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Internal Finance and Investment: Evidence from the Undistributed Profits Tax of 1936–37*

Theoretical work on financing costs under asymmetric information has linked shifts in firms' internal funds and investment spending, holding constant investment opportunities. An impediment to convincing tests of these models is the lack of firm-level data on the relative costs of internal and external funds. We use a tax experiment, the surtax on undistributed profits in the 1930s, to identify firms' relative cost of internal and external funds by calculating surtax margins. The investment of high-surtax-margin firms was sensitive to shifts in cash flow, holding constant investment opportunities. Other firms did not display sensitivity of investment to internal funds.

I. Introduction

Recent theoretical work on the financing of investment under asymmetric information has emphasized the existence of a shadow price differential between internal finance (retained earnings) and external finance (debt and stock flotations). "Lemons" premia in equity markets (as in Myers and Majluf 1984), and credit rationing or loan mispricing (as in Jaffee and Russell 1976; Stiglitz and Weiss 1981; Gale and Hellwig 1985; Williamson 1986; Bernanke and Gertler 1989; and Calomiris and Hubbard 1990) imply that external finance will be more costly than internal finance (for a review, see Bernanke, Gertler, and Gilchrist, in press). Moreover, the

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shadow price differential between internal and external finance will vary across firms depending on the relative degree of information asymmetry and on differences in simple transacting costs. Recent empirical research using data from the post–World War II period has found much evidence for the importance of this cost wedge between internal and external finance in explaining firm heterogeneity in investment behavior and aggregate sensitivity of investment to cash flow (see Fazzari, Hubbard, and Petersen 1988; Gilchrist 1991; Himmelberg 1991; Hoshi, Kashyap, and Scharfstein 1991; Hubbard and Kashyap 1992; and Whited 1992). This new body of theoretical and empirical work has formalized and quantified arguments that have a long history in the investment literature (see Butters and Lintner 1945; and Meyer and Kuh 1957).

According to an alternative view, costs of managerial control, rather than asymmetric information, can explain observed correlations between internal sources of funds (''free cash flow'') and investment. In contrast to the asymmetric-information approach, costs of managerial control imply that restrictions on the availability of free cash flow (e.g., increases in promised debt payments) can increase the value of the firm by limiting management's command over, and abuse of, resources.

In this article, we employ a new firm-level data set from the 1930s which is uniquely suited to measure the shadow value of internal funds and relate it to firms' characteristics and behavior. Our sample is drawn from manufacturing firms during the rapid recovery, and subsequent recession, of 1933–38. Our data allow us to investigate the potential effects of financial constraints on firm growth during the expansion and to take advantage of the heterogeneity in our sample to discover which firms placed highest value on internal funds and whether these firms were sensitive to cash flow disturbances (changes in the supply of internal finance). We find that firms that placed high shadow value on internal funds also displayed greater sensitivity of investment to internal funds. We argue that the characteristics of firms with high shadow values for internal funds and high cash flow sensitivity of investment are consistent with the asymmetric-information framework and cannot be explained as a consequence of the wasteful use of internal funds by entrenched managers.

What has been lacking in existing studies using firm-level data is a firm-level index of the marginal costs of external finance. Studies using the Q-theory approach model investment as being determined by beginning-of-period Q (to control for investment opportunities) and a measure of internal funds. For firms with high costs of external funds (due to asymmetric information between insiders and outsiders regarding firm prospects), investment will exhibit excessive sensitivity to cash flow, holding Q constant.[1] In existing studies low initial dividend payout ratios or small firm size are typically used as proxies for high costs of external finance. In this article, we are able to estimate the costs of external finance directly by examining firms' responses to a unique tax "experiment" in U.S. history, the undistributed profits tax (or surtax on undistributed profits) of 1936–37.[2] This tax was a surtax on corporate retentions over and above normal corporate taxes. Because the maximum marginal tax rate was 27%, most firms had large incentives to change their payout policies. Working against this response for some firms is the potential difference in the cost of internal and external funds. To the extent that the marginal cost of external funds is high, a growing firm with profitable investment opportunities might choose to pay the undistributed profits tax and invest its internal funds, rather than distribute funds and then reacquire them in the capital market. Under certain assumptions, the observed undistributed profits tax payments for such firms can be used to approximate the differential cost of external finance, and variation in the response to the tax across firms can be related to variations in investment behavior.[3]

Our study of the undistributed profits tax, and its implications for measuring the costs of external finance, is also motivated by a specific interest in the macroeconomic events of the 1930s. The timing of the undistributed profits tax experiment is fortuitous, since the protracted recovery from the Great Depression has been attributed by Fisher (1933) and Bernanke (1983) to increases in the costs of external finance. From 1934 to 1939, 98% of the investment funds of nonfinancial corporations were supplied internally; for other periods, from 1901 to 1929 and from 1946 to 1956, the comparable figure ranged from 55% to 64% (Miller 1967, p. 171). Bernanke stressed increases in the "cost of credit intermediation" which resulted from deflation-induced reductions in firms' net worth (which reduced firms' creditworthiness in the presence of leverage constraints) and the weakening and partial destruction of the banking system from 1930 to 1933. Bernanke points to time-series evidence of links between credit supply shocks (deflation and default premia) and investment and to the large excess reserve holdings of commercial banks to argue for the importance of credit constraints in limiting investment. A maintained assumption of this

1. See, e.g., Fazzari, Hubbard, and Petersen (1988) and Hoshi, Kashyap, and Scharfstein (1991).

2. Romer and Romer (1990) and Miron (1991) have stressed the value of historical policy experiments in models of interest to macroeconomists.

