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Equalization Of True Gift And Estate Tax Rates

Abstract
This paper primarily sets out to show that persons included under the U.S. Federal Estate Tax minimize taxes paid on their personal asset transfers. It asserts, and attempts to demonstrate empirically, that testators equalize true bequest and gift tax rates, which expresses the same point somewhat differently.

Disciplines
Estates and Trusts | Real Estate | Taxation | Taxation-Federal Estate and Gift | Tax Law
EQUALIZATION OF TRUE GIFT AND ESTATE TAX RATES

By

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The paper sets out to show that persons included under the U.S. Federal Estate Tax equalize true gift and estate tax rates, and thereby minimize their transfer taxes. True tax rate formulas are derived which take into account the preferential treatment of unrealized gains in estates under the Federal income tax. A comparison is drawn between shares of unrealized capital gains predicted from true tax rate equalization and shares estimated from stock-price data. The two are found to be quite similar.

*James D. Adams, Department of Economics, Iowa State University, Ames, Iowa, 50011. This paper is excerpted from my unpublished doctoral dissertation, University of Chicago, 1976. I am indebted to the members of my thesis committee, Professors Gary S. Becker, Theodore W. Schultz, and Gilbert R. Ghez for helpful advice and criticism. Professor Martin S. Feldstein also made useful suggestions, while Wallace Huffman and J. Peter Mattila significantly improved the exposition. I am responsible for remaining errors. Financial support from the National Institutes of Mental Health is gratefully acknowledged.
1. Introduction

This paper tests the hypothesis that persons included under the U.S. Federal Estate Tax minimize taxes paid on their personal asset transfers; or to express the same point somewhat differently, that donors equalize true bequest and gift tax rates on their transfers.

A series of studies culminating in a monograph by Shoup (1966) have shown beyond a doubt that the nominal bequest tax rate has regularly exceeded the nominal gift tax rate, and this has been a persistent puzzle. A reconciliation between our main thesis and this undeniable finding must then rely on a distinction between true and nominal rates of transfer tax. In fact, the paper takes the principal source of difference to be the favored income tax treatment of unrealized capital gains in estates compared to gifts. Hence, according to this hypothesis the nominal excess of the bequest tax rate is due to equalization of the true rates.

Organization of the paper is as follows: section 2 briefly presents the theory of transfers which predicts tax rate equalization; section 3 derives formulas for the true tax rates and a condition based on rate equalization which the share of unrealized capital gains in transfers must satisfy; section 4 estimates all tax parameters which enter these formulas; section 5 uses the equalization condition for unrealized capital gains to compare the predicted value with the value estimated from stock price data, and offers a statistical test of the congruence; section 6 predicts the effects of removing the favoring capital gains treatment of bequests; and section 7 briefly concludes the paper.
2. A Theory of Personal Asset Transfers

The utility of the testator (hereafter donor, to emphasize the choice between giving and bequeathing) is assumed to depend separably on the consumption of the donor and the utility of his recipients (on the separability literature, see Strotz (1957, 1959), Gorman (1959), and Goldman and Uzawa (1964)). The fact that the donor aggregates recipient consumption implies a planning horizon extending over their combined life spans. In the presentation it is assumed that maximization with respect to the underlying commodities has already been carried out, so that utility is a function of prices and expenditures, and the branch utility function for individuals (known as specific satisfaction functions in the separability literature) are written similarly. Therefore, all utility functions are indirect (on the concept of the indirect utility function see Houthakker (1952)). According to the above assumptions, the donor's utility function can be written as

\[ U = U \left( V_D, \pi_{D1}, \ldots, \pi_{DM}, C_D, V_R, \pi_{R1}, \ldots, \pi_{RN}, C_R \right), \quad (1) \]

where \( V_D \) is the donor's (indirect) satisfaction function, which depends on his consumption alone, the \( \pi_{Di} \) are prices of the commodities he consumes, and \( C_D \) is the present value of his lifetime consumption. Counterpart variables with subscript \( R \) stand for recipients, except that \( V_R \) is the utility function of recipients. Discounted recipient

\[ V_R \text{ depends only on consumption of recipients. Discounted recipient} \]

\[ ^1 \text{This assumption rules out any question of control over recipients, since there is no ground for conflict so long as net transfers are non-negative. A related analysis encompassing distinctions among recipients is feasible and is carried out for purposes of certain special applications in Adams (1976).} \]
consumption \((C_R)\) is the sum of net transfers \((T_R)\) and recipient's discounted income stream, or wealth \((W_R)\):

\[
C_R = W_R + T_R
\]

so that the donor acts as a residual supplier of wealth to his recipients.

Given positive transfer taxes and other causes of rising price, the donor spends more than recipients get, or in other words gross transfers \((T_G)\) exceed net \((T_R)\). Gross transfers are defined by

\[
T_G = \sum_{i} \sum_{k} P_{ik} T_{ik} \frac{1}{(1+r)^i},
\]

where \(P_{ik}\) = average price of giving a dollar in the \(i\)th period through the \(k\)th mode of transfer.\(^2\) Given rising prices, \(P_{ik} > 1\). Net transfers are defined by

\[
T_R = \sum_{i} \sum_{k} T_{ik} \frac{1}{(1+r)}.
\]

The donor expends his wealth \((W_D)\) on his own consumption \((C_D)\) and gross transfers \((T_G)\), so

\[
W_D = C_D + T_G.
\]

The nature of the maximizing process is then as follows: the donor maximizes utility \((1)\) subject to his budget \((5)\); however, transfer taxes and other influences create a difference between the amounts expended and the amounts received, when it comes to setting the optimal level of recipient consumption \(C_R\). Net amounts enter the satisfaction function \(V_R\) through substitution of \((2)\) and \((4)\) into \((1)\), while gross amounts enter the budget line, through substitution of \((3)\) into \((5)\). The donor's consumption decisions are only fully defined when

\(^2\)Examples of modes of transfer might be education embodied in the young, versus gifts of land or common stock to them.
(1) is maximized subject to all of equations (2), (3), (4), and (5). First order conditions imply that

\[ MC_{ik} = MC \]
\[ dMC_{ik} = dMC \]

where \( MC_{ik} \) is the non-diminishing marginal cost of the \( ik \)th transfer, and \( d \) is the differential operator, both of which are set at common values of \( MC \) and \( dMC \) respectively. Thus the model immediately yields the ceteris paribus prediction that marginal tax rates will be equated on gifts and bequests.

