for his child. However, part of his saving is also precautionary. He will reduce this component if he believes his child will provide for him an an emergency. The net effect is ambiguous.

Hammermesh and Menchik [1986] show that bequests are positively related to expected longevity, and negatively related to unexpected longevity. They view the first pattern as indicative of a bequest motive: increased longivity raises lifetime resources, and bequests are presumably normal. However, this conclusion does not follow if increased longevity does not imply a proportionate rise in earnings potential. The observed pattern could also be consistent with life cycle motives if greater longevity is associated with greater uncertainty.

A second strategy for distinguishing between intentional and unintentional bequests is to examine the relationship between observed bequests and the characteristics of recipients. In the absence of a bequest motive, recipient characteristics should have no discernable effects. Using probate data, Tomes [1981] finds that bequests are inversely related to the resources of children; he interprets this as evidence in favor of a bequest motive. However, this pattern is also consistent with the view that parents with wealthier children have less of a precautionary motive for saving, since they can count on their children in emergencies. Since emergencies might actually arise infrequently, the typical family might still make no intergenerational transfers. In addition, Menchik [1984] has raised serious questions about the reliability of Tomes' data. One should also bear in mind the unrepresentative nature of probate samples.

A third strategy is to evaluate evidence concerning attitudes towards various forms of insurance. Life cycle consumers should be anxious to annuitize their resources, even at relatively unfair rates (Yaari [1965]). Nevertheless, there seems to be a general resistance to annuitization (Bernheim, Shleifer, and Summers [1985]). Friedman and Warshawsky [1985a, 1985b] document the availability of annuities on private markets, and conclude that one must posit a bequest motive to explain portfolio choices and patterns of accumulation. They do not, however, consider precautionary motives arising from fear of large unplanned expenses, such as medical costs. These can create a reluctance to annuitize, and would explain higher levels of accumulation

(see Kotlikoff [1986b] for some simulation results).

One can, however, distinguish between precautionary and bequest motives by examining behavioral responses to changes in the level of annuity provision. If a bequest motive is present, consumers can undo annuities by purchasing life insurance. This is not the case if resistance to annuities arises from the fear of large unplanned expenses. Bernheim [1985] analyzes a cross-section of elderly individuals drawn from the Retirement History Survey, and concludes that increased levels of annuitization do in fact stimulate life insurance purchases. This provides strong support for the hypothesis that a large fraction of elderly individuals intend to leave bequests.

(iii) Are bequests altruistically motivated?

Bernheim, Schleifer, and Summers [1985] (BSS) provide evidence linking the behavior of children (parental visits) to the bequeathable assets of parents. This relationship is particularly strong when parents are in poor health, and holds in families with two or more children, but not in single child families. This last observation is particularly important, since the single/multiple child distinction is predicted by the BSS model of strategic bequests, but not by Becker's [1974, 1981] formulation of the altruistic motive. Furthermore, this distinction deflects many methodological criticisms: unless one believes that there is a spurious behavioral difference between single and multiple child families, it is difficult to offer another explanation of this result.

Cox [1987] and Kurz [1984] both provide evidence on intra vivos transfers that reinforces the BSS conclusion. Cox finds that, while the probability of receiving a transfer falls with the recipient's income, the magnitude of transfers conditional upon receipt rises. The first finding is consistent both with exchange and altruistic motives. However, the second is strictly inconsistent with altruism. The exchange theory yields an ambiguous prediction, since a rise in the recipients income increases the price of his services, and since bequests measure expenditures on services, rather than quantity. An additional implication of the altruistic model is that the consumption of each family member should depend only upon the family's total wealth, so that a redistribution of wealth between a donor and the corresponding recipient will be completely offset by private transfers. Kurz tests this proposition by looking separately at the effects of donors' and recipients' wealth on transfers. His results are strongly inconsistent with the prediction outlined above. Unfortunately, both studies are based upon the PCPP survey, which does not contain information on the characteristics of both donors and recipients for any single observation. This creates an important omitted variables problem, since parental characteristics (such as wealth) are undoubtably correlated with those of their children, and certainly influence the magnitude of transfers. Cox makes some corrections for this potential bias, and finds that his results are essentially unaffected.

Independent corroboration of the exchange-motive hypothesis is provided by survey responses to direct questions about parental motives

(Sussman, Cates, and Smith [1970], Horioka [1983]). In addition, this model can better account for consumers' evident reluctance to give gifts, despite significant tax advantages (Shoup [1966], Cooper [1979], BSS; see also Adams [1978] for an opposing viewpoint, and BSS, p. 1071, footnote 25 for a response).

Menchik, Irvine, and Jianakoplos [1986] find some evidence that is both consistent with the altruistic motive, and inconsistent with one important formulation of the exchange motive (Kotlikoff and Spivak's [1981] "family as an annuity" hypothesis). Using data from the National Longitudinal Survey, they show that parental expression of an intent to bequeath is almost completely uncorrelated with the perception that children would provide aupport during periods of financial hardship. Note in addition that Bernheim's [1985] finding concerning life insurance purchases (discussed above) is also inconsistent with the "family as an annuity" hypothesis: when forced to hold high levels of annuities, a life cycle consumer would never undo this by purchasing life insurance, only to undo his life insurance purchase by entering into an annuity agreement with his family members. However, the results of these studies are compatible with the more general model of exchange described by BSS.

Some support for the altruism model can be found in an important paper by Tomes [1981], which I have already mentioned in another connection. However, his central finding--that bequests are negatively related to recipients' resources--is easily reconciled with the exchange hypothesis (recall Cox's observation that the exchange model yields an

ambiguous prediction concerning the effect of recipients' resources on transfers; it is, however, somewhat puzzling that Cox and Tomes obtain coefficients of opposite signs in studies of, respectively, intra vivos transfers and bequests). While Tomes does directly reject a link between bequests and the behavior of one's children, he does not adjust for many sources of potential bias, as do BSS.

Both models of intergenerational transfers are inconsistent with Menchik's [1980, 1984] finding that testators tend to divide bequests equally between their children. This observation is somewhat troubling, since it suggests that we do not yet fully understand bequest motives. However, its importance is generally exaggerated. Suppose for example that equal division simply reflects an egalitarian constraint superimposed upon other motives by social norms. If consumers are otherwise altruistic, Ricardian equivalence will still hold (Abel and Bernheim [1986]). Furthermore, parents could still manipulate their children subject to the constraint that they divide transfers equally in equilibrium (since a sizable minority of testators do not follow the equal division rule, it seems likely that social norms do not proscribe penalizing a miscreant offspring). Accordingly, Menchik's finding is not particularly telling in the current context.

I have now discussed evidence concerning each of three components of the intergenerational linkage hypothesis. Taken as a whole, this hypothesis has an additional, directly testable implication: economic activity should be independent of the distribution of resources across generations. Boskin and Kotlikoff [1985] test this directly with

aggregate time series data, and find that the age distribution of resources matters a great deal. However, their study suffers from many of the problems encountered in other time series investigations (see section 4). In addition, their procedure is unusually dependent upon assumptions about preferences and uncertainty, in that they extrapolate consumption profiles, and then attempt to explain the difference between actual and predicted consumption. The behavioral assumptions underlying their calculations are very strong, and of questionable validity (see e.g. Starrett [1986] for a discussion of isoelastic, intertemporally separable utility functions).

Overall, bequests seem to be significant for a large segment of the population. In addition, much microeconomic evidence is inconsistent with traditional life cycle models. One can explain some, but not all of this evidence by appealing to risk aversion concerning length of life and unplanned expenses. Indeed, data on life insurance holdings point directly to a bequest motive. However, much evidence indicates that bequests are not motivated solely by altruism. In contrast, no existing evidence successfully isolates the altruistic motive. I conclude that a substantial minority of individuals probably make little or no intentional transfers, and that most other individuals are motivated by a variety of factors.

3.2 Liquidity constraints and myopia

There is now a large literature which tests various implications of the joint hypotheses that consumers maximize intertemporal utility, and capital markets function efficently. Much of this literature builds

upon Hall's [1978] stochastic permanent income hypothesis. Following Hall, many investigators have estimated consumption Euler equations to test orthogonality conditions (i.e. innovations in consumption should be unrelated to lagged information). Others have supplemented Hall's model with a process describing the evolution of income, and estimated multiple equation systems to determine whether consumption is excessively sensitive to income innovations (see Sargent [1978] and Flavin [1981]). In the interests of conserving space, I refer the reader to two excellent surveys of this literature by King [1983] and Hayashi [1985]. Despite numerous problems with estimation and interpretation, the evidence on balance supports the view that a sizable minority (roughly 20%) of individuals fail to behave in a way that is consistent with unconstrained intertemporal optimization. Unfortunately, these studies do not identify the constrained group (does it consists of one set of irrational individuals, or do liquidity constraints tend to bind at some particular point in the life cycle?), nor do they allow us to determine the persistence of liquidity constrained states. Both issues are extremely important in the current context.

