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James M. Poterba; Robert E. Hall; R. Glenn Hubbard

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JAMES M. POTERBA
Massachusetts Institute of Technology

Tax Policy and Corporate Saving

ALTHOUGH CORPORATIONS are responsible for roughly half of private saving in the United States, most studies of saving focus exclusively on household behavior. Policy initiatives to increase saving have also concentrated on personal saving, through such measures as Individual Retirement Accounts and reductions in marginal tax rates. The Tax Reform Act of 1986 is likely to prove a particularly costly example of the neglect of corporate saving. The new law increases corporate taxes approximately $120 billion over the next five years and reduces the tax incentives for retaining corporate earnings. Even if it does not affect pretax corporate earnings, it could reduce corporate saving between $30 billion and $40 billion a year by 1989.

Whether tax-induced changes in corporate saving affect the level of private saving is a central issue in evaluating the recent tax reform. Most theoretical studies model household consumption and saving decisions as a function of the private sector's budget constraint, implicitly assuming that households "pierce the corporate veil" and take full account of corporations' saving on their behalf. According to that view, the Tax Reform Act's reallocation of tax burdens between individuals and corporations will not affect private saving. In contrast, most macroeconometric models and saving studies that link consumption decisions

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to disposable income and household wealth without any explicit recognition of undistributed profits find that corporate saving does affect total private saving. An increase in dividend payments offset by a reduction in undistributed profits, which raises disposable income and lowers share values, will reduce total private saving if the marginal propensity to consume out of disposable income exceeds that from wealth.

This paper investigates both the impact of tax policy on corporate saving and the effects of corporate saving on private saving. The first section documents the importance of corporate saving. The paper then considers how the recent increase in corporate taxes and reduction in dividend taxes will affect corporate saving. Time series estimates of the relationship between corporate dividends, after-tax profits, and the tax treatment of dividends suggest a substantial decline in corporate saving, raising the question whether changes in corporate saving affect the level of private saving. The U.S. time series evidence suggests that personal saving adjusts only partly to offset shifts in corporate saving. The movements in corporate saving induced by the Tax Reform Act are therefore likely to reduce private saving, although by less than the decline in corporate saving. The concluding section suggests several directions for future work.

The Importance of Corporate Saving

Private saving equals the sum of personal saving, or the excess of disposable income over personal consumption, and corporate saving. Although the precise division of private saving into these two components is ambiguous, most measures suggest that gross corporate saving has accounted for roughly half of gross private saving during the 1980s. This section discusses the measurement of corporate saving and provides summary statistics on its changes since 1950.

MEASURING CORPORATE SAVING

Gross corporate saving in the National Income and Product Accounts (NIPA) equals undistributed corporate profits, while net saving equals undistributed profits less capital consumption. Since capital consumption should be treated as an expense of doing business, this paper focuses

primarily on net saving.[1] Table 1 reports data for both gross and net private saving since 1950. Net private saving declines dramatically as a share of net national product during the 1980s, although gross private saving as a share of gross national product is relatively constant. Gross corporate saving accounts for approximately half of gross private saving during the 1980s. The corporate share of net saving is somewhat smaller, about 30 percent. Although gross corporate saving accounts for a larger fraction of gross national product in the 1980s than in any previous decade, net corporate saving reaches its postwar low. It averages only 2.1 percent of net national product during 1980–86, down from 2.7 percent in the 1970s and 3.8 percent in the 1960s. Since 1984, net corporate saving has returned to its level during the 1970s, but it is still well below its 1960s average.

Table 1 also shows the decline in personal saving during the 1980s.[2] Gross personal saving drops from 9.5 percent of GNP in the 1970s to only 8.7 percent in the 1980s and averages only 7.8 percent since 1984. Net personal saving declines even further, from 6.2 percent of NNP in the 1970s to 4.8 percent in the 1980s. The dramatic drop in net personal saving has increased the relative importance of corporate saving.

Corporate saving includes saving by nonfinancial corporations, financial corporations, and foreign affiliates of U.S. firms. Domestic nonfinancial corporations have accounted for 68 percent of net corporate saving during the postwar period, although their share has declined to only 58 percent during the 1980s. The two other corporate saving components exhibit opposing trends. Saving by financial corporations averaged about 0.6 percent of NNP from the 1950s through the 1970s, but has decreased to only 0.1 percent in the 1980s. In contrast, undistributed profits of foreign affiliates have become more important, rising from 0.2 percent of NNP during the 1960s to 0.7 percent in the 1980s. In

1. Some argue for examining movements in gross saving, because of potential measurement error in capital consumption. This problem is more likely to arise in analyzing the level of private saving than in comparing the level at different dates. Most of the changes in capital consumption as a share of NNP arise from variation in the respective shares of equipment and structures in the capital stock and from changes in the capital-output ratio. Neither trend is likely to be measured with substantial error.

2. The profits of sole proprietorships, partnerships, and other noncorporate businesses are included in personal saving because of the difficulties in allocating them between entrepreneurial labor income and capital income.

Table 1. Gross and Net Saving Rates, United States, 1950–86

	Gross saving (percent of GNP)			*Net saving (percent of NNP)*		
Year	*Corporate*	*Personal*	*Private*	*Corporate*	*Personal*	*Private*
1950	7.1	8.3	15.4	3.1	4.8	7.9
1951	6.9	8.9	15.8	2.9	5.4	8.3
1952	7.1	8.9	16.0	3.0	5.4	8.3
1953	6.7	8.9	15.6	2.5	5.4	8.0
1954	7.2	8.5	15.8	2.9	4.8	7.7
1955	8.2	7.9	16.1	4.0	4.3	8.3
1956	7.8	9.1	16.8	3.3	5.5	8.7
1957	7.8	9.1	16.9	3.0	5.5	8.5
1958	7.4	9.5	16.9	2.4	5.9	8.3
1959	8.2	8.4	16.6	3.5	4.8	8.3
1960	7.7	8.0	15.7	3.0	4.4	7.4
1961	7.7	8.6	16.3	2.9	5.1	8.0
1962	8.3	8.3	16.6	3.8	4.9	8.7
1963	8.4	7.7	16.1	3.9	4.4	8.4
1964	8.6	8.5	17.1	4.2	5.3	9.5
1965	9.1	8.4	17.4	4.8	5.3	10.1
1966	9.0	8.1	17.0	4.7	5.1	9.8
1967	8.6	9.0	17.6	4.2	6.0	10.2
1968	8.1	8.2	16.3	3.6	5.2	8.8
1969	7.5	7.9	15.4	2.9	4.8	7.6
1970	6.9	9.3	16.2	1.9	6.2	8.2
1971	7.6	9.7	17.3	2.6	6.6	9.3
1972	8.0	8.8	16.8	3.1	5.6	8.6
1973	7.7	10.2	18.0	3.0	7.2	10.1
1974	6.8	10.5	17.3	1.5	7.2	8.7
1975	8.4	10.6	19.0	2.6	7.3	9.9
1976	8.6	9.4	18.0	2.9	6.0	8.9
1977	9.2	8.6	17.8	3.5	5.1	8.6
1978	9.2	9.0	18.2	3.4	5.5	8.7
1979	8.8	9.0	17.8	2.8	5.3	8.0
1980	8.0	9.5	17.5	1.6	5.6	7.2
1981	8.3	9.7	18.0	1.6	5.9	7.5
1982	8.1	9.5	17.6	0.7	5.5	6.2
1983	9.0	8.4	17.4	2.2	4.3	6.5
1984	9.2	8.8	17.9	2.7	5.0	7.8
1985	9.4	7.8	17.2	3.0	4.0	7.0
1986	9.3	6.9	16.1	2.9	3.0	6.0
Averages						
1950–59	7.4	8.7	16.2	3.0	5.2	8.2
1960–69	8.3	8.3	16.6	3.8	5.1	8.9
1970–79	8.1	9.5	17.6	2.7	6.2	8.9
1980–86	8.7	8.7	17.4	2.1	4.8	6.9

Source: National Income and Product Accounts (NIPA), tables 5.1 and 1.10.

1986, net saving by foreign affiliates of U.S. firms was nearly one-third of net corporate saving.[3]

Many questions involving the demarcation of personal and corporate saving are difficult to resolve, and there are several plausible alternatives to the NIPA division. Two modifications are particularly important. The first involves corporate pensions. The national accounts treat corporate pension contributions as a corporate labor cost and a component of personal labor income, while imputing interest and dividends earned on corporate pension assets to individuals and including them as part of disposable income. Actual payments from pension funds to pensioners are not included in disposable income, but are treated as asset transactions within the household sector. Just as a household's decision to sell common stock and receive cash in return for an asset does not affect disposable income, neither does the partial withdrawal of pension assets. These conventions imply that if firms increase their pension plan contributions, corporate saving will fall and personal saving will rise. An increase in the nominal rate of return on pension assets will also increase measured personal saving.

The difficulty with this approach is that roughly three-fourths of corporate pension plans are defined-benefit plans in which the firm is liable to provide a particular stream of benefits to workers regardless of the corporate pension plan's asset position.[4] Variations in pension funding affect neither the firm's total pension liability nor the value of the employees' pension asset. The assets in defined-benefit plans are effectively assets of the corporation, and contributions to these plans net of changes in liabilities should be considered corporate rather than personal saving. The asset income of defined-benefit plans should similarly be credited to the corporate sector. These adjustments do not affect total private saving, but they alter the shares of corporate and personal saving.

3. Undistributed profits net of the inventory valuation adjustment and the capital consumption adjustment for the domestic financial and nonfinancial corporate sectors are drawn from NIPA, table 1.16. Undistributed profits of foreign affiliates are reported in NIPA, table 6.23.

4. A more complete discussion of saving issues posed by corporate pension contributions may be found in B. Douglas Bernheim and John B. Shoven, "Pension Funding and Saving," in Zvi Bodie, John B. Shoven, and David A. Wise, eds., *Pensions in the U.S. Economy* (University of Chicago Press, forthcoming).

Illustrative calculations presented below allocate all income from and contributions to defined-benefit plans, net of benefit payments, to corporate saving. That approach probably overstates the amount of corporate saving through pension plans, since increases in plan assets are partly offset by accruing liabilities. The adjustment reported below is strictly accurate only if the stock of net pension liabilities remains constant. Since it is virtually impossible to measure the level or the changes in the net liabilities of defined-benefit plans, the adjustment is based only on observable cash flows.[5]

The second modification involves the national accounts' failure to adjust corporate saving for inflationary gains on corporate debt, although the accounts adjust profits for spurious inflation gains on inventory and for the difference between capital consumption on a historical and a replacement-cost basis. The accounting failure arises from the focus on nominal rather than real interest payments. During inflationary periods, nominal interest payments are partly a repayment of principal, a transfer that offsets the inflationary erosion of the lenders' real asset value. By subtracting nominal interest payments from corporate income, the national accounts treat this repayment of principal as an expense and therefore mismeasure corporate saving.

The magnitude of this mismeasurement depends on the balance between nonfinancial corporations, which are net borrowers, and financial corporations, which are net lenders. In the 1950s, the nominal assets of financial corporations virtually offset the nominal liabilities of the nonfinancial corporations, so the required correction to corporate saving was trivial. By the late 1970s, however, the net nominal liabilities of the nonfinancial firms were substantially greater than the nominal assets of the financial corporations, and correcting the inflation-induced transfers therefore raised corporate saving.

Table 2 reports the pension and interest rate adjustments to corporate saving. The first column presents NIPA net corporate saving as a percentage of NNP. The second column shows the correction for

5. Accurate measurement of net liabilities requires detailed information on the market value of pension assets and the characteristics of both pension plans and their participants. It also requires forecasts about future mortality rates and discount factors. Even without these difficulties of implementation, there are controversial conceptual issues in the definition of pension liabilities. These issues are discussed at length in Jeremy I. Bulow, "What Are Corporate Pension Liabilities," *Quarterly Journal of Economics*, vol. 97 (August 1982), pp. 435–52.

corporate saving through defined-benefit pension plans. Since pension contributions plus pension income exceed benefit outflows for most of the postwar period, pension-adjusted corporate saving exceeds unadjusted saving. For the 1980s, the pension adjustment raises corporate saving by 1.5 percentage points from 2.1 percent to 3.6 percent of NNP. Although the pension adjustment is somewhat larger during the 1980s than in either of the previous decades, pension-adjusted corporate saving still exhibits a marked decline since the 1960s.

The third column of table 2 shows the saving adjustment for inflationary gains on corporate debt, net of losses on nominal assets held in defined-benefit pension plans. This inflation correction raises corporate saving an average of approximately 0.5 percent of NNP during the last two decades, with the largest effect during the mid-1970s. In 1980, when NIPA corporate saving was 1.6 percent of NNP, inflationary gains on nominal liabilities increased corporate saving by 0.6 percent of NNP. The inflation adjustment has become less important in recent years as the inflation rate has fallen. In 1986, gains on nominal liabilities raised corporate saving only 0.2 percent of NNP. The inflation correction therefore accentuates the decline in corporate saving during the 1980s.

The pension and inflation corrections increase the corporate share of total private saving. Although NIPA measures attribute just over 40 percent of net private saving in the past three years to corporations, the two adjustments raise that share to nearly two-thirds. Adjusted net corporate saving exceeds net personal saving throughout the postwar period.

Further adjustments to the reported corporate saving series are also possible. The national income accounts ignore accruing capital gains and losses as well as the proceeds of asset sales in the definition of income, and do not treat outlays for asset acquisition as an expense. This exclusion poses a particular problem in measuring corporate saving, since cash dividends and share repurchases are treated differently. If a corporation uses after-tax profits to pay cash dividends, corporate saving falls and disposable income (hence personal saving) rises. If the corporation uses its funds to repurchase shares, however, the expenditure is treated as an asset transaction that neither reduces corporate saving nor increases personal disposable income. Such expenditures are not deducted from after-tax earnings in computing undistributed profits, inducing a potential inconsistency in the measurement of corporate saving.

It is impossible to avoid some inconsistency in distinguishing personal

Table 2. Adjusted Corporate Saving Measures, United States, 1950–86
Percent of NNP

Year	*NIPA net corporate saving*	*Pension adjustment*[a]	*Inflation adjustment*[b]	*Repurchase adjustment*[c]
1950	3.1	0.5	−0.1	−0.1
1951	2.9	0.5	0.0	−0.1
1952	3.0	0.6	0.0	0.0
1953	2.5	0.6	0.0	0.0
1954	2.9	0.6	0.0	−0.1
1955	4.0	0.7	0.0	−0.1
1956	3.3	0.7	0.0	−0.1
1957	3.0	0.7	0.0	−0.1
1958	2.4	0.7	0.0	0.0
1959	3.5	0.8	0.0	−0.1
1960	3.0	0.8	0.0	0.0
1961	2.9	0.8	0.0	−0.2
1962	3.8	0.8	0.0	−0.3
1963	3.9	0.8	0.0	−0.1
1964	4.2	0.8	0.0	−0.2
1965	4.8	0.9	0.1	−0.2
1966	4.7	0.9	0.1	−0.1
1967	4.2	0.9	0.1	−0.2
1968	3.6	0.9	0.4	−0.1
1969	2.9	0.9	0.4	−0.1

from corporate saving. Distinguishing stock repurchases from other types of asset purchases, including purchase of stock in other companies, would link the corporate saving rate to the type of assets purchased by corporations. Treating share repurchases and dividends alike would lead to inconsistencies between asset transactions that transferred cash from firms to households. If a household were to sell a patent or equity in a partnership to a corporation, the sale would not alter measured corporate saving, while selling corporate stock back to the firm would. Moreover, if share repurchases were considered net dissaving, then debt-financed common stock repurchases would affect measured saving, even though these transactions simply exchange one security for another. In principle, corporate saving could be measured net of all asset transactions. It would then correspond to gross capital formation within the corporate sector. But that is not the concept that the national income accountants, concerned with the share of corporate income that is reinvested within the corporate sector, attempt to measure.

