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**The effect of alternative systems of taxation on individual
savings: An experimental approach**

Hebble, Annette, Ph.D.

University of Houston, 1989

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THE EFFECT OF ALTERNATIVE SYSTEMS OF TAXATION
ON INDIVIDUAL SAVINGS:
AN EXPERIMENTAL APPROACH

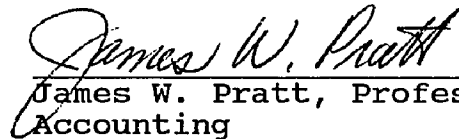
A Dissertation
Presented to
the Faculty of the College of Business Administration
University of Houston - University Park


In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Philosophy


By
Annette Hebble
April, 1989

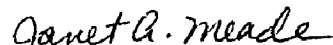
THE EFFECT OF ALTERNATIVE SYSTEMS OF TAXATION
ON INDIVIDUAL SAVINGS:
AN EXPERIMENTAL APPROACH


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Abstract

Currently, the level of saving is lower in the United States than in many other industrial countries. It has been claimed that granting tax incentives to selected forms of personal savings would increase rates of return and thereby increase the level of saving. This study tests the theory that individuals increase saving at the margin when such investment is accorded consumption or modified consumption tax treatment as opposed to income tax treatment. Under a consumption tax both the original amount saved and the related earnings escape current taxation. On the other hand, under a modified consumption tax only the earnings escape current taxation.

Studies to date have emphasized the increase in aggregate savings. Actual changes in individual behavior were not explored. In order to test the latter aspect of individual saving behavior, subjects in this study engaged in a laboratory task that required them to allocate current income among consumption and savings options under three simulated tax treatments: income taxation, consumption taxation, and modified consumption taxation. The study hypothesized that subjects would exhibit the least propensity to save under the treatment simulating income taxation, whereas their propensity to save would be the greatest under the treatment simulating consumption taxation.

The findings of the study indicated that the savings behavior of the subjects was greatest under the consumption tax treatment, both at the aggregate and individual levels. The benefit of modified consumption tax treatment was less evident. Overall saving did increase, but it could not be attributed to a significant change in individual behavior.

From a tax policy perspective, this study indicates that some individuals can be induced to increase their saving if amounts invested escape current income taxation. Tax-deductible contributions to Individual Retirement Accounts (IRAs) represent consumption tax treatment of selected savings. If the availability of IRAs increases saving at the margin, Congress may have acted hastily in eliminating this tax incentive for a substantial portion of those individuals who are likely to take advantage of it. This information has implications for future decisions with respect to tax policies relating not only to IRAs, but also other forms of long-term saving.

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CHAPTER 1

INTRODUCTION

Personal saving behavior has both a scientific and a public policy interest. On the side of scientific concerns, understanding saving behavior is central to understanding economic growth, income inequality, and cyclical movements in the economy. On the side of policy, there has been much concern in recent years about the relatively low rate of personal saving¹ in the U.S. economy and its implications for capital formation, productivity, and economic growth. The changing demographic structure of the United States may further deteriorate this situation. Fear exists that a retirement age burgeoning population will push the saving rate even lower in the future [Juster, 1986].

There are four principal ways in which public policies can increase national saving: government surpluses, changes in the structure of social security benefits and financing, reform of the regulation of financial institutions, and change in tax rules [Feldstein, 1977]. The latter is the focus of this study insofar as it relates specifically to personal saving. The purpose of this study is to test an economic theory of saving behavior in the abstract and the

study does not address questions regarding the reasonableness of that theory as an abstraction of the real world.

Feldstein and Feenberg [1983] state that personal saving has traditionally accounted for more than half of all real net private saving in the United States. Others say that the contribution of personal savings in the overall scheme of things is much smaller. Under any circumstances, incentives that increase the personal saving rate have a potentially significant effect on the total rate of capital formation. There are, of course, many factors in addition to the personal tax rules that contribute to the low rate of saving in the United States, including consumer credit rules, the social security system, the taxation of business income, and the tax treatment of personal interest expenses prior to the Tax Reform Act of 1986.

The issue of particular interest in this study is whether an individual can be induced to consume less and save more as a result of incentives in the form of tax deferrals. To date research in this area has been limited to the aggregate response to saving incentives. Little is known about the reaction to such incentives at the individual level. The focus on the personal tax treatment of savings and the income from savings should not be misinterpreted as an indication that personal tax rules alone are responsible for the low United States saving rates. However, changes in

these tax rules are a potentially useful way to attempt to reverse the trend of personal savings.

Savings contribute to the formation of investment capital needed for economic growth. Many economists feel that the United States would be better off with more business capital formation, although there is disagreement on how much [see among others, Feldstein, 1979; Musgrave, 1979]. Further, it is claimed that tax policies such as larger investment credits, faster depreciation, or more exemptions for selected forms of saving would increase rates of return and thereby increase saving and capital formation to the extent that saving is elastic with respect to the rate of return [Minarik, 1984]. In addition to the concerns relating to the effect on the economy as a whole, personal saving provides security for the retirement years.

The passage of the Economic Recovery Tax Act of 1981 (ERTA), with various investment incentives, was largely intended to spark a surge of investment and savings. One of the incentives made available to all wage earners was the individual retirement account (IRA). Funds contributed to an IRA account were accorded consumption-tax treatment, which meant that payment of taxes was deferred on contributions as well as on the earnings generated until the funds were withdrawn. Yet, in spite of the IRA and various other tax incentives, the personal savings rate dropped from 7.1 percent in 1980 to 3.2 percent in 1987 [Bacon, 1988, p. 1].

Only a year after the passage of ERTA, the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA) scaled back some of the incentives enacted in 1981. Further restrictions on some tax incentives were instituted by the Deficit Reduction Act of 1984 (DRA). Additional changes affecting the taxation of individuals were introduced in The Tax Reduction Act of 1986 (TRA '86). Overall, TRA '86 decreased individual tax rates, but at the same time many deductions were curtailed or eliminated. For example, the tax deferral on IRA contributions was eliminated for the majority of individuals who were likely to take advantage of this savings incentive.²

The Treasury Department's tax reform study [1984] suggested that a consumption tax, also called an expenditure tax or cash flow tax, with IRA tax treatment for all investments, was ultimately the preferred tax system. Consequently, a major expansion of IRAs may be justified on other grounds, apart from retirement policy. If IRA treatment is simply the proper tax policy for investment, then there is also no reason for withdrawal penalties or restrictions of any kind. In addition to providing the most potent and equitable incentives for saving and investment, broadly distributed incentives for saving and investment, distributed throughout the whole population, would also greatly encourage individuals to rely more on private savings to serve a wide range of needs now served in large part by government spending and programs. These include not

only retirement income support, but also disability support, medical care, education, housing, unemployment support, and others [Ferrara, 1986].

Even though the United States generally imposes a tax on all income, the IRA is an example of a savings vehicle that is accorded consumption tax treatment. There is surprising little known about individual saving behavior and an individual's response to savings incentives that are accorded some kind of consumption tax treatment. Some recent empirical works suggest that consumption tax treatment, or IRAs, lead to increased marginal savings [Hubbard, 1984; Venti and Wise, 1986a; Venti and Wise, 1986b; Venti and Wise, 1987; Collins and Wyckoff, 1988].

To date, research relating to IRAs has been conducted using econometric models, an approach that focuses on the aggregate response to the tax deferral on funds invested through IRAs. Prior studies have not provided any insights into whether an individual can be induced to decrease consumption and save more when tax deferral is allowed on amounts saved. It is possible that the increase in savings generated by the availability of IRAs has occurred at the expense of the government alone, and that the individual has not increased savings at the margin. The purpose of this study was to determine whether an individual may be induced to change his behavior, and increase marginal savings when the funds invested are accorded consumption tax treatment instead of income tax treatment. In order to address the

issue of change in behavior at the individual level, a laboratory experiment was conducted.

Overview of the Experiment

Thirty-two individuals participated in an experiment in which they were required to make a series of decisions between consumption and saving. The experimental task was conducted in the behavioral laboratory at the University of Houston and was administered by a personal computer. Each subject was asked to make a choice between consumption, saving, or a combination of the two. The main consumption choice consisted of the opportunity to play computer games while the savings choice offered no entertainment, but increased the cash payment made at the conclusion of the experiment.

The experiment was further divided into three segments. Each segment offered a different tax treatment and was randomly presented to the subjects. The three tax treatments introduced during the experiment were (1) consumption tax treatment, (2) modified consumption tax treatment, and (3) income tax treatment. During each segment, the subject had to make eight to ten consumption versus saving choices. The cash payment received by the subjects at the end of the experiment was determined based on the number of points saved at the end of each segment.

It was hypothesized that different savings incentives would increase overall savings as well as induce the

subjects to change their behavior and allocate more of their own funds to savings during the segments offering more favorable tax treatments. It was found that overall savings were significantly larger when consumption tax and modified consumption tax treatments were in effect. In addition, the participants in the experiment also changed their behavior and saved more and consumed less during the segment when consumption tax treatment was in effect, but no significant differences could be detected between modified consumption tax treatment and income tax treatment.

Organization of the Study

The remainder of the chapters are organized in the following manner. Chapter 2 includes a discussion of IRAs, consumption taxes and reviews prior research on the response to savings incentives. Chapter 3 incorporates the research methodology and sets forth the hypotheses of this study. Chapter 4 contains an analysis the data obtained from the experiment and presents the results. Chapter 5 contains the conclusions, limitations, and suggestions for future research.

Endnotes

¹Saving is synonymous with liquid saving in this study.

²A contribution may still be made in order to obtain tax deferred growth on the earnings in an IRA [I.R.C. Sec. 408(o)].

CHAPTER 2

CONSUMPTION TAX

Although a great many specific proposals to encourage saving have been made, all of them have in common the purpose of increasing the net rate of return on saving or, equivalently, of increasing the amount of future consumption that can be obtained per dollar of current consumption that is foregone. The most general of these proposals is to replace the income tax with a tax on consumer spending. As income equals consumption plus savings plus taxes, the difference between a tax on income and a tax on consumption is the inclusion of savings under an income tax.

An income tax negatively affects the growth of saving in two ways. First, by taxing the return on capital, the income tax reduces the rate of return and also makes the before-tax and after-tax rate of return unequal. Second, transferring resources from the private to public sector reduces further the national saving rate since the marginal propensity to invest out of government revenue is less than that in the private sector [Boskin 1978]. The extent of this distortion and the loss of economic efficiency is

determined by the extent to which private saving depends on the real or after-tax rate of return, the interest elasticity or sensitivity of savings changes in interest rates, and the difference between the public and private propensities to save [Davies, 1986].

Neutrality with respect to consumption is important not only because it keeps the tax from bearing more heavily on one person than another on account of differences in need or taste for particular goods or services, now or in the future. All this is without even taking account of graduated rates, which are likely to make the relative burden of an income tax even heavier by subjecting earnings to higher rates even when put aside to support consumption in low-income retirement years. Mills [1921] called the discrimination of an income tax against deferred consumption a double tax on savings, once as they accumulate and again as they produce their own return. Many economists would now agree that Mill's once popular argument that saving is doubly taxed under an income tax is outdated, and that only new income generated for investment is taxed. However, it can be argued on equity grounds that there should be a lower tax on high savers because their contribution to social welfare is greater than the low savers or high consumers [Seidman, 1980].

The consumption tax has many distinguished proponents such as Mill, Marshall, Pigou, Fisher, Einaudi, Kaldor, Meade, and Feldstein. The consumption tax is proposed to

either replace or supplement the income tax. A shift towards a consumption tax is supported strongly by those who believe that the income tax has an adverse effect on incentives to save and invest and that private saving must be increased to raise the level of output and income.

Equity Considerations

The debate over the relative equity of consumption and income taxation has centered on whether income or consumption is a better measure of ability to pay, and whether horizontal equity should be measured by reference to similarly situated consumers or similarly situated earners. In more general terms, the debate has asked whether a social product in the form of money-returns to both capital and labor is a fairer tax base than what an individual takes out of society in the form of money spent on consumption [Graetz, 1979].

Claims for consumption taxation based on economic efficiency have likewise produced lively debate. There is general agreement that a consumption tax inherently leads to fewer difficulties than an income tax in times of significant inflation, and that a consumption tax provides more evenhanded treatment of present and postponed consumption [see for example, Mieszkowski, 1978; Bradford, 1980; Davies, 1980; Andrews and Bradford, 1988]. But economists differ widely in their predictions about the effects of treating savings more favorably [see for example

Wright, 1967; Boskin, 1978; Boskin and Lau, 1978; Howrey and Hymans, 1978]. The economic consequences will essentially depend upon the relative responsiveness of savings and labor to changes in after-tax interest and wages. The empirical work in this area has as yet been inconclusive [Graetz, 1979].