3. Indeed, opponents of the surtax (which was only effective for 2 years) argued that it discriminated against firms with limited (or costly) access to centralized securities markets (see Kendrick 1937; Butters and Lintner 1945). Contemporary chroniclers emphasized the effect of bank failures and reduced credit availability from banks in increasing the shadow price of external finance for many firms in the 1930s.

argument is that costs of external finance were large for a significant number of firms in the economy. We argue that cross-sectional evidence from firms' responses to the undistributed profits tax provides evidence of very high costs of external finance for a large proportion of firms.[4]

Finally, the undistributed profits tax provides a significant opportunity to gauge the comparative importance of the asymmetric-information-cost and managerial-control-cost theories for explaining the allocative role of cash flow. The tax was passed as a means to discipline managers but was repealed largely because it was perceived as an impediment to the growth of young, dynamic firms. By investigating the incidence of the tax across firms, and the changes in dividend payout in response to the tax, one can gauge the extent to which the tax produced unintended costs by raising the costs of financing positive net present value projects.

Section II reviews the history of the surtax on undistributed profits, describes its incidence on firms of different sizes, and explains our method for identifying the marginal cost differential between external and internal finance. Section III describes our data set. In Section IV, we provide some basic summary statistics on the characteristics of firms with high costs of external finance, as measured by undistributed profits tax margins. We argue that the differences between firms with high and low costs of external finance reflect information-related capital market frictions. Section V reports regression results relating investment behavior (particularly cash flow sensitivity) to differences in the costs of external finance. We find that a neoclassical investment model with no explicit capital market frictions cannot be rejected except for firms with high surtax margins. The investment spending of those firms displayed excess sensitivity to internal funds. In addition, working capital accumulation was responsive to cash flow only for high-surtax-margin firms, suggesting the use of working capital to smooth fixed capital investment when external finance is costly. The cash flow sensitivity of investment is attributable to the behavior of

4. Calomiris and Hubbard (1989) report results akin to Bernanke's for the pre–Federal Reserve period of U.S. history. Temin (1989) uses panel data for investment to challenge Bernanke's view that costs of credit were unusually high during the 1930s. Temin argues that if Bernanke's channel were important, industries with low concentration ratios (which Temin identifies as more vulnerable to increases in the cost of credit intermediation) should have invested relatively less in the 1930s than at other times. Temin finds no evidence to support this prediction and therefore dismisses the credit-cost explanation of the Great Depression's unusual persistence. Clearly, it would be preferable to measure investment response at the firm level by using a direct measure of the shadow cost of external finance rather than to rely on comparisons across industries by using the dubious proxy of industrial concentration. Indeed, as we show below, firm size (which motivatives Temin's use of industry concentration) is a very noisy indicator of external finance costs.

type C firms with high values of Tobin's Q, which we argue is inconsistent with a managerial-control-cost explanation of cash flow sensitivity. In Section VI, we show that industries with the highest proportions of firms with high surtax margins were among the fastest growing of the day. Section VII concludes.

II. Measuring Finance Costs Using Surtax Margins

The surtax on undistributed profits (SUP) was created to restrict corporate discretion over retained earnings. Indeed, the SUP taxed all of retained earnings, including funds used to finance investment projects. By taxing retained earnings it was thought that firm managers would be forced to face the discipline of the capital market to finance their investments, thus making the capital allocation process more efficient (see Berle and Means 1932; Tugwell 1933; Hazlett 1936; and Buehler 1937).[5] The logic of this argument is quite similar to recent theoretical models of free cash flow that emphasize potential agency problems between management and shareholders of mature firms (Easterbrook 1984; and Jensen 1986).

A. The Tax Experiment

The surtax on undistributed profits appears to have been unanticipated (see the discussion in Blakey and Blakey 1936). No reference was made to it in President Roosevelt's budget messages of June 1935 or January 1936. The proposal was presented by the president in a special message to Congress on March 3, 1936, in which he announced the need for the tax as a revenue-raising device. Strong opposition by key Congressional factions and lobbying efforts by business groups to repeal the surtax led to early amendment and repeal of the surtax. The surtax survived in its original form through 1937. By 1938, legislative amendments reduced substantially the effective surtax rate. The tax expired formally in December 1939, in accordance with the Revenue Act of 1938. At the time, most observers seemed to agree that the tax had a significant effect on dividend payouts only in 1936 and 1937 (see Kendrick 1937; Thorp and George 1937; McIntyre 1939; Guthmann 1940; and Lent 1948).

The Roosevelt administration proposed the SUP as a substitute for the corporate income tax (which would have avoided the double taxation of dividends), but Congress added it to the existing corporate tax as a surtax on retained earnings. From the beginning there were pro-

5. Another possible contributor to the intellectual current in support of the surtax was the "liquidationist" school of thought, discussed in De Long (1991). According to this school, depressions were necessary times of upheaval in which reallocations of capital from low-productivity to high-productivity uses occurred. The "discipline" of external finance might have been valued as a means to hasten such a transformation.

tests against the tax, particularly from small, growing enterprises. These firms complained that the tax discriminated against growing firms with high costs of external finance. Responses to a Brookings Institution survey of firms in 1937 (Kendrick 1937) contained many such complaints. In one case a large, dominant firm noted that it had gained a competitive advantage as the result of its low financing costs, given the greater incidence of the tax on its smaller and younger competitors. The large firm (perhaps uncharacteristically) argued that this was an unfair advantage and suggested repeal of the tax. Many annual corporate reports for 1936 contained special statements discussing and criticizing the new tax. As a result of these protests, the tax was repealed in 1938 (see also Lent 1948; and Dobrovolsky 1951).