3. Tax Structure and Basic Tax Formulas

Real marginal tax rate formulas will take into account all taxes to be paid on the transfer, including income taxes. A central difference in the tax treatment of gifts and bequests in the United States is the income tax to be paid by recipients on a portion of unrealized capital gains. If assets are transferred through bequest, unrealized gains which have accrued over the span

\[ L = U\left( V_D (\pi_{D1}, \ldots, \pi_{DM}, C_D), V_R (\pi_{R1}, \ldots, \pi_{RN}, W_R + \sum_{i} T_{ik} \frac{1}{(1+r)^i}) \right) + \lambda(\xi_D - \sum_{i} P_{ik} T_{ik} \frac{1}{(1+r)^i}) \]

A representative first order condition for the \( ik \)th transfer would be

\[ \frac{\partial U}{\partial V_R} \frac{1}{(1+r)^i} - \lambda MC_{ik} \frac{1}{(1+r)^i} = 0 \]  
\[ \text{The common value for } MC_{ik} \text{ is clearly } \frac{\partial U}{\partial V_R} / \lambda. \text{ In this equation} \]

\[ MC_{ik} = P_{ik} + T_{ik} \frac{\partial P_{ik}}{\partial T_{ik}} \]

where the \( P_{ik} \) are taken as continuous.
of time between the initial purchase date and donor's death are exempt from recipients' income taxes. In other words, the basis value for the capital gains computation is the value at donor's death. If the assets are transferred through gift, the basis value used is the value at the time of initial purchase. Thus income taxes based on unrealized capital gains accruing between purchase and death are levied on gift recipients, but not bequest recipients. Assuming positive gains, and the absence of other sources of differential tax treatment, the marginal bequest tax rate must exceed the marginal gift tax rate if true equalization occurs. 4

In the following model of gift and bequest assets, it is assumed that undervaluation through tax evasion is the same for gifts and bequests.

Where $E =$ value of marginal estate, and $b =$ marginal bequest tax rate, marginal estate tax is

$$B = bE.$$ (8)

Estates are assumed to yield income perpetually, and the marginal estate less bequest taxes ($E - B$) provides the yield ($Y_e$) so

$$Y_e = r(E-B) = r(1-b)E,$$ (9)

where $r =$ rate of yield on gifts and bequests. Income taxes per period are a fraction $t$ of the yield, where $t$ is the marginal income tax rate. Hence taxes $T_e$ are

$$T_e = tY_e = tr(1-b)E.$$ (10)

4 The comparison between true tax rates is direct and not related through a discount factor. Only estate taxes require discounting, not estate tax rates.
Under the perpetuity assumption, their capitalized value is

\[ \frac{T_e}{r} = t(1-b)E. \]  

(11)

True net estate (E) is the value of the estate (E) less bequest taxes (B) and the capitalized value of the income tax (Te/r), so

\[ \bar{E} = E - B - \frac{Te}{r} = (1-t) + (1-b)E. \]  

(12)

The true marginal estate tax rate (\( \tau \)) is the proportional difference between the value of marginal estate (E) and true net marginal estate (\( \bar{E} \)), or

\[ \tau = \frac{E - \bar{E}}{E} = 1 - (1-t)(1-b) = b + t(1-b) \]  

(13)

A related procedure is followed for gifts. Where g is the marginal gift tax rate and G the value of the marginal gift, the marginal gift tax collected (V) is

\[ V = gG \]  

(14)

The tax base for gifts is more complicated than for bequests, since unrealized capital gains (\( \gamma G \)) (where \( \gamma \) is the share of unrealized capital gains) will comprise a source of taxable income, in addition to ordinary income. If the marginal gift net of the gift tax (G-V) is traded in evenly over the planning horizon at a rate which approximately exhausts the gift, it will be traded at rate \( r. \)

The per period tax (\( T_G \)) is the sum of the tax on the ordinary income component and the tax on unrealized capital gains, or

\[ T_G = rt(1-g) + \frac{rt}{2} \gamma G \]

\[ = rt(1-g) + \frac{1}{2} \gamma G \]  

(15)

We have \( \sum_{1}^{\infty} \frac{r(1-g)G}{(1+r)^t} \approx (1-g)G, \) where the approximation enters through the fact that trading need not continue indefinitely. The assumption about turnover of gift assets is meant to represent its central tendency. An additional approximation used in all the formulas is constancy of the income tax rate through time.
where \( r(l-g)G \) is the yield on gifts net of the gift tax and \( r_G \) is the value of gifts in unrealized capital gains traded in each period. The tax rate on the first component is assumed to be \( t \), and \( t/2 \) on the second.\(^6\) Income taxes capitalized are

\[
\text{income tax capitalized} = t(l-g + \frac{y}{2})G
\]

The true net gift (\( \bar{G} \)) is defined as the value of the marginal gift less all taxes, or

\[
\bar{G} = G - gG - t(l-g + \frac{y}{2})G = (1-t)(1-g) - t\frac{y}{2}G.
\]

The true gift tax rate (\( \rho \)) is defined as the proportional difference between the gross and true net values, or\(^7\)

\[
\rho = \frac{G - \bar{G}}{G} = 1 - (1-g)(1-t) - t\frac{y}{2} = g + t(l-g) + t\frac{y}{2}.
\]

\(^6\) Equation (15) assumes that capital gains are taxed at \( \frac{1}{2} \) the rate on ordinary income. Note also that it correctly assumes that gross gift is taxed under the capital gains tax.

\(^7\) This computation assumes that \( t < 0.50 \), since strictly speaking, unrealized capital gains are only taxable at a rate equal to \( \frac{1}{2} \) the ordinary rate up to a maximum of 25 per cent. If \( t \geq 0.50 \), the formulas for \( \rho \) must be revised to read:

\[
\rho = g + t(l-g) + \frac{y}{4}.
\]

This implies that the expression for the predicted \( \gamma \) becomes:

\[
\gamma = 4(b-g)(1-t)
\]

However, for data based on means, \( t \) as the marginal income tax rate will probably not exceed 0.50, and therefore the expressions in the text have been used in the empirical work.
Now set the true estate tax rate $\tau$ equal to the true gift tax rate $\rho$.