Table 2. ***(continued)***
Percent of NNP

Year	NIPA net corporate saving	Pension adjustment[a]	Inflation adjustment[b]	Repurchase adjustment[c]
1970	1.9	0.9	0.5	−0.1
1971	2.6	1.0	0.7	−0.1
1972	3.1	1.0	0.5	−0.2
1973	3.0	1.1	0.8	−0.1
1974	1.5	1.2	1.0	−0.1
1975	2.6	1.4	0.9	−0.1
1976	2.9	1.4	0.5	−0.1
1977	3.5	1.5	0.5	−0.2
1978	3.4	1.6	0.6	−0.2
1979	2.8	1.7	0.6	−0.2
1980	1.6	1.9	0.6	−0.2
1981	1.6	1.8	0.4	−0.5
1982	0.7	1.7	0.3	−0.4
1983	2.2	1.6	0.2	−0.7
1984	2.7	1.4	0.1	−1.0
1985	3.0	1.2	0.2	−0.7
1986	2.9	1.0	0.2	−0.7
Averages				
1950–59	3.0	0.6	0.0	−0.1
1960–69	3.8	0.9	0.1	−0.2
1970–79	2.7	1.2	0.6	−0.1
1980–86	2.1	1.5	0.3	−0.6

Sources: Net corporate saving from table 1, col. 4. Adjustments are computed by author. See text description.

a. The correction for defined-benefit pension plans adds 0.72 times (employer contributions to pension and profit sharing plans less benefits paid from these plans plus imputed interest received by households from pension plans) to the flow of corporate saving. Time series on contribution, benefit, and interest flows are found in National Income and Product Accounts, tables 6.11 and 8.8. The 0.72 factor is the fraction of pension assets in defined-benefit plans in 1978, as reported in Emily S. Andrews, *The Changing Profile of Pensions in America* (Washington, D.C.: Employee Benefit Research Institute, 1985). This fraction has remained relatively stable since 1971, when data first became available, so the error associated with assuming a constant value through time does not seem large. The share of the imputed interest flow from life insurance and pension funds is allocated to pensions using Federal Reserve Board data on the share of total life insurance assets that are held for pension plans.

b. The inflation adjustment is computed as the annual (fourth-quarter-to-fourth-quarter) change in the GNP deflator times the book value of net corporate debt. The data series for the book value of outstanding corporate debt was provided by Joosung Jun. The book value of nominal assets in defined-benefit pension plans was estimated using the Federal Reserve Board's Flow of Funds Account data on pension assets held by both life insurance companies and private pension funds. Since the Flow of Funds does not distinguish defined-benefit from defined-contribution plans, the earlier allocation of 72 percent of assets to defined benefit plans was applied.

c. Corporate share repurchases.

This paper focuses on corporate saving unadjusted for share repurchases. To highlight the difference between this approach and one using the repurchase-adjusted saving series, the last column of table 2 presents the ratio of share repurchases to net national product. Throughout most of the postwar period, stock repurchases constituted a negligible fraction

of corporate earnings. The 1980s, however, have witnessed a rapid increase in repurchases.[6] If corporate saving in 1985 had been measured net of share repurchases, it would have been 0.7 percent of NNP below its unadjusted level.

WHY HAS CORPORATE SAVING DECLINED?

Tables 1 and 2 show that net corporate saving as a share of net national product has declined during the last two decades. Some insight on the source of this decline is provided by the accounting identity linking corporate saving to pretax profits, interest payments, dividends, and corporate taxes:

$$CORPSAVE = INCOME - REALINT - DIVIDENDS - TAXES. \tag{1}$$

INCOME corresponds to corporate earnings before interest and taxes, after accounting for inventory valuation gains and capital consumption. *REALINT* corresponds to net real interest payments, net interest from NIPA plus the inflationary gain on corporate debt. *DIVIDENDS* denote net payments on both common and preferred stock, and *TAXES* include federal as well as state and local corporate profits taxes.

The decline in corporate saving is largely due to lower profits and higher interest burdens; lower corporate taxes have partially offset the decline. Pretax corporate profits have declined from 11.6 percent of NNP during the 1960s to 10.1 percent during the 1970s and to 9.3 percent during the 1980s. Falling profitability is therefore a key to the decline in net corporate saving. If all other factors had been constant, the decline in profits would have lowered corporate saving by 0.8 percent of NNP between the 1970s and the 1980s. Higher real interest payments have further reduced corporate saving. From a negligible level in the 1960s and 0.5 percent of NNP during the 1970s, real interest payments rose to 1.8 percent of NNP in the 1980s. The ratio of interest to corporate income

6. The growth in repurchases is probably related both to takeover pressures and to managers' gradual discovery that the IRS would not treat large repurchases as if they were dividend payments. Carol J. Loomis, "Beating the Market by Buying Back Stock," *Fortune* (April 29, 1985), pp. 42–52, is a useful introduction to corporate repurchase activity. A detailed discussion of the implications of repurchases for studies of corporate behavior is John B. Shoven, "The Tax Consequences of Share Repurchases and Other Non-Dividend Cash Payments to Equity Owners," in Lawrence H. Summers, ed., *Tax Policy and the Economy* (MIT Press, 1987), pp. 29–54.

increased even more dramatically. In part offsetting the first two factors, corporate taxes have declined from 4.4 percent of NNP in the 1960s to 3.5 percent in the 1970s and 2.3 percent in the 1980s. Accelerated depreciation and the drop in corporate taxes due to falling profits reduced tax burdens nearly enough to offset the profitability decline. The ratio of corporate taxes to corporate income has dropped from 47 percent in the 1950s to 35 percent in the 1970s and 25 percent in the 1980s.

The corporate saving identity also indicates some of the channels through which the Tax Reform Act of 1986 may influence corporate saving. Changes in average corporate tax payments will alter the cash flow available for shareholders, potentially affecting both dividends and corporate saving. Changes in marginal tax rates on firms and investors will also affect the share of corporate profits going to interest payments, retentions, and dividends and will thus affect the level of undistributed profits. Changes in marginal tax incentives for investment, as well as in the relative advantages of internal versus external finance, may also affect the level of corporate saving. The sources and uses of funds identity for the corporate sector requires that

$$INV = CORPSAVE + \Delta EQUITY + \Delta DEBT, \tag{2}$$

where INV designates investment outlays, $\Delta EQUITY$ corresponds to net new equity issues, and $\Delta DEBT$ measures the change in net debt outstanding. Although this study focuses on how changes in average corporate tax rates and dividend payout incentives affect corporate saving, further study of the tax reform's impact on investment would provide additional information on its ultimate consequences for private saving.

Taxation and Corporate Dividend Payout

The impact on corporate saving of changing the relative tax burdens on dividends and capital gains is one of the most controversial issues of capital income taxation.[7] A preliminary analysis of corporate financial

7. This section draws heavily on James Poterba and Lawrence Summers, "The Economic Effects of Dividend Taxation," in Edward I. Altman and Marti G. Subrahmanyam, *Recent Advances in Corporate Finance* (Homewood, Illinois: R. D. Irwin, 1985), pp. 227–84. A related discussion may be found in Alan Auerbach, "Taxation, Corporate Financial Policy and the Cost of Capital," *Journal of Economic Literature*, vol. 21 (September 1983), pp. 905–40.

policy suggests that because some shareholders are tax-penalized when firms pay dividends instead of using cash to repurchase shares, firms should not pay dividends at all, but should use nondividend channels such as share repurchases to transfer cash to shareholders. Nevertheless, dividend payments are an enduring practice of most large corporations, and many investors incur substantial tax liabilities as a result. In 1986, individuals paid an estimated $27 billion dollars in taxes on $81.2 billion of dividends.[8]

There are three major views of how dividend and corporate income taxation affect corporate saving. The first two imply that changes in household dividend tax rates will not affect corporate saving. The third and more traditional view, which holds that dividends are set by balancing the dividend tax burden against the benefits of paying dividends, suggests that changes in the relative tax burden on dividends and capital gains will affect corporate saving. The empirical evidence supports the traditional view.

THE TAX-IRRELEVANCE VIEW

The tax-irrelevance view assumes that share prices for dividend-paying firms are set by investors who face equal tax burdens on dividends and capital gains.[9] Since marginal investors do not demand higher pretax returns to induce them to hold dividend-paying securities, dividend-paying firms are not penalized in the marketplace. Tax changes that affect neither the identity nor the tax treatment of these marginal investors will not affect firms' incentives to pay dividends.

In several situations, marginal investors could be untaxed on dividend income. Untaxed institutional investors such as universities and pension funds, for example, held 32 percent of U.S. corporate equity at the end of 1986.[10] The dividend tax burden is also effectively zero for individuals

8. This estimate is calculated using the TAXSIM data file at the National Bureau of Economic Research.

9. For a fuller exposition of this view, see Merton H. Miller and Myron S. Scholes, "Dividends and Taxes," *Journal of Financial Economics,* vol. 6 (December 1978), pp. 333–64.

10. This calculation is based on the Federal Reserve's Flow of Funds data, aggregating the equity holdings of private pension funds plus 20 percent of the equity held in the household sector, which includes persons, nonprofit institutions, and trusts. The share of

for whom dividend income relaxes restrictions on interest deductions that are related to investment income. In both of these cases, the untaxed status of the marginal investor leads immediately to the classic Miller-Modigliani irrelevance result for a taxless world. Changes in tax rates on individuals who are not marginal investors will leave incentives for corporate payout, and hence corporate saving, unchanged.

The assumption that marginal investors are untaxed is ultimately verifiable only from empirical study. The somewhat controversial finding that on ex-dividend days share prices decline less than the value of their dividends suggests that marginal investors may face higher tax rates on dividends than on capital gains.[11] This assumption can also be tested by studying the reaction of corporate payout decisions to changes in dividend tax burdens.

The principal weakness of the irrelevance view is its failure to explain why substantial numbers of investors who *are* taxed on dividend income hold dividend-paying securities. Based only on tax considerations, these individuals should prefer firms that distribute profits by repurchasing shares, and it is not clear why a clientele of such firms has not arisen and eliminated dividend tax revenues.

THE TAX-CAPITALIZATION VIEW

Both the second and third views of dividend taxation postulate that shares are valued as if the marginal investor faces a higher tax rate on

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household equity held by nonprofits is based on Robert B. Avery and Gregory E. Elliehausen, "Financial Characteristics of High Income Families," *Federal Reserve Bulletin,* vol. 72 (March 1986), p. 175.

11. The ex-dividend evidence suggesting that investors are taxed more heavily on dividends than on capital gains includes Edwin J. Elton and Martin J. Gruber, "Marginal Stockholder Tax Rates and the Clientele Effect," *Review of Economics and Statistics,* vol. 52 (February 1970), pp. 68–74; Robert H. Litzenberger and Krishna Ramaswamy, "The Effect of Personal Taxes and Dividends on Capital Asset Prices: Theory and Empirical Evidence," *Journal of Financial Economics,* vol. 7 (June 1979), pp. 163–95; and Michael Barclay, "Tax Effects with No Taxes? The Ex-Dividend Day Behavior of Common Stock Prices Prior to the Income Tax," *Journal of Financial Economics,* forthcoming. Merton H. Miller and Myron S. Scholes, "Dividends and Taxes: Some Empirical Evidence," *Journal of Political Economy,* vol. 90 (December 1982), pp. 1118–41; and Roger H. Gordon and David E. Bradford, "Taxation and the Stock Market Valuation of Capital Gains and Dividends: Theory and Empirical Results," *Journal of Public Economics,* vol. 14 (October 1980), pp. 109–36, question this evidence and suggest that taxes do not affect valuation.

dividends than on capital gains. These two views, which try to explain why corporations pay dividends in spite of their tax disadvantage, differ in their predictions about how changes in dividend tax rates and corporate tax burdens affect corporate saving. The two views make different assumptions about the constraints on corporate financial behavior, and each could apply to some corporations. Empirical evidence is needed to determine which view more accurately captures the overall effect of taxes on corporate saving.

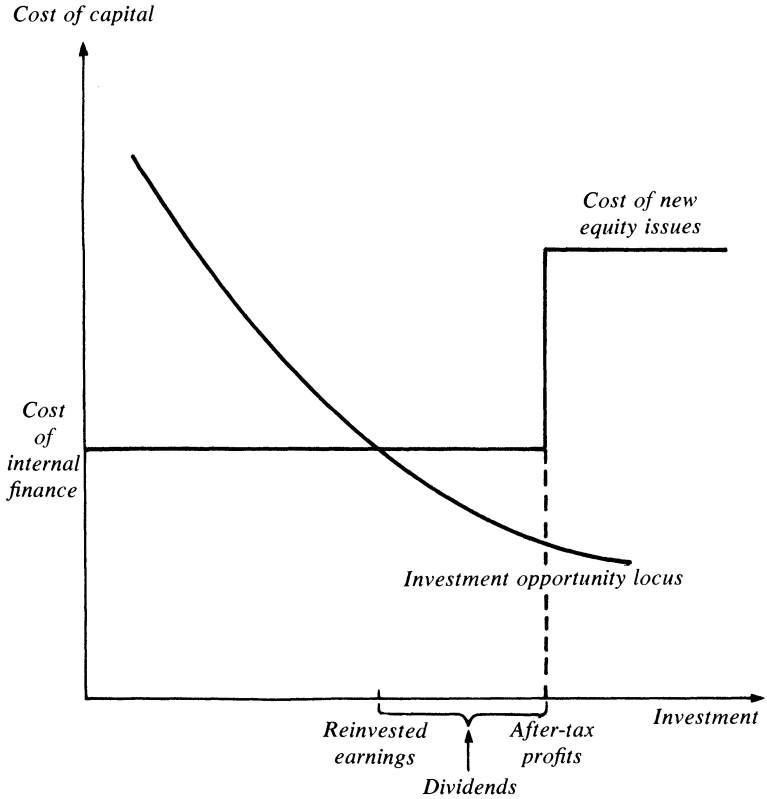
The tax-capitalization view applies to mature firms with after-tax profits in excess of their desired investment expenditures.[12] Figure 1 depicts both the firm's investment opportunity locus and its cost of funds schedule with a kink at the point where the supply of internal finance is exhausted.[13] Firms whose behavior is accurately described by the tax-capitalization view will have excess cash flow after financing all investment. If they cannot find tax-free channels for transferring income to shareholders, then retained earnings are their marginal source of investment funds. Dividend payments are determined as the residual after the firms finance all profitable projects from internal cash flow.

Provided the firm anticipates using retained earnings as the marginal source of funds in all future periods, dividend taxes have no effect on investment decisions, as can be illustrated with a two-period example. In the first period, investors forgo $(1 - m)$ dollars of after-tax income when the firm invests one dollar, where m is the household marginal dividend tax rate. In the second period, the firm receives $1 + (1 - \tau)f'(k)$ on its investment, where τ denotes the corporate tax rate, and the firm distributes the earnings as dividends. The shareholder receives $(1 - m)[1 + (1 - \tau)f'(k)]$, or a rate of return of $(1 - \tau)f'(k)$. Because

12. The tax-capitalization view was developed by Alan J. Auerbach, "Wealth Maximization and the Cost of Capital," *Quarterly Journal of Economics*, vol. 93 (August 1979), pp. 433–46; David F. Bradford, "The Incidence and Allocation Effects of a Tax on Corporate Distributions," *Journal of Public Economics*, vol. 15 (February 1981), pp. 1–22; and Mervyn A. King, *Public Policy and the Corporation* (London: Chapman and Hall, 1977).

13. Differences between the cost of internal and external finance can be generated in models with either imperfect information or taxes. An example of the former is provided in Stewart C. Myers, "The Capital Structure Puzzle," *Journal of Finance*, vol. 39 (July 1984), pp. 575–92. The tax considerations that lead to differences in the cost of internal and external funds are described in Alan J. Auerbach, "Taxes, Firm Financial Policy, and the Cost of Capital: An Empirical Analysis," *Journal of Public Economics*, vol. 23 (February–March 1984), pp. 27–57.