At this point, it is appropriate to mention a number of studies which use microeconomic data to measure the relationship between asset accumulation and the present value of anticipated social security benefits (Feldstein and Pellechio [1979], Kotlikoff [1979], Blinder, Gordon, and Wise [1980], Diamond and Hausman [1984], Kurz [1981, 1984], Dicks-Mireaux and King [1984]). There seems to be a weak consensus within the profession that social security partially displaces personal

saving, by perhaps twenty to forty cents on the dollar. It is important to understand that this is not a direct test of Ricardian equivalence, since it tells us nothing about aggregate saving. Indeed, if capital markets are perfect and successive generations are linked by altruistically motivated transfers, then family members should be entirely indifferent about who (parents or children) does the saving.[17] Accordingly, one cannot test the full Ricardian hypothesis without information about the wealth of all relevant family members.

Nevertheless, if we reject the intergenerational linkage hypothesis on the basis of other information, then these studies do provide valid tests of life cycle planning models, in that they allow us to determine whether the postponement of income affects current consumption.[18] Viewed in this light, the evidence points to significant liquidity constraints or myopia over long planning periods. There are, of course, other explanations for these findings. Social security may be an imperfect substitute for other assets. Heroic assumptions about expected social security benefits may be quite wide of the mark (although see Bernheim [1987b]). Finally, mispecification of the social security wealth variable may create large downward biases in estimates of wealth displacement (Bernheim [1987c]).

4. Direct Evidence: Aggregate Time Series

I now turn my attention to studies which attempt to measure the effects of deficits directly from aggregate time series data. In subsection 4.1, I discuss some general problems which, taken together,

may well be insuperable. Subsections 4.2 and 4.3 concern studies of real variables (especially consumption) and nominal variables (especially interest rates), respectively. Subsection 4.4 summarizes.

4.1. General problems

It is useful to begin this discussion by summarizing eight common problems shared by virtually all studies which use macro time series data to measure the effects of deficits.

First, measurement of debts and deficits is problemmatic (see Eisner and Pieper [1984, 1986], Eisner [1986], and Boskin [1982, 1986]). Measurement issues include: inflation adjustments, adjustments from par to market values, properly accounting for government assets and investments as well as for contingent liabilities, and valuing liabilities from social insurance programs. Many of these issues pose thorny conceptual problems, so that the "right" measure is not obvious (Kotlikoff [1986b]). Furthermore, econometric estimates appear highly sensitive to the set of corrections that one actually makes (Boskin [1986]).

Second, completely aside from issues about the deficit, it is not at all clear that economists have yet devised satisfactory models for aggregate variables, including consumption and interest rates (see for example Hayashi's [1985] discussion of aggregate consumption relationships). To the extent one mispecifies the relationship of interest, estimates of fiscal effects may be highly unreliable, being contaminated by biases of unknown direction and magnitude. Evidence that appears to reject some hypothesis about deficits may in fact simply

reject the underlying model.

Third, it is important to distinguish between expected and unexpected movements of explanatory variables. Indeed, under the stochastic permanent income hypothesis, only unexpected changes matter. Accordingly, if consumers anticipated historical movements in the deficit perfectly, then we might well find no empirical relationship between deficits and concurrent economic activity, even though real activity would have been much different had the government followed some alternative deficit policy.[19/]

One method of distinghishing the effects of unexpected changes in the deficit is to model the evolution of deficits statistically, and relate deficit innovations to consumption innovations (i.e. run VAR's, and employ cross-equation restrictions implied by rational expectations). This procedure is valid only if consumers form expectations by the same statistical model used by the econometrician. In practice, VAR models are very parsimonious, and omit a tremendous amount of information, so that a portion of the deficit "innovation" may be expected. This would create serious biases in favor of Ricardian equivalence.[20/]

I strongly suspect that VAR models omit important institutional information, which individuals actually use to form their expectations. Each year, a variety of organizations (including the Council of Economic Advisors and the Congressional Budget Office) make well-publicized forecasts of deficits and spending. These forecasts are presumably based upon current knowledge of legislative plans and programs, in addition to recent economic performance. I conjecture that such

forecasts are highly correlated with the prediction error from simple VAR models.

I investigated this hypothesis by estimating some simple VAR processes for deficits, government expenditures (federal, state, and local spending on goods and services), and net national product (all in real per capita terms) using annual data obtained from the Federal Reserve data bank. In one specification, I included three lagged values of each variable; in the other, I included five lags. I estimated both models for the sample period 1956 to 1984, using data for years prior to 1956 to accomodate the lag structure. I then reestimated these models, adding to each equation the forecast of deficits and government spending published in the Economic Report of the President, beginning in 1956. While I suspect that these forecasts may in some cases have been shaped as much by politics as by the desire for accuracy, my purpose was merely to determine whether institutionally based forecasts would enter significantly.

While the forecast variables did not enter into the equations for income and government spending with statistically significant coefficients, the forecasted deficit showed up quite strongly in the deficit equations. Specifically, the coefficients were 1.01 with a t-stat of 5.11, and 0.92 with a t-stat of 3.92 for the three and five lag models, respectively. These coefficients suggest that the VAR models entirely ignore the marginal information incorporated in the institutional forecasts. In addition, this information accounted for a high fraction of the residual variation: the addition of the forecast

variables raised the R^2's is the deficit equations from 0.900 to 0.959, and from 0.940 to 0.974 for the three and five lag models, respectively.

The important point here is not simply that one can explain part of the VAR forecast error through the addition of variables--certainly, this is almost always the case. Rather, my results suggest that more than half of the VAR error is explainable by information that individuals almost certainly use when forming expectations. While these calculations do not necessarily establish that more complicated VAR models (using perhaps more variables, more lags, and quarterly, or monthly data) face similar problems, I take them to be strongly suggestive.

Fourth, the levels of explanatory variables, as well as the innovations in these variables, convey an amalgum of information about future events. Current deficits (or innovations in the deficit) may be correlated with future income or government spending. Realizing this, consumers may change spending today in response to current deficit policy, but not because of the deficit.[21/]

Fifth, endogeneity is a severe problem. Deficits, government spending, consumption, income, and interest rates may all be determined simultaneously. While some authors have employed instrumental variables, the exogeneity of their instruments is highly questionable.

Sixth, it is very difficult to distinguish between the effects of different fiscal policy variables. Most obviously, until very recently government spending and deficits moved together very closely. This aside, there is a more subtle problem concerning identification. We are

generally concerned with five fiscal policy variables: government spending, transfers, taxes, deficits, and debt. Each has an independent effect on economic activity. Yet the first four variables plus interest on the debt sum to zero. Typically, one deals with this problem by assuming that, since taxes decrease disposable income, the tax coefficient equals the negative of the income coefficient. But this assumption is valid only when taxes are non-distortionary. Recall that a rise in deficits with spending constant may well imply a fall in current capital income taxes, so saving may rise even though deficits themselves actually stimulate consumption. To identify these models properly, we therefore need data on effective marginal tax rates, especially for capital income. Unfortunately, movements in marginal tax rates may follow movements in revenue rather closely, making identification difficult. Furthermore, measurement of effective tax rates on capital income is both complex and controversial (see e.g. King and Fullerton [1984]). It would be extremely difficult to obtain a reliable series.

Seventh, no existing study has attempted to measure the relationship between the effects of deficits and the length of the associated payback period. Poterba and Summers [1986] argue that deficits have actually been paid off rather quickly during the twentieth century. If so, evidence from this century only bears on deficit policies where rapid payback is envisioned. Since the current fiscal experience is extremely atypical, it is not at all clear that the historical pattern will persist, and it is even less clear that the average taxpayer

expects it to persist. It is therefore extremely dangerous to draw inferences from U.S. time series about the effects of current deficit policy, or any other policy which involves the extended deferral of taxes.

Eighth, it may be extremely difficult, if not impossible, to distinguish between interesting hypotheses given the level of macroeconomic noise. Recall the discussion of section 2: when the intergenerational linkage hypothesis is violated, the marginal propensity to consume out of temporary deficits may be only five cents on the dollar. Since this short run effect is so small, we may have difficulty picking it up in the data, despite the existence of enormous long run effects. Indeed, it may be hard to distinguish between zero, five cents, and twenty five cents on the dollar (the latter being the hypothesized effect in a world where some consumers are liquidity constrained).

