

# The Behavioral Response of Wealth Accumulation to Estate Taxation: Time Series Evidence

**Abstract** - This paper explores the behavioral response of taxable bequests to estate taxation. To gauge its effects, the estate tax is converted to an equivalent income tax. This highlights the importance of expected rates of return, and also makes it possible to compare effective tax rates on saving over time. Using data on federal revenues from the estate tax over the past 50 years, and employing the equivalent income tax rate measure, the findings suggest that estate taxes have a dampening effect on the reported size of taxable estates. Estate taxation seems to depress taxable bequests by almost ten percent.

## INTRODUCTION

Taxes on capital, by reducing rates of return, may influence saving decisions. As with income taxes that apply to capital gains, interest, and dividends, estate and inheritance taxes may also reduce rates of return (Poterba, 2000). How this reduction in returns affects saving is theoretically ambiguous, and, a priori, depends on the offsetting substitution and income effects.

More specifically, the effects of the estate tax on saving depend on the preferences of the potential saver. In the presence of altruistic bequests, for instance, Caballe (1995) and Laitner (2001) simulate the estate tax to have a depressing effect on the capital stock. Similarly, Gale and Perozek (2001) argue that the effects on saving depend critically on the underlying transfer motives. Ultimately, however, the effect of estate taxation is an empirical question. One is tempted to rely on the findings in the literature on the effects of income taxes.<sup>1</sup> But because bequest taxes apply to the stock of terminal wealth, they may not be directly comparable to the income tax that applies to the return to saving or annual income flows during the life cycle.

The scarcity of data on the size and distribution of wealth spanning different tax regimes, particularly for the wealthiest segment of society, has limited the thorough study of

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<sup>1</sup> For the taxable income response, see Feldstein (1995), Auten and Carroll (1999), Carroll (1998), Gruber and Saez (2002), and Kopczuk (2005). For the effects on savings, see Bernheim (1999).

the effects of estate taxation. Chapman, Hariharan, and Southwick (1996), hereafter CHS, explore how estate taxes affect post-war federal government estate tax revenues. In modeling the effects of estate taxes on wealth accumulation, CHS make creative use of annual time series data on federal estate and gift tax revenues. Lacking individual level data, they regress these annual collections on an imputed contemporaneous measure of the estate tax rate. They report tax rates to have a sizeable negative effect on this source of revenues to the government.<sup>2</sup> A major limitation of this paper is that the dependent variable is the combined sum of estate and gift taxes, two variables that do not always move in tandem and are governed by different tax regimes. Indeed the sharp increase in revenues reported by CHS in fiscal year 1977 has little to do with estate taxes; it is explained by the acceleration of gifts in 1976 with gift taxes paid in 1977 (Joulfaian, 2004).<sup>3</sup>

Moving away from time series data, Holtz-Eakin and Marples (2001) employ the Health and Retirement Survey panel data, where the wealthy are underrepresented, to explore the effect of estate taxes on wealth accumulation. They find estate and inheritance taxes to have a depressing effect on wealth accumulation.

In the most recent study on the effects of the estate tax on wealth accumulation in the US, Kopczuk and Slemrod (2001), hereafter KS, resort to estate tax data for the pre-war period with its frequent law changes, and augment them with limited data for the post-war years.<sup>4</sup> KS pursue two strategies in examining the effects

of the estate tax on wealth. First, they expand on CHS and employ time series analysis using aggregate wealth reported on estate tax returns for the years 1916 through 1945, and select post-war years. Using three measures of the tax rate—the maximum, and those imputed for 40 and 100 times per capita wealth—KS report a negative correlation between the share of top wealth-holders and the estate tax rates. This contemporaneous relationship holds controlling for a number of other influences. A similar sentiment is expressed in Kopczuk and Saez (2004) as they contrast the share of household wealth held by the wealthiest estates with contemporaneous estate tax rates.

In the second strategy, KS resort to pooled cross-sectional analyses that make use of individual estate tax returns. Unlike their time series analysis, the effects of the contemporaneous estate tax rate on the size of reported wealth is weak. However, they find much stronger effects when the tax rate is measured using laws that prevailed at age 45 or ten years before death. The estimates from their preferred specification imply that a tax rate of 50 percent reduces reported wealth by about 10.5 percent.

The cutting edge work of KS in exploring pooled data is quite formidable, particularly when compared to their time series analysis as well as that of CHS. Indeed, it is not clear how to interpret the findings on the effects of contemporaneous tax rates. How does the tax regime in effect at death explain wealth accumulated during life? After all, if the focus is on wealth accumulation, the behavioral response

<sup>2</sup> Tax collections usually lag the liability year. Much of the collections in fiscal year 1977, for instance, reflect wealth and tax liabilities in calendar year 1976. Hence, their specification generally tests whether the tax rate, say, in 1977 affected wealth reported in 1976. In effect, their estimates reflect a forward-looking process, and not a measure of the contemporaneous effects.

<sup>3</sup> The maximum gift tax rate increased from 57.75 in 1976 to 70 percent in 1977. The increase in revenues in fiscal year 1977 predates the reduction of the maximum estate tax rate from 77 to 70 percent.

<sup>4</sup> Generally reliable cross sectional estate tax data are available for deaths in 1982 and most of later years. Reliable data is also generally available for the years 1962, 1969, 1972, and 1976. For prior years, data is available for the period 1917 through 1945.

and estate planning must have preceded the date of death. Thus, KS's analysis of the effects of lagged tax regimes should be viewed as a significant contribution to the literature.

