NBER WORKING PAPER SERIES

FINANCIAL LIFETIMES AND THE CROWDING OUT EFFECTS OF BUDGET DEFICITS

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Working Paper No. 1955

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
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June 1986

We are indebted to William Gentry for excellent research assistance and to Laurence Kotlikoff, Greg Mankiw and especially Olivier Blanchard for helpful discussions. The NSF and NBER provided financial support. The research reported here is part of the NBER's research programs in Financial Markets and Monetary Economics, Economic Fluctuations and Taxation. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

This note explores the sensitivity of the short-run savings effects of government deficits to assumptions about household planning horizons. Using a lifecycle simulation model, we show that even though deficit policies shift sizable tax burdens to future generations, individuals live long enough to make the assumption of an infinite horizon a good approximation for analyzing the short-run savings effects. In practice, periods of debt accumulation such as that in the United States during World War II are reversed sufficiently rapidly to make their short-run effects on consumption and national savings relatively small.

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At least since Ricardo, economists have wrestled with the dual questions of whether or not government bonds represent net wealth, and whether government deficits affect national savings. The answers are far from obvious. James Tobin (1952) asked rhetorically, "How is it possible that society merely by the device of incurring a debt to itself can deceive itself into believing that it is wealthier? Do not the additional taxes which are necessary to carry the interest charges reduce the value of other components of private wealth? There must certainly be effects in this direction." While Tobin (1980) concluded these effects are small, the economic effects of government indebtedness remain controversial.

The argument that government debt does not represent net wealth may be stated simply. While government bonds represent an asset to those holding them, they represent a liability to taxpayers who must ultimately redeem them. These assets and liabilities exactly offset each other; barring distributional effects the existence of government debt should not affect total spending. A major counter-argument, developed by Modigliani (1961) and Diamond (1965) among others, suggests that debt does represent net wealth to the extent that the asset of present generations is offset by a liability of unborn future generations.

Robert Barro (1974) challenged this counter-argument by suggesting that any burdens shifted to future generations may be offset by intergenerational transfers. His article spawned a continuing debate on the so-called Ricardian equivalence proposition. A substantial part of this debate has centered on intergenerational economic linkages; whether transfer motives give consumers effectively infinite horizons has been seen as a critical issue. The implicit assumption in this debate has been that if appropriate linkages do not exist, then debt burdens can be shifted to future generations and government deficits affect national savings.

This note examines the quantitative importance of intergenerational linkages for analyzing the short-run effects of government deficits on national savings. The view that deficits significantly alter national savings lies behind the frequent assertions that they crowd out investment and reduce international competitiveness. Our purpose is not to evaluate these claims, but rather to explore the limited question of whether or not the intergenerational transfers induced by deficits, taken alone, are sufficient to justify them.

Our conclusion is that while deficit policies like those the United States has historically followed shift substantial tax burdens to future generations, this effect is not large enough to significantly alter national savings in the short run. The extent and nature of bequest motives are therefore of secondary importance for judging whether deficits have short-run crowding out effects, even though they are primary determinants of the long-run effects of deficits.

This note is divided into three sections. The first uses a stylized lifecycle simulation model to show that actual human lifetimes are long enough so that for purposes of analyzing the short-run effects of fiscal policies, they can be approximated as infinite. This is true even though deficits can have a potentially large impact on long-run capital intensity. Section II reviews the U.S. experience on debt repayment policy, a critical factor in analyzing the long-run effects of these policies. We focus on World War II and show that roughly two-thirds of the war debt was repaid within the lifetimes of persons in the working population during the war. There is a brief conclusion.

I. Deficit Policy in Lifecycle Models

We use a lifecycle model to compute the net wealth effects of the government debt accumulated during deficit periods, and to calculate the short-run effect of deficits on national savings.[1] We assume that agents work for the first T' years of their lives, and then retire for the final T - T' years. In our calculations, T = 55 and T' = 45.