The computation of a firm's SUP liability followed a simple rule. The marginal tax rate was progressive as a function of the percentage of net (after-tax) earnings retained annually, beginning with the calendar year 1936. On the first 10% of net earnings retained, a firm would pay 7% of retained earnings in tax. On the next 10%, it would pay 12% of retained earnings. On retentions of between 20% and 40% of income, a 17% marginal tax rate applied. For retentions between 40% and 60% of income, a 22% marginal tax rate was charged. On all retentions above 60% of income, the marginal tax rate was 27%. There were special exemptions (e.g., for firms with bond covenants that restricted dividend payments), and there was a small tax credit for firms earning less than $50,000 in income.

The maximum marginal tax rate paid by a firm provides a measure of the shadow price differential between external and internal finance costs, once one takes proper account of the tax consequences of dividends and retentions. In the appendix, we provide a method for approximating the shadow price differential using the firm's maximum tax margin and information on the tax rates applied to dividends and capital gains. For example, a firm at the 27% margin paying near-zero dividends and seeking to finance new investment projects was willing to pay 27 cents to avoid having to raise 73 cents in outside funds. We conservatively estimate that the median shadow cost differential for such a firm (in present value terms) was likely in excess of 15%.

Given the avoidability of the tax through dividend payments, one might expect that little revenue was actually raised by the tax and that very few firms paid the highest marginal rates. While it is true that the vast majority of firms increased dividend payout rates in 1936 to limit their tax liability under the new law, a substantial number of firms paid high marginal SUP rates, and the revenue from the new tax was significant. The SUP earned $145 million in revenue in 1936 and $176 million in 1937, compared to regular corporate tax collections of $950 million and $1,150 million for 1936 and 1937, respectively. As table 1 shows, retained earnings as a percentage of after-tax income fell from

TABLE 1 Retained Earnings as a Percentage of After-Tax Profits for Corporations with Positive Income, 1931–40

	Under 50	50–100	100–250	250–500	500–1,000	1,000–5,000	5,000–10,000	10,000–50,000	Over 50,000	All Classes
1931	57.3	47.8	39.1	32.1	26.4	21.5	13.9	11.1	3.7*	9.6
1932	39.9	31.5	31.6	28.8	26.1	20.8	12.6	7.6	8.9*	4.3
1933	64.0	66.5	61.4	61.3	56.5	47.1	39.4	22.2	2.5*	24.0
1934	53.7†	57.1	52.6	45.5	34.9	25.8	28.5	3.5	13.9	19.7
1935	56.4	52.0	48.5	44.5	34.7	28.2	20.5	8.0	19.8	23.0
1936	35.8	28.4	23.8	22.7	25.8	25.9	22.3	15.6	4.9	15.1
1937	30.4	29.4	24.1	22.8	23.2	22.2	20.7	16.0	8.3	15.1
1938	50.6	54.8	48.3	39.3	37.8	29.5	23.7	16.8	7.3	19.2
1939	62.0	63.1	55.6	46.1	44.6	37.8	33.9	24.2	18.3	28.8
1940	62.2	59.2	56.4	51.2	50.1	44.3	39.0	30.1	22.3	33.2
Average	51.1	48.1	44.1	39.4	36.0	30.3	25.5	15.5	8.0	19.2

SOURCE.—Butters and Lintner (1945, p. 66).
NOTE.—Asset size classes are in thousands of dollars.
* Indicates an excess of dividends over net profits after taxes.
† This item represents nonfinancial corporations only, because of the abnormal dividends paid by financial corporations of this size in 1934.

1935 to 1936 most dramatically for the largest firms in the economy. The average retention ratio for all firms fell from 23% to 15.1%. For firms with assets of greater than $50 million, the mean retention ratio fell from 19.8% to 4.9%. Mean retention ratios in 1936 decline with firm size, rising from 4.9% for the largest firms to 35.8% for the smallest.

Table 2 provides complementary evidence on the distribution of highest marginal rate paid on the SUP, conditioning on the size of firms measured by income. For firms earning profits (and hence subject to the surtax) a substantial fraction paid marginal tax rates of 22% or 27%. Firms with very low incomes (less than $10,000) avoided high tax margins mainly by applying the special tax credit available to firms with income less than $50,000. The very largest firms also avoided the highest tax brackets, presumably because of their lower costs of external finance. However, for income classes between $10,000 and $1 million, between 17% and 23% of firms paid marginal rates of 22% or 27%, with roughly 10% of firms in the 27% bracket. The concentration of high margins in middle-income ranges may also be due to differences across firm sizes in the ability of firms to reduce measured profits by adjusting the salary-profit mix of entrepreneur-managers, which was especially relevant for very small firms (see Thorp and George 1937; and Dobrovolsky 1951).