4.2. Studies of real variables

4.2.1. Consumption function studies

Table 1 summarizes the methodologies and results of studies that estimate aggregate consumption functions in order to assess the real impact of deficits. A cursory reading of these papers suggests that various authors have reached markedly different conclusions through essentially similar analyses of U.S. time series data. I begin this subsection by arguing that these differences are largely illusory. Interpreted properly, virtually all studies indicate that every dollar

Table 1: Summary of Consumption Function Studies

Study	Data	Key Omitted Variables	Technique	Instruments	Deficit Effect α_2	Deficit Effect $-\beta_2$	Debt Effect
Tanner [1970]	Canadian, Q, 1951-67	DEF, GS, W, MTR	OLS, L	NA	NA	NA	0.034 (0.018) to 0.040 (0.017)
Kochin [1974]	U.S., A, 1952-71	GS, W, DEBT MTR	OLS, L, D	NA	0.096 (0.048) to 0.276 (0.120)	NA	NA
Yawitz and Meyer [1976]	U.S., A, 1953-67	DEF, GS, MTR	OLS, L	NA	NA	NA	0.05 (0.013)
Tanner [1978]	U.S., A, 1929-40, 47-71	DEBT, MTR	OLS, L	NA	0.220 (0.076) to 0.279 (0.067)	NA	NA
Tanner [1979]	U.S., A, 1947-74	MTR	OLS, L	NA	0.291 (0.088)	NA	-0.014 (0.38)
Barro [1978]	U.S., A, 1928-74	DEBT, MTR	OLS, L	NA	0.05 (0.08) to 0.22 (0.06)	NA	NA
Feldstein [1982a]	U.S., A, 1930-76	MTR	2SLS, L	T(-1), Y(-1)	-0.083 (0.131) to -1.73 (2.27)	0.222 (0.247) to 0.276 (0.086)	0.023[a/] to 0.175 (0.179)
Seater [1982]	U.S., A, 1929-76	MTR	OLS, L	NA	-0.15 (0.10) to 0.29 (0.10)	NA	-0.002 (0.08) to 0.11 (0.03)
Kormendi [1983]	U.S., A, 1929-76	MTR	OLS, D	NA	NA	-0.01 (0.10) to -0.07 (0.08)	-0.055 (0.018) to -0.032 (0.020)

Table 1 (continued): Summary of Consumption Function Studies

Study	Date	Key Omitted Variables	Technique	Instruments	Deficit Effect α_2	Deficit Effect $-\beta_2$	Debt Effect
Seater and Mariano [1985]	U.S., A, 1929-75	Corporate MTR	2SLS, L	MG, STR, WCR	NA	-0.146 to 0.176 (0.465) (0.575)	-0.012 to 0.026 (0.101) (0.125)
Evans [1985]	U.S., A, 1901-1929	W, MTR	2SLS,L	b/	NA	-0.307 to 0.273 (0.763) (0.132)	-0.041 to -0.028 (0.062) (0.061)
Reid [1985]	U.S., MA, 1890-1981	DEBT, MTR	OLS, L	NA	NA	0.140 to 0.441 (0.080) (0.180)	NA
Boskin [1985]	U.S., A c/	MTR	OLS. L	NA	-0.014 to 0.219 (0.102) (0.072)	0.327 to 0.403 (0.089) (0.089)	0.03 d/
Mogigliani and Sterling [1986]	U.S., A, 1949-1984	MTR	OLS, L	NA	-0.100 to 0.187 (0.132) (0.069)	NA	0.073 to 0.106 (0.024) (0.033)

a/ Since this effect is calculated as the difference between two coefficients, I could not recover a standard error.

b/ I was unable to determine Evans instruments from the text of his paper.

c/ I was unable to determine Boskin's sample period from the text of his paper.

d/ Boskin reports that this coefficient is statistically significant, but does not give its standard error.

Key

Q:	quarterly	W:	privatel wealth	WCR:	wartime casualty rates
A:	annual	MTR:	marginal tax rate	NA:	not applicable
MA:	multiple year average	T(-1):	lagged taxes		
DEF:	government deficits	Y(-1):	lagged income		
GS:	government spending	MG:	money growth		
DEBT:	government debt	STR	statutory tax rates		

of deficits stimulates between \$0.20 and \$0.50 of current consumer spending.

Apparent differences in results can in most cases be traced to different formulations of the null hypothesis. A number of authors set out to estimate an equation such as the following:

$$(1) \quad C_t = \alpha_0 + \alpha_1(Y_t - T_t) + \alpha_2(T_t - G_t - r_t D_t) + \alpha_3 G_t + \alpha_4 D_t + \alpha_5 W_t + X_t\underline{\alpha} + \varepsilon_t \ ,$$

where C is consumption, Y is national income, T is tax revenues, G is government spending, D is debt, W is private wealth, r is the interest rate, X is a vector of other exogenous variables, and ε is a stochastic error term (so that $Y - T$ is disposable income, and $T - G - rD$ is government surplus). The natural null hypothesis for this specification is $\alpha_2 = 0$ --the alternative is the so-called "tax discounting hypothesis," which holds that consumers at least partially anticipate future taxes. A second group of authors estimate

$$(2) \quad C_t = \beta_0 + \beta_1 Y_t + \beta_2(T_t - G_t - r_t D_t) + \beta_3 G_t + \beta_4 D_t + \beta_5 W_t + X_t\underline{\beta} + \eta_t \ .$$

(i.e. they use gross income, rather than net income). For equation (2), the natural null hypothesis is $\beta_2 = 0$, which corresponds to pure Ricardian equivalence.

The hypothesis that $\alpha_2 = 0$ is certainly a straw man--few people believe that all consumers are completely myopic. Rather than test polar views, one should be ocncerned with quantifying the effects of deficits on current consumption. In this spirit, it is useful to note

that (1) and (2) are "almost" the same. Specifically, if the interest rate is time invariant, then one obtain (2) from (1) through a linear transformation of variables. The coefficients and error terms are then related as follows: $\beta_0 = \alpha_0$, $\beta_1 = \alpha_1$, $\beta_2 = \alpha_2 - \alpha_1$, $\beta_3 = \alpha_3 - \alpha_1$, $\beta_4 = \alpha_4 - r\alpha_1$, $\beta_5 = \alpha_5$, $\underline{\beta} = \underline{\alpha}$, and $\eta_t = \varepsilon_t$; $\alpha_2 = 0$ ($\beta_2 = -\beta_1$) represents the pure Keynesian view, $\alpha_2 = \alpha_1$ ($\beta_2 = 0$) represents perfect Ricardian equivalence, and $\alpha_1 - \alpha_2$ (β_3) measures the effect on current consumption of a $1 tax-for-deficit swap.

Ricardian advocates have objected to this interpretation of $\alpha_1 - \alpha_2$ on two grounds. First, they claim that since government surplus is more variable than disposable income, one would expect to find $\alpha_2 < \alpha_1$ (see e.g. Tanner [1978]). Yet this is plainly false. Under the Ricardian view, variability of the surplus has no effect on consumption, so in specification (2) one must estimate $\beta_2 = 0$ (equivalently, $\alpha_2 = \alpha_1$). In terms of equation (1), $\alpha_2 = \alpha_1$ is required to purge disposable income of the spurious tax component (α_3 and α_4 will adjust accordingly). Indeed, under the Keynesian view, high volatility biases β_2 towards zero, so if anything this consideration suggests that β_2 ($\alpha_2 - \alpha_1$) understates the effect of deficits. Second, they argue that if one measures Y_t as current income rather than permanent income, one may well find $\beta_2 \neq 0$ simply because government surplus helps to predict permanent income. Indeed, if consumption does depend upon permanent income and if current income and taxes move procyclically, then one would expect to find $\beta_2 < 0$ ($\alpha_2 < \alpha_1$). However, many authors include cyclical variables in X_t --it

is then not at all clear that the partial correlation between permanent income and taxes is negative. Other authors use cyclically adjusted measures of deficits. In these cases, the direction and significance of the resulting bias is not at all obvious.

With this observation in mind, I now turn to specific studies. The collumn labelled "α_2" under the heading "Deficit Effects" contains results based upon specifications that resemble equation (1). Although we are ultimately interested in the magnitude of $\alpha_2 - \alpha_1$, I report estimates of α_2 for two reasons. First, it is often difficult to infer α_1 from these studies.[22] Second, even if one had an estimate of α_1, it would be impossible to calculate a standard error for the difference in the absence of information about correlations between parameter estimates. I will simply note that in most cases, the estimated coefficient of current disposable income is at least 0.6 or 0.7, even when one includes a lagged income variable. Since the long run marginal propensity to consume is probably more on the order of 0.8 or 0.9, one should regard 0.6 or 0.7 as lower bounds for α_1.