The government can finance expenditures either by levying taxes or by issuing debt. We consider deficit policies which, for K years, transfer one dollar to each living person.[2] The government finances these expenditures with debt, and beginning in year K + 1, it levies lump-sum taxes on working individuals to meet its interest payments and maintain a target debt level.[3] The assumption that taxes are levied only on those who are still in the labor force is extremely generous to the view that models with finite lifetimes yield different results about national savings than models with infinite horizons, since it strengthens the positive relationship between an individual's marginal propensity to consume and his net wealth increment from the deficit policy.

We consider two possible government debt targets: one holds constant the real debt stock, while the other holds constant the real debt stock per capita. For each repayment policy, we compute the deficit's net wealth increment for a person of age α, designated $dW(\alpha)$ and $dW'(\alpha)$ in the constant real debt and constant real per capita debt cases, respectively.

For individuals who are retired when the government begins a period of deficit finance ($\alpha > T'$) or who will be retired when it begins to levy the taxes to finance the deficit ($\alpha > T' - K$), the repayment policy does not affect their net wealth increment:

$$dW(\alpha) = dW'(\alpha) = \begin{cases} \dfrac{1-e^{-r(T-\alpha)}}{r} & \alpha \geq T - K \\ \dfrac{1-e^{-rK}}{r} & T' - K \leq \alpha \leq T - K. \end{cases} \quad (1)$$

For younger agents, the repayment policy does matter. Their net wealth increments are given by:

$$dW(\alpha) = \frac{1-e^{-rK}}{r} - \frac{r(e^{-nK}-e^{-rK})(1-e^{-(r+n)(T'-K-\alpha)})}{(r-n)(n+r)} \qquad \alpha < T' - K \quad (2a)$$

and

$$dW'(\alpha) = \frac{1-e^{-rK}}{r} + \frac{(e^{-nK}-e^{-rK})(1-e^{-(r+n)(T'-K-\alpha)})}{n+r} \qquad \alpha < T' - K. \quad (2b)$$

The aggregate wealth effect of a deficit policy is a weighted average of the wealth effects in (1) and (2), with weights equal to the population shares of the different age cohorts. Table 1 reports the aggregate wealth increments associated with a one-year deficit policy. If all of the taxes used to finance the deficit were levied after the transfer recipients had died, the entries in the table would be 1.0. The results suggest that for the two debt repayment policies we consider, the present value of the associated tax payments are substantially less than half of the initial transfer. In economies with a population growth rate of one percent, a one dollar transfer followed by a constant real debt policy raises net wealth by an average of 85 cents if the real interest rate is .01, by 65 cents if r=.03, and by 53 cents if r=.05. If the government targets real debt per capita, then the net wealth effects for these three real interest rates are 100 cents, 77 cents, and 63 cents, respectively. These results, along with similar calculations for other parameter values, suggest that deficit policies may transfer substantial tax burdens to future generations.

To analyze whether these wealth transfers are accompanied by substantial crowding out of contemporaneous investment, however, we must consider the associated changes in national savings. We do this assuming that agents maximize additively separable constant-elasticity utility functions

$$V(\alpha) = \int_{\alpha}^{T} [c(t)^{\gamma}/\gamma]\ e^{-\delta(t-\alpha)}dt \tag{3}$$

where δ is the time preference rate, subject to the standard life-cycle budget constraint,

$$W(\alpha) = \int_{\alpha}^{T} c(t)\ e^{-r(t-\alpha)}\ dt \tag{4}$$

where $W(\alpha)$ is age-α person's wealth. For this specification of preferences, the marginal propensity to consume out of wealth is $(\theta - r)/(e^{(\theta-r)(T-\alpha)} - 1)$, where $\theta = (r-\delta)/(1-\gamma)$ is the agent's consumption growth rate. Since agents of different ages have different marginal propensities to consume, the age distribution plays an important part in determining the short-run consumption effects of deficit policies. We calculate the aggregate consumption effect by multiplying each cohort's wealth increment, computed as in (1) and (2), by its marginal propsensity to consume and weighting the resulting consumption changes by population shares.