If only a proportional tax on consumption was desired, a value-added tax or a retail sales tax would be adequate since relatively simple mechanisms exist to ensure that these taxes are roughly proportional to an individual's total consumption. The decision to adopt a progressive rate structure is thus the principal basis for choosing a consumption tax based on cash outflow rather than some other consumption base.

The logic of a consumption tax is that a 28 percent taxpayer who would have had \$10,000 to spend in the absence of tax should have \$7,200 after tax whatever combination of earnings and savings may have gone to produce \$10,000. An income tax is discriminatory because it will leave much less for the retiree whose potential \$10,000 is the product of work and saving than for another taxpayer with \$10,000 of current income. Insofar as accumulation is viewed as deferred consumption, a consumption tax seems fairer and economically more efficient than an income tax [Davies, 1986]. Although it is unlikely that the income tax would be totally replaced by a consumption tax in the United States,

the latter might be a useful supplement in attempting to encourage individuals to save more and consume less.

Practical Considerations

No one advocates direct accounting or consumption expenditures of individuals as a practical approach to a progressive tax on consumption. Recordkeeping in connection with numerous consumption purchases would simply be too onerous. Early discussions of consumption tax implementation typically regarded full reporting on an individual's bank balances, other accounts, and assets and liabilities at the beginning and end of each year as essential to the consumption tax computation, but subsequent commentators have viewed balance sheet reporting as unnecessarily complicating. Instead, consumption expenditures would be computed indirectly by calculating each year's transactions that produce funds available for consumption or savings and eliminating savings from the tax base.

A viable model tax system for a progressive consumption tax was suggested by Blueprints for Basic Tax Reform in 1984. *** This study was commissioned by *** and is typically referred to in discussions of a consumption tax system. The central feature of this model tax system is the use of cash flow accounting for financial transactions to obtain a measure of annual consumption for any individual or household. The principle involved is very simple. A

household could use monetary receipts in a year for three purposes: (1) personal consumption, (2) saving, and (3) gifts. By including all monetary receipts in the tax base, including the entire proceeds of sales of assets and gifts received, and allowing deductions for purchases of assets and gifts given, the annual consumption of a household could be measured without directly monitoring the purchases of goods and services.

Blueprints for Basic Tax Reform

Blueprints for Basic Tax Reform [1984] suggests two alternative approaches to keeping track of the tax base under a consumption tax system. The first alternative is the use of qualified accounts. These accounts would be established by banks and other financial institutions, which would keep records of deposits and withdrawals. Funds deposited in the account could be used to purchase any type of financial funds, or any other claim to current or future income. The future balance in the qualified account would depend, of course, on the profitability of the investment. No tax would be assessed against interest, dividends, or capital gains as they are earned, but the taxpayer would be required to include in his tax base the full value of any withdrawals from his qualified account that were not reinvested in similar accounts. The use of qualified accounts to handle financial transactions would ease the taxpayer's recordkeeping burden and would enable tax

authorities to trace the annual flow of funds available for consumption uses.

The qualified accounts described here are very similar to qualified retirement accounts under current law. These accounts include Keogh plans and IRAs, which provide a taxpayer a current deduction for contributions to funds for retirement and then, include withdrawals from the fund in the tax base after retirement. There are two major differences between these qualified accounts and qualified retirement accounts provided for under current law, however. First, withdrawal of funds from the qualified account would be allowed without penalty at any time during a taxpayer's lifetime. Second, there would be no statutory limit to the amount a taxpayer could contribute to a qualified account.

Modified consumption tax treatment, the second approach to the handling of investments, would enable an individual to alter the timing, but not the expected present value of the cash flow. The tax base would include the purchases of assets, but would exempt all returns from assets from tax.

The use of cash flow accounting of financial asset transactions to compute the tax base is illustrated, for an average wage earner, in the following example. Suppose a worker earns \$30,000 per year in wages, of which he uses \$28,000 for personal consumption and \$2,000 for saving. Under the consumption tax, the worker could deduct \$2,000 from his \$30,000 of wages, if he had deposited the \$2,000 in a qualified account. Under modified consumption tax, the

worker could also deposit \$2,000 of his \$30,000 of annual wages in a a qualified account. However, the entire \$30,000 of wage receipts would be included in his tax base in the initial year, but any future interest earned on the savings deposit and any withdrawal of the principal would be excluded from the tax base.

The flexibility of asset treatment and the use of individual discretion over any year's tax liability would allow both postponement and advancement of tax liabilities. By allowing individuals to avoid taxes totally in some years by rearrangement of asset purchases, these provisions might appear to provide a tax loophole. Because all income cannot be saved, an individual cannot generally escape taxation on most of his earnings. Furthermore, because of graduated tax rates, it would be to the advantage of a taxpayer to try to average his tax base over time. Thus, taxpayers would have an incentive to pay some tax every year, even though the means to postpone the tax is available. With increasing marginal rates, the taxpayer who uses the asset flexibility features of the model cash flow tax to acquire a year of tax-free consumption pays for that privilege. The present value of his tax liability would be increased in either prior or future years by an amount greater than the present value of tax saving in the tax-free year.

The efficiency arguments in favor of the consumption tax are compelling. Recent findings of significant positive estimates of the interest elasticity of saving suggest that

the move to a consumption tax and the subsequent higher, real after-tax return on saving would eliminate substantial welfare losses under the current tax system. As Boskin and Lau [1978] contend, even a modest elasticity of saving with respect to interest has drastic implications for the comparison of income and consumption taxes.

Individual Retirement Accounts

Every tax system involves decisions about taxes on the return to saving and investment incentives. The current tax system is inconsistent in its provisions. As a general matter, it puts substantial tax rates on the earnings from savings. On that account, the economy is biased toward too little saving and too much consumption. But Congress has inserted a number of special provisions intended to spur investment and offset the bias. On the business side, for instance, there is accelerated depreciation for business assets. On the personal side, savings placed in Keogh and IRA accounts receive tax deferral until the time the retirement benefits are paid out. But the overall effect of the saving-investment incentives are inconsistent both in scope and over time.

The existence of the Individual Retirement Accounts provisions is an example of consumption tax treatment of individual savings. IRA contributions are accorded consumption tax or modified consumption tax treatment in order to encourage individual long-term savings. Since

1982, every taxpayer with earned income can establish an IRA. The annual contribution to an IRA is currently limited to \$2,000 or 100 percent of compensation, whichever is less. If a taxpayer with earned income has a spouse with minimal or no earned income, the taxpayer may establish a spousal IRA into which he or she may make annual contributions on behalf of the spouse. The total contribution into both IRAs is limited to \$2,250 or 100 percent of compensation, with no more than \$2,000 paid into either IRA [I.R.C. Sec. 219(b)]. In addition, TRA '86 enacted certain additional limitations on the deductibility of contributions, such as limitations based on income and marital status.¹ Deductible IRA contributions constitute an example of consumption tax while nondeductible IRA contributions constitute an example of modified consumption tax.

Income earned in an IRA is tax-deferred, regardless of the deductibility of the contributions to the IRA [I.R.C. Sec. 408(o)]. When funds are withdrawn² from an IRA, an amount of the withdrawal proportionate to any unrecovered nondeductible contributions in the account is not subject to tax; the balance of the withdrawal is fully includable in gross income [I.R.C. Sec. 408(d)].³

When ERTA made IRAs available on a broad basis for the first time, the chief goal was to encourage Americans to increase personal savings [House Report, 1981] and to provide retirement security. Congress felt that an incentive was needed, since, as shown in Table 1, the rate

of saving in the United States was low relative to savings rates in other industrial countries throughout the world [Johnson, 1985].

In President Reagan's Proposals to the Congress for Fairness, Growth and Simplicity [1985], it was again stated that the use of IRAs for retirement saving should not only be encouraged, but made available on a broad and consistent basis. However, the previously stated purpose of this tax incentive was apparently forgotten or at least very quickly disregarded during the Congressional debates, which led to the enactment of Section 1101 (amending I.R.C. Sec. 219) of TRA '86. So, after only five years of availability to a broad category of individuals, the tax advantages of the IRA were severally curtailed. This attack on IRAs was contrary to both of the previously stated policy objectives, i.e., to increase personal saving and to provide security for retirement years.

In conjunction with the drafting of TRA '86, Congress reversed its opinion on the policy objectives stated in ERTA. With respect to the issue of security, it was felt that the wide ability of the option to make elective deferrals under cash or deferred arrangements and tax-sheltered annuities reduced the concern that individuals in qualified plans should be able to deduct additional amounts for retirement on a discretionary basis [House, 1986; Senate, 1986]. Another argument in favor of limiting the

TABLE 1

Personal Saving in Selected Countries

Ratio of Savings to Disposable Income (For a discussion of other measurements of savings rates, see for example Lipskey and Kravis [1987].)

<u>Year</u>	<u>U.S.</u>	<u>France</u>	<u>Germany</u>	<u>U. K.</u>	<u>Canada</u>	<u>Japan</u>
1970	8.0	16.7	14.6	9.3	5.3	18.2
1978	6.1	17.5	13.3	12.1	10.8	20.6
1979	5.9	16.2	13.9	12.4	11.3	18.7
1980	6.0	14.7	14.2	14.8	12.1	19.2
1981	6.7	15.6	14.9	12.5	13.8	19.7
1982	6.2	15.5	14.4	10.8	15.1	17.7
1983	5.0	14.0	13.2	8.4	12.9	17.1
1984	6.1	13.5	13.0	11.9	13.2	16.0
1985	4.5	12.3	12.7	11.3	12.1	16.0
1986	4.3	12.2	13.2	11.0	11.3	NA

Source: The data are from the Statistical Abstracts of the U.S., 1988, p. 435. NA means not available.

IRA was the fact that employer-provided plans were required to meet non-discriminatory rules. Additionally, data showed that IRA utilization was greatest among upper-income taxpayers⁴, which was generally interpreted to mean that those taxpayers who took advantage of the IRA provision would have saved irrespective of the tax incentive. As a result of the prevailing opinion that IRAs were ineffective,

TRA '86 eliminated the IRA deduction for all but the low-income groups and those individuals not covered by an employer-provided pension plan. At the same time, it was decided not to completely abandon the long-standing commitment to provide security for retirement. Therefore, the Senate [1986] suggested that individuals be allowed to make nondeductible contributions to an IRA on a discretionary basis and obtain tax-deferred growth on the funds.

It is estimated that amounts invested in IRAs and Keoghs in 1986 added up to \$303.9 billion, of which IRA assets totaled \$262 billion [EBRI, 1987]. On June 30, 1983, the amount invested in IRAs and Keoghs was \$101 billion [EBRI, 1984]. The attractiveness of the IRA scheme is easily understood when looking at the benefits of tax-deferred growth over a period of time. The cumulative effect of tax-deferred growth on an annual investment of \$2,000 (before taxes of 28 percent) over a 30-year period is illustrated in Table 2.

However, the growth in funds contributed to individual retirement savings plans is not interesting per se. Instead, economic and policy analysis of the effectiveness of IRAs and Keoghs in stimulating individual retirement saving must focus on the extent to which contributions

TABLE 2

Cumulative Effect of Annual Savings

MARGINAL TAX RATE	28.00%		
INTEREST RATE	10.00%		
ANNUAL PRE-TAX CONTRIBUTION	\$2,000		
YEAR	TAX-DEDUCTIBLE IRA (1)	NONDEDUCTIBLE IRA (2)	REGULAR SAVING ACCOUNT (3)
1	\$ 2,000	\$ 1,440	\$ 1,440
2	4,200	3,024	2,984
3	6,620	4,766	4,639
4	9,282	6,683	6,412
5	12,210	8,791	8,314
6	15,431	11,110	10,353
7	18,974	13,662	12,538
8	22,872	16,468	14,881
9	27,159	19,554	17,392
10	31,875	22,950	20,085
11	37,062	26,685	22,971
12	42,769	30,793	26,065
13	49,045	35,313	29,381
14	55,950	40,284	32,937
15	63,545	45,752	36,748
16	71,899	51,768	40,834
17	81,089	58,384	45,214
18	91,198	65,663	49,909
19	102,318	73,669	54,943
20	114,550	82,476	60,339
21	128,005	92,164	66,123
22	142,805	102,820	72,324
23	159,086	114,542	78,971
24	176,995	127,436	86,097
25	196,694	141,620	93,736
26	218,364	157,222	101,925
27	242,200	174,384	110,704
28	268,420	193,262	120,115
29	297,262	214,029	130,203
30	328,988	236,871	141,018

TABLE 2

Cumulative Effect of Annual Savings
Continuation of Table from Previous Page

Assuming a 20 year payout after retirement, the annual withdrawal net of 28 percent tax would be:

(1)	\$27,823
(2)	\$20,637
(3)	\$10,338

constitute new saving, i.e., amounts that would otherwise have been spent on consumption.