Figure 1. Investment Financing



the shareholder is liable for dividend taxes whenever the money is paid out, the level of the dividend tax rate has no effect on the rate of return he requires the firm to earn.

The firm therefore sets $(1 - \tau)f'(k)$ equal to the investor's discount rate, regardless of m. Since dividends are determined as the difference between after-tax profits and new investment, the level of the dividend tax rate, which affects neither profits nor investment, will not affect corporate saving.[14] In contrast, changes in the corporate tax rate have a substantial effect on corporate saving. Unless increased tax payments

14. Investment is not affected by the level of the dividend tax rate. Tax changes, however, do temporarily affect intertemporal rates of substitution and therefore investment.

cause the supply of retained earnings to fall below the firm's desired investment level, the firm will maintain investment and reduce dividends dollar-for-dollar with increased taxes.[15]

The primary weakness of the tax-capitalization view is that it assumes that firms have no alternatives to dividends for distributing cash to shareholders. Although that assumption might have been true until the early 1980s, when relatively few firms were repurchasing shares, it is untenable today. Table 3 displays the pattern of corporate cash payouts during the last decade for the firms in the Industrial COMPUSTAT data files. In 1985, these firms paid $85.8 billion in cash dividends, repurchased $43.0 billion in common stock, and spent $74.5 billion on cash acquisitions of other firms. Dividends accounted for less than 45 percent of corporate cash payout. In addition, many firms were operating on several financial margins simultaneously. In 1985, for example, 31.7 percent of the firms that paid dividends also repurchased some common stock. The explosion in alternatives to cash dividends raises serious doubts about the basic assumption underlying the tax-capitalization view and underscores that rather than explaining why firms pay dividends, this view assumes that they must pay dividends and then analyzes the incidence effects of tax changes.

A further weakness is the assumption that dividend payments are a residual in the corporate accounts and are therefore subject to substantial variation. Developments that increase desired investment should, in theory, reduce dividend payments, making dividends as volatile as investment expenditures. But for nonfinancial corporations during 1947–86, the standard deviation of the annual change in real investment expenditures was $15.8 billion (1982 dollars), compared with $2.2 billion for real dividends.

THE TRADITIONAL VIEW

The third and more traditional view of dividend taxation resolves the dividend puzzle by arguing simply that shareholders value dividend

15. Changes in corporate tax rates also affect the cost of capital, $(1 - \tau)^{-1}\rho$, for ρ, the shareholder's required after-tax rate of return. A shift in τ will therefore reduce dividends through the cash flow or average tax rate effect, but this will be partly offset by the reduction in investment due to the increased cost of capital. Provided investment is not too sensitive to changes in the cost of capital, the average tax rate effect will predominate.

Table 3. Corporate Cash Distributions, 1976–85
Billions of dollars

Year	*Cash dividends*	*Share repurchases*	*Acquisitions*
1976	36.4	1.8	4.3
1977	42.1	3.9	7.1
1978	47.0	4.3	10.0
1979	54.8	5.6	20.7
1980	60.9	6.6	17.9
1981	71.2	6.2	34.6
1982	76.0	10.6	29.7
1983	82.3	9.8	24.2
1984	86.4	30.3	62.6
1985	85.8	43.0	74.5

Source: Author's calculations based on the universe of companies on the combined COMPUSTAT Industrial and Research data files.

payments. Firms that pay dividends thereby derive an advantage that is reflected in their market value. Although the reason dividends are valuable remains unclear, some possible explanations include their signaling role in demonstrating managerial confidence in the company's prospects, the need to restrict managerial discretion, and possible consumption planning benefits conferred on dividend recipients.[16] While recognizing that firms can repurchase shares, advocates of this view argue that firms nonetheless pay dividends because at the margin, the benefits from payout just equal the additional tax burdens associated with dividends rather than share repurchases.

This intrinsic dividend value can be modeled by assuming that the discount rate investors apply to the firm's income stream (ρ) depends on the payout ratio (α), so $\rho = \rho(\alpha)$, $\rho' < 0$. While dividend taxes make dividend payments unattractive, the lower discount rate that results

16. One example of a signaling model of dividend behavior is Merton H. Miller and Kevin Rock, "Dividend Policy under Asymmetric Information," *Journal of Finance*, vol. 40 (September 1985), pp. 1031–51. Agency-cost models are summarized in Frank H. Easterbrook, "Two Agency-Cost Explanations of Dividends," *American Economic Review*, vol. 74 (June 1984), pp. 650–59. Two other ingenious explanations of why firms pay dividends, focusing on the value these payouts provide to shareholders, are provided by Hersh M. Shefrin and Meir Statman, "Explaining Investor Preference for Cash Dividends," *Journal of Financial Economics*, vol. 13 (June 1984), pp. 253–82; and Andrei Shleifer and Robert W. Vishny, "Large Shareholders and Corporate Control," *Journal of Political Economy*, vol. 94 (June 1986), pp. 461–88.

from higher payout induces firms to pay dividends. The firm's cost of capital, the pretax return it must earn to provide investors with an after-tax return of ρ, is

$$c = \frac{\rho(\alpha^*)}{(1 - \tau)[(1 - m)\alpha^* + (1 - z)(1 - \alpha^*)]}, \tag{3}$$

where z is the effective tax rate on capital gains. The cost of capital depends on α^*, the payout rate that maximizes market value. It also involves a weighted average of the after-tax income associated with one dollar of dividends and one dollar of retained earnings or share repurchases, with weights depending on the dividend payout ratio. On this view, both investment and payout choices are affected by dividend tax changes. Dividend tax reductions lower the marginal cost of signaling or other benefits, therefore raising the optimal steady-state payout ratio, and lower the cost of capital for new investment projects, raising the steady-state capital stock and therefore investment.[17]

The major weakness of the traditional view is that it assumes that investors demand dividends, but it does not provide a reason why they should. Current models of dividend behavior provide only weak motivation for the $\rho(\alpha)$ function, and there are few good explanations why firms should choose cash dividends rather than less heavily taxed means of communicating information to their shareholders.[18]

The traditional view also has difficulty explaining the infrequency of new share issues. Firms rely primarily on free cash flow and borrowing to finance investment. In 1985, for example, only 16.2 percent of the corporations in the Industrial COMPUSTAT file issued new equity worth more than 5 percent of their existing capital stock. Only 32.6 percent of firms reported any increase in common stock. Forty-nine percent of companies did not engage in any external financial transactions involving equity or long-term debt. It is possible, however, that new equity is still the marginal source of funds for some of these firms. They may use short-term borrowing to finance projects in years when they do not issue equity, and then redeem the debt when they issue new shares.

17. A reduction in the dividend tax encourages payout by lowering the marginal cost of obtaining the benefits of dividend payments, but it also encourages investment. In the short run, the effect of a dividend tax cut on corporate payout is therefore ambiguous.

18. One agency-theoretic account of why managers may avoid share repurchases is provided by Michael Barclay and Clifford Smith, "Corporate Payout Policy: Cash Dividends vs. Share Repurchases" (William Simon Graduate School of Management, University of Rochester, 1987).

Moreover, a wide variety of common financial activities—such as cash-financed takeovers—are in fact equivalent to equity issue or share repurchase.

ESTIMATING CORPORATE PAYOUT FUNCTIONS

One way to evaluate the competing views of how dividend taxes affect corporate saving is to test whether payout policy responds to changes in the relative tax burden on dividends and capital gains. Several studies have shown that Great Britain's repeated changes in the relative burden of corporate and personal taxes affected corporate payout.[19] With the exception of John Brittain's study on U.S. taxation and dividend behavior before 1960 and a small literature debating the effects of the 1936 Undistributed Profits Tax, however, there has been little evidence on how dividend taxes affect payout policy in the United States.[20] The variation in tax rates due to the tax reforms of 1964, 1969, and 1981, along with the changing pattern of share ownership, now makes it possible to test the competing theories.

The controversy surrounding why firms pay dividends makes it difficult to motivate an empirical payout equation. No widely accepted theoretical model of payout behavior can be invoked to derive an estimating equation. Most empirical studies of dividend behavior thus adopt an ad hoc specification first proposed by John Lintner on the basis of interviews with corporate financial officers.[21] Lintner postulated a

19. The studies showing that British dividends responded to tax changes include Martin S. Feldstein, "Corporate Taxation and Dividend Behaviour," *Review of Economic Studies,* vol. 37 (June 1970), pp. 57–72; King, *Public Policy and the Corporation;* and Poterba and Summers, "Economic Effects," pp. 264–70.

20. John A. Brittain, *Corporate Dividend Policy* (Brookings, 1966). The studies of the undistributed profits tax are summarized in George E. Lent, *The Impact of the Undistributed Profits Tax, 1936–37* (Columbia University Press, 1948).

21. John Lintner, "The Distribution of Incomes of Corporations among Dividends, Retained Earnings, and Taxes," *American Economic Review,* vol. 46 (May 1956, *Papers and Proceedings, 1955*), pp. 97–113. This partial-adjustment framework also provides the basis for the microeconometric study of dividend payout by Eugene F. Fama and Harvey Babiak, "Dividend Policy: An Empirical Analysis," *Journal of the American Statistical Association,* vol. 63 (December 1968), pp. 1132–61. A more recent study that provides some evidence against the Lintner model is Robert McDonald and Naomi Soderstrom, "Dividends and Share Changes: Is There a Financing Hierarchy?" Working Paper 2029 (National Bureau of Economic Research, September 1986). Alan J. Auerbach's recent study, "Issues in the Measurement and Encouragement of Business Saving," in Federal Reserve Bank of Boston, *Saving and Government Policy* (FRBB, 1982), pp. 79–100, estimates aggregate dividend models similar to those reported here without tax variables.

partial-adjustment model in which the change in dividends depends on the divergence between a dividend target and dividends in the previous period. He modeled the dividend target as a function of current earnings, but it could also depend on lagged earnings or dividend taxes.

The precise form of the dividend-adjustment model is unclear. Previous studies have not resolved whether managers focus on real or nominal dividends, whether they frame adjustments in absolute or percentage changes, or whether they consider dividends per share or total corporate payout. The analysis below focuses on the logarithm of aggregate real dividends, following several other time series studies of dividend payout.[22] The estimating equation is based on the partial-adjustment framework and follows closely the recent application of "error-correction" models to household consumption behavior.[23] The long-run target dividend level (D^*) is assumed to be a constant-elasticity function of equity earnings (Y) and the after-tax income associated with one dollar of corporate dividend payout relative to one dollar of corporate retention with resulting capital gains. If θ denotes this ratio of after-tax incomes, the dividend target is:

$$\ln(D^*) = \alpha_0 + \alpha_1 \ln(Y) + \alpha_2 \ln(\theta). \tag{4}$$

This steady-state specification is combined with flexible short-run dynamics to obtain a model for the annual percentage change in real dividends:

$$\begin{aligned}\Delta \ln(D_t) = {} & \beta_0 + \beta_1 \Delta \ln(Y_t) + \beta_2 \Delta \ln(\theta_t) \\ & + \beta_3[\ln(D_{t-1}) - \ln(D^*_{t-1})] + \epsilon_t.\end{aligned} \tag{5}$$

Although one could allow for richer dynamics by including additional lagged values of the changes in both taxes and earnings, the limited amount of information in sixty years of annual data made it impossible to reject equation 5 as an adequate dynamic model.

The dependent variable in equation 5 is the logarithmic change in real

22. Feldstein, "Corporate Taxation," Brittain, *Corporate Dividend Policy,* and King, *Public Policy and the Corporation,* all focus on the logarithm of aggregate dividends. Using the logarithm of profits as an independent variable requires omission of several years in the early 1930s when earnings are negative.

23. These models are discussed in Alan Blinder and Angus Deaton, "The Time Series Consumption Function Revisited," *BPEA, 2:1985,* pp. 465–511.

dividend payments by domestic corporations.[24] Several different measures of earnings (Y_t) are used to describe target dividends. The first equals after-tax corporate profits as reported in the NIPA. The second corrects after-tax profits for the inventory valuation adjustment and the capital consumption adjustment. The next two profit measures correct CCA- and IVA-adjusted profits for the alternative treatment of pension contributions and for the inflationary gain on corporate debt, both described in the last section. The final earnings measure includes both of these adjustments.

The tax preference parameter θ_t is a weighted average across shareholders of the after-tax income associated with dividend payout, divided by the after-tax income associated with undistributed profits:

$$\theta_t = \sum_{i=1}^{S} w_{it} \cdot \frac{(1 - m_{it})}{(1 - z_{it})(1 - \tau_t^u)}. \tag{6}$$

In this sum m_{it} is the marginal dividend tax rate on investors in class i, z_{it} is the accrual-equivalent capital gains tax rate, τ_t^u is the rate of tax on undistributed profits, and S is the number of distinct shareholder classes in the analysis. Although this measure of θ_t does not capture the tax treatment of any particular marginal investor, it reflects broad movements in the relative tax treatment of dividends and retentions. Equity ownership weights for households, pension funds, insurance companies, and banks are obtained from the Federal Reserve Board.[25]

Within the household sector, the Internal Revenue Service provides detailed information on the pattern of dividend income across income classes. Each class is treated as a separate shareholder category in equation 6, and the marginal tax rate on dividend income is computed for investors in each class. The capital gains tax rate is constructed by

24. The dividend and earnings series are drawn from table 1.16 of the National Income and Product Accounts. These data are restricted to the domestic corporate sector and exclude foreign subsidiaries, which are part of aggregate corporate saving, because they may be affected by tax considerations other than those governing domestic firms.

25. Equity ownership weights for households, pension funds, insurance companies, and banks are obtained from the flow of funds for the period since 1952. The analysis focuses solely on domestic equity holdings, implicitly assigning the average domestic tax rate on equity income to foreign investors as well. Limited information on share ownership before 1952 is reported in the U.S. Congress, House Committee on Interstate and Foreign Commerce, *Institutional Investor Study Report of the Securities and Exchange Commission,* 92 Congress, vol. 1 (Government Printing Office, 1971), p. 61. These ownership weights were interpolated to yield an annual time series.

assuming that the effective accrual rate is approximately 0.25 times the statutory rate.[26]

The final component of the tax preference parameter is the tax rate on undistributed profits. Throughout the postwar period the United States has levied the same tax on all corporate income and then taxed both dividends and capital gains again at the shareholder level. There was an important deviation from this pattern in 1936, however, when Congress enacted the Undistributed Profits Tax. This progressive tax with a maximum rate of 27 percent was imposed on undistributed profits for 1936 and 1937. Although many firms distributed a high enough fraction of their earnings to avoid the tax, and relatively few firms faced the top marginal rates, the tax nevertheless imposed a substantial burden: the average marginal tax rate on undistributed profits was roughly 8 percent.

Table 4 reports the time series on the share of corporate equity owned by households as well as the relative tax price series θ_t. During the 1930s, one dollar of earnings paid out as dividends yielded shareholders about 15 cents less after-tax income than one dollar retained. The increase in marginal tax rates during and after World War II widened the tax wedge between dividends and undistributed profits, with an average tax penalty of 30–35 cents per dollar between the 1940s and the early 1970s. The combination of rising institutional share ownership and marginal tax rate reductions in the early 1980s lowered the tax burden on dividends.[27] By 1986, the weighted average tax disadvantage on dividend payout was only 21.7 cents per dollar, the lowest since World War II.

The last two columns of table 4 report annual dividend payout ratios for the corporate sector. Column three shows corporate dividends as a share of unadjusted equity earnings, defined as profits after tax and nominal interest payments without either the IVA or the CCA. The fourth column shows payout as a fraction of equity earnings making these two corrections. The adjusted payout rate averages 48 percent during the past three years, compared with 45 percent during the 1970s

26. This approach to modeling capital gains tax burdens was used in Martin Feldstein, Louis Dicks-Mireaux, and James Poterba, "The Effective Tax Rate and the Pretax Rate of Return," *Journal of Public Economics,* vol. 21 (July 1983), pp. 129–58.