Inspection of the α_2 collumn reveals that most estimates tend to cluster around 0.25. The highest is 0.29, and there are a number of estimates that are substantially lower. In addition, most of these coefficients are estimated fairly precisely--standard errors tend to be in the neighborhood of 0.1. Accordingly, the evidence uniformly supports the view that a \$1 deficit-for-taxes swap raises consumption by at least \$0.40 to 0.50, and one can be extremely confident that the estimated effect exceeds \$0.10 to 0.20.[23]

Inspection of the $-\beta_2$ collumn reveals a somewhat more conservative picture. The median estimate is around 0.2, indicating that a $1 deficit-for-taxes swap raises consumption by about $0.20. The range of estimates is, however, quite large. The low estimates come exclusively from three studies: Kormendi [1983], Seater and Mariano [1985], and Evans [1985]. In the last two cases, the corresponding standard errors are so large that any reasonable confidence interval subsumes every hypothesis ranging from pure Keynesianism to pure Ricardianism.[24/] Kormendi's [1983] estimates are far more precise, but even in this case reasonable confidence intervals do not rule out the kind of small positive wealth effects that would be associated with failure of the intergenerational linkage hypothesis. Note that the other coefficients in this collumn consistently indicate that deficits have significant real effects, and in many cases the estimate is quite precise. Two studies merit further comment. Since Reid [1985] employs multi-year full cycle averages, the transitory components of his variables are presumably smaller than in other studies. It is therefore noteworthy that he obtains relatively large deficit coefficients. Boskin's [1985] estimates, which are based upon improved measures of the deficit (including cyclical corrections), also imply large real effects.

Table 1 also contains a collumn labelled "Debt Effect." To evaluate these coefficients, one should compare them to marginal propensities to consume out of other forms of private wealth.[25/] Various studies place this propensity around 0.03 to 0.05. Note that Tanner [1970], Yawitz and Meyer [1976], Feldstein [1982a], Seater [1982],

Seater and Mariano [1985], Boskin [1985] and Modigliani and Sterling [1986] all produce estimates in this range, many of which are quite precise. This supports the view that government bonds are net wealth.[26/] Several studies, including Tanner [1979], Seater [1982], and Evans [1985] produce very small or even negative coefficients, but in each case the estimated standard error is very large, and any reasonable confidence interval subsumes every conceivable hypothesis ranging from pure Ricardianism to pure Keynesianism. Only Kormendi's [1983] results allow one to reject the hypothesis that a substantial fraction of government bonds is net wealth.

Since Kormendi stands alone in finding support for the Ricardian view, his work deserves further comment. It is noteworthy that other aspects of his results are extremely peculiar (e.g. he finds that the long run marginal propensity to consume out of income is around 0.3), and indicative of potentially severe mispecification. Furthermore, his findings do not appear to be very robust either with respect to the sample period, or with respect to plausible alternative specifications (see Barth, Iden, and Russek [1984-85, 1986], Modigliani and Sterling [1986], and Kormendi and Meguire [1986] for a response).

Note that the preponderance of studies in Table 1 employ OLS (see the collumn labelled "Technique"). Failure to treat potential endogeneity is a serious omission. Shocks to consumption may be correlated with shocks to income, which in turn raise tax revenues (lower deficits). Thus, there is a natural bias in favor of Ricardian equivalence, even in a Keynesian world. Although Feldstein [1982a] and

Seater and Mariano [1985] employ instrumental variables, the validity of their instruments is highly questionable.[27]

Table 1 also contains a partial listing of "key omitted variables."[28] A number of studies fail to include either a measure of government deficits or government debt. Such studies are naturally less informative, and tend to confound the effects of debts and deficits, which are correlated. Others omit a measure of government spending. Since deficits are highly correlated with spending, and since government consumption appears to be a substitute for private consumption (Kormendi [1983], Aschauer [1985], Kormendi, LaHaye, and Meguire [1986]), this creates a bias in favor of Ricardian equivalence. Several other studies (Evans [1985], Boskin [1985], Modigliani and Sterling [1986]) include government spending, but impose the potentially spurious restriction that government spending is neither a substitute nor a complement for private consumption. In some cases, private wealth is omitted. Yawitz and Meyer [1976] show that this may bias estimates of the deficit effect downwards. In addition, private wealth is also almost certainly correlated with government debt. Finally, all studies (with the exception of Seater and Mariano [1985]) exclude measures of marginal tax rates. I emphasized the importance of controlling for tax rates in subsection 4.1. Indeed, Seater and Mariano's finding that personal tax rates enter significantly corroborates this view. Unfortunately, they do not include corporate tax rates, which are perhaps the most critical determinants of effective levies on capital income (see King and Fullerton [1984]).

Several papers have documented the sensitivity of certain results to the redefinition of certain variables (see e.g. Yawitz and Meyer [1976], Buiter and Tobin [1979], Seater and Mariano [1985], Boskin [1985], Barth, Iden, and Russek [1984-85, 1986], and Modigliani and Sterling [1986]), as well as to the choice of sample period (see e.g. Barth, Iden, and Russek [1984-85, 1986] or Tanner [1978]). The atypical nature of war years is particularly evident, and calls into serious question studies which focus on wartime periods (e.g. Evans [1985]).

In addition to the studies listed above, there is also a literature which estimates the relationship between aggregate social security wealth and consumption (see e.g. Feldstein [1974], Munnell [1974], Barro [1978], and Darby [1979]). These studies are subject to the general criticisms noted in section 4.1. In addition, they are of limited interest because the critical variable, aggregate social security wealth, is nearly impossible to measure. Extreme sensitivity of estimates to the method of constructing this variable is evident in papers by Barro [1978], Leimer and Lesnoy [1982], and Feldstein [1982b]. Auerbach and Kotlikoff [1983] have also conducted simulations which suggest that macro estimates of social security's impact on consumption are likely to be highly unstable. Little weight should be attached to these studies.

4.2.2. Consumption Euler equation studies

There is a close relationship between the Ricardian equivalence proposition and the stochastic permanent income hypothesis. This observation suggests that it may be possible to design more powerful

tests of the Ricardian view by employing a consumption Euler equation approach. Yet this approach has important limitations.

Tests of the Euler equation specification are generally unfavorable to the stochastic permanent income model of aggregate consumption (see Hayashi [1985]). Yet this finding may reflect factors that have nothing to do with Ricardian equivalence (e.g. failure of conditions for valid aggregation). Furthermore, even if these factors were related to Ricardian assumptions, one would learn very little: as long as the Euler equation is mispecified, one cannot use it to measure the effects of deficits (a different specification, based upon some alternative behavioral model, would be called for).

Failure to reject the Euler equation restrictions is, in the current context, also uniformative. Ricardian equivalence may fail for reasons that do not invalidate this specification (e.g. consumers plan consumption and saving rationally, but are myopic about the link between current deficits and future taxes). In addition, it is difficult to gauge the power of such tests against interesting alternatives (failure to reject may result from imprecision). Nevertheless, in this case one could in principle measure the effects of government borrowing by including a measure of the current deficit innovation.

Relatively few studies of deficits have adopted this approach. Aschauer [1985] estimates a consumption Euler equation using quarterly U.S. data (1948-81), and finds that lagged values of deficits are correlated with the consumption innovation. Rather than reject either Ricardian equivalence or the behavioral specification, he attributes

this to two factors: first, deficits are correlated with government spending, and second, government spending is substitutable for private consumption. He then tests (and does not reject) the hypothesis that lagged deficits matter only insofar as they are used to form expectations about government spending. Aschauer claims that his evidence jointly supports the stochastic permanent income hypothesis, rational expectations, and Ricardian equivalence. I take this support to be extremely weak at best, for three reasons. First, if consumers are rational about consumption but myopic about the link between taxes and deficits, or if the intergenerational linkage hypothesis is invalid, one would find exactly this pattern, despite the failure of Ricardian equivalance. Past deficits would be uncorrelated with Euler equation errors except insofar as they helped to predict government consumption (a component of total consumption). Nevertheless, unanticipated changes in the deficit would still have an independent effect on current consumption. Aschauer does not test for this. Second, the Euler equation specification might still fail other tests for reasons bearing on the validity of Ricardian equivalence. Third, Aschauer does not discuss the power of his test against particular alternatives. It is possible that one would also be unable to reject the hypothesis that lagged deficits have very large effects on the current consumption innovation, independent of their role in predicting government spending.