While the analysis in KS represents a significant improvement over the earlier two studies, the reliance on pre-war data should give the reader a reason to pause. Indeed, contrasting trends in wealth accumulation over different periods is quite challenging, in particular as gift taxes did not apply prior to mid 1932.<sup>5</sup> The easiest way to avoid estate and inheritance taxes is through tax-free lifetime gifts, unless this is checked by the imposition of gift taxes. It is noteworthy that during the congressional deliberations in 1932 to increase the maximum estate tax rate from 20 to 45 percent, and the introduction of a gift tax regime, one individual is reported to have made about \$100 million in gifts, and another to have made gifts of about \$50 million (Roosevelt, 1938, 313–4). Considering that the entire yield of the estate tax in 1932 was \$400 million, the tax-free inter-vivos transfers of \$150 million by these two individuals alone, not to mention likely gifts by scores of others, demonstrate the sizeable leakages from the estate tax in the absence of the gift tax. These leakages make intertemporal comparisons a challenging undertaking, and may produce biased behavioral estimates when periods with and without gift tax regimes are included in the same sample (Joulfaian, 2005).

In addition to the gift tax regime, and as noted in Auerbach (2001), relying on pre-war data to aid in gauging the effects of the estate tax can be problematic given the marked difference in economic activ-

ity commonly observed in the pre- and post-war periods. Also, and as argued in Clotfelter (1985, p. 240), given the frequent pre-war changes in tax laws, it is not clear which tax regime is driving behavior. Changes in the definition of residency as well as in the tax base only add to this challenge.<sup>6</sup>

More importantly, and notwithstanding the adequacy of the data or the period examined, the appropriateness of the use of the estate tax rate that applies years into the future—at death—to explain lifetime wealth accumulation has yet to be addressed. Poterba (2000), for instance, demonstrates how the estate tax is potentially more burdensome for the elderly given their mortality risk, and adds to the burden of the income tax.<sup>7</sup> This comparison to the income tax is important in the context of measuring the effects of taxes on saving during life. To expand on this, and formally gauge its effect, this paper develops a measure of the estate tax equivalent income tax rate. This equivalent income tax rate is defined as the rate that applies to the annual return on an asset, which leaves the size of inheritances unaffected. For a given estate tax rate, the equivalent income tax rate is low during periods of high rates of return expectations, and vice versa. The reported evidence using data for the past five decades is suggestive of a stronger estate tax effect when using the equivalent income tax measure instead of the estate tax rate itself.

This paper is organized as follows. The second section provides an overview of trends in estate tax collections by the federal government, and the evolving tax regimes. The third section discusses how the estate tax can be analyzed as an

<sup>5</sup> The federal government introduced a gift tax in 1924 that was repealed in 1926.

<sup>6</sup> The introduction of the US Treasury Liberty Bonds, and, subsequently, Flower Bonds, which may be viewed as a prepayment, albeit at a discount, of estate taxes (bonds as a form of life insurance), further complicates intertemporal comparisons. Similar complications are introduced by the treatment of pensions and annuities.

<sup>7</sup> Poterba employs the 1992 and 1995 Surveys of Consumer Finances and, by applying mortality rates, computes the tax burden among different households.

equivalent income tax. It also describes the data sources and explains the construction of variables. The paper employs data on federal government revenues from the estate tax for the fiscal years 1951 through 2001. The fourth section presents empirical evidence on the effects of the estate tax. A concluding comment is provided in the fifth section.

BACKGROUND

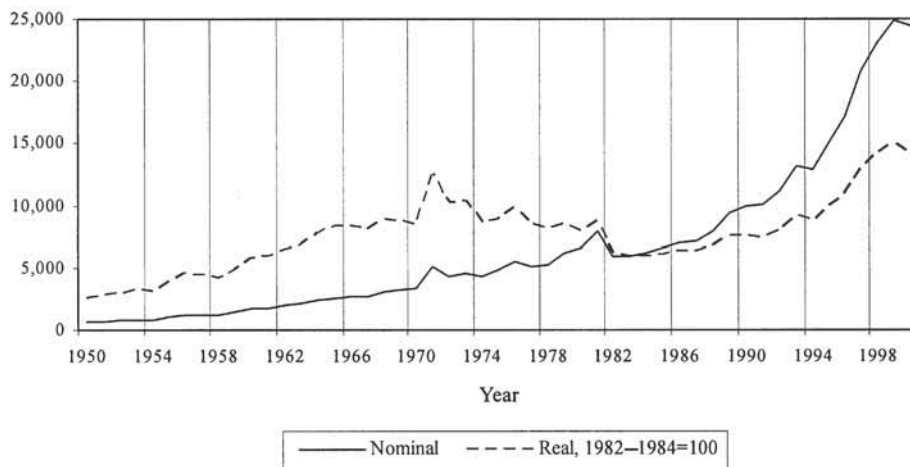
Federal estate tax revenues grew steadily in the post-war period. As shown in Figure 1 and Table 1, estate tax revenues grew from less than a billion dollars in 1950 to \$25 billion in 2000.<sup>8</sup> Real tax revenues grew through the early 1970s, and precipitately declined in the following years. It was not until the late 1990s that the levels experienced in the early 1970s were attained. When stated relative to GDP in Figure 2 or relative to household

net worth as in Figure 3, revenues grew over the years but never regained the peak collections of the late 1960s and early 1970s. On average, estate taxes represent one quarter of one percent of GDP, and less than one tenth of one percent of the Flow of Funds household wealth.

The spike in revenues observed in 1971 is noteworthy, and can be explained by a number of factors. First, the S&P index appreciated by some 18 percent over the previous year. Second, and perhaps even more importantly, the filing requirement of estate tax returns was shortened from 15 to 9 months. This invariably had the effect of accelerating revenues from the future into 1971.<sup>9</sup>

Examining the revenue streams depicted in Figures 1 through 3 is not directly helpful in gauging the effects of taxes on accumulated wealth. In particular, economic growth and the evolving structure of the estate tax make it rather difficult

Figure 1. Federal Estate Tax Revenues (\$millions)



<sup>8</sup> Again, these actually refer to fiscal years 1951 and 2001. Tax collections usually lag liabilities, reflecting filing requirements. Estate tax collection data is obtained from the IRS *Annual Report of the Commissioner* (various years a) as well as the IRS *Data Book* (various years b).