Tax Reform and Existing Research

Whether IRAs do increase marginal savings, or simply are a substitute for other forms of saving, was debated in Congress in connection with tax reform. The prevailing opinion was that those taxpayers for whom IRA utilization is the largest would generally have saved without regard to the tax incentive [Minarik, 1984; Halperin, 1985; House, 1986; Senate, 1986; The Congressional Budget Office, 1987; and Tax Analysts, 1987]. Additionally, it was believed that the lower tax rates, which were part of the new tax package, would be adequate to stimulate additional work effort and saving, and consequently would eliminate the need for tax-deductible IRA contributions [Senate, 1986].

TABLE 3

Proportion of Families with IRA Accounts
by Income and Age

Income Interval (\$1,000's)	Age Interval						
	<25	25-34	35-44	45-54	55-64	65+	All
0 - 10	1%	0%	3%	1%	4%	1%	1%
10 - 20	4%	4%	4%	9%	20%	4%	7%
20 - 30	5%	11%	10%	21%	36%	6%	14%
30 - 40	15%	25%	14%	34%	43%	19%	25%
40 - 50	0%	21%	41%	42%	38%	31%	34%
50 -100	0%	33%	51%	53%	75%	36%	51%
100+		49%	66%	79%	65%	58%	65%
All	3%	12%	19%	26%	30%	6%	16%

Source: Venti and Wise [1986a].
The data are weighted to be representative of all families.
The total sample size for this table is 3,205 (year 1983).

Contrary to the prevailing opinion in Congress, recent empirical work suggests that the availability of IRAs has a positive impact on individuals' saving behavior [Hubbard, 1984; Venti and Wise, 1986a; Venti and Wise, 1986b; Venti and Wise, 1987; Collins and Wyckoff, 1988; and O'Neil and Thompson, 1988]. Additional support for this contention is the apparent success of such saving schemes in Canada.

These schemes have been available since 1956 but were greatly expanded and promoted in the early 1970s. It was at that time that the personal saving rates in the United States and Canada, which previously had been very similar, diverged with substantially higher rates in Canada thereafter [Venti and Wise, 1987].⁵

Although few families save through IRAs, most families save very little in other forms either, except housing. Thus, while IRA saving may seem small on average, it may not be so small relative to other saving, especially in the form of other financial assets. The median household saving for all families is \$1,200. For families earning \$30,000-\$40,000 with a head forty-five to fifty-four years old, the median is still only \$4,600 [Venti and Wise, 1987]. Consequently, if the current savings rate is too low the impact of the tax-deductible IRA on personal savings should not be discarded so quickly.

Tax is one of the factors which may affect the rate of return. Consequently, it is of interest to discover the effects of tax incentives on personal savings. All studies do not support the contention that consumption tax treatment of selected savings is the most efficient manner in which to increase personal savings. Becker and Fullerton [1980] reviewed six alternative plans which might be discussed in an effort to increase consumer savings through the personal income tax system. These plans attempted to affect savings through an increase in the real rate of return either by

direct tax cuts on savings or by indexing tax rates against inflation. Ranking the six plans by the size of the gain, results indicated that extensive inflation indexation of the U.S. tax system would yield the largest annual efficiency gain, while increasing allowable pension, Keogh and IRA contributions would yield the smallest gains.

On the other hand, recent empirical work has suggested that tax deferral has a positive impact on personal savings. Venti and Wise [1985, 1986a, 1986b, 1987], Collins and Wyckoff [1988] and O'Neil and Thompson [1988] focused their attention exclusively on the effect of tax benefits in relation to the IRA. Even if other tax incentives may yield a higher annual efficiency gain, the above researchers have found that IRAs do increase household savings at the margin.

The first issue analyzed focused on what determinants enter into an individual's decision to save through an IRA. There were at least two important issues to address in analyzing the determinants of IRA contributions. The first issue addressed what group of individuals contribute to IRAs. Age and income level are two major influencing factors. The fact that higher income taxpayers were more likely to contribute to an IRA is an established fact. In spite of that, Collins and Wyckoff [1988] found that the distribution of participants in IRAs was fairly widespread across age brackets and income levels. Some additional descriptive statistics emerged from the Venti and Wise study [1987a]. The mean age was 37.9 years, after-tax family

income was \$24,400, two-thirds were married and the family size was 3.0, and the individuals had 13.2 years education.

The second issue was that the determinants of whether one contributes at all may be different from the determinants of how much is contributed once an account is established. With respect to the effect of the marginal tax rate as it relates specifically to IRAs, Venti and Wise [1985] found that the rate may have a positive effect on whether to contribute, but did not appear to influence the contribution amount. O'Neil and Thompson [1988] confirmed these findings. O'Neil and Thompson [1988] also found that the presence of interest income was a significant influencing factor, which meant that those individuals already having an established pattern of saving were more likely to contribute to an IRA.

Feldstein and Feenberg [1983] and Venti and Wise [1985] have looked at the extent to which individuals would respond to a tax savings incentive by transferring preexisting assets into the special savings accounts. They found that first-year transfers would exhaust much of the available assets of most taxpayers. In interpreting the revenue losses associated with asset transfers, it is important to bear in mind that they represent a one-time fixed cost of transition to a new system.

Many of those who oppose saving incentives, such as the IRA, do it on grounds of high cost to the government. However, Feldstein and Feenberg [1983] show that the cost

would be small and limited to the transition period from one tax system to another. Further, they state that the true economic cost of this revenue loss is not the revenue loss itself but the much smaller excess burden that would be incurred in making up this lost revenue or that otherwise could have been avoided if the lost revenue had instead been used to reduce some other distorting tax. The corresponding gain is the present value of the perpetual reduction in the excess burden caused by the incorrect mix of taxes on capital and labor incomes. Because this is a comparison of a one-time cost with a perpetual gain in a growing economy, the one-time transition cost is likely to be relatively small.

The issue of particular interest in this study is whether an individual can be induced to consume less and save more as a result of incentives in the form of tax deferrals. Hubbard [1984] directed his research efforts solely at determining whether IRAs and Keoghs increased saving at the margin. The study examined household data to determine whether participants in IRAs and Keogh plans saved more than non-participants.⁶ The results of the study were consistent with both the hypothesis of a substantial interest sensitivity of saving and the hypothesis that much of the contributed funds represented marginal saving. Hubbard was not able to identify an average measure of the

new saving component of contributions due to lack of data on the contributions themselves.

Hubbard also found that the estimated impact of IRA and Keogh variables indicated that households with access to individual retirement savings plans had higher observed ratio of wealth to permanent income. There was almost no impact on saving for the lowest tax bracket; but more substantial effects were found in higher brackets.

Several studies by Venti and Wise have confirmed the results of the Hubbard study. In one of their studies, Venti and Wise [1986b] analyzed the effect of tax-deferred IRAs in the United States on net individual saving. The results suggested that contributions to IRAs represented substantial net saving increases. Were the IRA limit to be increased, only about 10 to 20 percent of the resulting increase in IRA contributions would be taken from other savings; about 50 percent would come from reduced consumption and about 35 percent from reduced taxes.

In another study, Venti and Wise [1987] compared individual IRA contributions with changes in other forms of saving, in particular liquid financial assets. To the extent that IRAs are funded by transfers from previously accumulated assets, other financial assets are the most likely source of funds, at least in the short run. The results indicated that the vast majority of IRA saving constituted net new saving, not accompanied by a reduction in other financial assets.⁷ Collins and Wyckoff [1988] also

found that the major portion of IRA contributions represented an increase in marginal saving.

Interest Elasticity of Savings

There are many methodological difficulties of studying the responsiveness of consumption to the rate of return. This is due to the fact that the expected real return must be measured and the statistical analysis must be performed using time series of observations on total U.S. income and consumption. This methodology requires the assumption that the quantitative relationships among the variables have been unchanged for a long period of time. In spite of these methodological problems, some empirical studies do indicate that individuals' plans for future consumption are sensitive to the after-tax rate of return.

The quantity of consumer goods which can be purchased in the future with a given amount of money will depend on the rate of inflation. Thus, the after-tax return (adjusted for inflation) determines the extra future consumption that a person can have by saving and sacrificing one dollar of current consumption. As an important determinant of the after-tax return, the marginal tax rate is likely to affect this choice. To what extent a reduction in marginal tax will stimulate saving depends on the rate-of-return responsiveness of saving.

In their study, Sinai, Lin and Robins [1983] found that the passage of ERTA and TEFRA had a major impact on the U.S.

economy. Additionally, they found that after-tax interest rates had significant effects on consumption, saving, and business fixed investment. These results lend support to Boskin [1978], who has argued that tax policy has a significant impact on saving through interest rates. Boskin [1978] found a relatively strong relationship between the interest rate and consumption, i.e., lower rates induce consumption. In terms of the relationship between saving and the interest rate, his study indicated that the interest elasticity of saving is about 0.4, implying that a 10.0 percent increase in the interest rate resulted in a 4.0 percent increase in saving. The results of this study were in sharp contrast to most earlier research. Boskin's analysis was an attempt to explain consumption in the years 1929 to 1969 on the basis of a number of variables, including the unemployment rate, household wealth, the inflation rate, and disposable income, as well as the long run expected real after-tax rate of return on saving.

Howrey and Hymans [1978] have criticized Boskin's study, including the definitions of the appropriate variables. They claimed that Boskin's definitions of the real after-tax rate of return were inappropriate. They contended that instead the relevant variable would be the expected real after-tax rate of return, not merely the interest rate. To compute the real after-tax rate of return, the inflation rate must be subtracted from the interest rate. Additionally, since the real after-tax rate

of return may change in the future, the expected rate would be more relevant. For this and other reasons, they argued that Boskin's results were unreliable. In their study, Howrey and Hymans performed a time series analysis similar to the one performed by Boskin, but found no significant evidence of a positive effect on saving. Consequently, Howrey and Hymans concluded that no relationship existed between saving and the interest rate.

Various other studies of the relationship between saving and the interest rate have been published with mixed results. The work of Wright [1967, 1969], Taylor [1971], Heien [1972], Juster and Wachtel [1972], Juster and Taylor [1975], Blinder [1975], Gylfason [1981], and Summers [1982] all reported empirical evidence of an inverse relationship between aggregate consumption and interest rates. On the other hand, Howard [1978] found evidence of a positive relationship between inflation and saving in the United States, but he found no evidence of interest rate effects.

In spite of the controversy with regard to Boskin's methodology, much applied work has utilized Boskin's estimate of an interest elasticity of saving equal to 0.4. Utilizing Boskin's estimate as a benchmark for quantitatively assessing saving responses, Slemrod [1985], estimated that a reduction in marginal rates could be expected to increase saving by less than 2 percent, holding interest rate constant. In spite of the fact that only a small quantitative effect was found, Slemrod did establish a

positive response with respect to savings to changes in marginal tax rates.

Deferred Consumption

An individual has to make a choice between labor and leisure, as well as the choice between present and future consumption. For example, a greater after-tax rate of return may make it more attractive for individuals to work and save for the purpose of increasing their consumption in retirement years.

Consider the options of someone who has an endowment of \$100 to split between saving and current consumption in a two-period model in which future consumption is the only rationale for saving. If the real rate of interest is 10 percent, the person can spend the entire \$100 now, can save it and consume \$110 in the future, or can achieve any intermediate position by saving a fraction of the \$100. Assume that we extend the two-period model to n periods and that the individual wishes to maximize his wealth over the n periods. Further, assume that consumption tax treatment is in effect and that a person chooses to defer consumption until period n at which time the full amount becomes taxable ignoring inflation, he will have

$$m(1+r)^n(1-t) \tag{1}$$

where m is the money saved, r is the interest rate and t the marginal tax rate. The person is in a superior position in

period n if all taxes are deferred until that time rather than imposed on a current basis.

