The Link Between Savings and Interest Rates: A Key Element in the Tax Policy Debate

*Robert H. DeFina**

If the "supply-side revolution" in economic thinking did anything, it highlighted the interplay of our fiscal system with people's day-to-day financial decisions. Taxes, subsidies, and tariffs all create incentives that can influence how much a person buys and sells, works and plays. And knowing this, policymakers have become more aware of the consequences that their revenue measures have for individual behavior.

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So it is with the amount that people save. As things stand now, several elements of our tax code reduce the rate-of-return that savers earn, the reward for postponing today's spending. Understandably, policymakers are concerned that this government-created reduction in the real (inflation-adjusted) return stacks the deck against thriftiness and thereby stunts the private sector's contribution to the nation's pool of savings.

Saving is, of course, crucial to a growing economy because it makes resources available for the production of physical capital and for the research and development needed to fuel economic growth and enhance our standard of living.

Coupling this important role of saving with the anxiety of policymakers, it is not surprising that legislators have backed tax reforms aimed at eliminating perceived anti-saving biases in the code. These proposed reforms include sweeping changes, such as substituting taxes on consumption for the present income tax, as well as piecemeal adjustments, such as granting tax-deferred status to certain forms of saving.

Unfortunately, the push to amend the tax structure, while well-intentioned, is curiously premature from an economic perspective. To be sure, the income tax unquestionably reduces the reward to savers, a fact that gives legitimate cause for concern. Nonetheless, available evidence suggests the presumption of a sizable negative saving response to such a reduction in the real return may be unwarranted, however intuitively appealing that key assumption might be.

SAVING AND REAL INTEREST RATES: WHAT DO ECONOMISTS KNOW?

In order to systematize their thinking about what influences saving, economists have developed behavioral models of the "typical" individual. Although these models generally focus on spending behavior, saving behavior is described simultaneously. The reason is that once a person's spending is determined, his saving can be calculated simply as his unspent income. This only reflects the obvious: that spending and saving are opposite sides of the income coin.

The conventional framework used by economists envisions people as long-run, or life-cycle, planners who consider not only today's economic conditions but also expected future conditions when scheduling their spending plans. Moreover, the framework views individuals as free to borrow and lend. An important implication of this freedom is that people's current spending is not constrained by their current income; rather, it is limited only by their lifetime earnings, or "human wealth," as it has been called.[1] Such models essentially argue that individuals prefer a smooth pattern of consumption over their lifetimes, with consumption (c) in each period equal to some proportion (a) of their total wealth (w); that is, $c = aw$.

How does the rate-of-return to saving get into the picture?[2] As it turns out, the rate-of-return is important in the spending/saving decision because it influences both the proportion of one's wealth that a person consumes in the current period and the amount of an individual's lifetime wealth. The rub is that the rate-of-return affects the determinants of spending in offsetting ways. As a result, the net impact on spending due to a change in interest rates is conceptually indeterminate. Appeals have been made to empirical analysis in an attempt to arbitrate this ambiguity; unfortunately, such appeals have been answered with results that buttress several competing views.

Theoretically, Anything Goes. . . In theory, a change in the rate-of-return can influence the fraction of wealth going to today's spending through two channels.[3] The first is by changing the relative financial attractiveness of spending and saving.

One motivation for putting off today's spending is that it yields a reward. That reward takes the form of even greater consumption in some future period: by forgoing a dollar of spending today, a person can enjoy more than a dollar's worth of spending in the future. How big an increment do individuals receive? They receive an amount equal

[1] It may be noted here that people's wealth takes a variety of forms, including stocks, bonds, and property in addition to human wealth. We confine our attention to human wealth for consistency with the conventional framework employed by economists and for ease of exposition. Nonetheless, the basic life-cycle model can be amended to incorporate nonhuman wealth, such as stocks, bonds and property with no substantive implications for the following discussion.

[2] Charles Steindel, "The Determinants of Private Saving," in Jared J. Enzler, ed., *Public Policy and Capital Formation*, (Board of Governors of the Federal Reserve System, 1980), pp. 101-114 contains a lucid mathematical exposition of the points discussed here.