<sup>9</sup> A third change, albeit with possibly modest effects, is that estates were made to choose to value assets at death or from six months from such date, down from one year. These changes were introduced by the Excise, Estate, and Gift Adjustment Act of 1970. The number of returns filed also dramatically increased; 131,870 returns were filed in fiscal year 1970, 149,432 in 1971, 192,833 in 1972, 201,975 in 1973, and 211,540 in 1974.

**TABLE 1**  
ESTATE TAX REVENUES, 1950-2000

Year*	Nominal (\$millions)	Real** (\$millions)	Year*	Nominal (\$millions)	Real** (\$millions)
1950	616.8	2,559	1976	5,551.1	9,756
1951	735.4	2,829	1977	5,145.6	8,491
1952	774.3	2,922	1978	5,236.1	8,031
1953	862.2	3,229	1979	6,172.9	8,503
1954	836.2	3,109	1980	6,571.3	7,975
1955	1,047.6	3,909	1981	7,883.0	8,672
1956	1,240.1	4,559	1982	5,904.3	6,118
1957	1,259.1	4,481	1983	5,858.3	5,882
1958	1,215.8	4,207	1984	6,145.7	5,915
1959	1,418.9	4,876	1985	6,577.5	6,113
1960	1,725.1	5,828	1986	6,990.0	6,378
1961	1,777.0	5,943	1987	7,167.6	6,309
1962	1,951.2	6,461	1988	7,915.5	6,691
1963	2,088.7	6,826	1989	9,371.8	7,558
1964	2,424.8	7,822	1990	9,903.1	7,577
1965	2,619.0	8,314	1991	10,099.3	7,415
1966	2,692.2	8,309	1992	11,140.5	7,940
1967	2,679.3	8,022	1993	13,136.3	9,091
1968	3,097.6	8,901	1994	12,965.0	8,748
1969	3,205.2	8,734	1995	14,975.0	9,826
1970	3,303.4	8,514	1996	17,136.0	10,922
1971	5,072.6	12,525	1997	20,787.0	12,951
1972	4,280.1	10,239	1998	23,136.0	14,194
1973	4,594.2	10,347	1999	24,926.0	14,962
1974	4,235.6	8,591	2000	24,441.0	14,193
1975	4,784.3	8,893			

\*Correspond to fiscal years 1951-2001, proxy for calendar year liabilities.

\*\*Computed using CPI 82-84=100.

Source: Internal Revenue Service (various years a and b).

Figure 2. Estate Tax Revenues as Percent of GDP

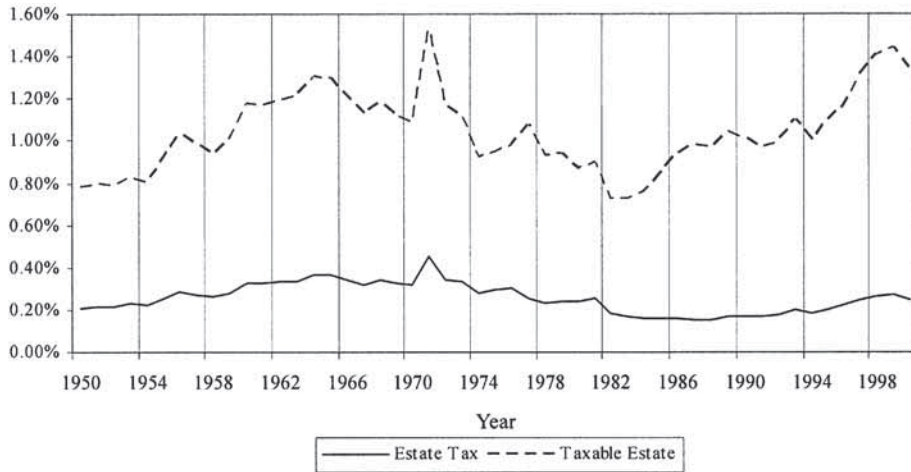
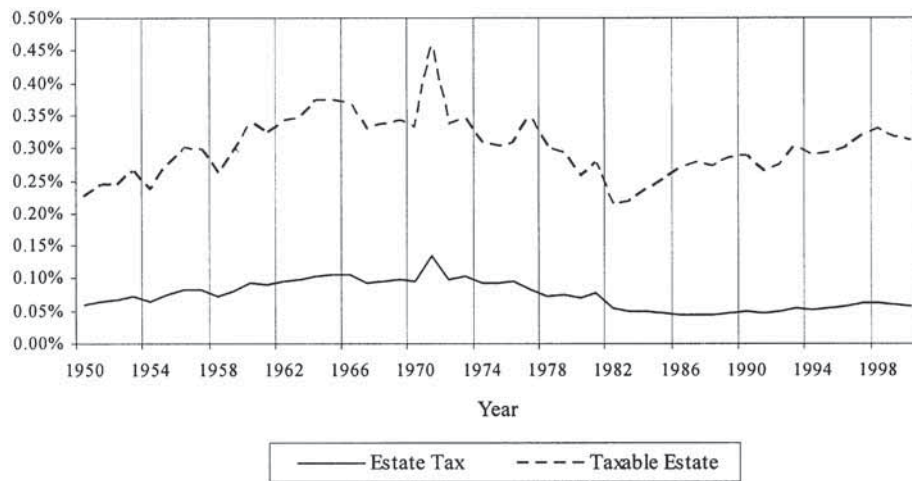


Figure 3. Estate Tax Revenues as Percent of Household Net Worth



to gauge such effects. While estate tax revenues grew 42 fold in this period, for instance, the S&P index grew even faster by 80 fold.