On the other hand, if modified consumption tax is in effect the money saved is taxed currently, but the tax on the rate of return earned on that money is deferred until consumption occurs in period n . Under such a scenario, he will have

$$[(m(1-t)(1+r)^n] - t\{[m(1-t)(1+r)^n] - m(1-t)\} \quad (2)$$

available for consumption in period n . This is less than the amount which would have been available had all taxes been deferred until the time of consumption. However, modified consumption tax treatment is still preferable as opposed to an income tax on both the money saved and on the annual return. In the latter case, the amount available for consumption in period n would be

$$m(1-t)[1+(r)(1-t)]^n. \quad (3)$$

The savings available under a consumption tax would exceed the amount available under a modified consumption tax by

$$([mt(1+r)^n] - mt)(1-t) \quad (4)$$

in period n . Further, the difference between a modified consumption tax and an income tax in period n would be

$$\{[m(1-t)(1+r)^n] - m(1-t)\}(1-t) - \\ \{m(1-t)[1+r(1-t)]^n\}m(1-t). \quad (5)$$

The above equations illustrate that a wealth-maximizing individual would have more of an incentive to save if funds are accorded consumption tax treatment rather than modified

consumption tax treatment. At the same time, modified consumption tax would provide more of an incentive than an income tax.

Many of those who advocate a consumption tax as a complete or partial replacement for the individual income tax believe that the rate of national saving is too low and that saving would increase if it were not subject to tax [Mill, 1921; Fisher, 1942; Kaldor, 1955; Feldstein, 1978]. For each additional dollar saved, potential future purchasing power would be larger under an consumption tax than under an income tax, and households would presumably save more to take advantage of the opportunity to consume more in the future. A contrary theoretical argument can be made, however, that some taxpayers might choose to save less under the consumption tax, because less personal savings would be required to attain a planned level of consumption. Thus each household would be faced with two offsetting influences under the consumption tax, the opportunity to consume more later for each dollar of forgone consumption today, and the need to save less to achieve any given level of consumption later. Minarik [1984] has stated that theory alone cannot predict which force would be stronger and hence whether personal saving would go up or down, so that question must be answered by empirical measurement.

Some of those who believe that IRAs do little to increase savings use the same argument as the opponents of a consumption tax. Their argument can best be shown by an

example. At an interest rate of 10 percent and a marginal tax rate of 30 percent, to achieve \$1 million in retirement saving by age sixty-five would require giving up \$4,377 per year in expenditures for current goods and services beginning at age twenty-five if saving were through a regular account, but only \$1,775 if the saving were through an IRA. Thus, to attain the same level of consumption after retirement, one need forgo less consumption before retirement if saving is done through IRAs.

A counter argument can be made that it is unlikely that individuals will actually reduce their saving because of a higher growth rate achieved by tax-deferral. Such behavior requires them to be highly rational and have a clear view of the future, which are textbook characteristics not found in most humans. In reality, many people allocate their saving, for instance to an IRA, once a year. Having made their spending-saving decision, the funds enter a pool where they become relatively inaccessible. It is difficult to believe that individuals closely follow the amount of earnings in their tax-deferred accounts and reduce their other saving, accordingly [Johnson, 1985].

An income tax applies to income from capital as well as income from labor. A consumption tax effectively taxes only labor income, earnings on investments are free of tax. Although the United States has adopted an income tax, some items such as qualified pension, profit sharing plans, Keoghs and certain IRAs receive consumption tax treatment.

If saving through an IRA does not increase personal savings, then the cost associated with the tax incentive represents funds that could be better spent elsewhere. On the other hand, if a tax-deductible contribution to an IRA increases savings, Congress may not have made a wise decision in eliminating the deduction for the majority of those individuals who are likely to avail themselves of the benefit.

Hypotheses

Drawing from the theory and empirical findings reviewed above, the proposition of this study is that consumption tax treatment of savings would induce individuals to increase their marginal savings. The IRA is the only savings vehicle widely available to individuals, which is subject to either consumption tax or modified consumption tax treatment. As previously noted, consumption tax treatment significantly increases the rate of return for the investor. In fact, an individual who invests through an IRA, and is subject to 28 percent tax and earns a 10 percent return on the investment will have \$656 more after one year if the maximum allowed is invested in a tax-deductible IRA rather than a non tax-favored saving scheme. This means that the individual really earned a 43 percent return for the first year, i.e., a 491 percent increase over the return available if the funds had been invested net of taxes and growth was subject tax on a current basis. Even though taxes will be

imposed at a later date, the effect of compounding will add to the total amount saved. For an individual who wishes to save some money for the retirement years, the rate of return should be very attractive.

The non tax-deductible IRA also offers an incentive, although not of the same magnitude. The investor who invests in this type of IRA will increase his rate of return from 7.2 percent to 10 percent, that is a 39 percent increase. The effect on the rate of return is lower, but over a period of time compounding ensures a larger nest egg. However, due to the loss of the immediate tax-deduction it appears that this type of IRA is less desirable than a tax-deductible IRA, but still advantageous compared to many other types of investments.

The above leads to the following research hypotheses:

- H₁: Consumption tax treatment (including subsidized saving) induces individuals to increase overall saving at the margin relative to a modified consumption tax.
- H₂: Modified consumption tax treatment (including subsidized saving) induces individuals to increase overall saving at the margin relative to an income tax.
- H₃: Consumption tax treatment (including subsidized saving) induces individuals to increase overall saving at the margin relative to an income tax.
- H₄: Consumption tax treatment induces individuals to increase net saving (excluding subsidized saving) at the margin relative to a modified consumption tax.
- H₅: Modified consumption tax treatment induces individuals to increase net saving (excluding subsidized saving) at the margin relative to an income tax.

H₆: Consumption tax treatment induces individuals to increase net saving (excluding subsidized saving) at the margin relative to an income tax.

These six hypotheses were tested in a laboratory setting in order to isolate the variables of interest. Prior research has addressed the issue of an increase in aggregate savings rather than a change in individual behavior. An experimental approach made it possible to examine the issues at the individual level rather than in the aggregate.

Endnotes

¹For taxable years beginning after December 31, 1986, the following rules apply [I.R.C. Sec. 219(g)]:

1. For a taxpayer who is not covered by a qualified retirement plan, the allowable deduction is \$2,000 regardless of income level.
2. For a taxpayer who is covered by a qualified retirement plan, and whose adjusted gross income is below \$40,000 if married and filing a joint return, or \$25,000 for those who are single, the full amount of the annual contribution is deductible.
3. For a taxpayer who is covered by a qualified retirement plan, and whose adjusted gross income exceeds the above limitations, a partial deduction is allowed. Once the adjusted gross income exceeds \$50,000 (married) or \$35,000 (single), no portion of a contribution to an IRA is deductible. However, the deductible portion shall not be reduced below \$200 when a partial deduction is allowed.

²For purposes of computing tax on IRA distributions during a calendar year, all IRA accounts are treated as a single "aggregate" IRA, and it makes no difference whether the individual receives distributions from one account or from several accounts [I.R.C. Sec. 408(d)(2): IRS Notice 87-16 (Q & A D8)].

³Effective for distributions made after December 31, 1986, a 15% tax is imposed on "excess distributions" with respect to an individual during any calendar year. "Excess distributions" generally mean the aggregate amount of retirement distribution in excess of \$150,000, after aggregating all distributions from IRAs and most other types of tax-deferred plans.

⁴See Table 3 for a break down of savings for different income levels.

⁵Increased contributions to Registered Retirement Saving Plans (RRSPs) are being discussed in Canada. The United Kingdom has recently instituted two new tax-deferred saving programs. Similar plans are also available in France and Belgium.

⁶Explanatory variables in determining whether or not to participate included age, number of children under eighteen years of age, permanent income, education, and the ratio of current earnings to permanent income (as a proxy for the ability to contribute). Occupational dummy variables for whether the potential contributor held managerial or a professional position were added to the list above to compose the list of explanatory variables. The product of the estimated probability and the marginal tax rate was a proxy for contribution.

⁷The analysis did not rule out the long run substitution of IRAs for non-liquid assets, housing in particular. However, they believe that there is little possibility of substitution in the short run, which means the results of their study would not be affected. On the other hand, the substitution possibilities are greater over time.

CHAPTER 3

RESEARCH METHOD

As noted in previous chapters, empirical support is emerging to endorse the argument that tax-deferrals on earnings not consumed currently may have a favorable effect on the amount of personal savings. To test the hypotheses set forth in this study, with an emphasis on internal validity, an experimental economics approach was selected. In order to have a valid controlled microeconomy, five precepts must be satisfied [Forsythe, 1986].

1. Non-satiation (or monotonicity of reward). Subjects prefer any increase in the reward medium.
2. Saliency. Subjects have the unqualified right to claim rewards that increase with good outcomes.
3. Dominance. Financial rewards dominate in the experimental market.
4. Privacy. The subjects in an experiment only learn of their own reward structure and outcome.
5. Expected utility. The subjects use the expected utility model to evaluate risky alternatives.

There is no element of risk involved in this laboratory task, so the fifth precept does not affect this particular experiment.

This experiment required subjects to allocate earned points between consumption and saving. The subjects had a

choice among spending points on playing computer games, saving the points and earning a cash reward, or a combination thereof. The consumption alternatives reduced the amount of the potential cash reward, but provided instant gratification to most of the subjects.

The aim of the experiment was to determine whether the subjects could be influenced, by the tax treatment of points earned, to forego the consumption alternative and ensuing immediate gratification in return for a cash payment at the end of the experimental task. The cash reward was paid immediately after the experimental task was concluded. The average amount of cash payment was \$14.04, with a range from \$1.59 to \$25.49. The maximum amount that could be earned was \$32.19. The cash payment satisfied the precept of dominance.

Table 4 further details the amount of cash payment received by the subjects. Table 5 indicates that the subjects felt that the amount of cash payment was adequate, one of the precepts of an experimental economics study.

Subjects

The experimental task was administered during a three week period. The subjects were asked not to discuss the experiment with each other for that period of time. The

TABLE 4

Cash Payment to Subjects

<u>Amount</u>	<u>Number</u>	<u>Percent</u>
\$ 1.59 - \$ 4.99	6	19%
\$ 5.00 - \$ 9.99	6	19%
\$10.00 - \$14.99	7	22%
\$15.00 - \$19.99	2	6%
\$20.00 - \$24.99	9	28%
>\$25.00	2	6%
Total	32 =====	100% =====

subjects consisted of 32 graduate students attending evening classes in the College of Business at the University of Houston.¹ Most of these students worked full-time and held career-oriented positions. Part-time graduate students at an urban university would possess many of the characteristics of those individuals who are likely to save a portion of their earnings. See Tables 6 through 11 for information about age, income, educational background, gender, marital status, and number of children of the participants in this study. Some researchers may still claim that "real" investors may not behave in the same manner as the participants in this study in spite of the similarity in characteristics exhibited by the subjects and

TABLE 5

Adequacy of Cash Payment
as Perceived by the Subjects

<u>Adequacy of Cash Payment</u>		<u>Number</u>	<u>Percent</u>
High	7	16	50%
	6	4	13%
	5	9	28%
	4	2	6%
	3	1	3%
	2	-	-
Low	1	-	-
		32	100%
		32	100%

TABLE 6

Educational Background of Subjects

<u>Degree</u>	<u>Number</u>	<u>Percent</u>
Bachelor's Degree	22	71%
Master's Degree	8	26%
Ph.D.	1	3%
Total	31 ^a	100%
	31 ^a	100%

a 1 subject did not respond.

TABLE 7

Marital Status of Subjects

<u>Marital Status</u>	<u>Number</u>	<u>Percent</u>
Married	16	52%
Single	15	48%
Total	<u>31^a</u> =====	<u>100%</u> =====

a 1 subject did not respond.

TABLE 8

Age of Subjects

<u>Age</u>	<u>Number</u>	<u>Percent</u>
22-25	5	17%
26-30	7	24%
31-35	7	24%
36-40	6	21%
40-55	4	14%
Total	<u>29^a</u> =====	<u>100%</u> =====

Average Age 32.7 years
=====

a 3 subjects did not respond.

TABLE 9

Income of Subjects

<u>Income</u>	<u>Number</u>	<u>Percent</u>
<\$14,999	2	7%
\$15,000 - \$29,999	4	15%
\$30,000 - \$44,999	14	52%
>\$45,000	7	26%
Total	27 ^a =====	100% =====

a 5 individuals did not respond.