[3] Technically, one cannot simply discuss the effect of a change in interest rates on saving without first specifying the way in which the change comes about. The present discussion may be thought of as referring to a change in interest rates arising from a switch from an income tax to a consumption tax, where each tax is set to raise the same amount of revenue. Moreover, the present discussion considers only so-called partial equilibrium effects, excluding the impact of the change on other markets and prices and the subsequent feedback. Lawrence Summers, "Tax Policy, The Rate of Return, and Savings," *National Bureau of Economic Research Working Paper No. 995* (September 1982) provides a useful elaboration of these points.

to the real, after-tax interest rate for each dollar of present consumption they postpone.[4]

In a sense, consumers can be bribed to refrain from indulging in the pleasures of spending today with the promise of even greater spending tomorrow. And, quite naturally, the higher this bribe or reward, the more willing people are to exercise spending restraint. So, from at least one angle, it appears that the tax-induced reduction in the return to saving would increase the fraction of wealth that is spent today. Or, in other words, the lower return means less saving.

The story does not end there, however. Indeed, people have another motivation to save, namely, to accumulate funds to meet payments that would otherwise strain current period income. And in this case, a lower return would spark more, not less saving.

To see why, imagine an individual who, at the beginning of the year, is trying to accumulate $4,600 by the end of year in order to meet a law school tuition payment. Assume that the person already has $4,000 in a bank account and that the after-tax interest rate is 10 percent. Under these circumstances, this individual will hit his target of $4,600 by saving $200. At year-end, he will have the $4,000 he has saved already plus the $400 in interest earned on it ($4,000 x 10%) plus the new saving of $200 which equals $4,600. But suppose the after-tax return falls to 8 percent from 10 percent. Now, if he decides to save $200, this individual will fall short of his target by $80 because his interest income will decline to $320 ($4,000 x 8%) from $400. In order to reach his year-end goal of $4,600 with the lower rate-of-return, then, he must *increase* his new saving to $280 from $200.

Although this discussion relies on a particular example, the conclusion holds in general. Whether they are socking away money for retirement, for their children's education, or for a weekend jaunt to Samoa, "target" savers will respond to a reduction in the rate-of-return by boosting their saving (that is, by decreasing the fraction of lifetime wealth consumed today). In that way, they compensate for any prospective shortfall due to reduced interest earnings on their existing accumulation of saving.

In addition to the two conflicting ways in which interest rate changes affect the proportion of wealth spent in the current period, movements in the real return can alter saving in a third way: by changing the value of wealth available for spending and saving.[5] Earlier, we mentioned that individuals can be thought of as spending a given proportion of their lifetime wealth each period. It follows logically, then, that an increase in wealth due to an interest rate change increases today's spending and, hence, diminishes saving; a decrease in wealth due to an interest rate change has the opposite effect.[6] The question of concern to policy-makers that remains is: how does a change in the real return alter the value of wealth?

The answer is unequivocal: an increase in real rates of return diminishes wealth, while a decrease augments it (see HUMAN WEALTH AND INTEREST RATES, p. 18). Consequently, a tax-induced reduction in real rates inflates individuals' wealth, increasing their current period spending and, hence, lowering their saving.

Overall, then, theoretical considerations create a quandary. To recap, a lowering of interest rates influences the amount that people save in three competing ways. Two of these ways, a diminution in the attractiveness of saving relative to spending, and an enhancement of wealth, work to reduce people's saving; the third way, a lowering of the interest earnings of "target" savers, works to boost people's saving. As a result, saving could either rise or fall in response to a drop in real rates, depending on which of the three effects is dominant.

Which effect is, in fact, dominant? No amount of theorizing can determine that. Instead, actual data must be brought to bear on the issue. Unfortu-

[4]For instance, if a person in the 30 percent tax bracket receives a real return of 10 percent on her saving, her after-tax rate of return is 7 percent ((1-.3) x .1 = .07).

[5]This avenue has been neglected in many earlier discussions of the relationship between interest rates and saving. Both Charles Steindel, "The Determinants...," and Lawrence Summers, "Tax Policy...," can be credited with highlighting the importance of this channel.

[6]It is useful at this point to recall that saving plus consumption equals disposable income. If only wealth changes without an associated income change, then the resulting variation in consumption must be offset exactly by variation in saving. Consequently, if wealth rises, causing current period consumption to rise, current period saving will fall, and conversely.

Human Wealth and Interest Rates

People generally have some idea of what their earnings will be during future periods of their life. In measuring human wealth, individuals try to judge how much their future stream of earnings is worth today. That is, each person answers the following question: "Suppose that I stop working today. How large a lump-sum payment must I receive today to ensure that when I reach retirement age I have exactly as much money as I would have had if I had continued working?"