This requires that

$$\gamma = \frac{2}{t} \frac{(1-t)}{(b-g)}$$

or that $\gamma$ be a simple function of the marginal income tax rate and the difference in nominal bequest and gift tax rates. If the income tax rate decreases or the difference in transfer tax rates increases, then the $\gamma$ implied by true equalization increases.

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Formula (13) for $\tau$ and formula (18) for $\rho$ both assume that recipients choose not to decumulate transfers received, since a constant flow of income on the transfers net of nominal transfer taxes is assumed in each case. While its quantitative importance is hard to evaluate the direction of the effect is clear: the importance of $\gamma$ would be increased relative to other factors. For example, suppose that gifts and bequests are completely spent within the period in which they are received. This is the most extreme decumulation assumption possible. Then (assuming income on estates and gifts is yielded at the close of each period) no income taxes are yielded by estates, so that $\tau = b$, while the only income taxes on gifts are levied on $\gamma$, so $\rho = g + t \frac{\gamma}{2}$

Hence if $\tau = \rho$, $\gamma^* = \frac{2}{t} (b-g)$. Now $\gamma^* = \frac{\gamma}{1-t} > \gamma$. The equalization formula used to an unknown extent underestimates $\gamma$. 
4. Computation of Marginal Parameters

Published data are available in the form of tabulated means for 1962 which permit estimation of the parameters entering equation (19). The strategy used is to calculate the predicted share of unrealized capital gains, assuming that (19) is satisfied. The predicted shares are then compared to estimates based on common stock calculations.

Calculation of the marginal income rate is simple: illustrative computations by Pechman show that the marginal rate applicable to wages and salaries reaches .40 quickly and levels at .50 for higher earnings.\(^9\)

Estimates of marginal bequest and gift tax rates require some computations. In Table 1 data on 1962 estates are reported which permit rough calculations of average and marginal estate tax rates. Since the federal estate tax allows unlimited deduction for charities, and a marital deduction up to one-half of the Gross Estate less debts and expenses (Economic Estate), the average tax rate on a given gross estate varies widely and is subject to the Donor's choice. Therefore use of Taxable Estate (Economic Estate less deductions) more closely approaches a concept under which the rate is determined by the tax schedule. This fact is reflected in the stable relationship between average and marginal tax rates in Table 1. The final two columns show that if the average tax rate is known, so is the marginal tax rate within a narrow range. However, one element of ambiguity remains, because federal estate taxes can be either gross or net of credits allowed for state and foreign death taxes paid. For this reason alternative estimates of average rates and ratios of marginal to average rates have been prepared. In each case, an

\(^9\)Cited in David (1968), Table 4-18, p. 88. These calculations suggest that for incomes in the range of $40,000, t approximates .5. This income level is assumed to approximate the circumstances of recipients; a justification for this, to be kept in mind, is the large volume of \textit{inter vivos} transfers in educational or other form passing to recipients prior to bequest.
average of the average tax rates and the two sets of ratios was computed, weighted by the fraction of taxable estate in each Gross Estate class. For the before credit concept of taxes, this average was 1.21; for the after-credit concept it was 1.35. Thus given the average after credits tax rate of .26, the estimated marginal tax rate in 1962 would have been 1.35 times that, or .351. A comparable calculation for the before credits tax concept, using the before credits tax rate of .295, times its multiplier of 1.21 gives .357 as the marginal rate. Thus there is not much difference between them, and point estimates of the marginal federal estate tax rate range from .35 to .36.

Finally we arrive at the calculation of additional taxes imposed by the states. In 1962, $389 million in total transfer taxes were collected by states after deduction of federal tax credits. Of this amount, approximately $6 million consisted of state gift taxes; thus $383 million in death taxes were collected by states after credits. The nature of the state taxes varies widely, but they appear to share a common characteristic in a minor progressive rate component. In the ensuing calculations, the unknown progressive rate

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\(^{10}\) The federal tax credit is partly a deduction for state death taxes paid. See Shoup (1966), pp. 83-85, for an example of the computation. In 1962, these credits amounted to $205 million, bringing before credit state taxes to $594 million. Note that after credit concepts of both state and federal taxes cannot be simultaneously employed.


\(^{12}\) Blinder (1974), p. 44 documents this for the case of California, where rates rise from 2% to 10% on bequests to minor children, and from 10% to 24% on bequests to unrelated persons.
component is assumed to be negligible, so that the marginal rate is approximated by the average.\textsuperscript{13} The base for the state taxes is not clear, but can probably be bounded by total Economic Estate and total Taxable Estate. The sizes of these totals were $16,129 million and $7,071 million in 1962. For the after-credit concept of the state taxes, the tax rate was approximately 2\% of Economic Estate and 5\% of Taxable Estate. Corresponding rates for the before-credit concept are approximately 4\% and 8\%. The range of marginal estate tax rates established by the sum of federal and state components is shown in Table 2, which shows point estimates ranging from .38 to .44.

Calculation of the marginal gift tax rate is more difficult because the exemptions used in calculating taxable gifts are more complicated, including both annual and lifetime exemptions, and not well recorded in any available body of gift data.\textsuperscript{14} The information presently available about rates of gift tax paid is summarized in Table 3, which is an intermittent time series of current year taxable gifts and amounts of gift tax paid. Rates of tax have been calculated from this information, as shown in the rightmost column. The figures shown are approximations to the marginal tax rate because of the structure of the gift tax. The current year's rate of gift tax is determined by the present year's taxable gift and accumulated taxable gifts from previous years. Subtraction of current year and lifetime exemptions and charitable deductions yields figures which summed constitute accumulated taxable gifts.

\textsuperscript{13} Even were the progressive rate component sizable, computation of the average rate would be preferable to assuming a zero state tax rate, though the tax rate would be underestimated.