TABLE 10

Gender of Subjects

<u>Gender</u>	<u>Number</u>	<u>Percent</u>
Male	16	50%
Female	16	50%
Total	32 =====	100% =====

TABLE 11

Number of Children

<u>Number of Children</u>	<u>Number</u>	<u>Percent</u>
0	18	62%
1	9	31%
2	2	7%
Total	<u>29^a</u> =====	<u>100%</u> =====

a 3 subjects did not respond.

"real" word investors. On the other hand, proponents of experimental economics have not found significant subject pool differences which would bear on the reliability of economic theory [Plot, 1982].

It can be seen from above tables that the individuals who participated in this study have many of the traits that appear to influence savings behavior. Consequently, these individuals would be likely candidates to respond to a saving incentive, and, therefore, may be considered representative of the population of interest.

Task

The intent of the experiment was to determine whether individuals could be induced to reduce consumption and

increase savings if the savings were accorded consumption tax treatment instead of income tax treatment. The task was divided into three segments. Each segment represented a different tax treatment: (1) income tax; (2) consumption tax; and (3) modified consumption tax. The experiment was not an attempt to create tasks and settings which replicated natural tasks and settings, but to create tasks and settings which evoked behaviors that may unfold in natural tasks and settings. Thus, experimental economics provides a mechanism to directly test economic theory as to the tax effects under rigorous and controlled conditions.

The experiment was conducted at the behavioral laboratory in the College of Business at the University of Houston. The experiment was administered by a personal computer, and it took most participants between 1 and 1½ hours to complete the task and the post-test questionnaire. See Appendix A for a copy of the questionnaire. Paper, pencil and a calculator were also provided for each subject.

Before commencing the actual experiment, each subject viewed an eight minute video-taped presentation as an introduction to the experiment. The video-taped presentation ensured that all subjects were exposed to the basic rules of the experimental task. The presentation introduced the key concepts and terms which were to be used during the course of the experiment.

The presentation which was displayed on a video monitor was prepared with the help of colorful computerized text and

images. In the background, a narrator further explained the experimental task. The narrative was done by someone not associated with the experiment in order to avoid the possibility of biasing the subjects. A copy of the narrative is found in Appendix B.

At the end of the video-taped presentation the subjects were asked to review the written instructions carefully before starting the training session on the computer. The instructions generally covered the same material as the video-taped presentation, but provided further detail with regard to the various choices facing the subjects during the experimental task. Appendix C contains the written instructions. The subjects generally found the instructions understandable as evidenced by Table 12.

Both the video-taped and written instructions made it clear that the cash payment would be received immediately after the experiment was over. This satisfied the precept of saliency. Additionally, it was stressed that the amount of cash earned as a result of participating in the experiment would remain confidential. Thus, the precept of privacy was also met. This assured that the privacy precept of an experimental economics study was met.

When the subject was ready, a training module on the microcomputer further familiarized the subject with the experimental task. During this module the subject had the opportunity to go through each segment once in order to try the various consumption and saving options. If the subject

TABLE 12

Understandability of Instructions

Understandability		Video-taped Instructions		Written Instructions	
		<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
High	7	10	31%	11	34%
	6	7	22%	7	22%
	5	6	19%	7	22%
	4	5	16%	5	16%
	3	3	9%	2	6%
	2	1	3%	-	-
Low	1	-	-	-	-
Total		<u>32</u>	<u>100%</u>	<u>32</u>	<u>100%</u>
		=====	=====	=====	=====

so wished, he could repeat the training session a second time. However, after the second training session the experiment began.

The limitation on the number of training sessions was intended to prevent subjects from taking advantage of the consumption choices free of charge. In the absence of a limit on the number of training sessions, a subject could conceivably repeat the training session numerous times in order to choose the consumption options after which he may save all the points during the actual experiment. This

would have distorted the results since activity during the training session had no impact on the results of the experiment.

The three segments were self-contained, so choices made, for example, during the second segment did not affect the results in the first or third segment. Each segment was characterized by a different tax treatment of points saved. Consequently, the rate of return on points saved varied as a result of the tax treatment in effect for a particular segment. Each segment was further divided into eight to ten trials during which the points allotted and the interest rate applied to the points invested varied. The exact number of trials was determined randomly by the computer. The subjects were not appraised of the exact number of trials in order to avoid end-of-the-game effects. The consumption and investment choices, as well as the interest rate applied for a trial, were constant for all three segments. Consequently, the only factor affecting the rate of return was the particular tax treatment, or assessment scheme, in effect.

Each segment had to consist of a minimum number of trials in order that the compounding effect would be sufficiently large and attractive to the subjects. On the other hand, the multitude of trials could not be too numerous, since the task would be too repetitive and the subjects may lose interest. The minimum of eight and maximum of ten trials was decided upon after it was found to

be acceptable in pre-trials. However, a subject would never be exposed to more than 26 trials in total, so for example if one segment had ten trials the other two segments would only have eight. The order of the periods was randomly administered to the subjects, so that fatigue and end-of-the game effects should be evenly distributed throughout the experimental task.

Three different assessment schemes were used as a disguised tax. The points allotted at the beginning of each trial were subject to a 30 percent assessment. The imposition of the assessment meant that the subject could only spend or save points net of such an assessment unless the subject chose to save during a segment when the consumption treatment was in effect. If that was the case, the assessment would be added back to the extent of points invested.

Each subject started out with an endowment of 400 points for each segment. In addition, 600 points were made available at the beginning of each trial. The assessment of 30 percent was subtracted from the 600 points when appropriate. After receiving the 600 points (or 420 net points), the subject was asked to make a consumption versus saving choice with regard to the points. The consumption choice was represented by the opportunity to play a game. Three different games were available throughout the experiment. For each game, four versions or levels of difficulty were made available. The intent behind offering

several games was to make this alternative seem less repetitious in order to remain an attractive option throughout the experiment.

The games were in color and easy to learn. Only the left and right arrow keys were utilized in playing the games. The aim of two of the games, the parachute game and the roadrace, was to survive as many seconds as possible without running into obstacles moving around on the screen. The highest score for each segment was added together in order to arrive at a survival score.² At the end of the experiment, the subject was appraised of how well he had done relative to other individuals who had played the games.³ The survival score was intended to attempt to keep the subject interested in the games throughout the experiment. For those individuals who were not intrigued by computer games, four colorful geometric displays were also made available.

In Table 13 it is shown that on a scale of one to seven, the subjects rated playing computer games a four. On average, the subjects enjoyed the parachute games as much as they enjoyed computer games in general. The roadrace game and the geometric displays found less favor with the subjects. However, the games appear to have been attractive enough to provide an interesting consumption alternative during the experiment.

TABLE 13

Subjects' Enjoyment of Computer Games

Computer Games		Computer Games in General	Parachute Game	Roadrace Game	Geometric Displays
		Number (Percent)	Number (Percent)	Number (Percent)	Number (Percent)
High	7	4 (13%)	7 (23%)	4 (13%)	1 (3%)
	6	1 (3%)	5 (17%)	2 (6%)	- -
	5	8 (25%)	4 (13%)	4 (13%)	2 (6%)
	4	10 (31%)	4 (13%)	4 (13%)	6 (19%)
	3	3 (9%)	1 (3%)	5 (16%)	3 (10%)
	2	- -	1 (3%)	5 (16%)	7 (23%)
Low	1	6 (19%)	8 (28%)	7 (23%)	12 (39%)
Total		32(100%) =====	30(100%) ^a =====	31(100%) ^a =====	31(100%) ^a =====
Average Ranking		4.0 ===	4.0 ===	3.3 ===	2.4 ===

a All subjects did not try all games.

With respect to playing the games, three options were available. Each option carried a different price tag. The higher the cost of the game, the more choices the subject had with regard to which game and level of difficulty he preferred. On the other hand, the low cost option left

some points to save, but the game and the difficulty level was determined randomly by the computer. The options available were as follows:

Option 1: At a cost of 560 points, the subject had the opportunity to choose any game or difficulty level he may prefer. This option would only be available if the subjects had points invested that could be withdrawn in order to cover the difference between the cost and the current net allotment of 420 points. A negative balance was not allowed in the investment vehicles, so if the subject tried to spend more points than available a warning would appear on the screen. The subjects would then be asked to choose a less costly option, one for which enough points were available.

Option 2: At a cost of 420 points, the subject could choose the particular game he preferred, i.e., the parachute game, the roadrace, or the geometric displays. However, the subject could not choose the difficulty level of the game. The computer determined the difficulty level on a random basis.

Option 3: At a cost of 280 points, both the actual game and the difficulty level were presented on a random basis. Consequently, the subject did not know whether he would have the opportunity to play a game, watch a geometric display, or the particular version of the game or geometric display.

The pricing strategy was determined based on experience in pre-trials as well as on a reasonable cash payoff based on the length of time the subjects were involved in the

experimental task. The price of playing a game varied from 21 cents to 42 cents, a price which is comparable with the cost of playing a video game outside the experimental setting.

If an individual chose to save rather than consume, he would have to wait and watch the time ticking on the screen while the points earned interest. Watching the time display, rather than playing a game or watching a geometric display, allowed the subject to save points with the view to maximize the cash reward. At the same time as making the choice to watch the time display or play a game, the subject must also decide between the investment strategies available for that trial.

A second consumption alternative, consisting of payment of a fee to reduce the length of time the subject had to watch the time display on the screen was also available. If a subject chose to save all points for a trial, he had to watch the time display for one minute. For a fee of 105 or 210 points, the subject could reduce the time to 45 and 30 seconds, respectively.⁴ The major reason for the second consumption alternative was to capture any differentiation in behavior of those subjects who had little or no interest in the games or in the geometric displays.

Investment Strategies

Each segment represented a different tax treatment. The tax rate used in this experiment was 30 percent.⁵ The

segments were presented in a random order for each subject. The influence of order effects would then be controlled effectively because every treatment condition would occur at each possible position in the sequence.

The same rate of return was in effect for all segments. The rates varied between 17 and 22 percent⁶ for the ten trials. The rate of return was consistent for the trials for all three segments. For example, the interest rate for the first trial was always 21 percent regardless of which segment was in effect. Consequently, the only element affecting the rate of return was the imposition or absence of a 30 percent assessment.

For experimental purposes, the three segments were referred to as Neptune, Pluto, and Saturn. Neptune represented income tax treatment of points saved. Points could only be saved net of taxes, and interest earned was subject to an assessment at the end of every trial. Pluto represented consumption tax treatment of savings. To the extent a subject saved points, the assessment withheld in the beginning of the trial was added back to the points invested. In other words, the subject received a tax deduction for the number of points invested. Interest earned on the points saved was not subject to an assessment either. Saturn represented modified consumption tax treatment. Points were invested net of an assessment, but interest earned on such points was not subject to an assessment.

Points saved could be invested in one of two funds, Fund A or Fund B. Both funds were available for each segment. Fund A always represented income tax treatment of points saved. Fund B varied depending of which segment was currently in effect. Consequently, in order to obtain consumption or modified consumption tax treatment of points saved, the points had to be invested in Fund B. The existence of two funds would demonstrate that the subjects did understand the differences in assessment schemes and would reduce the possibility that any differentiation in their behavior during the different segments was due to chance alone.

Measurements

The dependent variable was increased savings. The independent variables were the tax treatment of points accumulated in Fund A or B. Two different measures were obtained for the dependent variable. The first measurement was intended to measure the amount of overall savings for each individual in order to determine whether he saved more points when consumption tax treatment was in effect. The second measurement was aimed at learning whether an individual changed his behavior and increased net saving. This measurement was aimed at determining whether an increase in savings would be generated from the government subsidy alone or if the individual actually consumed less.

The first measurement was generated by adding the total amount of points saved at the end of trial eight for each segment. It was assumed that all points were withdrawn and subject to tax at that point in time. The savings of one subject is illustrated in Table 14.

TABLE 14

The First Measurement			
	<u>Neptune</u>	<u>Pluto</u>	<u>Saturn</u>
Points saved at the end of trial 8	6,253	14,074	9,523
Deferred taxes	0	(4,222)	(1,933)
Net points	<u>6,253</u> =====	<u>9,852</u> =====	<u>7,590</u> =====

The second measurement was constructed by computing the net points a subject saved for each trial multiplied by the time value of money. The second measurement did not include points from the original endowment, but only looked at whether a subject would forego consumption out of the periodic allotments in favor of additional savings. It is shown in Table 15 how this second measurement was determined for the same subject as above. The formula would be identical for all three segments, so the computation is only shown for one of the segments. This second measurement does

not reflect any benefits received from the tax-deferral, only the individual's behavior.