A crucial element in this determination is the level of interest rates. The reason is that the person will be able to invest his lump-sum payment for all the years until retirement age. The lower the prevailing level of interest rates, the greater the lump-sum payment that is required to match the future earnings stream, because the less that interest income will augment the initial lump payment. That is, human wealth and interest rates are inversely related.

An example will help clarify these notions. Suppose that a person lives for two periods. In the first period she earns $100 and in the second period she earns $150. Also, suppose that a 10 percent real return will prevail throughout her working life. Now, presuming that she gets paid at the end of each period and saves all of her earnings, she will have $260 at retirement: the $100 earned in the first period, plus $10 interest income on the $100 invested throughout the second period, plus the $150 earned during the second period equals $260.

What is the human wealth implied by her earning stream? It is the amount that, when invested today for the following two periods at the real return of 10 percent, will yield $260. Calculation reveals this to be $214.88: at the end of the first period, she has $236.36 after investing the $214.88 at 10 percent; by reinvesting the $236.36 at 10 percent during the second period, her investment grows to $260.

Computations similar to those above indicate that the lower the interest rate, the higher the person's wealth. For instance, if the real return in the above example were 5 percent instead of 10 percent, the person's human wealth would be $231.29 instead of $214.88; if the real return were 2 percent, human wealth would be $242.21. Although the focus here is on numerical examples, the essential point will always be true; namely, that human wealth and interest rates are inversely related.

nately, even empirical analysis has yet to provide a clear answer.

. . . **And Empirical Estimates Are Hard To Pin Down.** A number of researchers have used statistical techniques to measure the historical relationship between households' saving and movements in interest rates. A common empirical approach is to implement life-cycle type models of individuals' spending behavior in an attempt to measure the interest elasticity of saving. This elasticity is a summary measure of the responsiveness of saving to interest rate movements, and equals the percentage change in saving due to a 1 percent change in interest rates. For example, if the elasticity is 0.7, this means that for each 1 percent change in interest rates (say, from 5 percent to 5.5 percent), saving would rise by 0.7 of a percent (say, from $53 billion to $53.6 billion). To relate this concept to the earlier theoretical discussion, if the amount saved falls as a result of a rise in interest rates, the measured elasticity will be negative; if the amount saved rises as a result of a rise in interest rates, the measured elasticity will be positive; if the amount saved is unaffected by a rise in interest rates, the measured elasticity will be zero.

The results of these statistical studies have been of only limited use to policymakers. The reason is that nothing resembling a consensus on the interest elasticity has emerged. At one level of the debate, there is disagreement on the qualitative impact on saving of interest rate changes. Although a majority of studies have found that the interest elasticity is positive, implying that a reduction in interest rates lowers saving, a sizable minority find that saving is insensitive to fluctuations in rates (that is, the elasticity is zero). At another level of the debate, there is disagreement even among those studies that find a positive interest elasticity. Some researchers have estimated that the elasticity is 0.03; that is, for every 1 percent fall in interest rates, saving falls by 0.03 percent. Based on the figures for 1983, this implies an inflation- adjusted increase in personal saving of $16 million for each 1 percent rise in interest rates. Others have estimated that the elasticity is in excess of 5.0, well over one hundred times as great. (See THE ELUSIVE INTEREST ELASTICITY OF

SAVING.) So, even if one were to cast one's vote with the majority of studies that argue for a positive elasticity, the magnitude of the elasticity is still very much open to discussion.

In a sense, the disparity in the estimates is not surprising. Any attempt to determine the interest elasticity of saving is fraught with practical and conceptual difficulties. One significant stumbling block is that many of the variables needed to implement models of consumer spending are unobservable. A case in point is the real, after-tax interest rate. Roughly, the real interest rate is equal to a nominal rate, which can be observed, less the inflation expected during the time period to which the rate applies. The problem occurs because inflation expectations cannot be directly observed; rather, they must be approximated from available data. As yet, economists do not agree on the best way of carrying out the approximation. And, the estimates of the interest elasticity vary depending on how the approximation is done. This problem of how best to represent theoretically required variables is not limited to the interest rate; instead, it concerns such variables as human wealth and spending as well.[7]

Compounding the problems caused by data deficiencies are questions about the appropriate empirical specification of the conceptual model. Although theory gives some guide as to the form of the empirical framework, it does leave room for interpretation. For instance, it is up to the researcher's judgement as to what lags in the relationship between variables might reasonably be expected, what is the most suitable time period for the analysis, and to what extent special factors, such as auto strikes and wars, should be accounted for. Different opinions on these issues can lead to

[7]Gerald Carlino and Robert H. DeFina, in "Inflationary Expectations and the Consumer," *Federal Reserve Bank of Philadelphia Working Paper No. 84-1,* survey the different empirical assumptions that have been employed in studies of consumer spending.