As for the estate tax structure, major changes took place in 1977, 1982 through 1987, and to a lesser extent in 1998 and beyond.<sup>10</sup> The size of exempted estate from estate taxation remained at \$60,000 through 1976. The exemption was replaced by a tax credit, which effectively doubled the exemption in value in 1977, and greatly expanded it between 1982 and 1987 to \$600,000. In real terms, however, the exemption fell in value in the early years, expanded from 1977 through 1987, and then fell again as shown in Figure 4. Other things equal, this had the effect of expanding the tax base in the earlier as well as later years.

In the period under study, the maximum estate tax rate was reduced from 77 to 70 percent in 1977. It was further reduced to 55 percent, but leaving much

of the schedule for lower brackets intact. The expansion of the size of exempted estates, however, effectively reduced the marginal tax rates in the lowest brackets to zero. The rate schedule for credit for state death taxes remained unchanged.

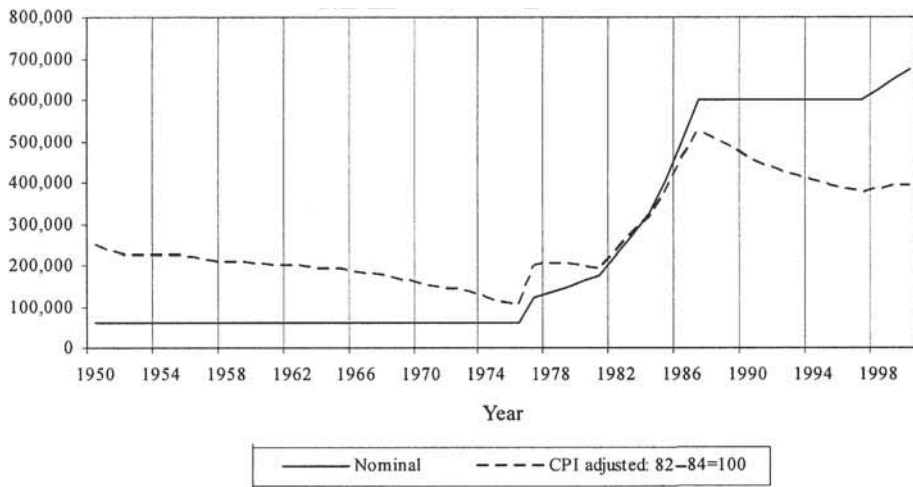
Another significant tax reduction took place in 1982, when spousal transfers became exempt from tax. Prior to 1982, the deduction for spousal bequests was limited to 50 percent of the estate as first introduced by the Revenue Act of 1948, and later modified to the greater of \$250,000 and 50 percent between 1977 and 1981 by the Tax Reform Act of 1976. This change led to a surge in spousal bequests (Bernheim, 1987). But because spousal transfers may potentially enlarge the estate of the surviving spouse, they do not necessarily escape taxation.<sup>11</sup> This, at least in part, may explain the growth in revenues in the late 1980s and 1990s, reported in Figure 1, as more and more of the estates of surviving spouses became subject to the estate tax.

<sup>10</sup> These include the Tax Reform Act of 1976 (TRA76), the Economic Recovery and Tax Act of 1981 (ERTA81), and the Taxpayer Relief Act of 1997 (TRA97). Joulfaian (1998) provides a detailed description of the changes.

<sup>11</sup> Throughout this period, state Elder Laws, which dictate pre-set amounts or shares of estates to be set aside for the surviving spouse, were also changing, further confounding the measurement of the effects of estate taxation.



Figure 4. Estate Tax Exemption



The timing of the “recapture” of taxes on spousal bequests depends on the longevity of the surviving spouse. Table 2, which reports information on the mortality risk of surviving spouses, illustrates the potential pattern for the recapture of the expanded marital deduction. Assuming no change in the behavior of the surviving spouse, 4.2 percent of the transfers made in 1982 will be reported in the estate of the spouse in 1982, 6.3 percent in 1983, 6.4 percent in 1984, and so on. For transfers in 1983, the second year of the introduction of the unlimited marital deduction, the process repeats itself, and again in 1984 and so on. Again absent any change in behavior and in the values of assets transferred,  $m$  percent—the cumulated mortality risk—of past transfers will be recaptured in any given year. For widowed decedents in 1983, for instance, 10.5 percent of transfers will be recaptured—4.2 percent from transfers in 1983, and 6.3 percent from transfers in 1982. In 1984, this will rise to 16.9 percent, all the way up to 100 percent as illustrated in the last column of Table 2. Using the cumulated mortality rates across the years,  $m$ , and again holding

constant behavioral changes on the part of the surviving spouse, the marital deduction rate in effect post 1981 becomes  $0.5+0.5*(1 - m)$  when contrasted with the deduction rate in effect in 1981 and prior years. Figure 5 depicts the effective rate for the unlimited marital deduction pre and post ERTA81.

#### MODELING THE EFFECTS OF ESTATE TAXATION

Much of the wealth held by the very wealthy becomes subject to the estate tax at death. In many ways, the tax can be viewed as an excise tax on large bequests or future consumption. This tax, which applies once to accumulated savings, is not directly comparable to the income tax, which may apply annually to the return on saving. More specifically, the burden of the estate tax, unlike that of the income tax, may vary with the rate of return and the age of the bequest—motivated saver.

To facilitate comparisons, this “excise” tax on bequests can be restated as an equivalent income tax that applies to annual accruals of the return to saving.

**TABLE 2**  
LIFE EXPECTANCY OF SURVIVING SPOUSES

Years*	Relative Frequency	Cumulative Relative Frequency
<1	0.042	0.042
1	0.063	0.105
2	0.064	0.169
3	0.054	0.223
4	0.066	0.289
5	0.059	0.348
6	0.054	0.402
7	0.058	0.459
8	0.047	0.506
9	0.033	0.539
10	0.034	0.573
11	0.031	0.604
12	0.026	0.630
13	0.027	0.656
14	0.025	0.681
15	0.025	0.706
16	0.022	0.729
17	0.020	0.748
18	0.021	0.770
19	0.016	0.785
20	0.016	0.802
21	0.013	0.815
22	0.017	0.832
23	0.019	0.851
24	0.012	0.863
25	0.014	0.877
26	0.015	0.892
27	0.010	0.903
28	0.013	0.916
29	0.007	0.923
30	0.013	0.936
30+	0.064	1.000

\*Distance between deaths of first and second spouse.  
Obtained from estate tax returns of decedents in 1995

Assume that the bequest motive is the sole purpose for saving, say, as in the joy of giving model of bequests. Then, a saver is indifferent between an estate tax that applies to bequests at death and a lifetime annual equivalent income tax on the return to accumulated wealth that leaves the size of transfers to the heirs unaltered.