27. The calculation of θ_t assumes that pension funds are untaxed institutions. It ignores the possibility that some defined-benefit plans may be terminated, in which case income from the pension assets would be taxable to the terminating firm.

and 40 percent during the 1960s. Relative to unadjusted earnings, the increase in dividend payout is even more striking. Dividends in the past three years average 69.4 percent of unadjusted equity profits, up from 34 percent and 42 percent in the 1970s and 1960s, respectively.

ECONOMETRIC RESULTS

The results of estimating equation 5 using annual data for 1948–86 are reported in table 5. In addition to the explanatory variables described above, the estimating equations include an indicator variable for the effects of voluntary dividend guidelines during the wage and price control period of the early 1970s. This variable equals unity for the years 1972–74.[28]

The results in table 5 demonstrate the importance of tax policy for corporate payout. The tax preference variable enters virtually all of the dividend equations in a statistically significant and substantively important way. The estimated tax effects are similar across various specifications: a 1 percent increase in the ratio of after-tax dividend income to after-tax capital gain income raises real dividends about 0.66 percent in the short run. The long-run effect of such a dividend tax reduction is a 2 percent to 3 percent payout increase. The dynamics of adjustment can be illustrated using the estimates from the third column, where the equity profit measure is adjusted for the CCA, IVA, and pensions. A dividend tax reduction that causes a 1 percent increase in θ induces dividends to rise by 0.63 percent, 0.92 percent, 1.13 percent, and 1.38 percent in the four subsequent years. The steady-state elasticity of dividend payments with respect to tax changes is 1.57 for this equation. These substantial tax effects suggest that neither the tax-irrelevance nor the tax-capitalization views of dividend taxation are adequate for modeling the U.S. dividend time series.

Comparing the various equations in table 5 provides some evidence on the relative power of different profit measures in explaining payout decisions. The accounting profit measure in the first column has the highest explanatory power, and the profit measures that recognize

28. Voluntary dividend controls were in effect between November 14, 1971, and April 30, 1974. The guidelines suggested that dividends should be limited to 4 percent above the highest payout level in the three years before the controls.

Table 4. Tax Incentives for Payout and Dividend Payout Ratios, 1929–86

Year	Share of corporate equity owned by individuals	Relative after-tax income from dividends vs. retained earnings[a]	Dividend payout ratio[b]	
			Accounting earnings	Adjusted earnings
1929	0.915	0.901	0.67	0.70
1930	0.914	0.909	1.93	1.00
1931	0.913	0.918	−4.44	3.64
1932	0.911	0.851	−0.93	−1.25
1933	0.910	0.850	4.20	−1.10
1934	0.909	0.814	1.63	6.50
1935	0.908	0.809	1.08	1.63
1936	0.907	0.822	0.92	1.26
1937	0.906	0.831	0.89	1.12
1938	0.905	0.814	1.07	1.12
1939	0.904	0.799	0.67	0.97
1940	0.904	0.759	0.54	0.67
1941	0.904	0.704	0.42	0.67
1942	0.904	0.609	0.40	0.51
1943	0.904	0.557	0.39	0.44
1944	0.904	0.631	0.40	0.44
1945	0.904	0.616	0.50	0.51
1946	0.902	0.613	0.34	0.70
1947	0.900	0.605	0.29	0.52
1948	0.898	0.656	0.28	0.38
1949	0.897	0.675	0.36	0.38
1950	0.895	0.650	0.33	0.50
1951	0.893	0.620	0.37	0.47
1952	0.890	0.607	0.40	0.46
1953	0.887	0.627	0.40	0.49
1954	0.887	0.635	0.41	0.46
1955	0.885	0.629	0.35	0.38
1956	0.883	0.632	0.37	0.44
1957	0.879	0.641	0.41	0.46
1958	0.877	0.644	0.47	0.51
1959	0.875	0.646	0.40	0.41
1960	0.870	0.656	0.45	0.46
1961	0.866	0.649	0.46	0.45
1962	0.862	0.658	0.43	0.39
1963	0.858	0.657	0.44	0.39
1964	0.854	0.688	0.41	0.37
1965	0.850	0.701	0.38	0.35
1966	0.845	0.698	0.37	0.34

Table 4. (continued)

Year	Share of corporate equity owned by individuals	Relative after-tax income from dividends vs. retained earnings[a]	Dividend payout ratio[b]	
			Accounting earnings	Adjusted earnings
1967	0.844	0.690	0.40	0.37
1968	0.844	0.677	0.43	0.41
1969	0.836	0.699	0.46	0.46
1970	0.824	0.703	0.54	0.56
1971	0.809	0.714	0.44	0.44
1972	0.793	0.714	0.39	0.40
1973	0.775	0.721	0.33	0.42
1974	0.757	0.718	0.29	0.62
1975	0.744	0.721	0.34	0.45
1976	0.738	0.714	0.29	0.40
1977	0.722	0.709	0.27	0.35
1978	0.701	0.713	0.27	0.37
1979	0.687	0.691	0.26	0.45
1980	0.678	0.695	0.33	0.67
1981	0.670	0.699	0.42	0.63
1982	0.655	0.752	0.69	0.92
1983	0.635	0.768	0.60	0.56
1984	0.630	0.780	0.61	0.49
1985	0.629	0.784	0.70	0.46
1986	0.634	0.783	0.77	0.50
Averages				
1930–39	0.909	0.842	0.70	1.49
1940–49	0.902	0.643	0.39	0.52
1950–59	0.885	0.633	0.39	0.46
1960–69	0.853	0.677	0.42	0.40
1970–79	0.753	0.711	0.34	0.45
1980–86	0.647	0.752	0.59	0.61

Source: Author's calculations with data from NIPA, table 1.16. See text description.

a. The tax preference parameter, θ_t (see equation 6).

b. The payout share of accounting earnings is defined as dividend payments by domestic corporate business divided by after-tax profits plus nominal interest payments. The payout share of adjusted earnings adjusts the after-tax profits plus nominal interest series in the denominator for the Inventory Valuation Adjustment (IVA) and the Capital Consumption Adjustment (CCA).

inflationary gains on corporate debt have the worst fit, suggesting that managers may not consider these real gains in setting payout policy. Although adjusting accounting earnings for the CCA and IVA reduces the explanatory power of the dividend model, adding the defined-benefit pension correction as well yields an estimating equation that fits almost

Table 5. Dividend Payout Models, 1948–86[a]

		Adjustments to accounting earnings			
Independent variable	*Unadjusted earnings*	*CCA and IVA*	*CCA, IVA, and pensions*	*CCA, IVA, and inflation gain on debt*	*CCA, IVA, pensions, and inflation gain on debt*
Constant	0.61	0.70	0.61	0.73	0.73
	(0.42)	(0.43)	(0.41)	(0.43)	(0.43)
$\Delta \ln (Y_t)$	0.18	0.11	0.15	0.11	0.12
	(0.06)	(0.05)	(0.06)	(0.06)	(0.07)
$\Delta \ln (\theta_t)$	0.78	0.64	0.63	0.65	0.61
	(0.35)	(0.39)	(0.37)	(0.39)	(0.39)
$\ln (D_{t-1})$	−0.13	−0.21	−0.32	−0.26	−0.30
	(0.08)	(0.10)	(0.11)	(0.10)	(0.11)
$\ln (Y_{t-1})$	0.02	0.08	0.16	0.10	0.12
	(0.04)	(0.05)	(0.07)	(0.06)	(0.06)
$\ln (\theta_{t-1})$	0.52	0.60	0.50	0.59	0.52
	(0.29)	(0.31)	(0.30)	(0.31)	(0.31)
Dividend control	−0.10	−0.07	−0.07	−0.08	−0.09
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)
Summary statistic					
R^2	0.41	0.34	0.41	0.33	0.34
Sum of squared residuals	7972	8891	8033	9106	8918
Durbin-Watson	2.04	2.11	2.09	2.08	2.07

Source: Author's estimates of equation 5. See text description.

a. All equations are estimated by ordinary least squares using annual data. The dependent variable in each equation is the percent change in real dividend payments by domestic corporations, defined as $\Delta \ln (D_t)$. Independent variables are defined as follows: corporate accounting earnings, $\Delta \ln (Y_t)$ and $\ln (Y_{t-1})$, is corporate profits in the NIPA; the adjustments to this variable are described in the text; the tax preference parameter, $\Delta \ln (\theta_t)$ and $\ln (\theta_{t-1})$, is from equation 6 in the text. The dividend control variable equals one in 1972–74. Standard errors are in parentheses.

as well as the accounting earnings equation. The estimates of the long-run dividend target for this model are substantially more plausible than those for the accounting earnings equation, since the elasticity of dividends with respect to profits is 0.50 as opposed to 0.15.

In each equation, the estimates suggest relatively small short-run responses to changes in profitability. A 1 percent increase in real earnings raises real dividends about 0.15 percent in the first year, and even after three years dividends increase no more than 0.35 percent. The results also suggest that dividend control reduced payout. Although the point estimates vary across equations, dividend controls in the early 1970s appear to have lowered payout by 7 percent to 10 percent.

These results suggest that the dividend tax burden affects dividend payments, but they shed no light on the relative efficacy of taxes at the firm level as against taxes on shareholders in altering payout behavior. To explore this question, the equations are reestimated for the period since 1935, which includes the Undistributed Profits Tax.[29] For the longer sample period the data needed for many of the profit adjustments in table 5 are unavailable, but adjustments based on the CCA and IVA are still feasible.

Table 6 presents dividend models estimated for the longer period, excluding World War II. The first column under each profit concept reports an equation analogous to that in table 5, although for a longer sample period. As in the postwar estimates, the unadjusted profit measure is most successful in explaining payout, and the tax parameters are estimated to have a powerful effect on payout choices. A 1 percent change in θ raises payout by 1.5 percent in the year when it occurs, approximately twice the effect estimated for the postwar sample. The second column under each profit concept disaggregates the tax preference variable to allow separate effects for the component based on shareholder taxes and the corporate undistributed profits tax. This is straightforward, since

$$\ln(\theta_t) = \ln\left[\sum_{i=1}^{S} w_{it} \cdot \frac{(1 - m_{it})}{(1 - z_{it})(1 - \tau_t^u)}\right] = \ln\left[\sum_{i=1}^{S} w_{it} \cdot \frac{(1 - m_{it})}{(1 - z_{it})}\right] - \ln(1 - \tau_t^u). \tag{7}$$

The results suggest that an undistributed profits tax has a much larger short-run impact on dividend payout than a shareholder tax, but that its long-run effect is much smaller. A 1 percentage point change in the marginal rate of undistributed profits tax changes dividend payments 4 percent to 5 percent in the first year. A change in shareholder tax rates with the same impact on θ would raise payout 1 percent in the first year and 3 percent to 4 percent in the long run.

29. Corporate tax payments during the period when the undistributed profits tax was in effect were partly determined by payout policy. Treating tax payments as endogenous and instrumenting for after-tax earnings using actual after-tax profits plus undistributed profits tax revenues does not alter the estimates reported in table 6.

Table 6. Dividend Payout Models, 1935–86[a]

	Unadjusted earnings		*Earnings adjusted for CCA and IVA*	
Independent variable	*(1)*	*(2)*	*(3)*	*(4)*
Constant	0.08	0.23	1.01	0.90
	(0.23)	(0.19)	(0.33)	(0.22)
$\Delta \ln (Y_t)$	0.43	0.20	0.28	0.09
	(0.06)	(0.06)	(0.06)	(0.04)
$\Delta \ln (\theta_t)$	1.62	...	1.41	...
	(0.50)		(0.60)	
Shareholder	...	0.98	...	1.00
		(0.38)		(0.37)
Corporate	...	4.59	...	5.10
		(0.66)		(0.62)
$\ln (D_{t-1})$	−0.13	−0.11	−0.47	−0.32
	(0.09)	(0.08)	(0.12)	(0.07)
$\ln (Y_{t-1})$	0.13	0.08	0.23	0.14
	(0.05)	(0.04)	(0.05)	(0.03)
$\ln (\theta_{t-1})$	0.43	...	0.85	...
	(0.22)		(0.27)	
Shareholder	...	0.42	...	0.81
		(0.17)		(0.18)
Corporate	...	−0.18	...	−0.38
		(0.69)		(0.67)
Dividend control	−0.13	−0.10	−0.05	−0.08
	(0.05)	(0.04)	(0.06)	(0.04)
Summary statistic				
R^2	0.64	0.82	0.49	0.83
Sum of squared residuals	2451	1238	3457	1146
Durbin-Watson	1.80	1.82	2.05	2.08

Source: Author's estimates of equation 5. See text description.

a. All equations are estimated by ordinary least squares using annual data. The dependent variable is real dividends, $\Delta \ln (D_t)$, as in table 5. The equations estimated in columns 1 and 3 are analogous to columns 1 and 2 of table 5, and the independent variables are as defined in table 5, note a. The remaining two columns include a disaggregated tax preference variable, $\Delta \ln (\theta_t)$ and $\ln (\theta_{t-1})$, that allows for separate effects of shareholder taxes and the corporate undistributed profits tax. The dividend control variable equals 1 in 1972–74. Standard errors are in parentheses.

The extreme payout effects of the undistributed profits tax may be due to the transitory nature of the underlying tax experiment. Managers may have understood in 1936 that the undistributed profits tax was likely to be short-lived; if so, they would have gone to greater lengths to minimize its effects than if they had perceived the change as permanent. In the short run, managers have substantial flexibility in retiming their

investments and expenses. The payout effects of a permanent corporate undistributed profits tax would therefore probably be smaller than the estimates in table 6 suggest.

The equations reported in tables 5 and 6 presume that the long-run dividend target is related to corporate profits. Terry Marsh and Robert Merton propose a different approach to modeling the dividend target.[30] Expanding on Lintner's argument that dividends are determined by "permanent earnings," they argue that share prices provide the best estimate of long-run earning prospects. While this market-determined forecast of future earnings has obvious merit, it has one important drawback for studying how tax changes affect dividends. Since stock prices equal the present discounted value of after-tax dividends on existing corporate capital, an increase in dividend taxes will lower share values, even if the tax change has no effect on corporate earnings.[31] Identifying the total effect of taxes on dividend payout therefore requires specifying both the direct effect through the tax parameters and the indirect effect through stock market revaluation. Despite this shortcoming for addressing the tax question, dividend equations based on share prices can nevertheless provide useful evidence on the robustness of the link between taxes and payout policy.

Table 7 presents dividend payout equations including the level and change in the real value of the stock market, defined as $\ln (S_{t-1})$ and $\Delta (\ln S_t)$, measured by the Standard and Poor's Composite Index divided by the GNP deflator.[32] Including the stock market variables improves the explanatory power of the dividend models, but it does not alter the basic conclusions regarding the long-run effects of dividend taxes. The equation in column five, which includes stock market variables but excludes real earnings, implies a long-run payout elasticity of slightly above 3. The estimates from equations including both share prices and earnings suggest similar long-run effects. Although adding stock prices

30. Terry A. Marsh and Robert C. Merton, "Dividend Behavior for the Aggregate Stock Market," *Journal of Business*, vol. 60 (January 1987), pp. 1–40.

31. A dividend tax increase reduces share values in either the tax-capitalization or traditional views described above. Further discussion of this issue may be found in Poterba and Summers, "Economic Effects."

32. To avoid obvious simultaneity problems, the change in real dividends between years t and $t - 1$ is related to the change in real stock market values between the beginning of years t and $t - 1$, and the level of the market at the beginning of period $t - 1$. The variable $\ln (S_t)$ is therefore the beginning-of-period real stock market value.