B. Direct Evidence of Costly External Finance in the 1930s[6]

Independent evidence from surveys by the Securities and Exchange Commission (SEC; 1941*a*, 1941*b*) on the cost of common stock flotation confirms that costs of issuing securities in the 1930s often were large. For example, as reported in table 3, for a sample of 64 firms with assets of under $5 million average costs of flotation ranged between 20% and 27% of the value of the amount of common stock issued. Physical expenses accounted typically for costs of 2% or 3%. The remainder was paid as compensation to the intermediary who handled the issue. Underwriting insurance costs do not account for the bulk of this fee. In 1938 underwritten common stock issuers paid an average compensation of 17.5% of the issued amount to brokers, while nonunderwritten common stock issuers paid 19.1% on average. Recent models of information production by securities intermediaries may help explain such high fees. According to Benveniste and Spindt (1989), for example, costs of public stock brokerage reflect substantial costs of gathering information.[7]

The view that costs of finance mainly reflect information costs is

6. In addition to studies of flotation costs, studies using modern data have tested for implied cost differences between internal and external equity finance; see, e.g., Asquith and Mullins (1986); Masulis and Korwar (1986); and McDonald and Soderstrom (1986).

7. See also Ramakrishnan and Thakor (1984).

TABLE 2 Corporations Subject to Surtax on Undistributed Profits, 1937

Net Income Class ($000s)	Returns with Net Income ($)	No Surtax (%)	7% Rate (%)	12% Rate (%)	17% Rate (%)	22% Rate (%)	27% Rate (%)
Under 5	119,805	19.2	80.8	.0	.0	.0	.0
5–10	18,611	34.7	39.4	8.9	10.4	6.6	.0
10–15	9,150	38.0	32.4	5.6	6.1	7.4	10.7
15–20	5,697	40.0	27.4	7.5	8.3	4.7	12.1
20–25	3,879	39.8	24.1	7.7	11.2	5.4	11.8
25–50	9,282	40.5	18.0	8.7	13.1	8.6	11.1
50–100	6,046	39.8	13.7	9.9	15.7	9.9	10.9
100–250	4,620	38.8	13.0	9.6	15.8	11.8	11.1
250–500	1,819	38.3	13.2	9.2	16.7	13.0	9.6
500–1,000	1,071	36.4	13.8	13.8	17.6	10.2	8.1
1,000–5,000	974	42.2	15.1	11.8	16.5	9.4	4.9
Over 5,000	240	43.3	15.8	17.5	16.7	5.0	1.7

SOURCE.—Figures are derived from U.S. Internal Revenue Service (1937).
NOTE.—Classifications are by highest surtax rate paid.

TABLE 3 Cost of Flotation for Common Stock Issues Effectively Registered for Sale to the Public by Asset Size of Issuer, 1938–41

	1938		1939		1940		1941	
	Number of Issues	Cost as a Percentage of Amount	Number of Issues	Cost as a Percentage of Amount	Number of Issues	Cost as a Percentage of Amount	Number of issues	Cost as a Percentage of Amount
Underwritten issues:								
Under $1	9	27.3	11	22.9	10	22.8	5	20.4
$1–$5	5	20.0	9	19.5	19	15.9	11	19.9
$5–$10	2	19.2	3	11.4	3	12.9	3	12.5
$10–$50	...	...	...	...	6	10.4	3	10.2
$50–$100	...	...	...	...	1	9.1	...	...
$100–$200	...	...	...	...	1	8.3	...	...
Over $200	...	...	...	...	...	...	...	...
Best-effort issues:								
Under $1	44	21.7	36	24.1	31	24.4	7	19.1
$1–$5	6	20.9	10	20.3	3	16.5	2	23.6
$5–$10	2	14.8	2	10.9	2	16.4	...	...
$10–$50	...	...	1	4.8	...	...	1	4.4
$50–$100	...	...	...	...	1	2.2	...	...
$100–$200	...	...	...	...	...	...	...	...
Over $200	...	...	...	...	...	...	...	...

SOURCE.—Butters and Lintner (1945, p. 97).
NOTE.—Asset size classes are in millions of dollars. All data refer to issues proposed for sale by the issuer through investment banking facilities.

supported further by comparing the broker's compensation on preferred stock and bonds with those on common stock. Compensation for preferred stock and bonds sold to the public was substantially lower than for common stock and as before was highest for nonunderwritten issues. For example, nonunderwritten preferred stock compensation to brokers on public issues averaged 12.2% in 1938 for 31 issues, compared to a 2.7% average for 12 underwritten issues. For bond issues, brokers' compensation and physical expenses were roughly comparable and together small in comparison to stock issue costs. These findings show that firms faced substantially different marginal costs of finance in markets for different types of securities. In equilibrium, low-cost forms of finance were rationed to certain firms.[8] Comparisons of commissions across issues (Mendelson 1967) and across investment banking regimes (Calomiris 1995; and Calomiris and Raff 1995) confirm the positive association between information costs and commissions.

In summary, SEC data on the measured costs of public securities issues support the evidence in table 2 that a substantial number of firms faced a shadow price differential between external and internal funds in excess of 20%. Furthermore, differences in costs of finance across securities lend support to theoretical models of credit or equity rationing based on asymmetric information, which are consistent with such market segmentation.

III. The Data

We constructed a firm-level data set combining information on income, investment, financial structure, dividend payout, firm market values, and SUP margins for as many firms as possible during the period of recovery from the Great Depression. An extremely valuable primary source for firm-level data for our period is the *Survey of American Listed Corporations* (1940), which summarizes data submitted to the Securities and Exchange Commission for all publicly traded firms. These data include detailed information from balance sheets, income and expense statements, and records of dividend distributions.