The two measurements are aimed at two distinct issues as they relate to increased savings. The first issue is whether overall savings increase and the second issue is whether the individual himself save more and consume less. If the results are not significant for the second measure,

TABLE 15

The Second Measurement

Trial	<u>Segment</u>				
	Net Allotment	Consumption	Points saved	Interest factor ^a	Score
1	420	280	140	1.14 ⁸	399
2	420	0	420	1.14 ⁷	1,051
3	420	0	420	1.14 ⁶	922
4	420	0	420	1.14 ⁵	809
5	420	0	420	1.14 ⁴	709
6	420	280	140	1.14 ³	207
7	420	0	420	1.14 ²	546
8	420	0	420	1.14	479
Total	<u>3,360</u> =====	<u>560</u> ====	<u>2,800</u> =====		<u>5,122</u> =====

a Expected interest rate net of 30 percent tax.

it could mean that the increase in marginal saving is generated by a tax subsidy and not by a change in individual behavior.

Endnotes

¹A request for volunteers was made in several MBA evening classes. Forty-two individuals originally volunteered but, four individuals could not be reached and four individuals did not show up. In all, thirty-four individuals took part in the experiment. Two individuals failed the manipulation checks in the post-test questionnaire and were therefore excluded from the study.

²The justification for adding the highest score from each segment was to make the consumption choice equally attractive throughout the three segments.

³The score was divided into quartiles based on the results of those individuals who participated in the pre-trials.

⁴The length of the time-displays were based on the reactions from subjects who went through the pre-trials.

⁵Based on a random sample of approximately 135,000 returns over a four year period (1979-1982), it was found that most IRA contributions are made by individuals whose marginal tax rate was equal to or greater than 30 percent [O'Neil and Thompson, 1988]. Galper and Byce [1986] had similar results for 1984. Additionally, a 30 percent rate is representative of the rate structure in effect for 1988.

⁶The returns used were as follows:

<u>Trial</u>	<u>Rate of Return</u>
1	21 percent
2	22 percent
3	17 percent
4	20 percent
5	20 percent
6	17 percent
7	21 percent
8	22 percent

The returns were based on the small stock index for the years 1980-1986 [Ibbotson and Associates, 1987].

CHAPTER 4

RESEARCH RESULTS

This study hypothesized that individuals will increase their savings and forego consumption if the funds saved receive favorable tax treatment. A consumption tax imposed on income less money saved would increase the rate of return on funds invested. The increase in rate of return would be due to the tax deferral received on the initial amount of savings and the rate of return generated from such savings. A modified consumption tax would not relieve the individual from payment of taxes on the original amount of savings, but would provide current growth on savings free of tax. It should be noted that either form of consumption tax is only a deferral and not an exemption from taxes. Taxes would be paid on all deferred amounts not previously taxed upon withdrawal from the investment vehicle in favor of consumption.

There were six hypotheses of interest in this study.

- H₁: Consumption tax treatment (including subsidized saving) induces individuals to increase overall saving at the margin relative to a modified consumption tax.
- H₂: Modified consumption tax treatment (including subsidized saving) induces individuals to increase overall saving at the margin relative to an income tax.

H₃: Consumption tax treatment (including subsidized saving) induces individuals to increase overall saving at the margin relative to an income tax.

The first three hypotheses addressed the issue of whether or not an individual's total savings would increase as a result of the tax deferral obtained on points saved in this experiment. This is of interest since an argument is sometimes raised that individuals may actually save less since it takes less of their own money to reach the same goal as if the savings were subject to current income taxation. If that was true, overall savings would remain relatively constant.

If overall savings would increase, is it still possible that the subjects did not actually change their behavior. It is conceivable that an increment in the points saved is achieved only as a result of the higher rate of return obtained due to the tax deferral. This would mean that the increased savings would result from a government subsidy and not from any significant change in behavior on the part of the individual. However, if the subjects in this experiment would save more points under consumption tax treatment than income tax treatment, it may be indicative of the subject's willingness to forego consumption if taxes on savings were postponed. The fourth, fifth, and sixth hypotheses addressed this issue.

H₄: Consumption tax treatment induces individuals to increase net saving (excluding subsidized saving) at the margin relative to modified consumption tax.

- H₅: Modified consumption tax treatment induces individuals to increase net saving (excluding subsidized saving) at the margin relative to an income tax.
- H₆: Consumption tax treatment induces individuals to increase net saving (excluding subsidized saving) at the margin relative to an income tax.

Even if the total number of points saved by each subject was larger when consumption tax or modified consumption tax treatment were in effect than when income tax treatment was in effect, it is still possible that the subjects did not actually change their behavior. A significant effect for the first measurement would indicate an overall increase in savings, but would not indicate whether the subjects reduced consumption in order to increase savings. On the other hand, if the subjects saved more of the after-tax points in the experiment, it would reflect an actual change in the behavior to forego consumption in favor of additional savings in the experimental setting. Consequently, a significant effect for both measurements would indicate that the increment in savings would not only come from a government subsidy¹, but also from a decrease in individual consumption.

Repeated-Measures Design

The data obtained from the experiment are analyzed using a repeated-measures design. Such a design is appropriate to measure differences between treatments where large individual differences exist.

There are several potential problems that may adversely affect the internal validity of repeated-measures designs. Notable among them are fatigue, carry-over effects, and practice effects. In an experiment of short duration, as in this particular case, the problem of fatigue should be minimal. Likewise, carry-over effects would be more of a problem in a study where the treatments had a lasting effect on the subjects. Perhaps the largest risk would be that of a practice effect. Even though the subjects went through a training session, it is possible that some subjects took additional time to understand the benefit of tax deferral. The fact that the order of the treatments was randomly determined should minimize this problem. If a considerable practice effect influenced the outcome of the experiment, it should manifest itself in an order effect, and none was found.²

From a statistical frame of reference, the univariate repeated-measures design suffers from a serious disadvantage because the validity of the F ratio is predicated on stringent assumptions that are often not met. The problems stem from the fact that, unlike the completely randomized designs, the residuals in repeated-measures designs tend to be intercorrelated because the same subjects are measured repeatedly. Nevertheless, it has been shown that when certain conditions are met, the F ratio is still valid. A sufficient condition for the validity of the F ratio is that the covariance matrices possess the property of compound

symmetry. This means that the variances of all the variables within a group are equal, as are the correlations among all the variables. The absence of the conditions for a valid F test results in increases in Type I error. That is, while the researcher may think that the alpha level is, say .05, it may be in fact larger. Therefore Greenhouse & Geisser [1959] have proposed the use of a conservative F test when the conditions for the validity of the F test are not met. Others [for example Bock, 1975; Davidson, 1972; Finn, 1969; McCall & Appelbaum, 1973; Poor, 1973] have advocated that multivariate analysis, which has fewer underlying assumptions be used in repeated-measures designs.

Sample size is a function of power, alpha, and effect size. Cohen [1969] suggests some guidelines for determining an adequate sample size. According to Cohen, alpha is often set at .05 and power at .8, for the trade-off between Type I and Type II errors, in behavioral studies. A large size effect ($d = .8$) is desirable due to the design of this particular study where the cost of consumption was set at fixed levels. The required sample size to meet the above criteria is twenty-six subjects, which is less than the thirty-two subjects who participated in the experiment.

As explained in the preceding chapter, two different measures were computed for each subject. The first indicated whether overall savings were increased as a result of consumption or modified consumption tax treatment. This first measure was directed to test H_1 , H_2 , and H_3 . This

measure took into account both the individual's behavior as well as the government subsidy of the funds invested. The second measure, aimed to test H_4 , H_5 , and H_6 , was considerably more restrictive and only looked at whether the individual saved or consumed the funds that would be available to him on an after-tax basis. Consequently, the compounded growth as a result of the government subsidy was not included in the second measurement.

Only the first eight trials of each segment were analyzed since this was the minimum number of trials to which each subject was exposed. The data from thirty-two out of the thirty-four subjects were included in the statistical analysis. Two subjects were excluded since they failed the manipulation checks in the post-test questionnaire.

Data Analysis

Three assumptions are underlying the use of a one group univariate repeated-measures design. These assumptions may be referred to as normality, compound symmetry, and additivity. Normal probability plots indicated that the distribution for the variables approximated a normal distribution.

Next, the assumption of compound symmetry was tested. The Anderson [1958] test for sphericity was utilized. The test was significant at the .01 level, so the assumption of compound symmetry was rejected. Last, Tukey's [1949] test

of additivity was performed for the variables to determine whether the subjects had interacted with the treatments and whether the use of the additive model was suitable. The results of these tests indicated that the assumption of no interaction was rejected at the .01 level. Consequently, the use of an additive model is not suitable for this experiment.

The assumptions of normality and circularity have been shown to be robust with respect to violations [Kirk, 1982]. In addition, a conservative measure developed by Greenhouse and Geisser [1959] adjusts the numerator and denominator degrees of freedom to control for the correlation among the repeated-measures. However, the issue of additivity is more problematic.

Both univariate and multivariate analyses were conducted for purposes of comparison. However, a multivariate approach was adopted since the data did not meet all the underlying assumptions for univariate tests. Additionally, there is some question with respect to the appropriateness of univariate tests for repeated measures designs [Bock, 1975; Davidson, 1972; Finn, 1969; McCall & Appelbaum, 1973; Poor, 1973].

The only assumption underlying a single factor multivariate design is that of normality. For the multivariate test procedures to be valid, the dependent variables must follow a multivariate normal distribution. Very little is known about violations of this assumption

[Harris, 1975]. Statistical tests based on sample data for the appropriateness of the assumption of multivariate normality are fairly complicated and power calculations are not exact [Karson, 1982]. Due to the difficulties involved in testing the assumption of multivariate normality and the fact that little is known about violations of these assumptions, the univariate normality was tested for each repeated measure as suggested by Srivasta and Carter [1979]. It was found that the variables approximated normality.

The results of the multivariate analysis for the dependent variable indicated a significant main effect of the consumption tax treatment vis-a-vis income tax treatment for both measures employed in the data analyses. This implied that there were differences in savings behavior depending on whether or not savings were subject to current taxation. For the first measurement of overall savings, the differences in the means were found to be significant at the .01 level. See Tables 16 and 17 for additional details.

Because a significant main effect was found for an increase in overall savings, multivariate contrasts were conducted among the tax treatments. A significant difference was found at the .01 level between consumption tax treatment and income tax treatment and consumption tax treatment and modified consumption tax treatment. The difference between modified consumption tax treatment and income tax treatment was significant at the .05 level (see

TABLE 16

Cell Means and Standard Deviations
of Overall Savings

<u>Tax Treatment</u>	<u>Mean</u>	<u>Standard Deviation</u>
Income Tax Treatment (Neptune)	3,903	2,559
Consumption Tax Treatment (Pluto)	5,923	2,883
Modified Consumption Tax Treatment (Saturn)	4,382	2,756

Tables 18 and 19). These results provided support for the first three hypotheses in this particular study. It was found that the subjects saved more points when either type of consumption tax treatment was in effect, and that consumption tax provided more of an incentive than modified consumption tax.

The second measurement also found differences between the means, which indicated a significant main effect at the .05 level. See Tables 20 and 21 for details. Because a significant main effect was found for the second measurement, multivariate contrasts were conducted.

TABLE 17

Univariate and Multivariate Tests
of a Marginal Increase in Overall Savings

Source	df	Sum of Squares	Mean Square	F Value	Probability
Tax Treatment	2	69,868,698	34,934,348	23.85	0.0001 ^a
Error	62	90,823,561	1,464,896		
Wilks' Lambda Criterion	2 30			13.92	0.0001

a With the Greenhouse-Geisser adjustment, the probability is 0.0001.

For the second measurement, addressing a change in individual behavior, a significant difference was found ($p = .0063$) between consumption tax treatment and income tax treatment and between consumption tax treatment and modified consumption tax treatment ($p = .0135$), but no significant difference was found between modified consumption tax treatment and income tax treatment ($p = .1741$). The fourth and sixth hypotheses were thus supported, but no evidence was found for the fifth hypothesis. The subjects did change their saving behavior in response to consumption tax, but not in response to modified consumption tax. See Tables 22 and 23 for additional details on the statistical analysis.