Table 7. Dividend Payout Models with Share Prices as Permanent Earning Measure, 1948–86

Independent variable	Profit measure: Profits adjusted for CCA and IVA		Profits adjusted for CCA, IVA, and pensions		Profits excluded
Constant	0.70	1.04	0.61	0.86	1.36
	(0.43)	(0.54)	(0.41)	(0.49)	(0.41)
$\Delta \ln (Y_t)$	0.11	0.05	0.15	0.10	. . .
	(0.05)	(0.06)	(0.06)	(0.07)	
$\Delta \ln (\theta_t)$	0.64	0.82	0.63	0.81	−0.20
	(0.39)	(0.42)	(0.37)	(0.39)	(0.38)
$\Delta \ln (S_t)$	. . .	0.13	. . .	0.12	0.17
		(0.07)		(0.06)	(0.06)
$\ln (D_{t-1})$	−0.21	−0.27	−0.32	−0.35	−0.30
	(0.10)	(0.12)	(0.11)	(0.12)	(0.10)
$\ln (Y_{t-1})$	0.08	0.05	0.16	0.15	. . .
	(0.05)	(0.06)	(0.07)	(0.07)	
$\ln (\theta_{t-1})$	0.60	0.87	0.50	0.71	1.09
	(0.31)	(0.41)	(0.30)	(0.39)	(0.33)
$\ln (S_{t-1})$	. . .	0.02	. . .	0.01	0.04
		(0.03)		(0.03)	(0.03)
Dividend control	−0.07	−0.08	−0.07	−0.08	−0.10
	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)
Summary statistic					
R^2	0.34	0.42	0.41	0.49	0.41
Sum of squared residuals	8891	7804	8033	6939	8044
Durbin-Watson	2.11	2.28	2.09	2.37	2.30

Source: Author's estimates. See text description.

a. All equations are estimated by ordinary least squares using annual data. The dependent variable is real dividends, $\Delta \ln (D_t)$, as described in table 5, note a. The independent variables are defined as follows: lagged real dividends, $\ln (D_{t-1})$; corporate earnings, $\Delta \ln (Y_t)$ and $\ln (Y_{t-1})$, is corporate profits in the NIPA (the adjustments to this variable are described in the text); the tax preference parameter, $\Delta \ln (\theta_t)$ and $\ln (\theta_{t-1})$, is from equation 6 in the text; the level, $\ln (S_{t-1})$, and change, $\Delta \ln (S_t)$, in the real value of the stock market, measured by the Standard and Poor's Composite Index divided by the GNP deflator. The variable $\ln (S_t)$ is real stock market value at the beginning of the period. The dividend control variable equals 1 in 1972–74. Standard errors are in parentheses.

to equations with earnings improves their fit, the equation with only stock prices has explanatory power comparable to that of an equation with earnings adjusted for CCA, IVA, and pension contributions.[33]

All of the payout models estimated above focus on links between cash flow and payout, but ignore the demand for undistributed profits induced by corporate investment. We used two strategies to control for these

33. A non-nested hypothesis test of two exclusive models, one including only earnings and the other only share prices, rejects earnings with CCA and IVA in favor of share prices but does not reject pension-adjusted earnings.

effects. First, we added a measure of the effective tax rate on corporate investment to the earnings-based payout models.[34] This variable was statistically insignificant in each of the equations, and its inclusion did not alter the estimated tax effects. Second, we added a measure of Tobin's q, the value of outstanding debt and equity divided by the replacement cost of corporate assets, to the payout models. The q variable should reflect the investment opportunities facing firms. The change in q was positively related to the change in real dividends, and there was evidence for a small negative steady-state effect of q on payout. The results were not precise enough to warrant reporting, however.

The equations presented above consider how tax changes affect the level of cash dividends. They provide no evidence on how tax reform might alter nondividend distributions such as share repurchases. A similar model could be applied to repurchases, although the earlier discussion of the changing institutional environment in the 1980s suggests that the model's parameters are unlikely to be stable throughout the postwar period. To provide some evidence on noncash payout, however, an equation similar to that in table 5, column three, was estimated for aggregate share repurchases (R_t) during 1948–86.[35]

$$\text{(8)}\quad \Delta \ln (R_t) = \underset{(5.39)}{-4.72} + \underset{(1.08)}{2.23}\,\Delta \ln (Y_t) + \underset{(6.65)}{5.26}\,\Delta \ln (\theta_t) - \underset{(0.28)}{0.48} \ln (R_{t-1})$$
$$+ \underset{(0.89)}{1.06} \ln (Y_{t-1}) - \underset{(5.40)}{0.16} \ln (\theta_{t-1}) + \underset{(0.58)}{0.50}\, DIVCON,$$

$R^2 = 0.29$; Durbin-Watson = 1.45.

Higher earnings increase repurchases, and the point estimates suggest that raising the dividend tax burden increases steady-state share repurchases. The standard errors on the tax variables, however, are too large to permit any reliable conclusions.

34. Effective tax rate series for 1953–85 were drawn from Alan J. Auerbach and James R. Hines, Jr., "Anticipated Tax Changes and the Timing of Investment," in Martin Feldstein, ed., *The Effects of Taxation on Capital Accumulation* (University of Chicago Press, 1987), p. 177.

35. The aggregate time series for share repurchases was calculated by multiplying the ratio of share repurchases to cash dividends for New York Stock Exchange firms included on the CRSP data tapes by the value of cash dividend payments by domestic corporations in the national income accounts.

The results of the dividend payout models in this section leave little doubt that changes in the relative tax burdens on dividends and capital gains affect the fraction of corporate earnings that are distributed to shareholders. They reject the tax-capitalization view, in which changes in after-tax earnings translate dollar for dollar into changes in payout, and provide estimates of the dynamic adjustments that follow tax and profit shocks. These estimates can be used to illustrate the effects of the Tax Reform Act on corporate payout and saving.[36]

The Payout Effects of the Tax Reform Act

The Tax Reform Act affects corporate saving in at least three ways. First, it raises average corporate tax rates and thereby reduces after-tax income available for either dividends or retentions. Second, it changes the tax treatment of dividends and makes them more attractive relative to capital gains. Finally, it alters the relative tax burdens on debt and equity financing, thereby affecting the share of pretax corporate profits that will be devoted to equity holders as opposed to lenders. This section describes these three tax changes in more detail and then illustrates their potential effects on corporate saving. The analysis is partial in that it ignores many other provisions of the tax reform.[37] The tax reform's reduction in investment incentives, for example, raises the tax burden on new investment and may further reduce corporate saving.

CORPORATE TAX PAYMENTS

Although the Tax Reform Act reduces the statutory corporate tax rate from 46 to 34 percent, a variety of provisions, including elimination

36. The dynamic paths described below must be viewed with caution. Most of the sample variation in after-tax earnings arises from movements in corporate profitability, not from tax changes. The estimated dynamics may therefore fail to describe the adjustment path following a tax increase. If managers resist cutting dividends after the Tax Reform Act takes effect, then the Tax Reform Act will lead to a larger corporate saving reaction than that predicted by the equations. There is unfortunately no way to resolve this issue given the available data.

37. The analysis assumes that relative prices do not adjust at all during the years immediately after tax reform, so that higher tax burdens on the corporate sector are not offset by increased cash flows. A more complete analysis would relax this assumption.

of the investment tax credit, strengthening of the corporate minimum tax, lengthening of depreciation lifetimes, and changes in accounting provisions, raise total corporate tax payments. The first column of table 8 shows the projected tax increases, measured in 1986 dollars, between 1987 and 1989.[38] Increased tax liabilities will exert downward pressure on corporate saving, although they may be partly offset by changes in dividend payout. Estimates for the effect of changes in after-tax earnings from the payout equation in the third column of table 5 suggest that the increase in corporate taxes will reduce dividends by $1.9 billion, $4.8 billion, and $8.4 billion (1986 dollars) in the years 1987–89. The payout reduction therefore offsets roughly one-third of the corporate tax increase by 1989. The drop in corporate saving in 1989 would be about $16.2 billion, assuming changes in marginal taxes on dividends do not affect payout decisions.

CHANGES IN PAYOUT INCENTIVES

The Tax Reform Act lowers marginal dividend tax rates for most individual investors while raising the tax burden on capital gains. Both changes will encourage firms to raise their payout rates, compounding the negative corporate saving effect of higher corporate taxes. The National Bureau of Economic Research's TAXSIM model indicates that the weighted average marginal tax rate on household dividend income will decline from 33.4 percent to 25.3 percent as a result of the tax change. Marginal dividend tax rates on most other investors are not affected by the reform.[39]

Determining the reform's impact on capital gains tax burdens is more difficult, since, for two reasons, the effective and statutory rates of capital gains tax facing individuals differ significantly. First, taxation on realization rather than accrual reduces the effective tax burden. For an asset held twenty years with an annual rate of return of 6 percent, with

38. The Tax Reform Act raises corporate taxes by more during the few years following the reform than in the steady state. A more detailed discussion may be found in Alan J. Auerbach and James M. Poterba, "Why Have Corporate Revenues Declined," in Summers, ed., *Tax Policy and the Economy*, pp. 1–28.

39. The tax reform changes many tax provisions relating to banks and insurance companies. These changes, typically involving the minimum tax, are likely to raise the tax burdens on dividends and capital gains, but their relative effects are unclear.

Table 8. Effects of 1986 Tax Reform Act on Corporate Saving, 1986–89
Billions of 1986 dollars

Year	Predicted change in corporate taxes	Tax parameter (θ)	Combined effect on dividends: Corporate tax	Combined effect on dividends: Marginal dividend tax	Combined effect on dividends: Total	Combined effect on corporate saving
1986	0	0.78	0	0	0	0
1987	31.7	0.83	−1.9	3.1	1.1	−32.8
1988	23.6	0.88	−4.8	10.6	5.8	−29.4
1989	24.6	0.88	−8.4	20.6	12.2	−36.8

Sources: The estimated tax changes in column 1 are drawn from Joseph Wakefield, "The Tax Reform Act of 1986," *Survey of Current Business*, vol. 67 (March 1987), pp. 18–25. Entries in column 2 are calculated using the NBER TAXSIM model to estimate the household tax burden after tax reform, along with the post-tax reform statutory rates on other investor classes. Predicted dividend changes are the author's calculations based on the dividend payout model in table 5, column 3. See text for further details. The baseline values are corporate profits, after adjustment for CCA and IVA and pension contributions, $186.5 billion, and domestic dividend payments, $76.2 billion.

a statutory capital gains tax rate of 33 percent, the accrual equivalent tax rate is only 22 percent. At a holding period of forty years, the rate falls to 15 percent. Second, a large share of capital gains escapes taxation entirely because it is bequeathed (and therefore has its tax basis stepped up), donated to charity, or never reported to the IRS. As a result, households' effective accrual capital gains rate is much less than the statutory rate; a ratio of one-fourth is assumed in the calculations below.[40] The Tax Reform Act also raises corporations' capital gains tax rate, from 28 to 34 percent.

The net effect of these changes on corporate payout incentives is summarized by θ, the dividend tax preference factor, which was 0.78 in 1986. Using the 1988 marginal tax rates on each investor class and their equity ownership weights for 1986, we calculate that θ will be 0.88 in 1988. The estimates of the payout function in table 6, column 3, imply that this shift will lead to an 8.1 percent increase in corporate dividends when the new law takes effect, and to a 20 percent dividend increase in the long run.

The third and fourth columns of table 8 show the tax reform's predicted effect on both dividends and corporate saving. As time elapses after the tax reform, payout rises as marginal dividend tax reductions exert a large

40. Further evidence on the relationship between statutory and effective capital gains tax rates is provided in James M. Poterba, "How Burdensome Are Capital Gains Taxes: Evidence from the United States," *Journal of Public Economics*, vol. 33 (July 1987), pp. 157–72.

effect. The increase in corporate tax burdens reduces corporate dividends, however, so the net effect is smaller than the pure dividend tax change would imply. In each year after the tax change, corporate saving is substantially below its level in the absence of tax reform; by 1989, the tax-related decline in corporate saving is 1.1 percent of NNP.

CHANGES IN LEVERAGE INCENTIVES

The Tax Reform Act also affects the relative desirability of debt and equity financing. The calculations in table 8 hold corporate leverage constant, because predicting a change is difficult. The new law has different effects on the incentives for debt finance facing different firms, and its net effect is unclear.

Firms that previously faced a marginal tax rate of 46 percent will find their tax rates reduced to 34 percent or, if they enter the minimum tax regime, 20 percent. For these firms, the tax incentives associated with leverage will fall. The situation is reversed for firms that face higher marginal tax rates. Since 1981, the combined effects of depressed corporate profits and accelerated depreciation allowances have generated negative taxable income for many corporations. Some firms have been able to claim tax refunds by carrying their losses back and offsetting previous tax payments, but approximately one-third of all firms have exhausted their carryback potential and generated loss carryforwards.[41] For many of these firms, reduced depreciation allowances coupled with the strengthened minimum tax will cause a return to tax-paying status at either a 34 percent or 20 percent marginal rate. These firms now face larger corporate tax incentives for borrowing.

The net tax benefit to corporate financing through debt as opposed to equity depends on both corporate and investor tax rates.[42] For an investor facing tax rates m_{int}, m, and z on interest income, dividends, and capital gains, respectively, debt finance is more attractive than equity if

$$(9) \qquad (1 - m_{int}) > (1 - \tau)\,[\alpha(1 - m) + (1 - \alpha)(1 - z)],$$

where α is the dividend payout rate. Table 9 presents illustrative

41. An estimate of the incidence of tax loss carryforwards based on a sophisticated imputation procedure using unpublished IRS data is reported in Rosanne Altshuler and Alan Auerbach, "The Significance of Tax Loss Carryforwards" (University of Pennsylvania, 1987).

42. This point is elaborated by Merton H. Miller, "Debt and Taxes," *Journal of Finance*, vol. 32 (May 1977), pp. 261–75.

Table 9. Changes in Leverage Incentives Due to 1986 Tax Reform Act

		After-tax income from debt finance minus after-tax income from equity finance (per dollar of corporate earnings)[a]		
Investor tax status	*Firm tax status*	*Before Tax Reform Act*	*After Tax Reform Act*	*Change*
Taxable at top marginal rate	Fully taxable	0.11	0.17	0.06
Taxable at top marginal rate	Fully taxable before TRA, minimum tax after TRA	0.11	0.06	−0.05
Taxable at top marginal rate	Loss carryforward before TRA, minimum tax after TRA	−0.23	0.06	0.29
Tax-exempt	Fully taxable	0.46	0.34	−0.12
Tax-exempt	Fully taxable before TRA, minimum tax after TRA	0.46	0.20	−0.26
Tax-exempt	Loss carryforward before TRA, minimum tax after TRA	0.00	0.20	0.20
Middle-income[b]	Fully taxable	0.26	0.18	−0.08
Middle-income[b]	Fully taxable before TRA, minimum tax after TRA	0.26	0.06	−0.20
Middle-income[b]	Loss carryforward before TRA, minimum tax after TRA	−0.13	0.06	0.19

Source: Authors' calculations. See text.
a. All equity calculations assume that dividends equal half of earnings available for common shareholders.
b. Adjusted gross income of $40,000. The marginal tax rate for a family of four with an adjusted gross income of $40,000 is 0.28 before and after the Tax Reform Act takes effect.

calculations of the relative tax burdens on debt and equity finance for different types of investors and firms, both before and after the Tax Reform Act. Depending upon the characteristics of the investors and firms under consideration, the tax incentive to use equity finance either rises under the new law or declines. The tax reform's net effect on leverage depends on the relative importance of the investors and firms in various situations. Analyzing the changes in corporate borrowing that will occur as a result of the Tax Reform Act requires detailed information on both investor and firm characteristics and is an important project for future study.

The dividend payout models estimated in the last section suggest that the Tax Reform Act may have a sizable impact on corporate saving. Three years after the new law takes effect, it may reduce corporate saving by 1 percent of NNP, a change as large as the drop in corporate

saving between the 1970s and 1980s. Even a conservative calculation, cutting the sensitivity of payout to dividend tax rates by half, would imply more than a $25 billion decline in net corporate saving. The key question for evaluating these changes is whether personal saving is likely to offset declining corporate saving.