Algebraically, with a marginal estate tax rate  $e$ , estate tax equivalent income tax rate  $\tau$ , expected rate of return  $r$ , and life expectancy or holding period  $n$ , the estate equivalent income tax rate  $\tau$  solves the equation:

$$[1] \quad E[(1+r)^n(1-e)] = E[(1+r(1-\tau))^n],$$

where  $E$  is the expectations operator, and  $r$ ,  $e$ , and  $n$  are stochastic. Using expected rather than stochastic values for  $r$ ,  $e$ , and  $n$ , [1] simplifies to:

$$[1'] \quad (1+r)^n(1-e) = [1+r(1-\tau)]^n.$$

An individual may save \$1 today and leave  $(1+r)^n(1-e)$  to his heirs in period  $n$ . Under an equivalent income tax regime, the heirs receive  $[1+r(1-\tau)]^n$ . Equation [1'] yields an income tax rate  $\tau$  of:

$$[2] \quad \tau = \frac{(1+r) - (1-r)(1-e)^{1/n}}{r}.$$

It follows then that, for a given estate tax rate, the equivalent income tax rate declines with life expectancy and the expected rate of return. Alternatively stated, older individuals face a higher equivalent income tax rate, while those expecting high rates of return face low tax rates.

Figure 6 illustrates the influence of age and rates of return on the measured equivalent income tax rate. Consider a male individual subject to an estate tax rate of 55 percent. For an individual age 21, with a rate of return of ten percent on assets and life expectancy of 54.6 years, the equivalent income tax rate on annual earnings is 16 percent. This declines to seven percent when a rate of return of 25 percent is expected. The respective tax rates become 68 and 31 percent in the case of a 71 year old with a much shorter life expectancy of 12.5 years. For older wealth holders, where life expectancies are short, the equivalent income tax rate is likely to exceed 100 percent as the estate tax applies to principle as well as the return to an asset.

In order to derive equivalent income tax rates, some measure of the rate of return expected over the remaining life expectancy is needed. In any given year, this measure is defined as the ten-year moving average rate of return to equity, measured as the growth rate of the S&P index. The



Figure 5. Marital Deduction

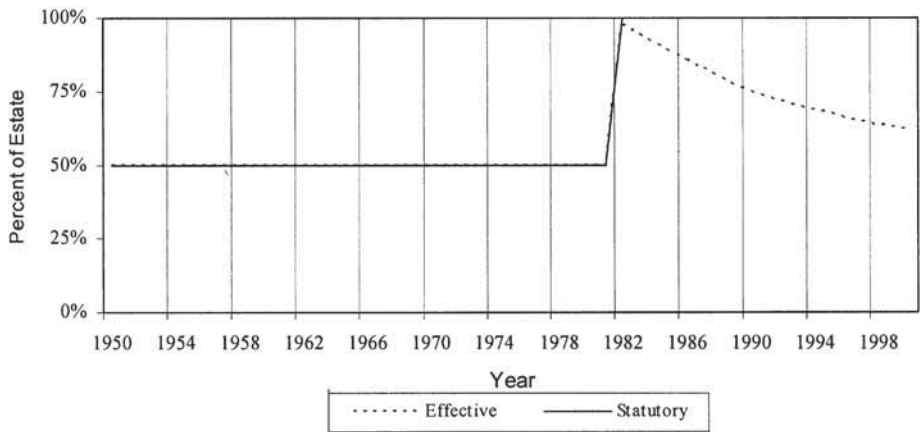
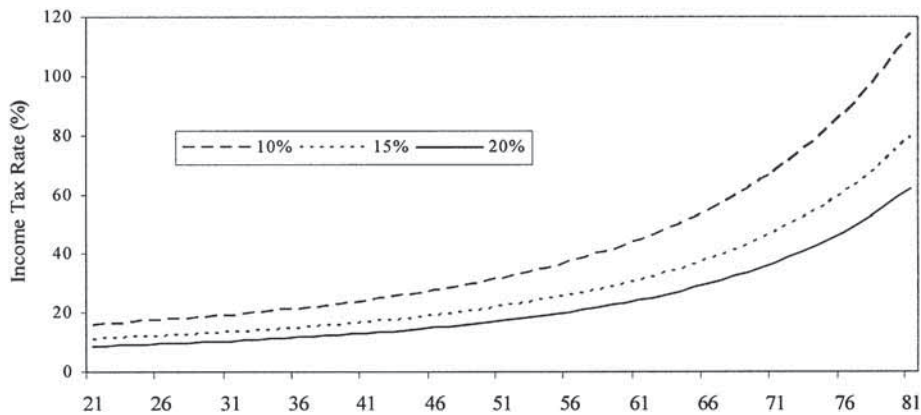


Figure 6. Estate Tax Equivalent Income Tax Rates (by Age and Rate of Return)



average rate of return is 8.4 percent (sd = 0.046), as reported in Table 3. In down markets, or when the expected rate of return is “too” low, investors are assumed to flee to the safety of cash (or its equivalent). Hence, the expected after-tax bond yield, also measured as a ten-year moving average, becomes a floor. This raises the average expected rate of return from 8.4 to

to 9.4 percent (sd = 0.032).<sup>12</sup> Figure 7 plots this expected rate of return.