8. For the sample of publicly traded firms we discuss in succeeding sections, only one in four firms issued bonds in 1936. Given the low brokerage costs of bond issues and the tax reduction benefits of debt, particularly in the presence of the surtax, it seems reasonable to interpret this low participation rate as evidence that many firms simply did not qualify for the bond market. Other evidence supports this conclusion. Ten percent of the firms in our sample accounted for 90% of firms' bond issues. Participation rates in the bond market for large firms (those with assets greater than $100 million) were nearly triple those for other firms. The mean size of bond issuers was more than triple the mean size of nonissuers. Finally, very few firms were "on the bond margin" in 1936. Only 11 firms in our sample of 273 increased outstanding bonds in 1936 or 1937, while seven firms showed a substantial decrease. Haven (1940, p. 7) argues that marketing restrictions on low-grade bonds introduced by the Banking Act of 1935 effectively restricted bond issues by small corporations in the mid-1930s.

Five hundred twenty-eight manufacturing firms appear in the *Survey* data set, which covers the years 1934–38 (with some limited coverage of 1939). Many of these firms, however, did not report consistent data for the period 1934–36 and hence were excluded from the dataset (many more would have been excluded if we had imposed the requirement of data availability for each year during the period 1934–38). Other firms were excluded because they did not earn positive profits in 1936 and therefore were not subject to the SUP. Still other firms were eliminated because stock price data were not available (from other sources noted below) for 1935 or 1936 or because taxation and dividend data were insufficient to calculate the maximum marginal rate of the SUP. These various deletions left us with 273 firms.

The principal source for data on SUP taxes and dividends was *Moody's Industrial Manual* (various years). In calculating dividends, it was crucial to know precisely when dividends were paid, since only dividends paid within the calendar year reduced liability for the SUP. Furthermore, stock dividends which were not bona fide disbursements of funds did not reduce SUP liability, so it was important to distinguish dividends by type.[9] *Moody's* was also a useful source of information on bond covenants; in a few cases, covenants restricting dividends paid (which were allowed by the SUP as an exemption to the tax) resolved seeming anomalies between the amount of SUP paid and the amount of tax liability implied by retained earnings. Where *Moody's* did not report data on SUP taxes paid, we referred to individual annual reports of corporations at the Stanford Business School Library, which accounted for roughly half of our data on SUP payments.

There are three ways to calculate a firm's maximum margin for the SUP. One needs any two of the following pieces of information to calculate the marginal tax rate: income, dividends, and SUP payments. To minimize the possibility of error, we performed the calculations all three ways where possible. If any methods led to contradictory results, we went back to *Moody's* and the annual reports to resolve the differences. If differences could not be resolved, we dropped the firms. In a few cases, SUP payment data were not available even though all other data were. For these firms, margins were inferred from data on dividends and income and were cross-checked with total corporate tax payments to ensure consistency as best we could. We then estimated the models described in Section IV with and without these firms. The presence or absence of these firms made no difference for any of our results, except by improving our sample size and standard errors, so we included them in our sample of 273 firms.

9. As a technical matter, firms could circumvent payment of additional cash dividends by distributing certain types of stock dividends (see Rolbein 1939). Firms, however, had to prove that such "dividends" increased the effective claims of shareholders.

Our estimated surtax margins are for the 1936 calendar year. While it is true that firms paid large amounts of surtax in both 1936 and 1937, we think the 1936 data are likely to provide a better indication of the costs of external finance for our purposes. Both 1936 and 1937 data have potential problems. The problem with using 1936 data is that firms may have been unable to estimate their true earnings accurately by the end of December and so may have paid high surtax rates by mistake. We think this is unlikely to be an important problem. The end of 1936 marked a continuation of economywide growth that had been occurring in the previous 2 years, so firms should have been able to estimate earnings reasonably well, particularly given their access to current sales data. Furthermore, many firms in our sample paid out extraordinary dividends in the last weeks of the year, presumably in response to updated information on earnings for the year.

The problem with using 1937 data is that a severe recession began in October 1937. A midyear recession creates two problems for our purposes. First, some firms may have overpaid dividends in anticipation of continuing earnings that did not materialize—leading to an underestimate of firms' desired surtax margins. Second, because our balance sheet and income statement data are annual, the year 1937 mixes two very different environments—an expansion and a recession. Thus, investment behavior over the year as a whole may be harder to predict on the basis of information available at the beginning of 1937, and the relationship between annual investment and annual earnings will be complicated by differences in the timing of investment.

To construct our measure of firm market values we collected end-of-year price data for common and preferred stocks for 1935 and 1936 from the *Wall Street Journal* and supplemented these price data, where necessary, with data from other newspapers and from *Moody's*. If it was not possible to gauge stock prices accurately (e.g., if reported ranges of values were large), we dropped the firm. Based on a preliminary analysis of bond price data, and on some difficulties disentangling bond aggregates from other forms of debt, we decided to value all debt at its face value. The small proportion of debt finance for most firms (and much smaller proportion of bonds), along with the fact that bonds traded very near par for the firms that issued bonds, imply that valuing debt at face value is unlikely to generate any important bias. Quantities of each stock of each class were taken from *Moody's*.

One limitation of our data is the definition of investment. Our measure of investment is the change in the book value of fixed capital (land, buildings, and equipment). Unfortunately, gross investment data are not reported by firms. While capital stock data are not ideal for our purposes because of possible idiosyncrasies in the measurement of depreciation, we think the strength and robustness of the net investment regressions we report argue for treating the change in book capital as a reasonable measure of investment.[10]

IV. Characterizing Firms with High External Finance Costs

In this section, we describe some of the salient characteristics of firms with different external finance costs as measured by the maximum marginal rate on the SUP. These descriptions are useful for two reasons. First, such a description can suggest whether previous empirical studies have been correct to associate low dividend payout and small firm size with high costs of external finance. Our direct measures of external finance costs support these assumptions.