\textsuperscript{14} For example, the gift data in the Treasury 1957 and 1959 Special Study is incomplete and unreliable. This is due to donor migration from one filing district to another, and the difficulty of combining the records of the different district offices.
### TABLE 1

RATIOS OF MARGINAL TO AVERAGE ESTATE TAX RATES, BY GROSS ESTATE CLASS, 1962

<table>
<thead>
<tr>
<th>Gross Estate Class ($ thousands)</th>
<th>Taxable Estate ($1 million)</th>
<th>Estate Tax ($1 Mill.)</th>
<th>Average Tax Rate $^1$</th>
<th>Number of Returns</th>
<th>Mean Taxable Estate ($ thousands)</th>
<th>Imputed Marginal Tax Rate</th>
<th>Ratio of Marginal to Average $^4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-100</td>
<td>207</td>
<td>16, 16</td>
<td>0.077, 0.077</td>
<td>14782</td>
<td>14</td>
<td>0.110</td>
<td>1.43, 1.43</td>
</tr>
<tr>
<td>100-150</td>
<td>513</td>
<td>73, 71</td>
<td>0.142, 0.138</td>
<td>13415</td>
<td>38</td>
<td>0.180</td>
<td>1.27, 1.30</td>
</tr>
<tr>
<td>150-200</td>
<td>523</td>
<td>97, 92</td>
<td>0.185, 0.176</td>
<td>8704</td>
<td>60</td>
<td>0.250</td>
<td>1.35, 1.42</td>
</tr>
<tr>
<td>200-300</td>
<td>843</td>
<td>186, 174</td>
<td>0.221, 0.206</td>
<td>7941</td>
<td>106</td>
<td>0.300</td>
<td>1.36, 1.46</td>
</tr>
<tr>
<td>300-500</td>
<td>1103</td>
<td>283, 259</td>
<td>0.257, 0.235</td>
<td>5483</td>
<td>201</td>
<td>0.300</td>
<td>1.17, 1.28</td>
</tr>
<tr>
<td>500-1000</td>
<td>1292</td>
<td>374, 334</td>
<td>0.289, 0.259</td>
<td>3157</td>
<td>409</td>
<td>0.320</td>
<td>1.11, 1.24</td>
</tr>
<tr>
<td>1000-2000</td>
<td>985</td>
<td>323, 281</td>
<td>0.328, 0.285</td>
<td>1115</td>
<td>883</td>
<td>0.370</td>
<td>1.13, 1.30</td>
</tr>
<tr>
<td>2000-3000</td>
<td>455</td>
<td>168, 144</td>
<td>0.369, 0.316</td>
<td>287</td>
<td>1585</td>
<td>0.450</td>
<td>1.22, 1.42</td>
</tr>
<tr>
<td>3000-5000</td>
<td>443</td>
<td>182, 154</td>
<td>0.411, 0.348</td>
<td>190</td>
<td>2332</td>
<td>0.490</td>
<td>1.19, 1.41</td>
</tr>
<tr>
<td>5000-10000</td>
<td>409</td>
<td>199, 165</td>
<td>0.487, 0.403</td>
<td>101</td>
<td>4050</td>
<td>0.630</td>
<td>1.29, 1.56</td>
</tr>
<tr>
<td>10000-20000</td>
<td>168</td>
<td>98, 81</td>
<td>0.583, 0.476</td>
<td>24</td>
<td>7000</td>
<td>0.700</td>
<td>1.20, 1.47</td>
</tr>
<tr>
<td>20000+</td>
<td>130</td>
<td>88, 71</td>
<td>0.677, 0.546</td>
<td>8</td>
<td>16250</td>
<td>0.770</td>
<td>1.14, 1.41</td>
</tr>
</tbody>
</table>


$^1$This is the estate tax divided by taxable estate, where the estate tax is either before or after credits for state and foreign death taxes paid, etc.
TABLE 1 (Cont.)

2. This is taxable estate divided by the number of returns.

3. The marginal rate imputed is determined by mean taxable estate. In fact, it should be an average of the marginal rates, not the marginal rate applying to the average taxable estate. The data do not permit this calculation, however.

4. This figure is simply the marginal rate divided by a concept of the average rate. The mean value for column (1) is 1.21, for column (b) 1.35.
TABLE 2
MARGINAL ESTATE TAX RATES, INCLUSIVE OF STATE DEATH TAXES, 1962

<table>
<thead>
<tr>
<th>Estimates Based on Different State Tax Bases</th>
<th>Before and After Credit Concepts of State Taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Variant A&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Low Estimate&lt;sup&gt;1&lt;/sup&gt;</td>
<td>.381</td>
</tr>
<tr>
<td>High Estimate&lt;sup&gt;2&lt;/sup&gt;</td>
<td>.394</td>
</tr>
</tbody>
</table>

Source: See Text.

<sup>a</sup>Variant A is the sum of the before credit marginal rate of the federal tax (.357) and the after credit average rate of the state taxes.

<sup>b</sup>Variant B is the sum of the after credit marginal rate of the federal tax (.351) and the before credit average rate of the state taxes.

<sup>1</sup>The low estimate uses Economic Estate as the tax base for state taxes, yielding .024 as the rate after credits, and .037 as the rate before credits.

<sup>2</sup>The high estimate uses Disposable Estate as the tax base for state taxes, yielding .054 as the rate after credits, and .084 as the rate before credits.
<table>
<thead>
<tr>
<th>Year</th>
<th>Taxable Gifts, Current Year ($ million)</th>
<th>Gift Tax, Current Year ($ million)</th>
<th>Estimated Tax Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1939</td>
<td>$132</td>
<td>$ 19</td>
<td>.126</td>
</tr>
<tr>
<td>1940</td>
<td>226</td>
<td>34</td>
<td>.131</td>
</tr>
<tr>
<td>1941</td>
<td>484</td>
<td>70</td>
<td>.126</td>
</tr>
<tr>
<td>1942</td>
<td>121</td>
<td>25</td>
<td>.171</td>
</tr>
<tr>
<td>1943</td>
<td>124</td>
<td>30</td>
<td>.195</td>
</tr>
<tr>
<td>1944</td>
<td>148</td>
<td>34</td>
<td>.204</td>
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<tr>
<td>1945</td>
<td>170</td>
<td>37</td>
<td>.179</td>
</tr>
<tr>
<td>1946</td>
<td>265</td>
<td>62</td>
<td>.190</td>
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<tr>
<td>1947</td>
<td>257</td>
<td>64</td>
<td>.199</td>
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<td>1948</td>
<td>209</td>
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<td>.177</td>
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<td>1949</td>
<td>178</td>
<td>36</td>
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<td>1950</td>
<td>338</td>
<td>78</td>
<td>.188</td>
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<tr>
<td>1951</td>
<td>304</td>
<td>67</td>
<td>.181</td>
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<tr>
<td>1953</td>
<td>258</td>
<td>56</td>
<td>.178</td>
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<tr>
<td>1957</td>
<td>518</td>
<td>113</td>
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<tr>
<td>1959</td>
<td>478</td>
<td>105</td>
<td>.180</td>
</tr>
<tr>
<td>1961</td>
<td>657</td>
<td>158</td>
<td>.194</td>
</tr>
<tr>
<td>1963</td>
<td>790</td>
<td>183</td>
<td>.188</td>
</tr>
</tbody>
</table>