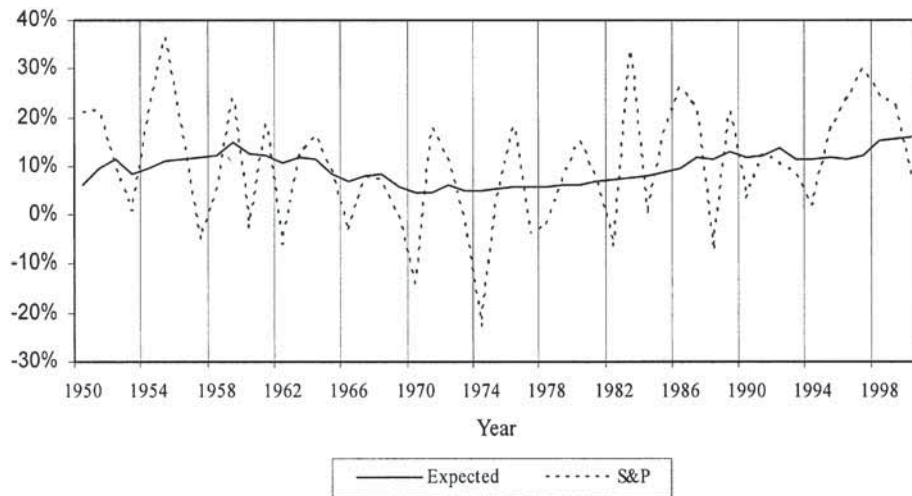
Identifying the tax regime in effect for estate planning purposes is critical. I start with a ten-year lag, but also consider a number of other lags as well. The taxable estate weighted age for decedents in 1998 was about 81.7 years. The life expectancy of each individual is determined using age

<sup>12</sup> The bond yield is proxied by the municipal bond yield. Much of the return on equity can be avoided by the step-up in basis at death. Replacing municipal bonds with taxable corporate bonds has little effect on the findings.

**TABLE 3**  
DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
Year	1975	14.866	1950	2000
Estate Tax (\$millions)	6,582	6,289	1,617	24,926
Real Estate Tax (\$millions)	7,670	2,920	2,559	14,962
Taxable Estates (\$millions)	32,339	35,495	2,293	133,437
Real Taxable Estates (\$millions)	33,568	16,815	9,514	80,094
Percent of GDP (%)	1.042	0.189	0.722	1.530
Percent of Household Net Worth (%)	0.300	0.046	0.215	0.458
Marginal Estate Tax Rate	0.391	0.030	0.315	0.454
Net Average Estate Tax Rate	0.245	0.050	0.154	0.312
Equivalent Income Tax Rate	0.316	0.128	0.175	0.588
Exemption Amount	247,729	242,864	60,000	675,000
Real Exemption	267,798	116,638	105,448	528,169
Marital Deduction	0.596	0.144	0.500	0.979
S&P Index	237	319	18	1,427
S&P Moving Average Growth Rate $t-10$	0.084	0.046	0.005	0.159
Expected Rate of Return $t-10$	0.096	0.032	0.045	0.159
Real GDP (\$billions)	4,831	2,277	1,777	9,817
Household Net Worth (\$billions)	10,960	11,616	1,017	42,332
Inequality Measure	0.068	0.019	0.051	0.120
CPI	86.88	49.03	29.60	172.20

Figure 7. Rates of Return



and gender reported on the estate tax return. Life expectancy, also weighted by the size of taxable estates, but evaluated at ten years before death, is 15 years.<sup>13</sup> Thus, the equivalent income tax rate in equation [2] is derived using  $n = 15$ . Given that the wealthy

experience lower mortality rates than those of the general population (Poterba, 2001),<sup>14</sup> as well as the five-year differential above, the life expectancy is more likely to be closer to 20 years. Hence, a tax rate computed using  $n = 20$  is also considered.

<sup>13</sup> This is computed using the general population life expectancy. See [http://www.cdc.gov/nchs/data/nvsr/nvsr52/nvsr52\\_14.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr52/nvsr52_14.pdf).

<sup>14</sup> For mortality rates of annuitants, which are much lower than those of the general population, see <http://library.soa.org:8080/xtbml/tableList.zip>.

To generate the income tax rates, I first derive a representative measure of the estate tax rate. Using a sample of estate tax returns for decedents in 1998, the average and marginal tax rates are computed at laws and real levels for the years 1950 through 2000. Wealth and estate expenses are adjusted for inflation and the law in effect each year is simulated. The average tax rate is computed as the tax liability, net of the credit for state death taxes, divided by total taxable estates. Marginal tax rates are computed by adding \$1,000 to the estate, and computing the change in tax liability before the credit for state death taxes.<sup>15</sup> The marginal tax rate for each estate is then weighted using its share of total taxable estates. Figure 8 plots the expected estate tax rates at period  $t-10$ , along with the derived measures of the expected equivalent income tax rates, using the rates of return in Figure 7.

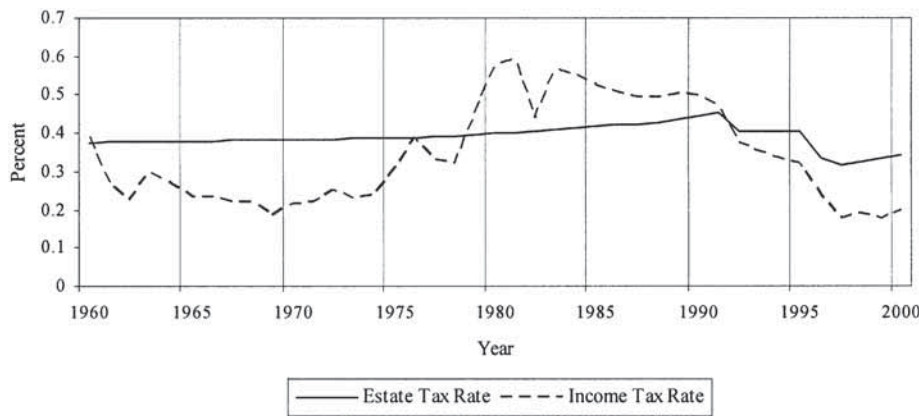
EMPIRICAL FINDINGS

To gauge the effects of estate taxation, I employ data on federal government estate

tax collections for the fiscal years 1951 through 2001. These years correspond to transfers or tax liability in calendar years 1950 through 2000. This stream of revenues is converted to taxable estates, a rough measure of intergenerational transfers, by dividing by the computed average tax rate. The resulting measure of taxable estates is then divided by the Flow of Funds household net worth, and represented by the dashed line in Figure 3. The pattern that emerges is similar to that observed for the ratio of estate taxes to net worth—the solid line in Figure 3; revenues grow through the late sixties, spike in 1971, and spiral downward afterwards.