Second, the characteristics of finance-constrained firms can help one to explain the source of high external finance costs and possibly to distinguish between the asymmetric-information-cost and managerial-control-cost views in explaining firms' reluctance to pay out dividends. The asymmetric-information view stresses incentives for retention that come from differences in the information insiders and outsiders possess about firm opportunities. Asymmetric information limits the supply of funds available to some firms, as described in Stiglitz and Weiss (1981), Myers and Majluf (1984), Bernanke and Gertler (1989), and Calomiris and Hubbard (1990). In this view, the quintessential high-surtax-margin firms would be small, growing enterprises in developing industries. According to the managerial-control-cost view, managers retain earnings even when they do not possess positive net present value projects because they benefit from the indirect consumption of free cash flow. Such models of managerial abuse are typically associated with large "sunset" firms with low investment opportunities (low values of Tobin's Q in Lang, Ofek, and Stulz 1994) and low debt service ratios, which allow wasteful managers to avoid the risk of bankruptcy (Morck, Shleifer, and Vishny 1990; Hanka 1992). Thus, the two frameworks have clear and different implications for the characteristics of high-surtax-margin firms.

A different approach to measuring the importance of the managerial-control-cost view is undertaken in a recent paper by Christie and Nanda (1994), which analyzes stock price reactions to Roosevelt's initial speech proposing a tax on retained earnings and argues that their evidence confirms the importance of free-cash-flow problems, which motivated the tax. They find greater stock price reactions for low-dividend firms in March 1936 and find that the reactions were especially large for low-Q firms. We find these results interesting but

10. This may not be true for periods outside our sample which saw lower levels of gross investment. Errors due to depreciation likely were reduced in importance by the high investment levels of 1935 and 1936.

do not agree with the authors' interpretation of them or with their broader interpretation of the costs and benefits of the surtax. First, Christie and Nanda omit zero-dividend firms from their sample, the inclusion of which would weaken average stock price reaction of low-dividend firms (Christie and Nanda 1994, p. 1735, n. 7). Second, Roosevelt's initial proposal would have substituted the tax on retained earnings for the regular corporate tax. For many firms, this could have had the effect of increasing available internal funds (after-tax) to finance investment. Thus, the stock price announcement effects they find around the date of Roosevelt's speech may reflect the relaxation of internal finance constraints rather than the elimination of free cash flow. In contrast to Christie and Nanda, in attempting to sort out the relative importance of managerial entrenchment and costly external finance for explaining the consequences of the surtax, we focus on the characteristics of firms that chose to pay high and low marginal tax rates. It is also important to note that the existence of managerial abuse of cash flow does not necessarily imply overinvestment in *fixed* capital, which is the focus of our study. Recent studies have suggested that entrenched managers may use free cash flow mainly for purposes other than fixed investment (Blanchard, Lopez-de-Silanes, and Shleifer 1994; and Hubbard, Kashyap, and Whited, in press).

To summarize the salient characteristics of the firms in our sample, and the differences across firms with different responses to the surtax, the tables that follow divide firms into three categories, based on their maximum SUP margins in 1936: firms with a 12% or lower maximum marginal rate, firms with a 17% marginal rate, and firms with a 22% or 27% marginal rate. These divisions correspond to retention rates in 1936 of less than 20% (type A), 20%–40% (type B), and greater than 40% (type C). By grouping firms into three categories, we economize on reporting and obtain large enough numbers of firms in each category to facilitate statistical inference.[11] The results we report do not differ qualitatively if we use all five categories rather than the three used

11. An added advantage to using fewer groupings is the reductions in the possibility of measurement error in type classification. Such errors might result from attempts by firms to disguise or reduce measured profits to reduce the burden of the surtax. For example, in closely held firms, managers would substitute direct compensation for dividends. Firms would also have incentives to increase advertising and maintenance expenses if they thought the tax was temporary. Also, the expensing of some forms of capital might have led some high-margin firms to accelerate some forms of capital investment. This latter effect seems to have been important in explaining investment in oil drilling equipment, which was expensed (see Hubbard and Reiss 1988). Thus, so long as firms faced upward-sloping cost of fund schedules, these various influences could lead us to underestimate some firms' external finance costs. By having few categories of firms, we minimize the bias that could come from such possible mismeasurement. In fact, our regression results indicate substantial differences in behavior for type C firms relative to type A and type B firms. Thus, we believe that few of the highest-margin firms avoid detection in our sample.

TABLE 4 Characteristics of Firms, by Surtax Margin

	Type A	Type B	Type C	All Firms
A. Ratio of dividends to after-tax profits:				
1935:*				
Mean	1.796	.516	.284	1.061
Median	.705	.512	.051	.530
SD	9.932	.461	.404	6.809
N	124	78	64	266
1936:†				
Mean	.950	.696	.463	.759
Median	.888	.689	.478	.731
SD	.629	.303	.374	.532
N	127	80	65	272
1937:‡				
Mean	1.449	.999	.547	1.102
Median	.855	.747	.516	.762
SD	4.852	1.165	.448	3.392
N	124	79	63	266
B. Total assets:				
1936:				
Mean	119,584	43,344	32,664	76,229
Median	22,622	13,833	6,426	15,393
SD	277,456	115,040	72,687	205,969
N	127	80	66	273
C. Pretax profit divided by book value of net worth:				
1936:				
Mean	.126	.161	.130	.137
Median	.099	.124	.100	.108
SD	.095	.106	.094	.099
N	127	80	66	273

* Seven firms with zero or negative profits are omitted from these tabulations. Of these, three are of type A, two are of type B, and two are of type C.