Does Corporate Saving Affect Household Saving?

Since corporate assets are ultimately owned by households, changes in corporate saving induce changes in household net worth. A revenue-neutral tax reform that reduces corporate saving but increases household disposable income can therefore leave total private saving unchanged if individuals adjust their saving plans to offset the change in corporate saving.[43] A variety of considerations, related both to constraints on consumers and to corporate financial behavior, may lead to imperfect saving offsets through this channel.

The effect of a change in corporate saving on private saving depends on the source of the change in corporate saving. Many shocks to corporate saving move personal saving in the same direction. If corporate saving increases because of an improvement in the productivity of corporate capital, for example, the rate of return available to private investors will also change. Corporate saving and personal saving would likely both rise. Other shocks might imply different correlations.

For owners of corporate stock, the new tax policy reduces taxes on personal account and raises imputed taxes through the corporate sector. If high-income households that own corporate stock successfully pierce the corporate veil, their saving decisions will reflect both their change in personal tax liability and the present discounted value of changes in corporate taxes paid by companies they own. Since 85 percent of common stock is held by individuals in the top decile of the wealth distribution, and 43 percent is held by those in the top 0.5 percent of the wealth distribution, consumption adjustments by equity holders are unlikely to be affected by liquidity constraints or other credit market

43. The argument for studying only the private sector budget constraint and assuming complete saving offset is presented in Merton H. Miller and Charles W. Upton, *Macroeconomics: A Neoclassical Introduction* (University of Chicago Press, 1986), especially p. 108, note 6.

imperfections.[44] Equity owners may nevertheless not respond in the same way to capital gains and other types of disposable income; in this case, consumption may be affected by a tax change that raises disposable income.

A revenue-neutral tax reform may also have a second effect, redistributing wealth from the owners of corporate stock to other individuals. There is no reason to expect the change in imputed corporate tax liabilities to balance exactly the change in personal liabilities on a household-by-household basis.[45] Even if households that own corporate stock pierce the corporate veil and adjust their consumption in response to their net tax liability, transfers between shareowners and other households may affect private saving.[46]

THE CASE AGAINST THE CORPORATE VEIL

The argument that households offset changes in corporate saving can be illustrated in a standard representative-consumer setting in which lump sum taxes on firms are reduced and lump sum taxes on households are increased. The household chooses consumption to maximize the discounted sum of utilities, subject to the budget constraint

$$(10) \qquad \sum_{j=0}^{\infty} (1 + r)^{-j} C_{t+j} = \sum_{j=0}^{\infty} (1 + r)^{-j} (wL_{t+j} - TP_{t+j}) + V_t,$$

where C_t denotes consumption outlays, wL_t is pretax labor income, TP_t denotes direct taxes levied on the household, and V_t is the market value of corporate equities at time t. The value of corporate equities equals the present discounted value of corporate dividends on existing capital assets:

$$(11) \qquad V_t = \sum_{j=0}^{\infty} (PROF_{t+j} - TC_{t+j})(1 + r)^{-j},$$

44. Avery and Elliehausen, "Financial Characteristics of High Income Families," p. 174.

45. Detailed information on the incidence of the Tax Reform Act's change in corporate tax burdens is provided by Martin Feldstein, "Imputing Corporate Tax Liabilities to Individual Taxpayers," Working Paper 2349 (National Bureau of Economic Research, August 1987).

46. If equity holders exhibit lower marginal propensities to consume than other households, a switch from personal to corporate taxation will lower saving.

where $PROF$ is corporate profits and TC_t denotes corporate profit taxes.[47] Substituting equation 11 into equation 10 shows that the household budget constraint is unaffected by tax shifts that preserve the present value of government revenue:

$$\text{(12)} \qquad \sum_{j=0}^{\infty} (1 + r)^{-j} C_{t+j} = \sum_{j=0}^{\infty} (1 + r)^{-j} (wL_{t+j} + PROF_{t+j}) - \sum_{j=0}^{\infty} (1 + r)^{-j} (TC_{t+j} + TP_{t+j}).$$

This equation provides the basis for the Ricardian equivalence debate about whether households recognize discounted streams of future tax liabilities. It also demonstrates that tax perturbations that affect the mix of TC and TP in various years without altering the sum of the two tax components in any year should therefore have no effect on consumption decisions. These changes alter the composition of the household's income stream but not its level.

The consumption effect of a switch from personal to corporate taxation (so $dTC_{t+j} = -dTP_{t+j}$) is given by

$$\text{(13)} \qquad dC_t = \sum_{j=0}^{\infty} \left(\frac{dC_t}{dTP_{t+j}} - \frac{dC_t}{dTC_{t+j}} \right) dTP_{t+j} = c_w \sum_{j=0}^{\infty} (1 + r)^{-j} dTP_{t+j} - c_{cg} dV_t.$$

Provided that households face no liquidity constraints and perceive changes in equity values as permanent shocks, the marginal propensity to consume out of changes in the present discounted value of labor income (c_w) is the same as that out of changes in capital gains (c_{cg}). If $dV_t/dTC_{t+j} = (1 + r)^{-j}$, then the tax switch will not affect saving.

There are reasons for suspecting that each of these conditions may fail, however, and that a tax reform that reduces corporate saving by one dollar may raise household saving either more or less than that amount. Two sets of arguments for this view, one implying that dV_t/dTC_{t+j} is not equal to $(1 + r)^{-j}$ and the other suggesting that the propensities to consume out of different types of income may differ, are described in the sections that follow.

47. This illustration assumes that there are no dividend taxes, only lump sums.

WEAVING THE CORPORATE VEIL: CORPORATE CONSIDERATIONS

Changes in average corporate tax burdens alter the supply of retained earnings available to managers. If the marginal projects undertaken by managers yield the market rate of return, then tax-induced shocks to free cash flow will affect share values dollar-for-dollar. But recent theories of corporate capital structure and its effect on investment decisions question whether marginal projects indeed yield the market rate of return.

At least since the work of Adolph Berle and Gardner Means, there has been concern that managers with an ample supply of retained earnings would invest these funds in projects that yield below-market rates.[48] The central problem of corporate control, on this view, is the shareholders' need to prevent managers from choosing the quiet life and misallocating resources. The recent wave of corporate takeovers has generated much discussion of the problems of corporate control. Michael Jensen, chronicling the growth of free cash flow in several takeover-prone industries, argues that managerial reluctance to return cash to investors, coupled with a proclivity to continue investing in familiar industries even though potential returns had declined, yielded below-market returns for corporate shareholders.[49] Although the empirical evidence on this issue is difficult to evaluate, studies of ex post rates of return suggest that internally financed projects yield lower returns than those financed by external borrowing or new share issues.[50]

If managers invest retentions in projects yielding below-market returns, then for the tax experiment described above, share values will decline by less than the full increase in corporate taxes. An increase in

48. Adolph A. Berle, Jr., and Gardiner L. Means, *The Modern Corporation and Private Property* (Macmillan, 1932).

49. Michael Jensen, "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review,* vol. 76 (May 1986), pp. 323–29. Evidence on the misallocation of free cash flow in the oil industry is provided by E. Allen Jacobs, "The Agency Costs of Corporate Control" (Sloan School of Management, Massachusetts Institute of Technology, 1986).

50. The most widely cited study of how financial policy affects the rate of return is William J. Baumol, Peggy Heim, Burton G. Malkiel, and Richard E. Quandt, "Earnings Retention, New Capital, and the Growth of the Firm," *Review of Economics and Statistics,* vol. 52 (November 1970), pp. 345–55. Similar evidence is reported in Auerbach, "Taxes, Firm Financial Policy, and the Cost of Capital."

corporate taxes will be partly financed by lower levels of managerial misappropriation, so higher corporate taxes combat a preexisting distortion in the market for corporate control. Even if households exhibit equal marginal propensities to consume out of capital gains and disposable income, a revenue-neutral increase in corporate tax burdens could therefore raise consumption.

A second line of argument regarding the difference between internal and external finance, however, suggests a different conclusion. If internally and externally financed projects yield different returns not because managers misappropriate funds, but because the imperfect observability of new project quality leads external financiers to demand rates of return *above* the investors' discount rates to compensate for the risk of being lured into unprofitable projects, then higher corporate tax burdens compound a preexisting distortion. For firms that face higher costs of funds when they rely on external project finance rather than retained earnings, a reduction in free cash flow may reduce investment.[51] Increased average tax burdens exacerbate the need to raise external finance. If firms consequently forgo new projects that would be profitable if evaluated using the shareholders' discount rate, then a one dollar increase in corporate taxes may reduce share values by more than one dollar, reflecting the firm's reduced access to a source of investment finance that avoids a costly market imperfection.

Each of these two scenarios may apply to some firms, but which predominates is unclear. Whether the net change in the market value of corporate equity diverges substantially from the increase in corporate taxes is difficult to test, since in practice corporate tax reforms are not lump sum levies. Actual tax changes affect incentives for investment and other aspects of corporate behavior, so assessing the valuation effects of tax reform requires a complete model of corporate behavior.

WEAVING THE CORPORATE VEIL: HOUSEHOLD CONSIDERATIONS

Even if the stock market reacts dollar-for-dollar to changes in corporate taxes, household saving may not completely offset movements in

51. Recent empirical evidence on the importance of retained earnings for the investment decisions of small and growing firms has been provided by Steven Fazzari, R. Glenn Hubbard, and Bruce Petersen, "Financing Constraints and Corporate Investment" (Northwestern University, 1987). These authors present evidence that the marginal returns from additional retentions-financed projects may be very high, at least for small firms.

corporate saving. Households may exhibit different marginal propensities to save out of different types of income. They may not believe that changes in asset values are permanent, but rather treat them as transitory "paper gains."[52] Households may have lower marginal propensities to consume out of such perceived transitory wealth increments than out of income shocks that are perceived to be more permanent, such as changes in dividends.[53]

An alternative explanation for different aggregate propensities to consume out of different kinds of income is that the households that receive capital gains have different saving propensities from those that depend primarily on labor income. In this case a tax change with no redistributive consequences would have no effect. Tax changes that redistribute income from households with equity holdings to those without such assets could affect saving, however, even if each household completely pierces the corporate veil with respect to the corporate tax liability of the firms that it owns.

Interhousehold differences in saving propensities may arise from factors that affect saving propensities at all ages as well as from life-cycle considerations. Variation in rates of time-preference or bequest motives could explain saving differences that persist throughout the life cycle. Households with lower time-preference rates will consume less in their early years and acquire a larger stock of wealth at the peak of the life-cycle trajectory than will households with higher time-preference rates. Asset holders will therefore have a higher saving rate than recipients of labor income, as in the growth models developed by Nicholas Kaldor and others.[54] Revenue-neutral increases in corporate

52. The question of whether households consume at the same rate out of different types of income has a long empirical history; see, for example, Lester D. Taylor, "Saving out of Different Types of Income," *BPEA, 2:1971,* pp. 383–415. Several recent studies have suggested that a substantial fraction of common stock returns may be transitory. These studies include Eugene Fama and Kenneth French, "Transitory and Permanent Components in Stock Prices," *Journal of Political Economy,* forthcoming; and James M. Poterba and Lawrence H. Summers, "Mean Reversion in Stock Prices: Evidence and Implications," Working Paper 2343 (National Bureau of Economic Research, August 1987). This may explain some differences in marginal propensity to consume from stock market capital gains and other income.

53. The marginal propensity to consume out of capital gains may depend on the source of capital gains. If households perceive declines in share values as the result of the tax change, they may adjust their consumption more than to other types of capital gains and losses on the grounds that these are relatively permanent gains or losses.

54. Nicholas Kaldor, "Alternative Theories of Distribution," *Review of Economic*

taxation will therefore reduce private saving, since they place higher burdens on high-saving households.

Life-cycle differences in saving behavior may alter this result. Most assets are held by older individuals, who might be expected to have a low marginal propensity to save. A corporate tax increase that reduces the value of the corporate capital stock therefore transfers wealth away from households with high marginal propensities to consume, potentially raising saving. The net effect of a revenue-neutral reform depends on the distribution of equity ownership and the magnitude of the differences in consumption propensities. The next subsection presents empirical evidence that attempts to estimate how corporate and personal saving interact.

DOES PERSONAL SAVING RESPOND TO CORPORATE SAVING? EMPIRICAL EVIDENCE

Nearly three decades ago, Edward Denison observed that gross private saving is more stable than either personal or corporate gross saving.[55] He interpreted that stability as evidence of substantial offsetting between personal and corporate saving. A number of subsequent econometric studies have supported Denison's conclusion, typically by including retained earnings in reduced-form household consumption functions and then testing whether the coefficient on this variable equals that on disposable income.[56] Failure to reject this hypothesis is inter-

Studies, vol. 23 (1955–56), pp. 83–100. A more recent discussion is Stephen A. Marglin, *Growth Distribution and Prices* (Harvard University Press, 1984).

55. Edward F. Denison, "A Note on Private Saving," *Review of Economics and Statistics,* vol. 40 (August 1958), pp. 261–67.

56. Among the recent econometric studies that cannot find a corporate veil are Paul A. David and John L. Scadding, "Private Savings: Ultrarationality, Aggregation, and Denison's Law," *Journal of Political Economy,* vol. 82 (March–April 1974), pp. 225–49; E. Philip Howrey and Saul H. Hymans, "The Measurement and Determination of Loanable-Funds Saving," *BPEA, 3:1978,* pp. 655–705; Martin S. Feldstein, "Tax Incentives, Corporate Saving, and Capital Accumulation in the United States," *Journal of Public Economics,* vol. 2 (April 1973), pp. 159–71; and George M. von Furstenberg, "Saving," in Henry J. Aaron and Joseph A. Pechman, eds., *How Taxes Affect Economic Behavior* (Brookings, 1981), pp. 327–90. Two studies analyzing the U.S. time series that find less than complete offset of personal for corporate saving are Kul B. Bhatia, "Corporate Taxation, Retained Earnings, and Capital Formation," *Journal of Public Economics,* vol. 11 (February 1979), pp. 123–34; and Patric Hendershott and Joe Peek, "Private Saving in the United States, 1950–1985," Working Paper 2294 (National Bureau of Economic Research, June 1987).

preted as evidence for the view that households pierce the corporate veil.

Previous studies are difficult to evaluate. Some focus on gross saving, providing little evidence for a discussion of net saving behavior. Only one adjusts measured corporate saving for inflationary revaluations in corporate debt, and none corrects for mismeasurement of pension contributions. The most important shortcoming of previous work, however, is the failure to treat corporate and personal saving as jointly endogenous variables. Many of the shocks that affect corporate saving may affect personal saving as well. The validity of simple regression evidence on the correlation between personal and corporate saving is therefore open to question.

The only way to attack the joint endogeneity problem is to identify a source of exogenous variation in corporate saving. The empirical results of the last section suggest that changes in dividend tax policy affect the share of corporate earnings that are retained. These tax shocks provide a natural instrument for studying how households react to changes in corporate saving. The model of saving underlying these tests is:

$$CORPSAVE_t = Z_{1t}\delta_1 + \theta_t{}^*\delta_2 + \nu_{1t} \tag{14a}$$

and

$$PERSAVE_t = Z_{2t}\delta_3 + CORPSAVE_t{}^*\delta_4 + \nu_{2t}, \tag{14b}$$

where Z_1 and Z_2 are vectors of other exogenous variables. The identifying assumption for my tests is that shifts in the relative tax burdens on dividends and capital gains affect the level of personal saving only through their influence on corporate saving.[57]

I used two different approaches to estimate the effect of corporate saving on personal saving. The first involves reduced-form private saving functions that relate private saving to the dividend tax variables that may shift corporate saving. Finding that lower dividend tax rates, which encourage corporate payout, reduce total private saving would suggest that households do not pierce the corporate veil. The second testing strategy includes corporate saving and other corporate cash flows in the

57. Dividend tax changes may have other effects on private saving. They are associated with changes in the tax system that affect the after-tax return to individual investors. The bias through this channel is likely to be small, however. For evidence that saving is not particularly sensitive to changes in the rate of return, see Robert E. Hall, "Consumption," Working Paper 2265 (National Bureau of Economic Research, May 1987).

private saving equation. This provides a more direct test of the hypothesis that the level of undistributed profits or pension contributions affects private saving. These equations are estimated both by ordinary least squares and by instrumental variables treating corporate saving as endogenous.