The first column of Table 2 shows the per capita consumption changes associated with a one year, one dollar per capita deficit policy. With a real interest rate of .03, a population growth rate of .01, and a consumption growth rate of .03, per capita consumption spending rises by either 6.1 or 6.5 cents, depending upon the debt repayment policy. A more realistic five year deficit policy raises consumption by only 22 cents assuming the same parameter values. Although the choice of parameter values and which debt repayment policy the government pursues can affect the short-run consumption change by one or two cents, these choices do not alter the general conclusion that deficits lead to trivial changes in consumption spending.

These results are very similar to those which would obtain in an infinite-horizon model. With stationary population, an infinite-lived agent would not change his consumption at all in response to the deficit policies we have considered. With population growth, however, the current generation does benefit through its ability to share future taxes with as yet unborn generations. For the parameter values we have chosen, this effect would lead to roughly a one cent increase in consumption by an infinite-lived consumer.

The central feature of the lifecycle model which explains our small short-run consumption effects is that for all but the oldest consumers, the marginal propensity to consume out of wealth is relatively small. Even if the government provided transfer payments to all currently living agents and financed them with taxes levied after the youngest members of the current generation died, the upper bound on the short-run consumption effect would be the population-weighted average of marginal propensities to consume. Assuming the real interest rate is three percent, this weighted average is .082 when $n=.01$ and $\theta = .01$, and .072 when $n=.01$ and $\theta = .03$.

It is essential to recognize that we have focused on the short-run savings effects of government deficits. To evaluate their long-run capital intensity effects, we must account for the legacy of increased debt which remains even after the budget is balanced. Absent altruistic bequest motives, this debt raises household wealth, increases consumption, and decreases savings. Although in any given year these savings effects may be small, they cumulate over time. Simulation results presented in Auerbach and Kotlikoff (1986) suggest that deficits may have sizable effects on the long-run capital stock. Future research should explore these long run effects in greater detail.

II. Evaluating Historical Debt Repayment Experience

Throughout our simulation exercises, we have assumed that the government never repays the debt principal. This biases our short-run consumption effects upwards, and generates a larger wealth increment from deficits, than more realistic repayment policies might suggest. In practice, periods of rapid debt accumulation tend to be followed by debt repayment.

Actual repayment experience is illustrated in Table 3, which shows the path of real debt per capita after three wars which were financed with heavy government borrowing.[4] Real debt per capita fell by nearly 47 percent in the two decades following the Civil War, and by 57 percent during a similar period after World War II. The experience after World War I is clouded by the onset of the Great Depression only ten years afterwards. In 1929, however, the real debt stock per capita had fallen forty-five percent relative to its level in 1919. The deflation of the 1930s, coupled with debt-financed fiscal policy, led to a pronounced increase in the real debt stock and by 1939, real debt per capita was over thirty percent greater than it was in 1919. Nonetheless, it seems reasonable to regard the Depression period as something of an outlier and to conclude from these data that repayment following debt growth is often quite rapid.

We illustrate this point by considering the aftermath of World War II in more detail. We calculate the fraction of the war debt which individuals of different ages in 1945 would have expected to repay if they had anticipated the path of real deficits over the next thirty years.[5] For each year between 1946 and 1970, we compute the per capita change in the real debt outstanding, Δb_t. We compute the expected present value of these repayments, viewed from 1945, using survival probabilities drawn from the 1950 U.S. life table and discounting the sequence of expected repayments using the path of realized real Treasury bill rates. The expected present value of debt repayments for an age-α individual in 1945 is therefore $dW(\alpha) = \sum_{i=1946}^{1970} S(\alpha,i)R(i)\Delta b_i$ where $S(\alpha,t)$ denotes the probability that an individual of age α in 1945 would still be alive in year t and R(i) is the i-year discount factor viewed from the perspective of 1945.