Poterba and Summers [1986] also estimate a consumption Euler equation using quarterly U.S. data (1970-86). They include a tax abatement variable, which reflects the current year impact of tax cuts

enacted into law during previous years. The coefficient of this variable is very large, but estimated imprecisely. Furthermore, since the abatement variable belongs to each consumer's lagged information set, Poterba and Summers effectively reject their Euler equation specification on the basis of an orthogonality test. This obscures the interpretation of the tax abatement coefficient.

It is also obvious from inspection of their tables that Poterba and Summers' results are driven by recent experience--during the 80's deficits have been high and saving low. While this could be explained by rising expectations, the authors argue that forecasts of income and GNP growth during this period looked relatively bad. Yet econometric forecasts need not reflect consumer expectations. In particular, much evidence suggests that President Reagan has inspired public confidence.[29/]

4.2.3. Studies of Aggregate Demand and GNP

Eisner and Pieper [1984, 1986] and Boskin [1986] estimate reduced form macro models to measure the effects of deficits on the size and composition of GNP. Unfortunately, there is no compelling *a priori* reason for excluding variables in any reduced form equation, so it is hard to distinguish cause and effect. In my view, this evidence simply describes correlations without permitting a behavioral interpretation. The results of such studies are at very best suggestive of the possibility that deficits might have real effects.

4.3 Studies of nominal variables

4.3.1. Interest rates

Common wisdom holds that deficits raise interest rates. Economic theory suggests that this might occur for two reasons. First, if deficits depress saving, then interest rates must rise to bring saving and investment back into balance. Second, if deficits stimulate aggregate demand, then the transactions demand for money may rise. With a fixed stock of money, higher interest rates are necessary to choke off the excess desire for liquidity. Since both effects can occur only if individuals perceive government bonds to be net wealth, these observations suggest a test of the Ricardian hypothesis.

The value of this test depends to a very large extent upon one's view of international capital markets. If international capital flows equalize interest rates across countries, then U.S. deficits cannot sustain domestic interest rates in excess of world rates. Work by Feldstein and Horioka [1980] and Harberger [1978] has spawned a substantial literature which studies the issues of capital mobility and interest rate equalization. A detailed discussion of this work would carry me much too far afield. Instead, I simply note that one cannot distinguish between the Ricardian equivalence and perfect capital markets hypotheses on the basis of reduced form relationships between government borrowing and interest rates.

There are nevertheless a very large number of studies that estimate such relationships. The Congressional Budget Office [1987] has recently summarized the methods and results of some two dozen studies.

The evidence is extremely mixed. Rather than reiterate this summary, I will organize my discussion around the major problems encountered by analyses of interest rates, and I will focus primarily upon recent papers that make some attempt to overcome these problems (Dwyer [1982], Evans [1985, 1986a, 1986b, 1986c, 1987], Plosser [1982, 1986], and Feldstein [1986b]).

It is important to emphasize that all of the issues raised in subsection 4.1 are directly relevant in the current context. Two of these merit further elaboration.

First, a number of papers employ very specific models of interest rate determination. Studies by Plosser [1982, 1986] and Evans [1986a, 1986b, 1986c, 1987] invoke the efficient markets hypothesis, and employ restrictive assumptions about the term structure, such as time and maturity invariant risk premia. One must always bear in mind that these studies test Ricardian equivalence jointly with these strong maintained hypotheses.

It is particularly interesting to note that most studies employing highly restrictive models of interest rate determination find a significant negative relationship between deficits and interest rates. One explanation is that, by introducing uncertainty, deficits crowd-in investment. For reasons mentioned in section 2, I regard this theory as far-fetched. This leaves two possibilities. First, reductions in marginal capital income tax rates may stimulate saving in the short run. While this explanation may account for historical experience, it renders the evidence uniformative for policy purposes--deficits

resulting from cuts in labor income taxes or inframarginal capital income taxes might well significantly stimulate current consumption. Second, restrictive interest rate models may simply yield spurious result.[30] In either case, the evidence is of little relevance.

Second, no study provides a fully satisfactory treatment of information and expectations. Feldstein [1986b] has emphasized that that interest rates are probably much more responsive to expected deficits, than to either current deficits or outstanding debt. Yet it is not at all clear that current deficits, or innovations in current deficits, are more highly correlated with future deficits than are other measures of current economic activity or fiscal policy. Likewise, current deficits may be highly correlated with the future values of other variables. Suppose, for example, that current deficits are generally followed by budget-balancing cuts in government spending. Since temporary spending tends to raise interest rates (see e.g. Barro [1986]), current deficits might then be inversely correlated with long term rates.[31]

Several authors have made some effort to cope with these difficulties. Feldstein [1986b] and Plosser [1986] both include measures of expected future budget deficits in various interest rate specifications. The measurement of these expectations is, of course, problematic, and undoubtably subject to serious error (see section 4.1). In addition, these authors fail to include measures of expectations about other variables, including government spending, output, and prices; the preceding remarks suggest that omitted and

included variables may be highly correlated.

Evans [1987] adopts a much different approach. He begins by specifying a reduced form equation for current interest rates as a function of lagged rates, current and lagged values of various other variables (including policy instruments), and expected future values of these other variables. His central assumption is that the coefficients on all deficit variables (including expectations) should be positive. He justifies this with reference to standard theory. He then supplements this equation with a model of the term structure and a stochastic VAR process describing the evolution of the other variables. Combining these equations, he shows that a standard VAR should satisfy the restriction that the deficit coefficients sum to a positive number. He finds that this restriction is inconsistent with the data.

Unfortunately, Evans' derivation employs some unusually strong and objectionable maintained hypotheses.[32/] More fundamentally, I question the validity of his central assumption. Evan's original reduced form equation omits expected future interest rates. To the extent future rates affect current behavior, Evans' basic equation represents a quasi-reduced form, from which expected interest rates have already been eliminated. This dramatically alters the interpretation of all coefficients. Suppose, for example, that some current (period t) policy variable raises future (period $t + 1$) interest rates. Then individuals will typically tend to reduce consumption in the relative short run (periods t and $t + 1$), in order to save more for the long run. Current saving (period t) will therefore rise. To bring current

saving and investment back into balance, current interest rates (period t) must then fall. Evans has simply neglected such intertemporal feedbacks.

I now turn to some problems that are specific to the analysis of interest rates. These problems have a common root, which is that interest rate equations have no direct behavioral interpretation. Rather, they are quasi-reduced forms, reflecting the interplay of forces which alter the supply and demand for funds. Interest rate effects depend upon the kind of behavioral relationships discuss in section 4.2--these are simply behind the scenes, shrouded by another layer of economic noise (such as term structure relations, and international capital flows). As a result, when studies of behavior and interest rates conflict, I am inclined to be very skeptical about the conclusions of the latter. Along these lines, three specific points merit discussion.

First, reduced form relationships may be highly unstable, and unreliable as policy guides (Lucas [1976]). Ample evidence indicates that this is the case in the current context.[33/]

Second, it is virtually impossible to assess the power of tests based upon interest rate equations. When estimating consumption functions, one has both a pure Ricardian and pure Keynesian benchmark. But in the case of interest rate equations, we have only a Ricardian benchmark: deficits do not alter interest rates. Since the empirical model is intended to represent a reduced form rather than a behavioral relationship, one cannot, in the absence of extensive information about

various elasticities, construct a natural Keynesian benchmark. Indeed, given the small magnitude of plausible wealth effects and the tendency for interest rates to equalize across countries, there is little reason to believe that deficits should significantly raise interest rates in the short run.

These observations lead me to conclude that interest rate studies are intrinsically uninformative as tests of the Ricardian hypothesis.[34] What can we deduce from the coefficient of deficits in an empirical relationship explaining interest rates? If it is significantly positive (as in Feldstein [1986b]), one might conclude that consumers perceive some fraction of government bonds to be net wealth, but one cannot estimate this fraction. If the coefficient is not significantly different from zero (as in Dwyer [1982][35] or most of Evans [1986a] estimates), one cannot reject Ricardian equivalence, but one also cannot determine whether the estimates are inconsistent with any other conceivable hypothesis of interest. If the coefficient is significantly negative, one has probably learned nothing at all (see above).

Third, estimated models of interest rate determination are extremely parsimonious. It is difficult to believe that the lion's share of movements in interest rates are driven by perhaps three to five explanatory variables. This raises the possibility that the included variables simply proxy for a variety of omitted factors. In most studies, omissions of this sort undoubtably bias the coefficients of interest.[36]

Not all of the evidence on interest rates is based upon econometric estimation. Barro [1986] has argued that two episodes in British history, during which the government ran deficits for apparently exogenous reasons, provide natural experiments by which to judge the Ricardian hypothesis.