To gain insights into the pattern observed in Figure 3, I regress the wealth share of taxable estates on the equivalent income tax rate as defined in [2]. This tax rate is computed using the derived wealth-invariant marginal estate tax rate, and reflects fully phased-in law. In other words, for estates in 1981 through 1983, it is the marginal estate tax rate schedule in 1985 stipulated in ERTA81 that matters.<sup>16</sup>

Figure 8. Expected Estate and Equivalent Income Tax Rates (Expected at  $t-10$ )



<sup>15</sup> The average (and marginal) tax rate was 0.55 in 2000 for very large estates. But because the federal tax provides a state death tax credit of up to 16 percent of the taxable estates, these estates paid about 39 percent of the taxable estate in federal taxes.

<sup>16</sup> ERTA81 phased in estate tax rate reductions from a maximum of 70 percent in 1981, to 65 percent in 1982, 60 percent in 1983, 55 percent in 1984, and 50 percent in 1985 and thereafter. Legislation enacted in 1984 froze the rate at 55 percent.

Also included are a number of control variables. The latter include the real size of the exempted estate. Expansions in the exemption amount, which reflects the filing threshold, should reduce the size of the dependent variable. I also control for the amount of spousal bequests accorded a marital deduction, measured as a fraction of the estate. The greater the fraction of the estate allowed as a marital deduction, the smaller is our dependent variable, an effect that declines over time as more of past transfers are recaptured in the estates of widowed decedents. The effects of the marital deduction on the estates of the surviving spouses have generally been ignored in all studies using longitudinal estate tax data.

Other variables include the S&P index to control for stock market appreciation. This index also controls for the effects of corporate and personal capital gains taxes in as far as they affect the return to holding corporate equity. A ten-year lag in the index is also considered as in KS. Given the spike in revenues in 1971, a dummy equal to one is also considered for that year. Table 3 provides descriptive statistics.

The regression estimates are reported in Table 4. Beginning with the equivalent income tax rate, lagged ten years, the estimated coefficient is  $-0.060$ , with a standard error of  $0.029$ . It implies an elasticity of  $-0.0945$  for the taxable estate with respect to the estate tax rate, and suggests that bequests are smaller by almost ten percent in the presence of the estate tax.<sup>17</sup>

Surprisingly, the sign on the size of exempted estate is positive rather than the expected negative, with an estimated coefficient of  $0.18$  ( $se = 0.06$ ).<sup>18</sup> The marital deduction enters with the expected negative sign with an estimate of  $-0.14$  ( $se = 0.03$ ), highlighting its adverse effects on the reported taxable estates. Both the log of real S&P index and its ten-year lag enter with positive coefficients as the value of the index is reflected in the corporate equity held in the estates.

A measure of income inequality—which is defined as the share of the top one percent of wage earners—is also considered.<sup>19</sup> This is introduced to capture any underlying trends in income inequality, and enters with a ten-year lag to avoid endogeneity. The estimated coefficient is not significantly different from zero.<sup>20</sup> Trend, or year, enters with a negative and significant coefficient. In contrast, and not surprisingly, the coefficient on a dummy indicator for 1971 is positive and highly significant.

The estimated coefficient on the equivalent income tax rate becomes smaller in absolute value, but remains significant when a life expectancy of 20 instead of 15 is employed (not reported). The coefficient is estimated at  $-0.079$  ( $se = 0.039$ ), but the implied elasticity with respect to the estate tax rate remains unchanged at  $-0.0941$ . However, the estimates lose precision when shorter lags are employed. In the case of a five-year lag, for instance, the coefficient becomes  $-0.012$  ( $se = 0.012$ ).<sup>21</sup>

<sup>17</sup> Using (2), the elasticity is computed as:

$$-0.06 \frac{(1-e)^{1/n-1}(1+r)}{nr} \frac{1}{\omega} e,$$

where  $\omega$  is the inverse of the wealth share, and all variables are evaluated at their mean values.

<sup>18</sup> However, the coefficient becomes  $-0.167$  ( $se = 0.051$ ) when all the other regressors are omitted.

<sup>19</sup> This is obtained from <http://www.nber.org/data-appendix/w8467/>, Figure 15; 1999 and 2000 are linearly extrapolated from earlier years.

<sup>20</sup> The coefficient becomes negative and significant when the trend or year variable is eliminated.

<sup>21</sup> The expected rate of return is calculated using five-year moving average, and five-year life expectancy. The estimated coefficient also loses precision when the equivalent income tax rate is derived using the return on equity only or when a portfolio of equity and bonds (three to one ratio) is considered.