The results of this calculation are shown in the first column of Table 4. An individual aged twenty at the end of the war could expect to repay 72.9 percent of the war debt within his lifetime.[6] This fraction is relatively insensitive to the individual's age. For a fifty year old, the expected repayment fraction was 67.0 percent. An individual would have to have been at least 75 years old in 1945 to expect to escape half of the war debt repayments, and even an eighty-year-old could expect to repay 43.3 percent of the war debt. On average, one additional dollar of debt at the end of the war constituted only a thirty-two cent increment to net wealth. This is less than half as large as the estimates suggested by our calculations in the last section.

To illustrate how wartime debt accumulation may have influenced consumption and savings, the second column in Table 4 reports the change in consumption which would have resulted if the United States government had repudiated its war debts in 1946.[7] The consumption effects, measured in 1972 dollars, range from a decrease of $18.86 for twenty year olds, to a fall of $115.34 for persons aged seventy, to a consumption drop of over three hundred dollars for an eighty-year-old. The aggregate reduction in per capita consumption, however, would only have been about $40. By comparison, per capita consumption in 1946 was $2604 dollars; even a dramatic policy such as debt repudiation would therefore have caused only a 1.5 percent decline in aggregate consumption under the maintained lifecycle hypothesis. These results suggest that the short-run savings effects of government deficits are therefore even smaller than indicated by our simulation results in the last section.

III. Conclusion

Our calculations suggest that for analyzing the short-run savings effects of government deficits, little of substance hangs on the presence or absence of intergenerational linkages. In the absence of population growth, an infinite lived consumer would not change his consumption at all in response to a government deficit. In realistic lifecycle models, we find that each dollar of government deficit will raise household consumption by roughly five cents. The distinction between finite and infinite horizon models, which has been stressed in much of the Ricardian equivalence debate, is therefore of little empirical importance for analyzing the short-run savings effects of budget deficits.

While the ability of debt policies to shift tax burdens to future generations does not justify a conclusion that deficits have a significant short-run impact on national savings, there exist a number of other arguments supporting this conclusion. First, tax cuts may portend future spending reductions because of the political response to deficits or tax smoothing as suggested by Barro (1979). Consumers who internalize the government's budget constraint will then feel richer and reduce their saving. This implies that even proponents of Ricardian equivalence should regard current fiscal policies as having potentially important effects on national savings. Second, a large body of evidence suggests the excess sensitivity of consumption to income changes. If this reflects liquidity constraints or consumer myopia, then current tax reductions financed by future tax increases are likely to raise consumption. Third, actual taxes are not lump sum levies. Barsky, Mankiw, and Zeldes (1985) argue that deficit policies may raise consumption because they reduce the precautionary demand for savings. In practice, the tax changes associated with deficits may give rise to intertemporal substitution effects of the type studied in Auerbach and Kotlikoff (1986). Future work should concentrate on measuring the empirical significance of these and other channels linking deficits and national savings.

FOOTNOTES

1. Similar experiments could be performed in Blanchard's (1985) finite horizon model.

2. Our calculations assume that the primary deficit rises by one dollar each year for each living person. This corresponds to an even larger change in the measured deficit in our multi-year experiments, since the interest payments on debt incurred in the first few years of the policy must also be financed by borrowing.

3. We assume that these taxes have no effect on labor force participation decisions.

4. Detailed information on the measurement and behavior of real government debt in both the U.S. and the U.K. may be found in Barro (1984).

5. Our calculations ignore a number of other policy changes in the post-war period which have induced substantial intergenerational transfers. The most important of these is the liberalization of Social Security benefits, a reform which had it been anticipated in 1945 would have raised the wealth increment for that generation.