The first episode occurred during the 1830's. Following the emancipation of slaves in the West Indies, the British government made large compensatory payments to slaveholders, and financed these payments primarily with borrowing. Barro points out that interest rates did not rise during this period. Yet it is not at all clear that this finding is contrary to the Keynesian view. Temporary deficits were not associated with tax cuts, so the consumption of a myopic British taxpayer would have been unaffected by this policy. Supposing that West Indies slave owners were fully compensated, they too would have maintained previous levels of consumption. In fact, if all assets were perfect substitutes, slaveowners would have been willing to purchase the newly issued bonds with the compensatory payments received from the government. Finally, the slaves themselves were wealthier after the adoption of the policy, in the sense that they become owners of humam capital. However, there is no reason to believe that their level of consumption significantly increased following emancipation (see Fogel and Engerman's [1974] analysis of slavery in the U.S.), and even if it did, it is not obvious that the emancipated slaves would have spent a large fraction of the increase on British goods. In short, if taxpayers were myopic, then the only short run effect of this policy was to

relabel certain investment activities (spending on slaves' food, clotning, housing) as consumption activities.

The second episode occurred in 1909, when a political deadlock lead to a one year lapse in the government's authority to collect certain revenues. This created a deficit equal to 1.5% of trend GNP, most of which was paid off in the following year. Barro finds no evidence of abnormally high interest rates over the relevant period. Yet this is hardly surprising, for two reasons. First, it was evidently well understood that the revenue shortfall was extremely temporary in nature. Certainly, no taxpayer could have anticipated significant intergenerational transfers. Most economists would concede the plausibility of approximate Ricardian equivalence under such extremely special circumstances. Second, it is not at all clear that the effects of this policy should have been detectable. Supposing that 20% of the population was liquidity constrained, one would have expected aggregate consumption in 1909 to have risen by 0.3% of GNP. Given reasonable levels of aggregate noise, it would be difficult to distinguish between the presence or absence of this effect using data on consumption, let alone from interest rates.

4.3.2. Other variables

A small number of studies have examined the link between deficits and exchange rates (Hooper [1985], Hutchinson and Throop [1985], Evans [1986d], Feldstein [1986c]). Conventional reasoning holds that, by raising domestic interest rates, deficits lead to inflows of foreign capital. International account balance requires offsetting inflows of

goods. Accordingly, the value of the domestic currency must rise in order to stimulate imports and discourage exports.

Empirical evidence on this point is mixed, with Feldstein and Evans bracketting the available estimates. This is hardly surprising: since the link between interest rates and exchange rates has nothing to do with Ricardian equivalence, analysis of exchange rates merely adds a layer of noise to the interest rate relationship. Accordingly, when Feldstein uses the same methodology as in his interest rate study, he reaches the same conclusions (similarly for Evans). If anything, estimation of exchange rate relationships is more problemmatic, in that one must work with relatively little data (the U.S. floated the dollar in 1973), and worry about a larger number of explanatory variables (those describing the economic environment of each trading partner).

Papers by Dwyer [1982], King and Plosser [1985], and Protopapadakis and Siegel [1984] study the relationship between deficits and inflation. According to standard theory, deficits should accelerate inflation by stimulating aggregate demand. Prior to the 1980's, there was indeed a high correlation between deficits and inflation in the U.S. However, this correlation was largely spurious, since constant real deficits imply higher nominal deficits during inflationary periods (see Dwyer). While studies tend to find little or no effect of real deficits on inflation, most of the criticisms raised in the context of interest rates are applicable.

Finally, Evans [1985] and Barth, Iden, and Russek [1984-85] estimate money demand equations. Evans focuses on World War II, during

which Treasury bill rates were pegged, and finds no evidence to support the traditional view; Barth Iden, and Russek modify a money demand equation originally estimated by Hafer and Hein [1984] by including a measure of deficits, and find that government borrowing significantly stimulates money demand. In addition to most of the problems discussed above, these studies may also confound supply and demand effects. Furthermore, since the real stock of money depends upon the price level, estimates also reflect the link between deficits and inflation.

4.4. Summary

While attempts to measure the effects of deficits directly may well face insuperable difficulties, they do supply one more piece of the overall picture. A succession of studies have established the existence of a robust short run relationship between deficits and aggregate consumption. While there are many potential explanations for this pattern, it is at very least consistent with the traditional Keynesian view. Results for interest rates are mixed, and considerably more difficult to interpret. Thus, while time series evidence weighs against Ricardian equivalence, it does not by itself tip the scales. However, in the context of theoretical reasoning and behavioral analyses, a coherent picture emerges in which the Ricardian outcome appears relatively unlikely.

Recent experience confirms this evaluation: during the 80's, deficits and interest rates rose dramatically, while savings rates plumetted (see Poterba and Summers [1986] or Feldstein [1986b] for discussions). This period was relatively unique in U.S. history, in

that large deficits resulted from declines in net revenue, rather than temporary increases in government spending, so that it presents us with a fairly clean experiment. This interpretation of the 80's is, of course, controversial, and formal statistical analyses have produced conflicting results (compare Evans [1985, 1986b] with Feldstein [1986b]). One key issue in this controversy concerns timing: when exactly did taxpayers begin to anticipate large deficits? I tend to believe that changes in expectations were approximately coincident with movements in interest rates and savings (indeed, more recently real interest rates and deficit projections have fallen together, although the direction of causality is perhaps not clear). Since this issue is extremely difficult to resolve, we are likely to learn more from longer term movements in deficits, than from very short term movements. I am therefore particularly struck by the comparison of the 80's with earlier periods. There is no question whatsoever that expected deficits, interest rates, and consumption have all on average been significantly higher since 1982 than in, for example, the 70's. While this is conceivably attributable to spurious factors (see subsection 4.2), the comparison is highly suggestive.

5. Direct Evidence: International Comparisons

As an alternative to analyzing time series data for individual countries, one could also measure the effects of government borrowing through international comparisons. This approach offers certain natural advantages. First, there is much more independent movement of deficits

and government spending across countries, than there is within countries. Second, by averaging over substantial periods of time, one can hope to measure the more permanent components of each variable, and thereby minimize problems arising from the informational and expectational issues discussed in section 4.1. In addition, results based on multiperiod averages may provide some clue as to the long run effects of sustained deficits. Finally, if one is willing to forego multi-year averages and pool time-series cross-section data, one can greatly expand the number of available observations.

On the other hand, cross-country comparisons hardly provide a panacea. Many of the issues described in section 4 apply equally well to international data. In addition, several problems become much more serious. First, the relevant variables may be measured differently (or mismeasured differently) in different countries.[37/] Second, countries differ structurally in terms of institutions, and the population of each country may behave somewhat idiosynchratically. Third, deficits may move for reasons unrelated to the Ricardian hypothesis (e.g. shocks to oil prices).[38/] Finally, practical considerations may seriously limit the number of observations available for analysis.

It is difficult to weigh the relative importance of these advantages and disadvantages a priori. Evidence from cross-country comparisons is therefore neither definitive nor irrelevant--it simply adds one more piece to the overall picture.

5.1. Social Security

To date, relatively few studies have used data from international cross-sections to address issues raised in the Ricardian debate. Almost all of the existing work, including papers by Feldstein [1977, 1980], Barro and MacDonald [1979], Kopitz and Gotur [1979], and Modigliani and Sterling [1983], analyzes the effect of social security on private saving or consumption. Generally, these studies describe regressions of saving or expenditure on age distribution variables, retirement variables, income growth, and a measure of social security benefits or entitlements.[39/]

In attempting to reconcile the mixed findings that emerge from these studies, Modigliani and Sterling point out that social security has an indirect effect on saving through its impact on retirement. Furthermore, this works to offset the direct effect. Since Feldstein and Modigliani-Sterling control for retirement, they tend to find a positive relationship between social security and spending, while Barro-MacDonald and Kopitz-Gotur, who fail to control for retirement, find little or no relationship. Under this view, social security has little effect on aggregate capital accumulation, but for reasons entirely unrelated to Ricardian equivalence. However, this explanation provides only a partial reconciliation of the existing results, in that neither Barro-MacDonald's nor Modigliani-Sterling's findings are robust. Given the difficulty of measuring social security wealth, particularly in a way that is comparable across countries, and given the degree of uncertainty involved in selecting a specification that adequately allows

for various socio-economic and demographic differences between countries, sensitivity to variable definitions and changes in functional specification is extremely disturbing. The evidence simply does not justify any strong inferences.