† Two firms with zero or negative profits are omitted from these tabulations. Both are of type C.

‡ Seven firms with zero or negative profits are omitted from these tabulations. Of these, three are of type A, one is of type B, and three are of type C.

here. Our smallest cell contains the 66 firms in the highest-surtax-margin group (type C firms), which are roughly evenly divided between those with maximum margins of 22% and 27%. The distribution of firms in different types closely parallels that of table 2 for firms of comparable size, except that type B firms are somewhat overrepresented, and type A firms somewhat underrepresented in comparison to the cells in table 2. In our sample, type A firms account for 47%, type B firms for 29%, and type C firms for 24%.

In tables 4–6, we report means, medians, standard deviations, and numbers of firms in each category for various firm characteristics including firm size (total assets in 1936), profit rates (operating profits less interest payments divided by book-value net worth), the change

TABLE 5 Characteristics of Firms, by Surtax Margin

	Type A	Type B	Type C	All Firms
A. Ratio of market-to-book value of assets:				
December 1935:				
Mean	1.472	1.545	1.306	1.453
Median	1.216	1.260	.980	1.247
SD	.977	.913	.897	.944
N	127	80	66	273
B. Percentage change, ratio of market-to-book value of assets:				
1935–36:				
Mean	.341	.274	.388	.333
Median	.228	.151	.365	.268
SD	.605	.406	.334	.496
N	127	80	66	273
C. Ratio of debt to market value of equity:				
1935:				
Mean	.226	.213	.359	.255
Median	.068	.075	.177	.088
SD	.434	.353	.428	.413
N	127	80	66	273
1936:				
Mean	.178	.188	.255	.199
Median	.077	.089	.149	.097
SD	.272	.287	.267	.276
N	127	80	66	273
D. Ratio of debt to book value of equity:				
1935:				
Mean	.193	.237	.283	.228
Median	.109	.112	.209	.138
SD	.278	.353	.236	.294
N	127	80	66	273
1936:				
Mean	.220	.260	.334	.259
Median	.146	.164	.242	.168
SD	.252	.316	.274	.280
N	127	80	66	273

in operating profits divided by assets, net operating profits relative to sales, the ratio of market-to-book value and its percentage change, and dividend payout for each type. These data highlight salient characteristics of high-finance-cost firms. Table 6 provides supplementary data on median standard errors and the statistical significance of differences in medians between type A and type C firms. Tests of differences across medians are not as sensitive to outliers as comparable comparisons of differences in means.

Panel A of table 4 reports data on dividends as a percentage of after-tax profits in 1935 and 1936 for firms with positive profits. For 1936, type differences in dividend payout are present by construction, since low dividend payout determines firm type. For 1935, however,

TABLE 6 Tests of Differences in Medians across Firm Types

	Median		t-Statistic for Difference in Medians of Types A and C
	Type A	Type C	
Dividends/aftertax profits, 1935	.705 (.074)	.051 (.012)	8.7
Total assets, 1936	22,622 (3,962)	6,426 (581)	4.0
Net operating profits/sales, 1935	.097 (.005)	.063 (.008)	3.6
Net operating profits/sales, 1936	.119 (.006)	.090 (.005)	3.7
Change in net operating profits, 1935–36/total assets 1935	.029 (.0002)	.046 (.058)	0.3
Change in ratio of market-to-book value, 1935–36	.228 (.050)	.365 (.050)	2.0
Debt/market value of equity, 1935	.068 (.009)	.177 (.041)	2.6
Debt/book value of equity, 1935	.109 (.019)	.209 (.034)	2.5

NOTE.—Standard errors are in parentheses.

dividend payout was not affected by the SUP. Table 4 shows that dividend payout in 1935 is much lower for firms in higher SUP margins in 1936; that is, ex ante low-payout firms tended to pay the highest marginal tax rates in 1936. The median payout ratio for type C firms is 4%, compared to 51% for type B firms and 70% for type A firms. Dividend payout ratios in 1937 are slightly higher than in 1936 for each category of firm, reflecting the rapid deterioration of earnings that occurred during the recession that began in October.

Panel B of table 4 reports data on firm asset size by type in 1936. Smaller firms tend to be the ones with the highest external finance costs (as measured by the surtax). These differences are statistically significant and economically meaningful (see table 6). The median firm size for type C firms ($6.4 million in assets) is less than one-half that of type B and less than one-third that of type A. The large standard deviations of firm size in each category, however, indicate that there is substantial overlap in the size distributions of the different types.[12] Thus, firm size, per se, may be an imprecise proxy for finance costs.

Finally, panel C of table 4 provides data on operating profits less interest divided by net worth for 1936. Profit rates are similar across types, with type B firms showing higher means and medians than types

12. The large standard deviation for type C asset size is attributable to seven large firms at the 22% margin whose mean asset size in 1936 was $211 million.

A and C, which are roughly identical. One possibility is that as firms progress in the "life cycle" from C to B to A their average profitability rises and then falls. An additional fact that is consistent with this interpretation is that the procyclical change in profits increases in "type." Though not shown in table 4, type B and type C firms typically exhibit larger profit growth during the boom year of 1936, and smaller profit growth in 1937, which saw a cyclical peak in October. Similarly, net operating profits relative to sales in 1936 are lowest for type C firms, and these firms show the greatest change in this ratio from 1935 to 1936.[13] The median profit-to-sales ratios are significantly different (see table 6).