The Elusive Interest Elasticity of Saving

Empirical estimates of the interest elasticity of saving—the percentage change in saving associated with a 1 percent change in real rates—vary considerably. The table below summarizes the results of a representative group of empirical studies, giving the author(s) of the study, the date of the study, and the corresponding estimate. For example, Boskin's 1978 study finds that a 1 percent increase in the real rate of return will increase saving 0.4 percent.

Author(s)[a]	Interest Elasticity of Saving
Alan Blinder (1975)	0.03
Michael Boskin (1978)	0.4
Gerald Carlino (1982)	0
Gerald Carlino and Robert DeFina (1983)	0
Thorvaldur Gylfason (1981)	0.3
Dale Heien (1972)	1.8
E. Philip Howrey and Saul Hymans (1978)	0
Charles Steindel (1980)[b]	5.8
Lawrence Summers (1982)[b]	1.3
Lester Taylor (1971)	0.8
Colin Wright (1967)	0.2

[a]Full citations are in the Bibliography.

[b]Both Steindel and Summers present a range of estimates of the interest elasticity of saving. In each of their formulations, the value of the interest elasticity depends both on assumptions about other parameters in the models and on the particular fiscal policy change that precipitates the interest rate change. The estimates listed in the table are chosen because they reflect each author's judgement about likely values for the other parameters in the model and a policy initiative that substitutes a tax on consumption for a tax on capital income while holding tax revenue constant.

different estimates of the interest elasticity of saving.

Needless to say, the equivocal nature of available results when considered as a group diminishes their usefulness to policymakers. But even if there were unanimity on the interest elasticity of saving, or if there were one study that could be accepted with confidence, this would not solve policymakers' problems. The reason is that historically based estimates of the interest elasticity of saving pose special problems when used to draw inferences about the impact of a policy change.[8]

One problem arises from the type of variation in interest rates that is used to infer the interest elasticity. Much of the variation reflected in the data arises from the normal ebb and flow of economic activity. Consequently, any given change in rates is unlikely to persist for an extended period. The continuing shift of economic activity will, instead, evoke further rate changes that either reinforce or dampen previous fluctuations. In contrast, movements in interest rates that result from a tax change are permanent, not transitory, in nature. That is, a tax change moves the net return to savers to a permanently lower or higher level, depending on the direction of the policy adjustment.

Because available evidence depends primarily on the relationship between saving behavior and *transitory* interest rate changes, it is of limited use to policymakers. In essence, the data on which the studies rely are inappropriate and can result in misleading estimates. At least one author has argued that this problem causes an underestimate of the interest elasticity of saving.[9] While the exact nature and significance of the bias may be questioned, this issue at least makes existing findings suspect.

Another difficulty in interpreting previous research results stems from the way in which people's expectations of future economic variables are tied to the fiscal and monetary policies that are in place. In the present context, people's expectations about such things as inflation and future real earnings are important because they influence the amount that individuals save and spend today. The common view among economists is that people's expectations of future economic conditions are rational; that is, their expectations reflect the most efficient usage of all available information. If this is so, then it follows that people's present economic decisions depend on the particular policy structure, or regime, that is currently in place. A person who forms expectations rationally cares about existing monetary and fiscal policies, such as the kinds of taxes that are levied, because they provide clues about the likely future course of economic conditions. This person will, then, use policy information when forecasting variables that influence her behavior.

Why does this limit the usefulness of available studies? The reason is that available statistical analyses are based on observations of people's saving behavior under a given policy regime. So, while estimates of the interest elasticity of saving might be accurate for that regime, they simply may not apply under a new regime because people's behavior is likely to change. In other words, it is not legitimate to infer automatically that people's saving will be just as responsive to interest rate changes after policy actions are taken to increase rates of return as before those actions are taken.[10]

This is a relevant concern in the ongoing debate about saving because suggested solutions to the perceived problem entail changes in the fiscal policy regime. An example is the switch from an income tax to a consumption tax, such as a value-added tax. Statistical techniques to account for this policy-dependence issue are being developed. As yet, however, they have been applied to the interest elasticity question only in a rough-and-ready fashion. Consequently, the associated results are not yet really reliable.

[8]See, Lawrence Summers, "Tax Policy. . .".