TABLE 18

Multivariate Contrasts Between Consumption Type Tax and Income Tax Treatment of Overall Savings					
Source	df	Sum of Squares	Mean Square	F Value	Proba- bility
Consumption Tax Treatment (Pluto)	1	127,428,639	127,428,639	27.19	0.0001
Error	31	145,290,932	4,686,804		
Modified Consumption Tax Treatment (Saturn)	1	6,790,534	67,905,345	5.48	0.0258
Error	31	38,408,735	1,238,991		

TABLE 19

Multivariate Contrasts Between Consumption Tax and Modified Consumption Tax Treatment of Overall Savings					
Source	df	Sum of Squares	Mean Square	F Value	Proba- bility
Consumption Tax Treatment (Pluto)	1	75,386,921	75,386,921	26.33	0.0001
Error	31	88,771,015	2,863,581		

TABLE 20

Cell Means and Standard Deviations
of An Individual's Savings Behavior

<u>Tax Treatment</u>	<u>Mean</u>	<u>Standard Deviation</u>
Income Tax Treatment (Neptune)	2,767	2,564
Consumption Tax Treatment (Pluto)	3,708	2,299
Modified Consumption Tax Treatment (Saturn)	3,040	2,595

TABLE 21

Univariate and Multivariate Tests
of An Individual's Savings Behavior

<u>Source</u>	<u>df</u>	<u>Sum of Squares</u>	<u>Mean Square</u>	<u>F Value</u>	<u>Probability</u>
Tax Treatment	2	14,999,020	7,499,510	6.81	0.0021 ^a
Error	62	68,305,583	1,101,702		
Wilks' Lambda Criterion	2 30			4.28	0.0232

^a With the Greenhouse-Geisser adjustment, the probability is 0.0050.

TABLE 22

Multivariate Contrasts Between Consumption Tax
and Income Tax Treatments
of An Individual's Savings Behavior

Source	df	Sum of Squares	Mean Square	F Value	Probability
Consumption Tax Treatment (Pluto)	1	28,333,510	28,333,510	8.60	0.0063
Error	31	102,150,892	3,295,190		
Modified Consumption Tax Treatment (Saturn)	1	2,384,382	2,384,382	1.93	0.1741
Error	31	38,201,695	1,232,312		

The results support five of the six hypotheses in this study. Consumption tax receives a favorable response from the subjects and they are willing to consume less and save more. Modified consumption tax treatment leads to higher overall savings, but at the expense of the government and not the individual.

To determine whether any of the above results were affected by the order in which the subjects encountered the three different tax treatments, further investigations

TABLE 23

Multivariate Contrasts Between Consumption Tax
and Modified Consumption Tax Treatments
of An Individual's Savings Behavior

Source	df	Sum of Squares	Mean Square	F Value	Probability
Consumption Tax Treatment (Pluto)	1	14,279,168	14,279,168	6.86	0.0135
Error	31	64,564,162	2,082,715		

were made. The data was analyzed once again using the same statistical techniques employed previously, but comparing differences among the means of both the measurements for order rather than tax effects. Table 24 reports the results, which indicate that no significant order effect could be detected for individual behavior ($p = .1179$).

Thus, it appears that individuals do respond to savings incentives through the tax system. The outcome of this experiment supports the results of previous studies, which have shown that savings increase at the margin if the funds put aside are not taxed currently. Additionally, this study shows that it is possible to induce individuals to save more and consume less.

TABLE 24

Univariate and Multivariate Tests
for Order Effects
for Individual Savings Behavior

Source	df	Sum of Squares	Mean Square	F Value	Probability
Order	2	1,419,487	709,743	2.13	0.1280 ^a
Error	62	352,294,127	6,074,037		
Wilks' Lambda Criterion	2			2.03	0.1490

a With the Greenhouse-Geisser adjustment, the probability is 0.1291.

Endnotes

¹A government subsidy in the form current tax savings. A government subsidy is equivalent of subsidized saving in this experiment.

² See Table 24.

CHAPTER 5

CONCLUSIONS

Personal savings are low in this country. Many feel [see for example Feldstein] that this is a trend that needs to be reversed. Advocates of consumption tax believe that the substitution of a tax on consumption rather than income would lead to higher savings. A complete overhaul of the U.S. tax system is unlikely. A more realistic option is an imposition of consumption tax on certain savings.

Only two countries to date have tried an unlimited consumption tax, India and Sri Lanka, with disastrous results. The problems encountered by those two countries may be partly traced to the inefficient enforcement and collection system that exist in those countries [Graetz, 1979]. Having an unlimited consumption tax also causes problems in the world today where so many investment and business transactions are global in nature. It would be difficult to coordinate a consumption tax with the tax system of other countries.

A limited consumption tax may prove to be a useful tool in encouraging more savings. Under the current system of taxation, we already have a hybrid system. Most types of income are subject to income taxation, but certain pension

schemes enjoy the benefits of consumption taxation. The only scheme available to a majority of individuals, and over which individuals have a large amount of latitude is the Individual Retirement Account, which has been available to a large segment of the population since 1982.

There is some evidence that the existence of IRAs have encouraged some individuals to increase their savings rate. There are many problems in ascertaining the extent to which deferral of taxation does influence individuals' savings behavior. Studies to date have emphasized the increase in aggregate savings since the inception of the IRA. Actual changes in individual behavior have not been explored. This study was aimed at determining whether it is possible to offer an inducement that is attractive enough to individuals to save more and consume less. More specifically, the effects of substituting a consumption tax for an income tax on personal savings was investigated in this study.

A study aimed at investigating individual behavior could best be executed in a laboratory setting where the variables of interest could be isolated and multiple tax treatments could exist simultaneously. Three tax treatments were introduced: (1) income tax treatment; (2) modified consumption tax treatment; and (3) consumption tax treatment. It was hypothesized that the subjects would forego the consumption alternatives and save the most while consumption tax treatment was in effect, and the least while income taxation treatment was in effect.

The results of this study have added valuable insights into the issue of whether individuals can be induced to change their behavior in response to various tax incentives, such as the IRA. It was found that in the task to which the subject was exposed, there was a difference in savings rate depending on the tax treatment. The subjects saved more of their points when consumption tax treatment was in effect. Further, not only did overall savings increase under consumption tax treatment, but it was not merely as a result of a government subsidy, but also due to less consumption and more savings on the part of the subject. Consequently, the data indicated an actual change in the subject's behavior.

The difference between consumption and modified consumption tax was also significant both with regard to overall savings and change in behavior at the individual level. The benefit of modified consumption versus income tax treatment was less evident. Overall savings did increase, but it could not be attributed to a significant change in individual behavior. Consequently, consumption tax treatment was perceived as a considerably more attractive savings incentive than modified consumption tax treatment.

If individuals can be induced to change their behavior in a laboratory setting, it is possible that the same may hold true with respect to taxdeductible IRA contributions. Recent empirical work specifically examining taxdeductible

IRAs [see for example Venti and Wise, 1985, 1986a, 1986b, 1987; Collins and Wycoff, 1988] have found this to be the case. The recent empirical findings are in contrast to earlier studies, which suggested a lack of response to changes in rate of return [see for example Howrey and Hymans, 1978]. On the other hand, non taxdeductible IRA contributions may be less of an incentive based on the actions of the subjects in this experiment.

The results from the current study further underscore the fact that tax incentives can induce changes in individual saving behavior. Additionally, the outcome of this experiment supports the recent findings that tax incentives such as the taxdeductible IRA has a positive impact on individual savings behavior. The studies indicating a positive response to IRAs appear not to have been discussed in Congress in connection with the Tax Reform Act of 1986. In view of mounting evidence that consumption tax treatment does increase marginal savings, Congress should reexamine the issue and establish an coherent and consistent policy with regard to the tax treatment of long-term individual savings.

Additional Observations

Some additional observations that may be of interest emerged from the analysis of the data. It was found that some subjects were very much consumption oriented and changed little no matter which tax treatment was in effect.

The other extreme was also evident among some of the subjects who barely differentiated, if at all, among the treatments. Obviously, they preferred to save their points and receive a cash payment at the end of the experiment. However, for those subjects who were less extreme in their behavior, the different tax treatments appeared to be more effective. Overall, the subjects preferred to consume rather than save. The subjects did indicate on the post-test questionnaire that they thought that the cash payment was adequate for the time involved, so presumably the preference for consumption did not occur as a result of lack of monetary incentive.

Generally, the subjects were reluctant to pick the consumption choice where the cost exceeded that of the 420 points allotted to them each trial. That kind of behavior may indicate that they were more reluctant to dip into savings than they were to consume out of current income. In spite of that, it was also noted that few of the subjects transferred the original endowment from Fund A to Fund B. An income tax was always imposed on points invested in Fund A irrespective of the tax treatment in effect for Fund B. Consequently, whether a subject was consumption or savings oriented, a wealth-maximizing individual would invest all savings, including the original endowment, in Fund B (except during the income tax treatment when the tax schemes of both funds were identical). The fact that the majority of subjects (even those who were primarily savings

oriented) did not transfer the original endowment from Fund A to Fund B may indicate a lack of thorough understanding of the effect current taxation has on the rate of return over a period of time.

There are other aspects of saving through an investment vehicle that need to be investigated. For example, limitations on contributions, early withdrawal penalties, and restrictions on types of investments are worthy of further investigation. It has been said that one of the largest challenges facing the new Bush administration is to increase national savings [Bacon, 1988, p.1]. If it is true that personal savings have entered into an era of irreversible decline, individuals may need an incentive such as the consumption tax.

Limitations

Laboratory experiments make it possible to learn about behavior in a controlled setting. This kind of experimental design stresses various aspects of internal validity, but lacks external validity due to the obvious limitations imposed by such a design. Consequently, five major limiting factors with respect to the results should be considered.

First, this experiment was designed to test a theory, and not savings accorded consumption tax treatment by the current tax law. Caution must be exercised in attempting to draw specific inferences with respect to actual savings

through an Individual Retirement Account or Keogh from these results.

Second, this experiment measured whether a subject can be induced to save instead of consuming by manipulating the growth rate of accumulated points and according saved points consumption-tax treatment. The subjects allocated points and not real money, so it is possible that they acted in a manner which is not consistent with their regular consumption versus saving decisions. However, the four precepts necessary for a valid and controlled microeconomy were satisfied in this experiment. The cash reward was deemed adequate by the subjects, the individual amounts paid were not publicly disclosed, and the cash payment was made directly after the experimental task was completed. The design of the experiment also assumed that the precept of non-satiation was satisfied.

Third, a 30 percent tax rate was adopted in this research design. A 30 percent tax rate is reasonable in view of the existing marginal rate structure. Historically, this is a rather low rate so if individuals responded at this level a higher tax rate may have resulted in an increased positive response. However, caution should still be exercised in generalizing these results to other tax rate levels, particularly to tax rate levels considerably different than those chosen for this experiment.

Fourth, the results are valid with respect to the thirty-two individuals represented in the experiment and may

not generalize to the population as a whole. The subjects had income levels and were of an age group similar to that of individuals who may respond to tax incentives. Consequently, the subjects exhibited many of the characteristics of individuals who are likely to take advantage of saving incentives.

Fifth, the growth in savings was limited due to a limited time-span of the experiment. Each tax treatment was in effect for eight to ten periods, so the growth and compounding effects were subject to time constraints. The benefits of consumption tax treatment becomes larger the longer period of time the funds remain invested. The effects of tax deferral is much more noticeable after a twenty to thirty year period than an eight to ten year period. In this experiment, the participants were treated as if they had to withdraw their funds in a lump-sum after a maximum of ten growth periods. In spite of this limitation, the subjects responded favorably to consumption tax treatment.

Future Research

Although several recent studies have indicated an increase in aggregate savings, none of these studies investigated the effects of consumption-tax treatment at the individual level. This study contributes an additional element to the research in this area by finding evidence that individuals can be induced to consume less and save

more as a result of tax incentives. Further, this study indicates that the increase in marginal savings can in part be attributable to a change in individual behavior and not only at the expense of a loss of current revenues to the government.

Based on the results of this study, future research can take two major directions. First, additional knowledge may be gained by conducting other experiments. Related areas of interest such as the effect of retirement savings and early withdrawal penalties on the personal saving rate lend themselves to the experimental approach. Second, field studies may generalize some of these results and investigate some related issues not easily investigated in an experimental setting.