5.2. Deficits

In this section, I present new evidence on the relationship between government borrowing and private consumption. The novel aspect of my analysis is that it is based upon international comparisons, rather than aggregate time series. Work in progress by Modigliani, Mason, and Sterling [1986] also tests the Ricardian hypothesis with cross-country data. Their preliminary results, based upon an alternative specification and substantially different sample, corroborate my findings.

The specifications estimated below are based upon equation (2), which I modify in the following ways. First, I drop the intercept term (i.e. assume that utility is homethetic), and divide both sides of the equation by Y to adjust for heteroskedasticity. This obviates the need to convert quantities to per capita figures, or to a common currency through exchange rates. Second, due to the lack of data, I omit W from the equation entirely.[40/] Third, I add measures of real income growth (YG) and population growth (PG). These variables may capture at least some of the socio-economic factors that create international variation in propensities to consume. My final empirical specification is therefore:

$$(3) \qquad C/Y = \beta_1 + \beta_2 DEF/Y + \beta_3 G/Y + \beta_4 D/Y + \beta_6 YG + \beta_7 PG + \varepsilon$$

(where DEF is the deficit).

I estimate equation (3) using data obtained from the IMF's International Financial Statistics. I measure the variable Y as gross domestic product, C as private consumption expenditure, D as total outstanding government debt,[41] and G as current government consumption, which is calculated in the manner prescribed by the United Nation's system of Standard National Accounts.[42] I use two different measures of DEF. One is the current net deficit (surplus) of the consolidated central government. For the other measure, I adjust the current deficit for inflationary erosion of the real value of outstanding government debt. I label this second measure ADEF. I measure YG as the log of the ratio of current to lagged real GDP; similarly, PG is the log of the ratio of current to lagged population.

Data quality is a severe problem. Many of the governmental variables for International Financial Statistics are evidently constructed internally by the IMF, and are considered highly unreliable. Accordingly, one should think of this exercise as a suggestive exploration. However, one should also bear in mind that errors in measuring of the fiscal variables should bias my findings in favor of the Ricardian hypothesis.

For many countries, one or more critical variables are simply unavailable. In other cases, data are missing in particular years. The most troublesome variable is outstanding government debt; the availability of this variable largely dictates sample selection. I

found that by focusing on the twelve year period from 1972 to 1983, I could assemble a relatively complete data set based on a reasonably large sample of countries. The sizes of the sample used below depend upon whether or not I insist on including D in the empirical specification. While the total sample consists of 39 countries,[43] only 26 have adequate information on government debt.

In an effort to identify robust empirical relationships, I have analyzed these data in a number of different ways. The first approach is to take twelve year averages for each country, and run simple cross-sectional regressions. The primary advantage of this approach is that it allows me to relate long run levels of the explanatory variables to long run private consumption. Transitory movements, which may carry spurious information or alter expectations in unknown ways, become significantly less important. As mentioned above, data on certain countries is not quite complete. In such cases, I base averages on the years for which all relevant variables are available. This may introduce a small amount of heteroskedasticity.

Table 2 contains the results of simple cross-sectional regressions. Equation 2.1 corresponds to the basic empirical specification, where DEF (unadjusted) is used as a measure of government deficits. Note that the coefficient of deficits is extremely large, and in fact exceeds the marginal propensity to consume. Although this coefficient is not estimated very precisely, it does differ from zero at the 10% level of confidence. Note also that the coefficient of debt is negative. However, all interesting hypotheses essentially lie within

Table 2: Regression Results for Twelve Year Averages

Variable	Equation Number			
	2.1	2.2	2.3	2.4
Intercept	0.802 (0.055)	0.737 (0.040)	0.822 (0.064)	0.847 (0.059)
DEF	1.27 (0.69)	0.700 (0.244)		
ADEF			1.16 (0.64)	1.50 (0.55)
GR	-1.28 (0.26)	-0.906 (0.198)	-1.41 (0.29)	-1.44 (0.29)
YG	-0.047 (0.675)	-0.318 (0.514)	-0.464 (0.750)	-0.553 (0.746)
PG	-0.686 (1.10)	0.783 (0.934)	-0.112 (1.14)	-0.04 (1.14)
D	-0.074 (0.127)		0.080 (0.078)	
Number of Countries	26	39	26	26
R^2	0.634	0.464	0.609	0.589

one standard deviation of the point estimate. The marginal propensity to consume from income is both reasonable (0.8) and precisely estimated. The estimates also suggest that government spending is a substitute for private consumption, in that a one dollar increase in tax-financed spending causes consumption to fall by $1.28. The coefficients of both YG and PG are insignificant.

The large standard error on the coefficient of debt suggests that the data may not be able to distinguish between interesting hypotheses on the basis of wealth effects. I therefore reestimate the basic specification, omitting D (note that this does not bias the remaining coefficients under the Ricardian view). This allows me to use the full sample of 39 countries. Results are given in equation 2.2. There are two noteworthy changes. First, the deficit coefficient is essentially the same as the marginal propensity to consume from income. In addition, it is estimated much more precisely, and differs from zero at extremely high levels of confidence. Second, the coefficient of G moves towards the marginal propensity to consume, so that one cannot rule out the possibility that utility is separable in public and private consumption.

Equations 2.3 and 2.4 provide similar estimates based upon inflation-adjusted deficits (ADEF). Estimates of the basic specification look essentially unchanged, except that the coefficient of D now has the expected sign (it is still insignificant). The omission of D raises the coefficient of ADEF, as well its precision. While the estimated coefficient is unreasonably large, sensible values lie within

two standard deviations of the point estimate.

Results based upon simple cross-sectional estimates are clearly suspect. A parsimonious regression cannot possibly capture the richness of socio-economic factors that create variation in saving rates across countries. Unobserved factors that are correlated with private extravagence (high levels of consumption) may also be associated with public extravagence (large deficits); this may in part explain the very large deficit coefficients in Table 2. Differences in accounting practices may also make international comparisons of deficit levels problematic.

To address these considerations, I divide the 12 year sample into two distinct six year subperiods (1972 to 1977 and 1978 to 1983), and analyze the relationship between changes in consumption and changes in deficits. Since this amounts to allowing for country-specific differences in the propensity to consume out of income (i.e. fixed effects), it should minimize biases arising from unobserved socio-economic differences. In addition, fixed effects estimation eliminates many problems arising from systematic differences between accounting techniques, since results depend upon changes in variables, rather than their absolute levels.

To implement this second approach, it is necessary to apply a somewhat more demanding sample selection criterion, in that one needs enough data to calculate a reliable average for each six year subperiod. Accordingly, I was forced to drop three countries. All of the remaining estimates are based upon a sample of 23 countries.

It is possible to get a feel for general patterns by looking at the data in a relatively unprocessed form. I refer the reader to Table 3. For each country, I list the change in private consumption, the change in deficits, and the change in adjusted deficits between the two six year subperiods. All values are expressed relative to concurrent GDP. My discussion of this table will focus on adjusted deficits, but similar conclusions follow for the unadjusted deficit variable.

Note first that for roughly two-thirds of the sample (15 of 23 countries), deficits and consumption moved in the same direction between the two six year subperiods. This correlation is stronger in cases where the change in deficits was large. 16 countries experienced a change in excess of 1% of GNP; in 11 cases, deficits and consumption moved in the same direction. Confining attention to cases in which the change in consumption was also large (greater than 1% of GDP), we see that deficits and consumption moved together in 9 of 11 cases. If we focus on countries experiencing a change in average deficits exceeding 2% of GDP, the comparable numbers are 9 of 13, and 7 of 9 countries, respectively. By restricting attention to those countries experiencing very large changes (more than 3% of GDP), we find that consumption and deficits moved together in 6 of 7 cases. Finally, deficits and consumption moved in the same direction for every country (4 of 4) experiencing both a very large change in deficits (greater than 3%) and a significant change in consumption (greater than 1%). Note that while the U.S. experience is consistent with this pattern, it is by no means egregious. In fact, given my choice of subperiods, the change in U.S.