The estimating equation in both tests relates total private saving at an annual frequency to business conditions, demographic variables that affect the economy's saving propensity, the stock of household wealth at the beginning of the year (NW_t), and the flow of household disposable income taking account of corporate cash flow. The latter measure, denoted YD^* for augmented disposable income, equals NIPA disposable income plus undistributed corporate profits corrected by the capital consumption and inventory valuation adjustments. Business conditions are measured using the GNP gap, and demographic patterns are captured with a variable for the fraction of the population aged sixty-five or older.

The private saving equation is scaled by the level of augmented disposable income to correct for possible heteroskedasticity related to the size of the economy. The reduced-form equation that underlies the first test of how tax policy affects total private saving is therefore:[58]

$$\left(\frac{SAVEPRI}{YD^*}\right)_t = \gamma_0 + \gamma_1\left(\frac{NW}{YD^*}\right)_t + \gamma_2 GAP_t + \gamma_3 SHARE65_t + \gamma_4\theta_t + \nu_{3t}. \tag{15}$$

Equation 15 was estimated with and without a time trend, which never had a statistically significant coefficient. The results are therefore presented without the trend variable. The equations were also estimated with measures of ex post real interest rates included, but this variable also had a small and statistically insignificant effect and was therefore deleted.

The results of estimating the reduced-form equation for the post-1948 period are shown on the following page. The estimates correct for first-

58. The standard aggregate consumption function such as that estimated by Albert Ando and Franco Modigliani, "The Life-cycle Hypothesis of Saving: Aggregate Implications and Tests," *American Economic Review*, vol. 53 (March 1963), pp. 55–84, takes the form $C = \eta_1 YD + \eta_2 W$. Dividing both sides by YD yields an equation for the "consumption rate," approximately one minus the saving rate that is the dependent variable in the estimated saving functions.

order serial correlation and include both the current and lagged value of the dividend tax preference variable:

$$(16)\quad SAVEPRI/YD^* = \underset{(0.07)}{0.36} - \underset{(0.010)}{0.036}\, NW/YD^* - \underset{(0.05)}{0.18}\, GAP - \underset{(0.49)}{0.41}\, SHARE65 - \underset{(0.10)}{0.09}\, \theta(-1) + \underset{(0.49)}{0.03}\, [\theta - \theta(-1)],$$

$$\text{rho} = \underset{(0.12)}{0.76};\ R^2 = 0.73;\ \text{Durbin-Watson} = 2.18.$$

The level of the dividend tax preference variable is negatively correlated with the private saving rate, although the estimated coefficient is statistically insignificant at conventional levels. A 5 percentage point reduction in the dividend tax rate, according to this equation, would translate into roughly a $12 billion reduction in private saving. Equations similar to equation 16 were estimated for other sample periods. While the θ variable had a negative coefficient in nearly all specifications, supporting the view that households do not completely pierce the corporate veil, the hypothesis that this coefficient equals zero could never be rejected. The coefficient on $\theta(-1)$ in equation 16 measures the total effect of current plus lagged shifts in the tax variable on corporate saving. Other specifications, including only the lagged-once value of θ, provided stronger evidence against the null hypothesis of zero effect. The weak results from this specification should not be surprising since the first-order autocorrelation correction removes much of the variation from the slowly evolving tax rate series.

The reduced-form approach in equation 16 can be supplemented with an alternative testing strategy that includes corporate saving as a share of YD^* directly in the estimating equation. The results of this approach are reported in table 10. The dependent variable is *SAVEPRI*, total private saving (= *CORPSAVE* + *PERSAVE*). The estimates in the first two columns correspond to the specification:

$$(17)\quad \left(\frac{SAVEPRI}{YD^*}\right)_t = \gamma_0 + \gamma_1 \left(\frac{NW}{YD^*}\right)_t + \gamma_2 GAP_t + \gamma_3 SHARE65_t + \gamma_4 \left(\frac{CORPSAVE}{YD^*}\right) + \nu_{2t}.$$

Table 10. Estimates of Private Saving Functions, 1948–86 and 1931–86[a]

	Model 1, 1948–86		*Model 2, 1948–86*		*Model 3, 1931–86*	
Independent variable	*Ordinary least squares*	*Instrumental variable*	*Ordinary least squares*	*Instrumental variable*	*Ordinary least squares*	*Instrumental variable*
Constant	0.28	0.45	0.28	0.34	0.24	0.21
	(0.06)	(0.14)	(0.05)	(0.06)	(0.04)	(0.04)
*CORPSAVE/YD**	0.26	0.27	0.33	0.23	0.65	0.84
	(0.18)	(0.20)	(0.18)	(0.22)	(0.15)	(0.16)
GAP	−0.14	−0.13	−0.13	−0.13	−0.18	−0.13
	(0.06)	(0.05)	(0.06)	(0.06)	(0.05)	(0.05)
SHARE65	−0.61	−1.98	−0.97	−1.21	−0.55	−0.32
	(0.33)	(1.15)	(0.37)	(0.43)	(0.31)	(0.26)
NW ($\times 10^{-2}$)/*YD**	−2.84	−3.34	−2.43	−3.13	−2.47	−2.61
	(0.93)	(0.89)	(0.90)	(0.88)	(0.52)	(0.52)
*PENSION SAVING/YD**	...	...	1.36	0.87	...	...
			(0.89)	(0.90)		
Summary statistic						
rho_1	0.74	0.93	0.67	0.76	0.65	0.66
	(0.13)	(0.04)	(0.14)	(0.11)	(0.14)	(0.11)
R^2	0.73	...	0.75	...	0.98	...
Sum of squared residuals	1834	1833	1733	1684	5420	5078
Durbin-Watson	2.05	2.46	2.13	2.34	1.90	2.05

Source: Author's estimates of equation 17. See text description.

a. The dependent variable in each equation is the ratio of private saving, *SAVEPRI*, to augmented disposable income, *YD**, defined as NIPA disposable income plus undistributed corporate profits and adjusted by the IVA and CCA. Independent variables are: the ratio of corporate saving, *CORPSAVE*, to *YD**; the GNP gap; the fraction of the population aged sixty-five and older, *SHARE65*; and the ratio of the stock of household wealth at the beginning of the year, *NW*, to *YD**, and in model 2, *PENSION SAVING/YD**, which corrects for corporate contributions to defined-benefit pension plans. Instrumental variable (IV) equations treat *CORPSAVE/YD** as endogenous and use current and once-lagged values of the dividend tax preference variable, θ_t, as instruments. Equations estimated by ordinary least squares are corrected for first-order serial correlation and IV equations are estimated by Fair's method, allowing for first-order autocorrelation.

The estimates in the first column do not correct for the possible endogeneity of the *CORPSAVE* variable, while those in the second column are estimated by instrumental variables using θ and $\theta(-1)$ as instruments.

The results again suggest that an increase in corporate saving raises private saving. The point estimates in the first two columns suggest that a one dollar decline in corporate saving, measured as undistributed corporate profits with the CCA and IVA corrections, reduces private saving by about 25 cents. The instrumental variable estimate suggests slightly more offset than the uncorrected equation. The second pair of equations in this table adds the saving correction for contributions to defined-benefit pension plans to the basic specification. Inclusion of this variable does not substantively affect the point estimates of the corporate

saving offset, but suggests that a one dollar increase in pension contributions raises private saving by approximately one dollar. Although this suggests that households may not perceive corporate pension contributions as saving on their behalf, the standard errors on the pension adjustment coefficient are too large for strong conclusions. Equations like those in table 10 were also estimated with other components of corporate saving, such as the inflationary gain on corporate debt and the difference between corporate profits adjusted and unadjusted for capital consumption and inventory valuation. None of these variables had a statistically significant effect on private saving, so the results are not reported here.

The last two columns in table 10 estimate the private saving function in equation 17 using a longer sample period, starting in 1931 but excluding the war years.[59] This period includes both greater variation in corporate saving and more pronounced movements in the dividend tax variable than the postwar period. The results support those from the shorter sample in suggesting that changes in corporate saving affect total private saving, but the effect is both substantively and statistically more significant than that for the post-1948 equations. A one dollar decline in corporate saving is estimated to reduce private saving by between 65 cents (the OLS estimates) and 84 cents (two-stage least squares estimates). In both cases the hypothesis that households pierce the corporate veil can be rejected at standard levels of significance, and it is difficult to reject the view that a one dollar change in corporate saving induces an equally large change in private saving.

To evaluate the effect of corporate on private saving in light of table 10, it is important to recognize that a decline in corporate saving affects private saving in two ways. First, it has a direct effect as suggested by the *CORPSAVE* variable. Second, it translates into reduced household net worth, which will raise private saving, but only by two or three cents per dollar change in net worth. Although the net worth effect does not offset the direct depressing effect of a corporate saving effect, it does cumulate through time.

The point estimates for both the postwar and full-sample equations

59. The Flow of Funds data series for household net worth is backdated using the time series reported in Martin Feldstein, "Government Deficits and Aggregate Demand," *Journal of Monetary Economics*, vol. 9 (January 1982), pp. 1–20.

suggest that households partially pierce the corporate veil. In the postwar period, the most conservative estimates suggest that a one dollar shift in corporate saving induces a 23 cent shift in private saving. For the longer sample period, the implied effects are much larger.[60] My estimate that the Tax Reform Act of 1986 could lower corporate saving by $36 billion in 1989 thus suggests that private saving could fall $10–$20 billion a year.

Conclusion

The changes in personal and corporate taxation embodied in the Tax Reform Act of 1986 may depress corporate saving by more than 1 percent of net national product by 1989. Time series evidence on personal and corporate saving suggests that changes in corporate saving are only partly offset by opposite movements in personal saving. A $1 decline in corporate saving is likely to result in a 25–50¢ decline in total private saving.

These findings suggest a clear research agenda on the allocative effects of corporate taxation. If the preeminent problem confronting shareholders in their relationships with managers is preventing the profligate reinvestment of free cash flow, then reducing the dividend tax or raising corporate taxes will have desirable incentive effects. A higher corporate tax rate provides a device for extracting free cash flow from firms and tightens the external capital market's control on new corporate investments. But if problems in monitoring managers are less important than the difficulties that firms with profitable new projects confront in trying to signal their opportunities to the market, then tax policies that limit the availability of internal finance exacerbate preexisting capital market distortions. This line of argument suggests that the corporate income tax may impose substantial welfare costs through its effect on corporate financing decisions. Resolving the relative importance of these two views is a high priority for future studies of the welfare cost of capital taxation.

60. Many studies of whether households pierce the corporate veil that cannot reject the null hypothesis of perfect offset report point estimates that imply additional corporate saving raises total private saving, often by significant amounts. For the task of evaluating the likely impact of a reduction in corporate saving, calculations based on these point estimates are of some interest.

Comments and Discussion

Robert E. Hall: James Poterba asks whether the financial relations between corporations and their owners have any influence on the ultimate consumption of the public. Standard principles of consumption say there should be no effect—if corporations elect to pay the owners later rather than sooner, there should be no change in the present discounted value of households' receipts from corporations and therefore no change in consumption. Poterba finds some evidence against this proposition, though it is far from definitive.

Although Poterba sees the ultimate issue as the effect of financial decisions upon consumption, the paper actually operates within the traditional framework of splitting saving into corporate and personal components and then asking if there is complete offset in personal saving when financial policies change corporate saving without any change in corporate fundamentals. As a result, much of the early part of the paper is the struggle of a well-trained economist with the elusive concept of saving. Poterba follows in the footsteps of Irving Fisher, Milton Friedman, and Franco Modigliani in finding that the definition of saving is inherently arbitrary. But rather than restating the question to avoid dealing with saving (the solution adopted by his predecessors), Poterba works with various arbitrary definitions in spite of his full recognition of their defects.

The most conspicuous example in the paper of the recognition of a problem of defining saving without doing anything about it is in the study of dividends without any parallel study of share repurchases. When a corporation buys back its own stock, the effect is economically equivalent to paying a cash dividend. However, as Poterba explains, adding repurchases to dividends is only the first step in considering all of the possible asset transactions of the corporate sector. Because there is no

underlying sharp economic principle to apply, the research winds up studying just one piece of corporate payments to shareholders, namely dividends.

Poterba's first approach to the empirical work is to define private saving as the difference between national income and consumption plus taxes. To the extent that tax and other variables that determine payout decisions affect total private saving (corporate plus personal), there is evidence that consumers are sensitive to payout decisions. The hypothesis that consumers don't care when payout occurs will be rejected. The direct evidence on this point, presented in equation 16, is completely inconclusive. A variable that measures the bias of the tax system in favor of dividends has a slightly negative coefficient, but the standard error is larger than the coefficient. That is, there is weak evidence that when the tax system encourages dividend payouts, total private saving declines. The evidence is weak because the saving equation has an unexplained residual whose movements over time have about the same serial correlation as do the tax variables, and the two are hard to tell apart.

As a matter of econometrics, the reduced-form approach just described is the right way to test the null hypothesis of the irrelevance of variables that influence only the payout policies of corporations. Essentially the same test can be carried out in a structural system where private saving is the dependent variable and corporate saving is an endogenous right-hand variable, with the dividend tax bias used as an exogenous instrument. Results for that test, presented in table 10, are exactly the same—there is inconclusive evidence that payout changes motivated by changes in dividend taxation influence total private saving. There is no good reason to perform both tests, in view of their essential econometric equivalence.

For some unexplained reason, Poterba carries out the second test, but not the first, for data starting in 1931. The result is a conclusive rejection of the hypothesis that saving is invariant to changes in dividend taxation. To the extent that Poterba believes the results for the Depression-era data, the finding should receive much more prominence in the paper than it gets.

I think Poterba's findings would be more convincing if they were placed within the more secure surroundings of a consumption function than in the questionable environment of a saving function. The consumption function implicit in Poterba's saving equation is naive com-

pared with Modigliani's work of thirty years ago. However, I have no reason to think that the basic conclusion would be any different; a simple life-cycle consumption function fitted to data starting in 1931 would probably show that consumption is shifted upward by a tax policy that encourages the payment of dividends as against the retention of earnings in the firm.

Although I am not happy with the macroeconomic specification adopted by Poterba, I see his work as an important contribution to public finance. The construction of the time series data for the bias of the tax system with respect to dividend payout, following sophisticated principles of public finance, is a big step forward.

In an open economy, saving and investment are not locked together. Now that Poterba has provided the crucial tax bias time series, it would be interesting to extend the search for effects of the tax bias to investment as well as consumption. One could imagine looking at all components of the GNP identity for corporate payout effects.

Another interesting extension of this work would be to examine more carefully the response of the corporate sector itself to the tax bias variable. Two added dimensions are available: investment and share repurchases. In the framework of the corporate sector's cash-flow accounting identity, corporate borrowing could be treated as the residual. My impression from table 2 is that relatively little of the upsurge of share repurchases can be explained by changes in the tax bias.

R. Glenn Hubbard: James Poterba's excellent paper contributes to our understanding in two areas of current research. First, despite many recent papers on the effects of tax reform, there has been little effort to integrate the effects on households and corporations. Second, although the past decade has witnessed numerous policy attempts to increase total private saving, most have been directed at household saving. The corporate sector has received little attention.

The large share of corporate saving in total private saving suggests at an intuitive level its relevance for policy analysis. The *size* of corporate saving is not the issue, of course. As a matter of theory, it is not generally the case that one can analyze the effects of tax policies on national saving by considering separately the effects on individual components of saving. Poterba's paper outlines well these issues and tries to account for and verify links between household and corporate saving decisions. The

study provides a much-needed first step in reexamining the sensitivity of corporate financial behavior as a whole to tax policy.