Source: Pechman, *Federal Tax Policy*, Table B-13, p. 272

*Filing years*

*Gift tax divided by gift tax plus taxable gifts. The gift tax is computed on the basis of the gift net of taxes (Taxable Gifts). Thus the marginal gift tax rate is g/l + g. Hence current year taxable gifts plus the gift tax are divided into the gift tax. See Shoup, *Federal Estate and Gift Taxes*, P. 15.*
TABLE 4

ESTIMATED SHARES OF UNREALIZED CAPITAL GAINS AT SELECTED ALTERNATIVE GIFT AND ESTATE TAX RATES, 1962

<table>
<thead>
<tr>
<th>Estimated Marginal Gift Tax Rate</th>
<th>Marginal Bequest Tax Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>.21</td>
<td>.38</td>
</tr>
<tr>
<td>.19</td>
<td>.34</td>
</tr>
<tr>
<td>.17</td>
<td>.38</td>
</tr>
<tr>
<td></td>
<td>.42</td>
</tr>
</tbody>
</table>

Source: See text.

1 Marginal income rate on wages and salaries assumed to be .5.

2 Alternative calculations of γ have been performed at alternative marginal income tax rates. The range of γ is .51 to .81 at t = .40, .42 to .66 at t = .45, and .31 to .49 at t = .55.
Therefore, since taxable gifts of the current year are an increment to gifts of past years, and taxes are also incremental, the computed tax rates may be said to be roughly marginal. Table 3 shows -- and it is a piece of good fortune that this is the case, since donors in 1962 may have made gifts in any pattern over the preceding years -- that recorded rates never varied by more than about .03 (.17 to .20) over the period from 1942 to 1963. The average of these rates is about .19 over the period.

The only question that remains, given the nature and constancy of the gift tax rates, is whether the .19 rate was really paid by 1962 estate tax decedents. So long as testators behaved as givers, the applicable marginal rate would have been about .19. However, wealthy decedents would conclude their lifetime gifts at a marginal rate above or below .19 if the unrealized capital gains share on their assets fell short of or exceeded the corresponding share for average givers. Finally, it has already been found that state gift taxes are negligible, so that the federal gift tax is the appropriate measure of total gift taxes.

To summarize: the tax rate calculation (admittedly of a rough nature) for the year 1962 would indicate that these marginal rates prevailed: an estate tax rate of about .41, a gift tax rate of about .19 (on the assumption that the typical 1962 decedent behaved like the typical giver for recorded years), and a marginal income tax rate of about .50.

5. Comparison of Predicted and Estimated Unrealized Capital Gains Shares

Inserting the estimated tax rates from the preceding section into equation (19), a range of predicted unrealized capital gains shares is created. These are presented in Table 4. The reason for the variation, given the use of point estimates, derives from the uncertainty which surrounds the mean federal estate
tax rate, the much more important uncertainty concerning the base of state
death taxes, and an assumed range of variability in the federal gift tax
rate bounded approximately by the highest and lowest rates appearing in Table 3.
Thus the predicted share of unrealized capital gains ranges from .34 to .54,
with .44 a middle estimate.

Estimated shares of unrealized capital gains were derived based on stock
price data, and the calculations of David (1968) and McClung(1966).15 The
estimated shares were further adjusted for estate and gift composition and the
effects of taxes on composition.

The primary source of information utilized regarding the share of assets
in unrealized capital gains is David (1968). Two other studies contained
deficiencies which David tried to correct in his own work. In McClung (1966),
trading of assets is assumed to be independent of past appreciation and the
past holding period biasing the share of realized gains upward, and the share
in unrealized gains (\(\gamma\)) downward, the latter of which is estimated at .40.
In Bailey (1969), inconsistent accounting is employed, which bases realized
capital gains on all assets held by individuals and fiduciaries and all gains
only on corporate equities held by individuals, again biasing the unrealized
gains share downward.

Here estimates of \(\gamma\) have been prepared using McClung's calculations
of original value (0) and current value (V), and David's corrected estimates
unrealized capital gains in all gains (U/A). Both are restricted out of
necessity to corporate shares, both terminate in 1963, and measure end

15 The reader should be warned that the computations of all researchers in this
area have been necessarily crude and are subject to error. Some of the
difficulties are discussed in the Appendix of the paper.
of period values. In David (pp. 93-103) the ratio of unrealized gains to all gains is estimated at

\[(U/A)_{low} = .792 \quad \quad (U/A)_{high} = .840\]

The ratio of all gains to current value is taken at McClung's value of

\[A/V = .676. \]

The share of unrealized capital gains in current value is the product of these estimates, so estimates for \(\gamma\) are obtained of

\[\gamma_{low} = (U/A)_{low} \cdot A/V = .535 \quad \quad \gamma_{high} = (U/A)_{high} \cdot A/V = .568\]

It is assumed that these values for \(\gamma\) are reasonable for estate assets in a class with corporate stock. The next step in the argument is to adjust for estate composition.

Table 5 presents background data on estate composition for selected years. The data are categorized by expected appreciation. Stocks, real estate, and other assets (largely comprised of equity in own business) are all assumed to match the appreciation of corporate equities and their share of unrealized capital gains. Bonds, mortgages, and notes presumably appreciate to a much lesser extent, and cash or life insurance do not appreciate at all. For the latter two asset groups unrealized capital gains are assumed to be zero.

---

\[A/V\] is calculated as \((V-0)/V\). McClung's is the only study known to me which takes account of assets passing out of existence, and hence is able to compute original value 0. Notice that while McClung's estimate of \(\gamma = U/V\) is subject to criticism, the figure for \(A/V\) is not, because the division of gains between realized and unrealized is irrelevant for the comparison. The main problem with McClung's estimate is that the asset data are not fully matched with David's.