The continuous decline in personal savings has been blamed on the existence of social security and pension funds that are available to many workers. It would be worthwhile to attempt to find some evidence for such claims, and to determine to what extent established benefits for old-age affect the nation's savings rate. Such a study could be conducted in an experimental setting. One way to attempt to test the theory that existing retirement benefits affect the nation's saving rate would be to divide subjects into two groups. Before the start of the actual experiment, the subjects in one of the groups would receive cash while the subjects in the other group would start the task without an initial cash payment. Additional cash could be earned

during the experiment. By comparing the saving rate between the two groups, it may be possible to discern some differences in saving behavior as a result of the initial cash payment.

Another interesting issue would be to examine the effects of early withdrawal penalties. On one hand, arguments have been made that such penalties reduce investment in tax-deferred savings vehicles, but on the other hand, it has been suggested that early withdrawal penalties discourage individuals to withdraw existing savings. An experiment may cast some light on this issue. An experimental task similar to the one in this study could be used to investigate the affect of an early withdrawal penalty. One group would be subject to the penalty while the other group would not be affected by that same penalty.

Because of the inherent limitations of generalizability from an experimental study, further knowledge may be gained by investigating actual behavior in a field study. It would be interesting to learn whether some of those individuals who contributed to IRAs prior to TRA'86 continued to do so for 1987 and 1988 and how many of those obtained a tax deduction for the amount contributed. If they did not continue to contribute, did those funds go into other forms of investment vehicles? Additionally, it would be interesting to study the effects of an individual's wealth, income and age on savings decisions.

Another area where a field study could possibly be beneficial is with regard to the trade-offs between investments in liquid and illiquid assets. Most studies investigating savings incentives equate savings with liquid savings. It is possible that some individuals put all available funds into a residence rather than saving through an IRA. Home ownership generally does generate some tax savings for the individual, even though the amount of tax benefit has been reduced after TRA'86 due to lower tax rates and a larger standard deduction. Additionally, upon sale of a residence after the age of 55, up to \$125,000 [I.R.C. Sec. 121] of deferred gains escape taxation entirely. The reason for scarcity of research in this area can to a large extent be attributable to the lack of data to measure the trade-offs between liquid and illiquid assets. A field study may be able to cast some light on the trade-off between liquid and illiquid savings.

The low level of individual savings in the United States is of considerable concern to many economists and policy makers. This study shows that tax incentives affect the individual saving rate. Consequently, additional research relating to tax incentives and their impact on individual savings merits further investigation.

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APPENDIX A

POST-TEST QUESTIONNAIRE

Please, circle the most appropriate answer to the questions below.

1. Do you enjoy computer games?

Not At All							Very Much
1	2	3	4	5	6		7

2. How much did you enjoy the parachute game?

Not At All							Very Much
1	2	3	4	5	6		7

3. How much did you enjoy the roadrace game?

Not At All							Very Much
1	2	3	4	5	6		7

4. How much did you enjoy the geometric displays?

Not At All							Very Much
1	2	3	4	5	6		7

5. How understandable were the video-taped instructions to the experiment?

Not Under- standable							Very Under- standable
1	2	3	4	5	6		7

6. How understandable were the written instructions to the experiment?

Not Under- standable							Very Under- standable
1	2	3	4	5	6	7	

7. Did you at any time prior or during the experiment learn about someone's earnings or survival score?

- a. No
- b. Yes, about someone's earnings.
- c. Yes, about someone's survival score.
- d. Yes, both about someone's survival score and earnings.

8. How was your cash payment at the end of the experiment determined?

- a. By the survival score.
- b. By the total points invested in Funds A and B.
- c. By a combination of survival score and points invested in Funds A and B.
- d. Other, please explain _____

9. How adequate is the cash payment for participating in the experiment?

Not Adequate							Very Adequate
1	2	3	4	5	6	7	

10. To what degree did you try to maximize your survival score?

Not At All							To a Large Degree
1	2	3	4	5	6	7	

11. To what extent did you try to maximize total points invested?

Not At All							To a Large Degree
1	2	3	4	5	6	7	

12. Overall, did you prefer to play the games or invest points during the experiment?

Invest Points							Play Games
1	2	3	4	5	6	7	

13. What was the average growth rate (or rate of return) on invested points during the experiment?

10% 20% 30%

14. What was the rate of the assessment in effect during the experiment?

20% 30% 40%

15. If you wanted to maximize the growth rate of points invested which of the following combinations would you choose?

Fund A (Neptune)	Fund A (Pluto)	Fund A (Saturn)
Fund B (Neptune)	Fund B (Pluto)	Fund B (Saturn)

16. If your investment strategies were different for any of the three segments (Neptune, Pluto or Saturn), please explain why they were different. Please continue your answer on the back of this page, if necessary.

A. Marital status? Married Single

B. Gender? Female Male

C. Age? _____

D. Number of children? _____

E. Educational level? Bachelor's degree Master's degree
 Other _____

F. Please indicate your income by circling the appropriate
category (include your spouse if your are married)..

<\$14,999 \$15,000-\$29,999 \$30,000-\$44,999 >\$45,000

APPENDIX B

Transcript of Video-Taped Instructions

Hello.

You are about to participate in an experiment which requires some decision making on your part. This video-taped presentation is intended as an initial introduction to the experimental procedures. The written instructions cover the same procedures in more detail, and the training session on the computer will further familiarize you with the experiment.

The experiment is divided into three segments. They are referred to as Neptune, Pluto and Saturn. Each segment is independent, which means for example that decisions made while Neptune is in effect will have no impact on Pluto or Saturn.

Each segment is further divided into eight to ten trials. The order in which Neptune, Pluto and Saturn is presented as well as the exact number of the trials is determined randomly by the computer.

For each trial the computer will lead you through a series of steps. At the beginning of each trial you will receive an allotment of 600 points in addition to the original endowment of 400 points. However, the 600 points you receive may be subject to a 30% assessment, which means that only 420 points would be available for you to spend, save or a combination of the two.

You may wish to spend points playing one of the games which the computer will make available to you, or you may prefer to save all or most of the points and watch the time display instead.

Page two of the written instructions describes all the options and sets forth the costs associated with each choice. Please, review this page carefully before starting the experiment.

Points that you save will earn interest during every trial, at a compounded rate. This graph illustrates the maximum number of points that is attainable for a segment after three, six, and ten trials.

The score obtained by playing games is determined by adding the highest score from Neptune, Pluto and Saturn. Your accomplishment in this area is measured by the quartile you fall into. This summary indicates how the quartiles were determined.

As soon as you have completed Neptune, Pluto and Saturn, you will learn what score you achieved by playing the games and how that score compares to that of other individuals who have previously played those same games. You also will see the total points you have invested and how much those points are worth to you in cash. The cash payment, based on total points invested at the end of each segment, will be paid at this time. Please note that all results are confidential. Consequently, no one will learn how you score or the amount of the cash payment you receive for your participation.

Should you have any points left over after having made the decision to play a game or watch a time display, you need to determine how to invest those points. There are two investment vehicles available throughout the experiment, Fund A and Fund B. Both funds pay an average interest rate per trial of 20% before any assessment which may be imposed. This is true for Neptune, Pluto and Saturn.

However, the manner in which the assessment is imposed will vary depending on whether Neptune, Pluto or Saturn is in effect. Please note that the assessment will reduce both the rate of return and the number of points available for investment.

Fund A always imposes the same assessment scheme throughout the experiment. However, this is not true for Fund B, where the assessment scheme will vary depending on whether Neptune, Pluto and Saturn is in effect.

With respect to Fund A, the 30% assessment is levied both on interest earned and the points invested in this fund. It does not matter whether Neptune, Pluto or Saturn is in effect. For Fund B, the rules for imposing assessments vary depending on whether Neptune, Pluto or Saturn is in effect. For Neptune, assessments are imposed both on interest earned and on points invested in this fund. However, for Pluto no assessment is imposed on either the interest earned or points invested. Saturn does not impose an assessment on interest earned but does impose an assessment on points invested in the fund. Page three of the written instructions has a summary of the different assessment schemes in effect during the experiment. You may wish to keep this page readily available during the experiment.

If you are not satisfied with the investment decision you made earlier in the trial, or in previous trials during the same segment, you will have an opportunity to transfer points from Fund A to Fund B or vice versa before the trial is over.

It is now time to review the written instructions. Please note that the last page of the instructions explain how to play the games. When you are ready to start the training session press the letter "S" on the keyboard . The training session consists of three trials, one from Neptune, one from Pluto and one from Saturn. Should you wish you may go through the training session a second time. However, after that the actual experiment will begin. As soon as you are finished, you will receive your cash payment and learn how well you scored. You will then be asked to complete a questionnaire.

Thank you for your attention. Please begin.

APPENDIX C

I N S T R U C T I O N S

INTRODUCTION

You are about to participate in an experiment which requires you to allocate points among various investment funds and computer games. In general, you can invest all available points in one or both of two investment funds, spend points to play one of three different computer games, or choose a combination of these alternatives. At the conclusion of the experiment, you will receive a cash payment based on the total number of points invested in the two funds.

The experiment is divided into three segments.

- * Neptune
- * Pluto
- * Saturn

The three segments are independent. Consequently, decisions made during one of the segments will not affect the outcomes of other segments.

During each trial, you will be asked to choose between the following two alternatives:

- A) Play a game; or
- B) Watch the time display.

ALTERNATIVES

If you choose to play a game, the following three options will be available:

Option 1 (cost of 560 points)

- * Play a game of your choice, and determine the specifics (i.e., you will be allowed to select the level of difficulty or particular version of the game you prefer).

Option 2 (cost of 420 points)

- * Play a game of your choice without determining the specifics.

Option 3 (cost of 280 points)

- * Play a game randomly selected by the computer.

If you choose to watch the time display, the following three investment plans will be available:

Plan 1 (no cost)

- * Watch the time display for one minute.

Plan 2 (cost of 140 points)

- * Watch the time display for 45 seconds.

Plan 3 (cost of 280 points)

- * Watch the time display for 30 seconds.

Irrespective of whether you choose to play a game or watch the time display, you will be asked to invest your net points (after subtracting the cost of playing the games or watching the time display) in funds A and/or B. The points invested in these funds will earn a rate of return between 17% and 24%, with an average rate of return of 20%. Your return on these funds, however, will be subject to various assessments, as shown below.

Fund A

Assessment levied on			
	Points allocated to Fund A	Interest earned on points in Fund A	Points removed from Fund A

Neptune:	30%	30%	None
Pluto:	30%	30%	None
Saturn:	30%	30%	None

Fund B

Assessment levied on			
	Points allocated to Fund B	Interest earned on points in Fund B	Points removed from Fund B

Neptune:	30%	30%	None
Pluto:	None	None	30%
Saturn:	30%	None	30% * points not previously subject to assessment

ALLOTMENT

- * You will start each segment with an endowment of 400 points invested in Fund A.
- * At the beginning of each trial you will be allotted 600 points.
- * An assessment of 30% is levied on each allotment (but not the original endowment).

TRANSFER OF POINTS BETWEEN FUND A AND B

- * For each trial you may invest points available from the current allotment, or withdraw points in order to play a game.
- * Should you not be satisfied with your allocation of points between Fund A and B, you will have one more opportunity to transfer points between the funds in order to increase your payoff. Points can be transferred from Fund A to B or vice versa.

CASH AWARD

- * At the end of the experiment you will be paid cash based on the total number of points you have accumulated in Funds A and B during the experiment.
- * Your cash payment will not be made known to other participants.

SURVIVAL SCORE

- * The success achieved by playing two of the three computer games is measured by survival time. The highest survival score achieved during each of the three segments will be added together.
- * At the end of the experiment you will learn how your survival score compares to that of previous participants.
- * Your survival score will not be disclosed to other participants.

HOW TO START THE TRAINING SESSION

- * You will be exposed to a single trial for each of the three segments (Neptune, Pluto and Saturn).
- * You will have the opportunity to go through the training session a second time, if you wish.
- * The decisions you make during the training sessions will have no effect on the actual experiment.

I N S T R U C T I O N S F O R
P L A Y I N G T H E G A M E S

For those games that require active participation on your part, the following rules apply:

1. The aim of the games is to survive as long as possible without bumping into an obstacle. The game ends at the time you hit an obstacle.
2. The object on the screen can only be moved left and right.
3. To move the object to the left: Press the key on the right part of the keyboard which is identified by the number "4" and <- (a left arrow).
4. To move the object to the right: Press the key on the right part of the keyboard which is identified by the number "6" and -> (a right arrow).

NOTE: Some games do not result in a survival score and do not require active participation on your part.