6. We assume that all debt repayments were applied to the accumulated war debt, biasing our conclusion toward the finding that debt repayment was rapid. War debt accounted for 74.5 percent of the outstanding real debt in 1945. If we assumed that outstanding debts of all vintages were paid off proportionately after the war, our calculations in Table 4 would show that expected debt repayments equalled .504 of the war-time borrowing.

7. We assume that all debt is domestically held. This exaggerates our estimates of how repudiation affects consumption, since actual repudiation would also effect a transfer from foreign debt holders to U.S. citizens.

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Table 1: Fraction of Deficit-Induced Government Debt which is Net Wealth

Parameter Values	Debt Concept Held Constant	Fraction of Debt which is Net Wealth
r=.01	Real	0.850
n=.01	Real Per Capita	1.000
r=.03	Real	0.651
n=.01	Real Per Capita	0.767
r=.03	Real	0.665
n=.02	Real Per Capita	0.888
r=.05	Real	0.531
n=.01	Real Per Capita	0.625
r=.05	Real	0.546
n=.02	Real Per Capita	0.727

Notes: All calculations assume that each household lives for 55 periods and works for the first 45 periods. The real interest rate is r, while n is the population growth rate.

Table 2: Short-Run Effects of Deficit Policies in Lifecycle Model

Parameter Values	Debt Concept Held Constant	Consumption Change/Deficit: One Year Deficit	Consumption Change/Deficit: Five Year Deficit
r=.01, n=.01,	Real	0.067	0.246
θ=.01	Real Per Capita	0.071	0.262
r=.01, n=.01,	Real	0.060	0.212
θ=.03	Real Per Capita	0.063	0.222
r=.03, n=.01,	Real	0.068	0.248
θ=.01	Real Per Capita	0.072	0.266
r=.03, n=.01,	Real	0.061	0.217
θ=.03	Real Per Capita	0.065	0.229
r=.03, n=.02,	Real	0.058	0.223
θ=.01	Real Per Capita	0.066	0.256
r=.03, n=.02,	Real	0.051	0.190
θ=.03	Real Per Capita	0.057	0.213
r=.05, n=.01,	Real	0.068	0.247
θ=.01	Real Per Capita	0.073	0.268
r=.05, n=.01,	Real	0.063	0.221
θ=.03	Real Per Capita	0.066	0.235
r=.05, n=.02,	Real	0.059	0.227
θ=.01	Real Per Capita	0.068	0.263
r=.05, n=.02,	Real	0.053	0.197
θ=.03	Real Per Capita	0.060	0.223

Notes: All calculations assume that each household lives for 55 periods and works for the first 45 periods. Deficits are financed using lump sum taxes on all working individuals; see text for further details.

Table 3: Movements in Real Debt Per Capita Following Major Wars

Episode	Percentage Change in Real Debt Per Capita After: 5 Years	10 Years	15 Years	20 Years
Civil War	-0.1	-17.1	-17.2	-46.6
World War I	-23.7	-44.6	+2.0	+36.7
World War II	-36.7	-44.8	-52.6	-56.9

Notes: Data on outstanding stock of publicly-held interest-bearing federal debt are drawn from Historical Statistics of the United States and the Federal Reserve Bulletin. The population measure is number of persons aged 16-plus, again drawn from Historical Statistics. The price level is the personal consumption deflator for the World War II episode, the all-commodities Consumer Price Index for World War I, and the Warren-Pearson Wholesale Price Index for the Civil War.

Table 4: Burden of Actual Post-World War II Debt Repayments

Age in 1945	Expected Present Value of Tax Repayments Per Capita War Debt	Repudiation Effect on Consumption
20	0.729	-18.86
30	0.723	-23.44
40	0.705	-31.71
50	0.670	-47.48
60	0.614	-58.52
70	0.534	-115.34
80	0.433	-306.81
Population Average	0.681	-40.04

Notes: All calculations are based on the actual path of real deficits, 1945-1970, and mortality probabilities based on the 1949-1951 Life Tables for the United States. Consumption changes in the last column are in 1972 dollars.