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**TABLE 5**

**COMPOSITION OF GROSS ESTATES** by asset types, selected years, 1922 to 1962

<table>
<thead>
<tr>
<th>Year</th>
<th>% in Stocks, Real Estate, and Miscellaneous</th>
<th>% in Bonds, Mortgages, and Notes</th>
<th>% in Cash and Life Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1922</td>
<td>69.1</td>
<td>15.0</td>
<td>16.0</td>
</tr>
<tr>
<td>1929</td>
<td>73.0</td>
<td>14.2</td>
<td>12.7</td>
</tr>
<tr>
<td>1933</td>
<td>56.8</td>
<td>22.4</td>
<td>20.8</td>
</tr>
<tr>
<td>1937</td>
<td>61.7</td>
<td>19.4</td>
<td>18.9</td>
</tr>
<tr>
<td>1944</td>
<td>61.8</td>
<td>21.7</td>
<td>16.5</td>
</tr>
<tr>
<td>1949</td>
<td>64.9</td>
<td>17.2</td>
<td>18.0</td>
</tr>
<tr>
<td>1954</td>
<td>70.2</td>
<td>13.6</td>
<td>16.3</td>
</tr>
<tr>
<td>1958</td>
<td>72.2</td>
<td>12.3</td>
<td>15.5</td>
</tr>
<tr>
<td>1960</td>
<td>72.8</td>
<td>12.5</td>
<td>14.7</td>
</tr>
<tr>
<td>1962</td>
<td>70.9</td>
<td>12.4</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Source: Carl S. Shoup, *Federal Estate and Gift Taxes*, Table 1-4, p. 9, and *Statistics of Income, Fiduciary, Estate, and Gift Tax Returns, 1962*, Table 1, p. 60.

*Year prior to filing, or presumed year of death.*

*Category Miscellaneous includes equity in closely-held businesses, and other real property.*

*For years 1922-1937, mortagages and notes could not be separated from cash.*

*Gross Estates include non-taxable as well as taxable returns.*
More detailed data for the sample year 1962 is presented in Table 6, which purposefully includes only taxable estates. Percentages of assets experiencing zero appreciation are tabulated by Gross Estate Class, as well as a rightmost expense column. The computations disclose that 72% of Gross taxable estates consist of equity-like assets.

The true tax rate formulas suggest that Disposable Estate and its composition are the relevant measures of bequest. However, data on estate composition, once taxes and indebtedness have been deducted, are not available. Limits for the share of disposable estate in equities can be obtained through the following argument. Cash and other liquid holdings are bequeathed, more than other assets, in order to discharge debts, expenses, and taxes. Hence, the minimum estimate of the equity asset share is the unadjusted 72% figure for taxable Gross Estate. The maximum estimate (actually an overestimate) can be made by assuming that the maximum possible amounts in liquid assets for the tabulated brackets are used to discharge cost items. Therefore, if the percentage in liquid assets exceeds the percentage in cost items, the difference is taken as the residual per cent; if the percentage of liquid assets is the smaller of the two, the residual per cent is assumed to be zero. This is an upper bound, because intra-class variation in estate composition makes some of the cancelling impossible, and actual behavior may differ from attributed behavior. Deducting all cost items from total gross estate, and dividing this figure into total residual liquid assets yields an 11% proportion. The maximum share of equity assets is therefore 89%.

---

18 Table 6 shows a falling share of liquid assets as the proportion of cost items rises with the rising average tax rate. However, time is granted for payment of the estate tax in order to avoid a liquidity problem. Thus the falling share of liquid assets is not inconsistent with the interpretation in the paper.
## TABLE 6

CLASS PERCENTAGES OF GROSS ESTATES IN COST ITEMS AND LIQUID ASSETS,

BY GROSS ESTATE CLASS, TAXABLE RETURNS, 1962

<table>
<thead>
<tr>
<th>Gross Estate Class ($1000)</th>
<th># of Returns</th>
<th>Amount of Gross Estate in Class ($1000)</th>
<th>% in Liquid Assets (^a)</th>
<th>% in Debts, Expenses and Taxes (^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 under 70</td>
<td>2,553</td>
<td>170,883</td>
<td>39.0</td>
<td>5.7</td>
</tr>
<tr>
<td>70 under 80</td>
<td>4,703</td>
<td>352,394</td>
<td>37.4</td>
<td>8.0</td>
</tr>
<tr>
<td>80 under 90</td>
<td>4,072</td>
<td>345,692</td>
<td>35.7</td>
<td>9.6</td>
</tr>
<tr>
<td>90 under 100</td>
<td>3,454</td>
<td>327,661</td>
<td>34.9</td>
<td>10.8</td>
</tr>
<tr>
<td>100 under 120</td>
<td>5,480</td>
<td>599,539</td>
<td>33.2</td>
<td>12.7</td>
</tr>
<tr>
<td>120 under 150</td>
<td>7,935</td>
<td>1,069,720</td>
<td>33.9</td>
<td>12.1</td>
</tr>
<tr>
<td>150 under 200</td>
<td>8,704</td>
<td>1,503,512</td>
<td>32.9</td>
<td>15.0</td>
</tr>
<tr>
<td>200 under 300</td>
<td>7,941</td>
<td>1,924,173</td>
<td>29.9</td>
<td>18.9</td>
</tr>
<tr>
<td>300 under 500</td>
<td>5,403</td>
<td>2,091,456</td>
<td>27.6</td>
<td>23.0</td>
</tr>
<tr>
<td>500 under 1000</td>
<td>3,157</td>
<td>2,154,005</td>
<td>24.8</td>
<td>26.3</td>
</tr>
<tr>
<td>1000 under 2000</td>
<td>1,115</td>
<td>1,527,582</td>
<td>22.9</td>
<td>30.0</td>
</tr>
<tr>
<td>2000 under 3000</td>
<td>287</td>
<td>690,457</td>
<td>22.3</td>
<td>32.8</td>
</tr>
<tr>
<td>3000 under 5000</td>
<td>190</td>
<td>714,192</td>
<td>21.9</td>
<td>34.2</td>
</tr>
<tr>
<td>5000 under 10000</td>
<td>101</td>
<td>665,754</td>
<td>21.9</td>
<td>40.0</td>
</tr>
<tr>
<td>10000 under 20000</td>
<td>24</td>
<td>334,640</td>
<td>25.9</td>
<td>37.7</td>
</tr>
<tr>
<td>20000+</td>
<td>8</td>
<td>241,845</td>
<td>19.6</td>
<td>43.0</td>
</tr>
<tr>
<td>Total</td>
<td>55,207</td>
<td>14,713,504</td>
<td>27.9</td>
<td>22.9</td>
</tr>
</tbody>
</table>

Source: Statistics of Income, Fiduciary, Gift, and Estate Tax Returns, 1962, Table 1, p. 60-63.