**TABLE 4**  
THE DETERMINANTS OF THE RATIO OF TAXABLE ESTATES TO HOUSEHOLD WEALTH  
(Standard errors reported in parentheses)

Variable	Taxable Estate / Net Worth			<i>ln</i> Estate Tax <sup>a</sup>
	(1)	(2)	(3)	(4)
<i>Intercept</i>	0.185** (0.108)	-0.038 (0.157)	0.013 (0.117)	8.423* (0.630)
<i>Estate Tax Rate</i>	—	—	0.049 (0.178)	0.377 (0.371)
<i>Estate Tax Rate</i> <sub><i>t-10</i></sub>	—	0.106 (0.191)	—	—
<i>Equivalent Income Tax Rate</i> <sub><i>t-10</i></sub>	-0.060* (0.029)	—	—	—
<i>ln (Real Exemption)</i>	—	—	—	-0.183* (0.041)
<i>Real Exemption</i> 10 <sup>-6</sup>	0.179* (0.059)	0.143* (0.065)	0.169* (0.085)	—
<i>Marital Deduction (%)</i>	-0.143* (0.025)	-0.148* (0.027)	-0.148* (0.027)	-0.629* (0.061)
<i>ln Real S&amp;P Index</i>	0.027** (0.016)	0.050* (0.013)	0.050* (0.014)	0.371* (0.036)
<i>ln Real S&amp;P Index</i> <sub><i>t-10</i></sub>	0.023* (0.014)	0.031* (0.06)	0.028 (0.015)	0.159* (0.039)
<i>Inequality Measure</i> <sub><i>t-10</i></sub>	0.160 (0.638)	0.429 (0.829)	0.072 (0.750)	-1.835 (2.049)
<i>Time</i>	-0.003* (0.001)	-0.003* (0.001)	-0.003* (0.001)	0.012 (0.002)
<i>Dummy 1971</i>	0.120* (0.015)	0.121* (0.015)	0.122* (0.015)	0.310* (0.042)
Adjusted R <sup>2</sup>	0.908	0.897	0.897	0.981
Observations	41	41	41	41
Elasticity wrt estate tax rate	-0.094	0.134	0.062	—

\*Significant at the 5% level.

\*\*Significant at the 10% level.

<sup>a</sup>Estimates corrected for autocorrelation with AR(2).

The estimates change considerably when the equivalent income tax rate is replaced directly with the estate tax rate. The coefficient on the tax rate lagged ten years is now positive but not precisely measured, with an estimate of 0.11 (se = 0.19). In contrast, the estimates on the coefficients for the control variables change very little. The coefficient on the real exemption is slightly smaller (0.14 with se = 0.7), while that on the real S&P index is larger (0.05 with se = 0.01). The coefficient

on the inequality measure is also larger, but again not precisely measured (0.43 with se = 0.83).

Next, the estate tax rate with a 10-year lag is replaced with its contemporaneous value. The estimated coefficients on all the regressors virtually remain unaffected by this change. The estimated coefficient on the tax rate is smaller, but continues to be measured imprecisely (0.05 with se = 0.18). Similarly, the coefficient on the inequality measure is smaller, but also

not significantly different from zero (0.07 with  $se = 0.75$ ).

Virtually identical estimates are obtained when the contemporaneous tax rate is added to the regressors in column (2), using the ten-year lagged tax rates. Similarly, the estimated coefficient on the income tax rate is unaffected when column (1) is augmented with the contemporaneous estate tax rate. The coefficient remains at  $-0.060$  ( $se = 0.030$ ), while that on the contemporaneous tax rate is  $0.055$  ( $se = 0.170$ ). The estimates also change very little when column (1) is augmented with both the contemporaneous and the ten-year lagged estate tax rates. The coefficient is now estimated at  $-0.068$  ( $se = 0.03$ ), with estimated coefficients of  $0.219$  ( $se = 0.206$ ) and  $0.307$  ( $se = 0.225$ ) for the contemporaneous and ten-year lagged estate tax rates, respectively.

Moving to a specification similar, at least in spirit, to that of CHS, the estimates in column (4) replicate those of column (3), but using the log of real estate tax revenues as the dependent variable. Here the estimated coefficient on the estate tax rate is positive, but not precisely measured. This is in sharp contrast to the sizeable negative coefficient reported in CHS. Note, however, that a positive coefficient does not necessarily mean that the estate tax does not affect the reported size of taxable estates. But given the nonlinear structure of the tax schedule, an elasticity measure is difficult to derive.

The estimated effect of the income tax reported in column [1] of Table 4 is somewhat sensitive to the period under study. The coefficient grows in size and significance, in absolute value, when some of the earlier years are dropped, but not so for the estate tax rate coefficients, which remain unaffected. In contrast, the esti-

mate loses precision when the dependent variable in column (1) is not normalized by household wealth, and is defined as the log of real taxable estates ( $-0.087$  with  $se = 0.112$ ). Again, the coefficients in columns (2) and (3) remain unaffected.

## CONCLUSION

This paper explores the effects of estate taxation on bequests using time series data on federal estate tax revenues over a period of 50 years. It derives an income tax equivalent measure of the estate tax rate, which allows for the effects of estate taxes to vary with the expected rate of return, and attempts to empirically gauge its effects.

Using the equivalent income tax rate, an elasticity of the taxable estate with respect to the estate tax rate of  $-0.094$  is estimated. In other words, and with the usual caveats, taxable estates are ten percent smaller because of the estate tax. In contrast, no discernable effect is detected using the estate tax rate directly. The determination of long-run expectations on the rate of return on assets, however, remains a major source of uncertainty in modeling the effects of estate taxation.

As with much of the work on the taxable income elasticity, it is not clear whether the findings measure the effects on saving and wealth accumulation or reflect tax avoidance (Slemrod, 2001). As one example, minority discounts claimed on estate tax returns filed in 2001 reduce taxable estates by about three percent.<sup>22</sup> In the absence of the estate tax, there will no longer be a need to engage in estate planning and employ strategies designed to reduce the reported value of assets. Nevertheless, and as pointed out by Feldstein (1999), both types of response reflect a welfare cost of estate taxation.

<sup>22</sup> Also note that some of the reduction in taxable estates may be recaptured under the income tax. Inflated executor commissions paid to a relative, for instance, are taxed under the income tax as compensation. Similarly, undervaluation of estates may lead to greater capital-gains realizations by the heirs.