[9]This discussion draws heavily from Lawrence Summers, "Tax Policy. . .".

[10]The general problem of evaluating policy when regimes change, of which this is a special case, was first articulated by Robert E. Lucas, "Econometric Policy Evaluation: A Critique," *The Phillips Curve and Labor Markets,* Carnegie-Rochester Conference Series on Public Policy, Vol. 1, eds. Karl Brunner and Allan H. Meltzer, (Amsterdam: North-Holland Publishing Company), pp. 19-46. For a nontechnical discussion of this issue see Richard W. Lang, "Using Econometric Models to Make Economic Policy: A Continuing Controversy," this *Business Review,* (January/February 1983), pp. 3-10.

CONCLUSION

Whether or not our tax system depresses personal saving is an issue of considerable importance. It is certainly true that the tax system lowers the net return to savers. But from an economic perspective, it is unwarranted to presume that the reduced rate-of-return ultimately reduces saving, however intuitive that presumption might seem. Neither economic theory nor empirical analysis unequivocally support that view.

This is not to say that the issue is resolved in favor of the "no-effect" position. Much work remains to be done in refining our empirical understanding of the situation and in clarifying the ambiguity of available evidence. And until those tasks are completed, policymakers should proceed slowly with costly fiscal reforms. For although there may be other reasonable motivations for wanting to undertake fiscal policy initiatives, our present level of understanding does not lead us to include a perceived bias in the tax code against saving as one of them.

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83-1

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Robert H. DeFina

During the past two decades, a number of studies have established the ability of unions to obtain wages for their members that exceed the payment to similar, but nonunionized workers. This article investigates empirically the impact that this wage differential has on the real incomes of union labor, nonunion labor, and capital. The analysis is accomplished by solving explicitly a numerically specified general equilibrium system with and without the union wage premium. Comparison of real factor incomes in each equilibrium yields the desired information. The findings indicate that union labor gains as a result of the differential, while nonunion labor and capital lose. This outcome is realized both in terms of real income levels and in a redistributive sense.

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Nicholas Carlozzi
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83-4
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Brian R. Horrigan

When can we know whether deficits cause inflation or inflation causes deficits? The correlation we observe between deficits and inflation does not permit an inference about causality. In steady state, higher inflation is always associated with higher deficits, regardless of what caused the inflation. The causal relation between deficits and inflation can only be inferred from a study of disequilibrium situations. In disequilibrium, the inflation-adjusted deficit is a better measure of the stance of fiscal policy than the conventional deficit.

83-5
THE ROLE OF THE DISCOUNT WINDOW IN MONETARY POLICY UNDER ALTERNATIVE OPERATING PROCEDURES AND RESERVE REQUIREMENT SYSTEMS

Herb Taylor

The paper uses a simple model of the reserves market to demonstrate the implications of discount window administration procedures for short-run money control. It is shown that when the Fed uses a funds rate operating procedure to control the money stock, discount window procedures do not affect the volatility of the money stock. When the Fed uses a reserves operating procedure combined with lagged reserve requirements, a relatively liberal discount window policy is shown to improve money control. With contemporaneous reserve requirements, the case for a more restrictive discount window policy is stronger, though a penalty discount rate does not necessarily maximize short-run money control.

83-6
CARRYING COSTS AND TREASURY BILL FUTURES

Brian C. Gendreau

Researchers have consistently found that yields on Treasury bill futures differ significantly from corresponding forward rates implicit in the term structure of interest rates. This paper focuses on the borrowing costs faced by investors as the source of that difference. Rates of return attainable on forward bills created implicitly by financing Treasury bills with term repurchase agreements are calculated and found to be not significantly different from yields on Treasury bill futures contracts. These results suggest that risk premia in the repurchase market are reflected in Treasury bill futures yields, and can explain why those yields differ from forward rates.

83-7
METROPOLITAN CENTRAL CITY POPULATION AND EMPLOYMENT GROWTH DURING THE 1970s

by Edwin S. Mills

This paper studies the determinants of Metropolitan Central City Population and Employment Growth from 1970 to 1980 using census data for metropolitan areas with at least 250,000 population. Central city and suburban population and employment growth are analyzed in a four-equation model. Population and employment growth reinforce each other strongly in central cities. Suburban population growth stimulates central city employment growth, but suburban employment growth is at the expense of central city employment growth. Central city population and employment growth are affected strongly by variables over which communities have control. Many eastern and northern central cities could have replaced decline with substantial growth by better control of crime and taxes and by improved educational systems.

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