\(^a\) Liquid assets consist of bonds, mortgages and notes, cash, life insurance proceeds, and annuities.

\(^b\) Expenses consist of executors' commissions, attorneys' fees, other expenses, and funeral expenses.
Table 7 shows some supporting data on gifts suggesting a nearly identical asset composition for gifts and estates. Consequently, either counterfactual holds as an approximation: if estates had been given as gifts capital gains taxes would have been levied on X % of the value, or if gifts had been left as estates, capital gains taxes would not have been levied on X % of the value.

In view of the foregoing, the expected share of unrealized capital gains in bequests can be bounded on the one hand by the product of the high estimates of the equity share of unrealized capital gains and the equity share in estates, and on the other, by the low estimates.

Table 8 presents these estimates, which range from .39 to .51. The range of stock-price estimates lies well within the range of predicted values, so it would appear that the existence of a capital gains share for the typical stockholder would have been sufficient to account for the 1962 divergence in transfer tax rates. This conclusion presumably applies to other years as well.

19 The proportion of equity assets in Gross Gifts is somewhat higher than for Gross Estate in 1962 -- 83% as opposed to 72%. However transfer taxes are a smaller fraction of Gross Gifts than Gross Estates, and also the expenses associated with death -- residual debt, funeral expenses, and various commissions -- do not pertain to gifts. Therefore Gross Gifts more closely approximate Disposable Gifts than Gross Estate does Disposable Estate, and the equity fraction should be higher. In view of the above, the share of equities in each transfer appears to be nearly the same.

20 These remarks presuppose that marginal composition does not differ appreciably from the average. The question may also be raised why gifts occur in appreciating assets rather than in cash. The answer must be that trading in these assets would cause the donor to pay capital gains taxes plus additional transactions costs at least as high as the capital gains taxes which would have been payed by recipients. Therefore there is no advantage in this maneuver.
TABLE 7

COMPOSITION OF TOTAL GIFTS BY ASSET TYPES, SELECTED YEARS, 1958 TO 1965

<table>
<thead>
<tr>
<th>Year</th>
<th>% in Stocks, Real Estate, and Miscellaneous</th>
<th>% in Bonds</th>
<th>% in Cash and Insurance</th>
<th>% in Gift Tax, Current Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965, all</td>
<td>81.0</td>
<td>2.1</td>
<td>16.9</td>
<td>10.4</td>
</tr>
<tr>
<td>1965, taxable returns only</td>
<td>84.3</td>
<td>2.6</td>
<td>13.2</td>
<td>17.4</td>
</tr>
<tr>
<td>1962, all</td>
<td>80.8</td>
<td>2.3</td>
<td>16.9</td>
<td>6.9</td>
</tr>
<tr>
<td>1962, taxable returns only</td>
<td>82.7</td>
<td>2.8</td>
<td>14.6</td>
<td>13.1</td>
</tr>
<tr>
<td>1960, all</td>
<td>81.8</td>
<td>2.4</td>
<td>15.7</td>
<td>6.8</td>
</tr>
<tr>
<td>1960, taxable returns only</td>
<td>85.1</td>
<td>2.4</td>
<td>12.5</td>
<td>12.9</td>
</tr>
<tr>
<td>1958, all</td>
<td>78.0</td>
<td>2.9</td>
<td>19.0</td>
<td>5.6</td>
</tr>
<tr>
<td>1958, taxable returns only</td>
<td>79.3</td>
<td>3.5</td>
<td>17.2</td>
<td>11.3</td>
</tr>
</tbody>
</table>

TABLE 8
ESTIMATED SHARES OF UNREALIZED CAPITAL GAINS IN ESTATES, 1962

<table>
<thead>
<tr>
<th>Estimates of Share of Unrealized Capital Gains ($\gamma$)</th>
<th>Estimates of Share of Equity Assets in Estate ($\alpha$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\alpha_{\text{Low}} = .72$</td>
</tr>
<tr>
<td>$\gamma_{\text{Low}} = .535$</td>
<td>.386</td>
</tr>
<tr>
<td>$\gamma_{\text{High}} = .568$</td>
<td>.410</td>
</tr>
</tbody>
</table>

Source: See text.
More formal testing is possible, though the fact that the \( \gamma \) estimates are means unaccompanied by variances prohibits the use of parametric methods. The Median Test is a useful nonparametric technique applicable to data of this kind. The one-sided \( P \)-value, or minimal level of significance at which the null hypothesis of identical \( \gamma \) distributions can be rejected, is \( P = .732 \). Hence, there is no significant difference observed in the two \( \gamma \) distributions.

6. A Prediction

The possibility of repealing the estate tax provision favoring unrealized capital gains is now under discussion. Since the repeal would offer in the absence of offsetting changes, an experimental test of the theory exposited in section 2., it seems useful to outline the results expected from this analysis. In the comparison nominal bequest and gift tax schedules are held constant.

The strongest result from the theory does not require any ceteris paribus conditions other than constancy of all other tax provisions. Nominal estate and gift tax rates will converge, and indeed become equal if it is literally true that

---

21 The Median Test assumes data points taken from two samples to be independent and applies Fisher's 2X2 Exact Test to sample observations cross-classified by subsample and whether they exceed or fall short of the median of the combined sample. For an exposition, see Brownlee (1965), pp. 246-247. The present application uses all ten data points from Tables 4 and 8.

22 This holds for a hypothesized difference of the estimated \( \gamma \) from the predicted \( \gamma \) in either the positive or negative direction. One-sided \( P \)-values were also calculated for alternative marginal income tax rates of \( t = .40, t = .45, \) and \( t = .55 \). These were found to be \( P = .024, P = .262, \) and \( P = .732 \) respectively. The calculation for \( t = .40 \) illustrates a small sample flaw in the test which is apparently inevitable, for a significance level lower than .024 is not possible even in this case, where all estimated \( \gamma \) values lie below the median. This problem disappears as the total number of observations increases, in any application of the test.
there are no differential factors remaining which affect gift and estate transfers. Equalization is an implication of equation (19), which ignores all other sources of differential treatment. This conclusion follows from the fact that real rates in the initial position favor gifts after repeal, and from the implication of the theory that no advantage can persist.