Table 3: Changes Between Six Year Subperiods

Country	ΔC	ΔDEF	ΔADEF
Belgium	0.037	0.053	0.057
Canada	-0.002	0.018	0.016
Costa Rica	-0.058	0.015	-0.020
El Salvador	0.031	0.043	0.034
Finland	-0.005	0.023	0.020
France	0.025	0.015	0.008
Germany	0.014	0.008	0.006
Guatamala	0.025	0.022	0.025
Iceland	-0.024	-0.021	-0.071
India	-0.026	0.023	0.021
Italy	-0.004	-0.002	-0.030
Korea	-0.049	0.002	0.007
Morocco	-0.017	0.020	0.005
New Zealand	-0.015	0.020	0.006
Norway	-0.037	-0.014	-0.025
South Africa	-0.031	-0.009	-0.012
Spain	0.010	0.036	0.032
Sri Lanka	0.008	0.078	0.059
Sweden	-0.007	0.065	0.059
Switzerland	0.024	0.003	0.001
Thailand	-0.011	0.016	0.020
United States	0.009	0.011	0.008
Venezuela	0.093	0.023	0.010

deficits was not even particularly large.

While the relationship between deficits and consumption is apparent in the raw data, one cannot measure it by inspection of the numbers, nor be certain that it does not reflect spurious correlations. Accordingly, I regress the change in private consumption on the changes in each of the dependent variables. Table 4 contains results. Equations 4.1 to 4.4 correspond exactly to 2.1 to 2.4. Several patterns emerge. First, the deficit coefficients are much smaller, generally indicating that a $1 deficit-for-taxes swap would raise consumption by $0.30 to $0.50. This confirms the view that unobserved factors are correlated with public and private extravagence, and that this biases simple cross-sectional regressions. However, the estimated effect is still quite sizable. Unfortunately, the coefficients are not statistically significant at conventional levels when debt is included in the specification. While the coefficient of debt is now positive regardless of whether uses adjusted or unadjusted deficits, it is still not significantly different from zero. Exclusion of the debt variable causes the deficit coefficient to become significant at high levels of confidence. Note also that the coefficients of government consumption are now consistent with the view that utility is separable, or perhaps even exhibits some complementarity between government and private consumption.

As a next step, I modified equations 4.1 through 4.4 by moving consumption in the first subperiod (lagged consumption, LC) from the left to the right hand sides (i.e., I regressed consumption on changes

Table 4: Regression Results for Movements in Six Year Averages

Equation Number	Dependent Variable	Intercept	ΔDEF	ΔADEF	ΔG	ΔYG	ΔPG	ΔD	LC	R^2
4.1	ΔC	-0.015 (0.011)	0.316 (0.319)		-0.796 (0.453)	-0.331 (0.301)	-2.24 (1.49)	0.126 (0.119)		0.381
4.2	ΔC	-0.013 (0.011)	0.505 (0.265)		-0.593 (0.412)	-0.403 (0.294)	-1.89 (1.48)			0.341
4.3	ΔC	-0.015 (0.011)		0.329 (0.226)	-0.733 (0.443)	-0.367 (0.293)	-1.99 (1.45)	0.134 (0.104)		0.418
4.4	ΔC	-0.010 (0.010)		0.442 (0.213)	-0.492 (0.409)	-0.444 (0.293)	-1.74 (1.46)			0.361
4.5	C	0.077 (0.053)	0.500 (0.316)		-0.823 (0.427)	-0.506 (0.300)	-1.12 (1.51)	0.116 (0.112)	0.848 (0.085)	0.912
4.6	C	0.082 (0.052)	0.674 (0.266)		-0.637 (0.388)	-0.577 (0.293)	-0.87 (1.50)		0.844 (0.085)	0.906
4.7	C	0.075 (0.050)		0.426 (0.218)	-0.768 (0.415)	-0.530 (0.289)	-1.03 (1.46)	0.143 (0.097)	0.853 (0.080)	0.918
4.8	C	0.077 (0.052)		0.542 (0.211)	-0.509 (0.389)	-0.605 (0.294)	-0.792 (1.50)		0.859 (0.083)	0.907

in the explanatory variables, and lagged consumption). I interpret the resulting specifications as Euler equations. While changes in explanatory variables between consecutive years certainly do not reflect innovations, it is more reasonable to expect that changes in six year averages might approximate innovations to long-run levels. The regression results are quite encouraging. The size of the deficit coefficient increases in all specifications, and is generally statistically significant at high levels of confidence. In addition, when I use adjusted deficits, the t-statistic for debt rises to 1.5, which is marginally significant. It is also noteworthy that a regression of current consumption on lagged consumption and all lagged explanatory variables suggested that the stochastic permanent income hypothesis' orthogonality condition is satisfied--the F-statistic for the hypothesis that all coefficients for lagged explanatory variables equal zero was 1.0.

By averaging over six year subperiods, one can examine the relationships between movements in different variables without sacrificing the advantages of using "long run" measures. As a final step, I also estimated regressions based on pooled, single year, time series cross-section data. Results are presented in Table 5. I will begin with equation 5.1 through 5.4, which do not contain country specific intercepts. While these estimates bear a strong resemblance to those obtained from 12 year averages, there are also some important differences. The coefficients of deficits are large, but unlike those in Table 2, not "too" large. In fact, the marginal propensities to

Table 5: Regression Results for Panel Data

Equation Number	Intercept	DEF	ADEF	G	YG	PG	D	R^2
5.1	0.794 (0.017)	0.721 (0.159)		-1.23 (0.083)	-0.218 (0.092)	-0.145 (0.326)	0.005 (0.032)	0.546
5.2	0.794 (0.016)	0.743 (0.094)		-1.23 (0.082)	-0.216 (0.091)	-0.153 (0.324)		0.546
5.3	0.805 (0.017)		0.586 (0.109)	-1.28 (0.082)	-0.367 (0.092)	0.141 (0.320)	0.084 (0.020)	0.560
5.4	0.833 (0.016)		0.756 (0.104)	-1.30 (0.084)	-0.426 (0.093)	-0.230 (0.328)		0.532
5.5	country specific	0.431 (0.086)		-0.329 (0.115)	-0.085 (0.046)	-0.415 (0.238)	0.029 (0.028)	0.919
5.6	country specific	0.445 (0.075)		-0.309 (0.114)	-0.102 (0.047)	-0.512 (0.240)		0.915
5.7	country specific		0.370 (0.056)	-0.395 (0.114)	-0.202 (0.047)	-0.427 (0.229)	0.059 (0.024)	0.924
5.8	country specific		0.382 (0.055)	-0.317 (0.111)	-0.229 (0.048)	-0.566 (0.234)		0.919

consume from deficits and income are almost indestinguishable in three of four cases. Standard errors in Table 5 are also much lower, owing to the relative size of the data sample. As before, government spending appears to be substitutable for private consumption. The debt coefficient is positive in both 5.1 and 5.3; note that it is statistically significant and of a reasonable magnitude in 5.3.

The inclusion of country specific intercepts somewhat alters this picture. Not surprisingly, these estimates bear a strong resemblance to those based on changes between six year subperiods. Deficits now appear to stimulate consumption by about $0.40 on the dollar, rather than $0.70. Once again, this effect is estimated very presicely. The coefficient of government spending now suggests significant complementarity with private consumption. Finally, the debt coefficient is positive in both 5.5 and 5.7; it is statistically significant and of a reasonable magnitude in 5.7.

Two remarks are in order. First, these results are very strongly pro-Keynesian and anti-Ricardian. Equation 5.7 is, in some sense, the preferred specification, in that it includes country-specific intercepts, employs a superior measure of deficits, and retains the debt variable. This equation suggests that a $1 deficit-for-taxes swap will increase consumption by about $0.37, and that $1 of debt raises consumption by $0.06. Both effects are estimated quite precisely. Second, the robustness of these results across specifications and estimation techniques is striking. It is particularly interesting to note the similarity of results based upon yearly data, and multi-year

averages. This suggests that one does not significantly contaminate the estimates with transitory effects by making use of yearly variation. However, one does obtain an enormous increase in the precision of the estimates.

One additional puzzle merits some discussion. Throughout this analysis, I have with few exceptions estimated the coefficient of income growth to be negative, whereas standard life cycle theory suggests that it should be positive. While the effect is not generally significant, it requires some explanation. It is possible that this pattern reflects confusion of cause and effect: extravagent countries may sacrifice growth for current consumption.

My findings are generally consistent with those of Modigliani, Mason, and Sterling [1986]. This is particularly striking in light of the fact that these authors use a different sample and empirical specification. Although they also employ data from the IMF's International Financial Statistics, they focus on the period from 1960 to 1980, and use a somewhat different set of countries. Since data on outstanding debt has only recently become available for many countries, they lack a direct measure of debt, and their attempts to construct a substitute measure are generally unsuccessful. However, by sacrificing the debt variable, they are able to make use of a much large sample.

Overall, analysis of cross-country data supports the view that government deficits stimulate private consumption. The robustness of this conclusion with respect to alternative specifications, estimation techniques, and samples is quite striking.

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