By my reading, the paper is organized around four questions:

—How do we measure corporate saving?

—Do taxes "matter" in empirical dividend models?

—How do the recent tax reforms affect corporate saving?

—How sheer is the corporate veil?

I will organize my comments by question, emphasizing directions for future theoretical and empirical work that might sharpen the analysis of the policy questions posed in the paper.

The first table of Poterba's paper illustrates the quantitative importance of corporate saving. Even if capital markets were perfect and household and corporate saving decisions were completely linked, the size of corporate saving suggests that its response to tax reform, directed at either households or businesses, cannot be ignored. Issues of measurement of household saving have traditionally been of concern to public finance economists. Poterba demonstrates the importance of two adjustments to official published measures of corporate saving—the treatment of corporate pension contributions and revaluations of nominal claims in the presence of inflation. As noted in table 2 of the paper, these adjustments are substantial, particularly during the 1970s, mitigating some of the supposed decline in corporate saving. The calculation of sources of the decline in corporate saving is useful, with the principal culprit being a decline in pretax corporate profitability.

Poterba also provides a useful summary of prevailing views of how tax policy affects the distribution of corporate profits between dividends and retained earnings. All three views outlined—tax-irrelevance, tax-capitalization (the "new view" in the public finance literature), and traditional—are incomplete explanations of why individuals hold dividend-paying securities despite their substantial tax disadvantages. The first view assumes that the marginal investor is tax-exempt, but fails to explain why *taxable* investors hold dividend-paying securities.[1] The

1. There is some empirical evidence that clientele effects are very weak. Marshall Blume and Irwin Friend have found that portfolios of institutions show approximately the same dividend yield as the market as a whole, despite the very low (or zero) tax rate applicable to institutions. Marshall E. Blume and Irwin Friend, "Institutional Investors: A Rapidly Growing Presence," in NASDAQ, *The NASDAQ Handbook: The Stock Market of Tomorrow—Today* (Probus Publishing Company, 1987), chap. 11.

second view just assumes that dividends are the vehicle for distributing cash to shareholders on the margin.[2] The so-called traditional view assumes that, for reasons either unstated or specific to individual models, dividend payments are valued by shareholders. At the most general level, this view has empirical promise only if an explanation for why companies pay dividends can be provided.

Several explanations of why investors might have a preference for dividends over retained earnings have been offered, including a need for current income by some investors, signaling, and agency considerations having to do with the need to place limits on managers' discretion in making investments. The first makes little sense except in the case of very large transactions costs. Standard signaling models see dividends as a response to information gaps between insiders (managers) and outsiders (shareholders): dividends signal favorable insider information. As an empirical matter, such models must confront evidence that smaller, rapidly growing firms, for which the information gap problem is presumably most severe, have lower payout ratios on average than do larger, mature companies.[3]

"Agency" benefits provide an intuitive explanation for dividend payments: firms will pay dividends until the marginal benefit is just matched by the tax cost. The substantial cross-sectional variation in payout rates must still be confronted, though. One possibility is that paying dividends is more costly for some firms than others. Recent research on imperfections in markets for equity and debt emphasizes that all firms do not have the same access to external capital markets.[4]

2. Telling evidence of the importance in recent years of share repurchases and mergers for cash is presented by Poterba and in recent work by John Shoven. John B. Shoven, "The Tax Consequences of Share Repurchases and Other Non-Dividend Cash Payments to Equity Owners," in Lawrence H. Summers, ed., *Tax Policy and the Economy* (MIT Press, 1987), pp. 29–54.

3. See the evidence in Steven Fazzari, R. Glenn Hubbard, and Bruce C. Petersen, "Financing Constraints and Corporate Investment," Working Paper 2389 (National Bureau of Economic Research, September 1987).

4. When firms and potential investors have asymmetric information about firms' prospects, it is possible that some sources of external finance may have higher costs or even be completely unavailable to certain categories of firms. Where managers act in the interest of existing shareholders and have superior information (relative to potential shareholders) about the true value of the firm's existing assets and new investment opportunities, one can show that some positive-net-present-value projects will be rejected. See the arguments in Stewart C. Myers and Nicholas S. Majluf, "Corporate Financing

For firms that face constraints in their ability to raise funds externally, dividend and investment decisions will not be independent. For such firms, the payment of an extra dollar of dividends has an additional shadow cost representing investment displaced. These firms pay out less, not because they are less subject to the agency problems to which Poterba alludes, but because the marginal cost of paying dividends can substantially exceed the cost arising solely from tax disadvantages.

An alternative description of the traditional view would make the after-tax rate of return, ρ, depend positively on the payout of the free cash flow (cash flow less investment) rather than on that of earnings. Such a rearrangement would reconcile low payout rates for firms facing financing constraints (whose free cash flows may be roughly zero) and high payout rates for mature firms lacking profitable investment opportunities on the margin. Dividend taxes will still affect the cost of capital in the way Poterba describes.

The time series study of the effect of tax policy on payout is an important contribution of the paper. Since John Lintner's seminal study, time series studies have been used to evaluate the determinants of dividend payout, though analyses of the effects of taxation have been rare.[5] Indeed, most such empirical studies have implicitly assumed that target payout ratios are independent of changes in personal and corporate income tax rates. As Poterba notes, since the 1930s there has been substantial time series variation in tax rates affecting payout policy.

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and Investment Decisions When Firms Have Information That Investors Do Not Have," *Journal of Financial Economics*, vol. 13 (June 1984), pp. 187–221.

The intuition is in the spirit of standard "market for lemons" models. If "good" firms and "lemons" cannot be distinguished, new shareholders will demand a higher return from good firms to cover losses incurred from inadvertently funding lemons. If this premium exceeds the share of the value of a new project going to existing shareholders, new shares will not be issued. For young firms with short track records, the probability of purchasing shares of a lemon is undoubtedly high. As firms mature, information asymmetries diminish and the lemons discount falls.

Debt securities may be subject to similar problems. In general, the cost of debt will increase with the extent of borrowing. The precise relationship between the quantity and shadow price of credit is likely to vary across firms according to information imperfections. For example, asymmetric information between borrowers and lenders can lead to "credit rationing" to some categories of borrowers. In addition, the importance of borrower net worth (internal finance) has been stressed by many authors.

5. John Lintner, "The Distribution of Incomes of Corporations among Dividends, Retained Earnings, and Taxes," *American Economic Review*, vol. 46 (May 1956, *Papers and Proceedings, 1955*), pp. 97–113.

The error-correction model that Poterba employs in his empirical work on dividends is convenient for evaluating jointly the determinants of the target level of dividends and the speed with which deviations from that target are corrected. The difficulty is that we lack a clear theory of either part. Given this problem, it is by no means obvious what model specification is appropriate here. Some additional comments on the implied dynamics, as well as comments on the results of alternative specifications, would be useful. Why, for example, need the error correction be symmetric? Would managers increase dividends when they fell below target faster than they would reduce an above-normal level of dividends? One alternative approach would be to model the payout rate—rather than the level of dividends—as depending on θ. In such a framework, the percentage increase in dividends associated with a given percentage increase in earnings would no longer be independent of the tax parameter.

The estimation results appear to corroborate a strong tax effect on dividend payout. Even though much of the variation in the data occurs before the Second World War, the coefficients on the tax variables reported in table 5 have the right sign and are in most cases precisely estimated. As I have indicated, though, interpretation for policy analysis is difficult.

Particularly striking is the result in table 6 about the effect on payout of the Undistributed Profits Tax of 1936–37. This policy experiment, in which funds were distributed from the corporate sector to the household sector, is particularly relevant for evaluating asymmetric-information models that stress the importance of net worth positions for investment. A useful extension would be to analyze the impact of the undistributed profits tax on dividends using firm data from the period. In the context of the capital market imperfections I discussed earlier, it is possible that the tax could depress investment in constrained firms. Contemporary chroniclers discussed the impact of the tax on investment and economic activity.[6]

Since Tobin's q incorporates the market's expectation of future after-tax dividends, it might be an important predictor of dividend payout, especially if managers try to adjust dividend payments relative to

6. See, for example, George E. Lent, *The Impact of the Undistributed Profits Tax, 1936–1937* (Columbia University Press, 1948).

permanent earnings. In the reduced-form equation, the expected effect is not obvious a priori. Cross-sectionally, one might imagine that capital-constrained firms have high q values and low dividend payouts; similarly, mature firms in declining industries may have high payout rates with low q values (reflecting a lack of new investment opportunities).

The third question addressed by Poterba is the impact of the Tax Reform Act of 1986 on corporate payout. Such effects are interesting for policy purposes if households respond less than completely to changes in corporate saving. Poterba notes that if managers resist cutting dividends after the Tax Reform Act takes effect, corporate saving will be reduced by more than his empirical estimates would predict. If the provisions of the new law are expected to be permanent, it is hard to imagine why shareholders would react severely to such cuts, provided that managers were at the optimal payout level previously. The projected declines in corporate saving during 1987–91 are substantial. The agency arguments emphasized by Poterba make it clear that some of the decline will be due to lower levels of wasteful managerial investment. Of concern, however, is the effect of the tax changes on firms that must rely on internal finance as their primary source of investment funds.

The remainder of the paper confronts directly the issue of links between personal and corporate saving. While it is true that high-income individuals, who receive most of the dividends and capital gains, are unlikely to be liquidity-constrained, an increase in the level of corporate taxation compensated by a reduction in personal taxes redistributes resources from shareholders to less affluent individuals, whose consumption is more likely to be constrained by current resources. It would be interesting to examine potential effects on consumption of such a tax policy given plausible estimates of the importance of constrained consumers in the economy.

As Poterba notes, there are good reasons to believe, based on consideration of agency and asymmetric information, that dividends and retained earnings may be valued differently by shareholders. The cases he discusses can be couched within the framework I outlined earlier. Suppose that dividends are paid until, on the margin, agency benefits from dividend payments are equal to the tax cost of paying dividends plus the shadow value of investment crowded out by the payment of dividends. For mature companies facing no capital market constraints, required dividend payouts are likely to be high. The absence of such

distributions may be taken as a sign of wasteful investment, making the firm vulnerable to acquisition by outsiders who will replace the current management. Poterba's argument that higher corporate taxes will not be fully reflected in equity values since they will be financed in part by lower levels of managerial waste ignores the potential importance of takeovers in disciplining wasteful investment.

In constrained companies, for which the shadow value of a marginal investment is high, dividend payouts are likely to be low. For firms facing financing constraints, an increase in corporate tax burdens has an unambiguously negative effect on investment and growth, and the decline in share values induced by a one dollar increase in current tax burdens will be greater than one dollar. While this scenario applies to many firms, more empirical work is needed to determine its relevance for aggregate movements in corporate saving. I do, however, agree with Poterba that complete piercing of the corporate veil would be extremely surprising on a priori grounds.

In taking up empirical issues in estimating offsets in personal saving to changes in corporate saving, Poterba notes that "the net effect of a revenue-neutral [tax] reform [on private saving] depends on the distribution of equity ownership and the magnitude of the differences in consumption propensities." Some illustrative calculations along these lines would aid interpretation of the empirical results that follow.

Interpretation of the empirical work estimating the impact of changes in corporate saving on household saving would be more straightforward if a consumption model were used; difficulties of addressing what is meant by household saving would then be avoided. Even then, offset estimates are not sufficient to distinguish the two views summarized by Poterba of why redistributing funds from the corporate sector to the household sector might have real effects. Consider, for example, a policy change in which the average tax burden of the corporate sector is increased, compensated by a reduction in personal tax burdens. A finding that household saving responds less than dollar for dollar to changes in corporate saving could be consistent either with a positive wealth effect from reduced managerial waste or with the presence of a minority of households whose consumption is sensitive to changes in after-tax income. What is needed in addition is a model of investment to investigate whether the level of investment is independent of the allocation of corporate earnings between retained earnings and distributions

to shareholders. In all fairness, such an effort is beyond the scope of this paper.

Within the context of the model Poterba actually employs, the idea of using tax shocks to study the reactions of households to changes in corporate saving is a good one; it is important to consider the effects of *exogenous* variation in corporate saving. One must be careful here, though, since changes in corporate and personal tax rates, which would affect personal saving, are often explicitly linked in policy actions. I will withhold obvious quibbles about the reduced-form character of the approach, since the results give us a broad overview of the likely size of offsets in personal saving to changes in corporate saving. The inclusion of the net worth variable complicates interpretation of the results; some changes in tax policy parameters presumably affect share values and net worth, leading to a further effect on households' consumption. In addition, given the incorporation of a net worth variable, why not include adjustments for social security wealth? These qualifications notwithstanding, the offset results presented are suggestive and provide an impetus to investigate channels through which less than complete offsets result, particularly with respect to the potential role of households and firms whose decisions must be made in imperfect capital markets.

In conclusion, I believe that Poterba's paper is an important step toward modeling the impact of corporate tax policy on corporate saving and investment. Policies designed to alter corporate saving must not lose sight of considerations of agency and asymmetric information in capital markets, which link real and financial decisions. I agree with Poterba that understanding these considerations may alter substantially our thoughts about the macroeconomic and efficiency effects of taxes on capital income.

General Discussion

William Nordhaus commended Poterba for examining the impact of the Tax Reform Act of 1986 on the corporate sector. Most analysts of the reform, he noted, had neglected corporations and failed to integrate the corporate and personal sectors when examining the outcome of the new policy. By considering the effect of the corporate tax on corporate saving, and indirectly upon personal saving, Nordhaus observed, the

paper filled an important gap. Nordhaus then turned to the issue of the treatment of pensions. He agreed with Poterba that it is difficult to measure accurately the liabilities of corporations corresponding to their obligation to pay future pensions. Nevertheless, he argued, the approach taken in the paper, measuring corporate saving by corporate contributions to defined-benefit plans as if there were no accrual of obligations, can give a badly mistaken picture. He noted, moreover, that over the past fifteen years corporate contributions have changed in response to legislative initiatives, for example the Employee Retirement Income Security Act of 1974 (ERISA), that have mandated a particular level of funding for pension plans without a corresponding change in pension fund liabilities. Such influences bias conclusions about the trend in corporate saving, preventing corporate saving from declining even more than it did.

Based upon the evidence in table 4, Martin Baily commented that the appropriate question now is "Why is it that corporations used to pay dividends, whereas now they use share repurchases to a much greater extent?" He suggested that corporations may have finally heard the message of economists and realized that share repurchases are preferable to dividends as a way to distribute earnings to shareholders. He wondered what caused the change. Poterba suggested that one cause was simply a change in the perception of managers as to the available options. For many years, managers believed that share repurchases would be treated as dividends and taxed accordingly. Repurchases by a number of prominent firms in the early 1980s proved them wrong. Poterba added that tax changes have little to do with the increase in share repurchases.

Joseph Pechman reminded the panel that the long-term impact of the Tax Reform Act of 1986 cannot be assessed without understanding the incidence of the new law. He argued, contrary to the approach taken in the paper, that the Tax Reform Act of 1986 should not be regarded as a general tax increase on all corporations. In fact, he noted, it would reduce taxes on the typical corporation in the manufacturing and service sectors and increase them on selected industries, such as defense and financial services. Pechman reasoned that, in the long run, the increase in the tax burden on defense contractors would be passed on to the government, thereby reducing saving in the federal sector, while the higher tax burden on financial firms would be passed on to the consumer.

Poterba's calculations of the ultimate effect of the new tax law on dividends and saving could thus be misleading.

William Brainard wondered where the increase in dividends that Poterba predicts in response to a tax increase would come from. For given before-tax corporate profits, increased dividends have to come from some combination of greater corporate borrowing, increased sale of equities, and a decrease in investment. Which of these bears the brunt of the adjustment makes a major difference to the assessment of the long-run consequences of the tax change to the economy.