Less strongly, at any given wealth of the donor, definite directions of change are imparted to the gift and estate tax rates. The nominal bequest tax rate falls, and the nominal gift tax rate rises. These effects can be overturned if accompanied by independent growth in wealth, since all transfers and nominal tax rates would increase if price effects of the repeal were overcome by wealth effects.

7. Conclusion

This paper has shown how formal incorporation of the differential income tax treatment favoring bequests over gifts can explain the excess of the nominal bequest tax rate over the gift tax rate, using published aggregate data. The usual caveats concerning reliability of estimates apply with special force to the calculation of the unrealized capital gains share, a matter discussed in somewhat more detail in the concluding Appendix. In addition, matched data on gift and bequest tax rates were not available, so observed tax rates based on the behavior of unmatched persons in the gift and bequest samples were utilized in their place. Matched data would provide a more accurate test of the principal

23. With equilibration of differentials in marginal transfer prices, the increase in the common marginal price is less than the exogenous increase in the bequest price permitting reallocation of transfer components towards gifts, and reduction of total net transfers in response to the higher common price at the reallocated former level. This implies that bequests fall, and with imperfect substitution against total net transfers, the rise in the common price implies an increase in gifts.
implication, inclusive of information on the unrealized capital gains share specific to transfers.

The importance of the demonstration in a practical sense lies in showing that decedents utilize the available tax loopholes, thus carrying the matter beyond conjecture, where it has stood for some years. Moreover, it supports the hypothesis exposited, which in another context has been tied to the issue of personal wealth distribution. The same approach can be used to show why donors would utilize transfers to help prevent erosion of the future generations's wealth position relative to their own. Under certain conditions gifts and bequests would become wealth elastic, thus contributing to wealth inequality. The model predicts more strongly that transfers of assets are more wealth elastic than transfers of education, thus basing the explanation of observed inequality in asset holding greater than inequality in the embodiment of human capital firmly on individual behavior. Hence, the present exercise relates not simply to an issue in taxation, but ultimately and more significantly, to the realm of distribution.
APPENDIX
Data on Capital Gains Shares of Assets

This appendix briefly documents the calculations performed by David and difficulties associated with them. The computations were limited to listed corporate stocks, for which total accrued gains can be estimated. Intercorporate and institutional shares were netted out, so that holdings were confined to households. Inclusion of intercorporate shares would cause double counting of gains, while inclusion of institutional shares would count gains not obviously received by households. Total gains or accruals were estimated by the formula

\[ A_t = \frac{V_{t-1}}{P_{t-1}} - 1 \]  

(A.1)

where

- \( A_t \) = accruals at the end of year \( t \).
- \( V_{t-1} \) = aggregate value of listed corporate equities held by households at the end of year \( t-1 \).
- \( P_t \) = weighted composite price per share in Moody's Industrial Manual.

Realized gains were computed from tax data in Statistics of Income - Individual Income Tax Returns, either as given or crudely adjusted upward for underreporting. The underreporting factor was a constant applied to all years, though derived from 1959 and 1961 data alone. The estimated realized gains were then adjusted downward for all years by another constant factor, the ratio of realized gains on corporate equities to all realized gains in 1959. This is because realizations apply to the whole spectrum of assets. The cumulated difference in accruals and adjusted realized gains is an estimate of all unrealized capital gains. It is not an estimate of unrealized taxable gains, and more important, it is not an estimate of unrealized taxable gains in estates. The basic reason is that the calculated gains treat assets as if they had never turned over through bequest.
To the extent that turnover takes place, an increase in basis value occurs which reduces taxable unrealized gains by that amount. Since taxable unrealized gains are the source of advantage to transfer through bequest, a deduction ought to be made for the increase, which is known technically as step-up. However, several difficulties stand in the way of an estimate. David calculates annual step-up as

\[ s_t = m_t (U_t + A_t - \frac{G_t}{2}) \]  

(A.2)

where

- \( s_t \) = annual step-up in year \( t \)
- \( m_t \) = mortality rate applicable to shareholders in year \( t \)
- \( U_t \) = cumulative unrealized gains from earlier years
- \( A_t \) = gain accruing in year \( t \)
- \( G_t \) = capital gains realized on corporate stock, adjusted for uniform distribution of deaths during year \( t \).

Total step-up is then simply taken as the sum of annual step-ups. Equation (A.2) assumes that death randomly converts unrealized gains into step-up. Taxable unrealized gains are then

\[ U_t = U_{t-1} - s_t + A_t - G_t \]  

(A.3)

The computation of step-up requires an appropriate mortality rate, which is estimated variously by David as the 1965 mortality rate weighted by the age distribution of stockholders, and applied to all years and mortality rates unweighted for each year and applied in sequence. Using the 1965 rate it is estimated that taxable unrealized gains \( U^* \) are in the following proportion to all gains \( A \).
These calculations are approximately 20% lower than the .792 and .840 figures used in the paper, and constitute David's minimum estimate of taxable unrealized gains in all gains. They contain two difficulties which could produce a serious underestimate of $U^*/A$. The first is the completely ignored erosion of step-up through retirement of assets. The second is the fact that step-up as a proportion may be lower than average for estates. Assets with comparable total unrealized gains would be likely to have low step-up shares since donors seek to bequeath assets on which there is an exceptional advantage. The overall estimate would be excessive if the mortality rate utilized were not a serious underestimate.

Computations of the revised minimal $\gamma$ based on the above fractions reveals a range of $\gamma$ from 31% to 40% as compared to text values of 39% to 51%, though again most of the difference in tax rates is accounted for. In addition the two factors mentioned above lead to an underestimate, as well as unrealized taxable gains in general expected to be larger than the average observed on stocks.

Finally, David (1968, p. 78) presents evidence indicating that capital gains shares on stocks, real estate, and own business equities were quite similar for traded assets in 1959 and 1961, which is the justification for the similar treatment of these assets in the estate data.
REFERENCES


Gorman, W.M., 1959, Separable Utility and Aggregation, Econometrica 27, 469-481.