Information on firms' financial valuation and financial structure is summarized in table 5. Panel A examines the level and growth of the ratio of market-to-book value.[14] While mean and median ratios of market-to-book value are lower in 1936 for type C firms, the change in the median market-to-book-value ratio during 1936 for type C firms is 37%, compared to 15% and 23%, respectively, for type B and type A firms. These differences in medians are statistically significant, as shown in table 6. As Brock and LeBaron (1990) argue, the greater procyclicality of firm valuation for type C firms is consistent with some models of financing constraints under asymmetric information. Business cycle upswings increase available cash flow (or "financial slack" in the language of Myers and Majluf 1984), which relaxes financing constraints and increases the value of constrained firms. While all firms will experience a rise in value during an expansion, constrained firms' stock prices will be more responsive to the cycle. Jog and Schaller (1992) find evidence in support of such a difference in a panel study of Canadian firms.

In panels C and D of table 5, we report tabulations of the ratio of debt to the market and book value of equity, respectively. We report these figures for both 1935 and 1936 to see whether the surtax affected firms' financing decisions. That is, by reducing taxable corporate income, debt finance would have reduced a firm's surtax liability. Using

13. The measured increases for all types in the ratio of net operating profits to sales is possibly surprising given the incentives for firms to increase expenses to avoid the surtax (i.e., move forward plans for advertising, and substitute executive compensation for owner-managers' capital gains). We take this as an encouraging sign that errors in measurement of surtax margins as a consequence of "expense padding" are likely to be small for most of our sample.

14. The values in the top panel of table 5 likely understate values for Tobin's Q in the economy. In particular, the average and median values reported in table 5 are likely to be less than the true average and median values of Tobin's Q because of the difference between replacement cost and book value for firms in 1936. As Kuznets (1961, p. 480) shows, the price index for producer durables was 15% lower in 1936 than in 1929, owing to the great deflation of 1929–33. Since most capital was purchased prior to the deflation, book value was far in excess of replacement cost.

the market value of equity, mean debt ratios are higher in 1935 than in 1936 for each type, and median debt ratios are higher in 1935 than in 1936 for type C firms, and differences in medians across types are statistically significant (see table 6). The lower mean debt ratios in 1936 likely reflect, in part, the growth in stock prices in 1936, along with transactions costs of converting existing equity into debt. Using the debt-to-equity ratios measured in book value (in panel D of table 5), all types show an increase from 1935 to 1936 in mean and median ratios, indicating an increased role for debt on the margin.

An interesting feature of the tabulations reported in panel C of table 5 is the relatively high ratio of debt to the market value of equity in the capital structure of high-surtax-margin firms in 1935 and 1936. One interpretation of the high debt ratios of high-surtax-margin firms is a greater reliance on financial intermediaries, who finance through debt. Financial intermediaries specialize in screening and monitoring borrowers and therefore have a greater role in financing firms whose prospects are not common knowledge.[15] More generally, many authors have argued that direct or intermediated debt contracts are likely to arise in environments where asymmetric information about project opportunities or outcomes is important.[16]

To summarize, we have argued that firm-level evidence on size, profitability, leverage, and stock price changes for firms at different surtax margins in 1936, as well as aggregate data on the high flotation costs of publicly traded securities, supports our focus on capital market frictions arising from asymmetric information as an important source of high costs of external finance for business fixed investment.

15. Mean ratios of bond debt to assets are essentially the same across types (0.03 for type A and type B firms, and 0.04 for type C firms). Thus, differences in debt-equity ratios are mainly attributable to short-term debt.

16. Townsend (1979), Diamond (1984), Gale and Hellwig (1985), and Williamson (1986) have argued for the importance of ex post asymmetric information. Townsend and Gale and Hellwig show that when lenders find it costly to verify firm profits, debt contracts will be useful as a means of limiting the states in which verification is required. Diamond and Williamson show that intermediated debt further can reduce costs associated with ex post bankruptcy penalties and state verification. These arguments predict that firms for which ex post information asymmetry is relevant should rely more on debt. Moreover, in some models of ex ante asymmetric information (e.g., for some cases of the adverse selection model of De Meza and Webb 1987), debt can be beneficial when firms differ unobservably in mean returns to firm investments. Firms with higher expected project returns prefer debt because it offers them higher expected profits, and low-returns firms are obliged to mimic the preferences of high-returns firms. Some combination of ex ante and ex post asymmetric information that motivate higher debt ratios (along with bankruptcy costs that limit optimal debt ratios) may help to explain the cross-sectional differences in the reliance on debt. It is interesting to note, from the perspective of the entrenched management motivation behind the undistributed profit tax, that theoretical and empirical studies of managerial entrenchment have argued that high debt tends to align managerial interests with those of stockholders (e.g., see Harris and Raviv 1990; Hanka 1992).

To the extent that advocates of managerial control costs have been correct in associating those costs with large size, low profits, and low debt ratios, our results do not indicate a connection between high surtax margins and managerial entrenchment.

One potential explanation for the absence of "entrenched management" firms from those in the high surtax margin category is that the surtax achieved its desired effect, namely, forcing the managers of unproductive firms to pay out greater dividends. That is, entrenched managers might have feared greater stockholder discipline if they had imposed the high costs of the surtax on their stockholders. To investigate that possibility, we examined the dividend payout choices in 1936 of firms that were paying very low dividends in 1935 (defined as dividend payout rates of less than 20%). Table 7 reports data on these firms according to their choice of surtax margin in 1936. Interestingly, low-dividend-payout firms in 1935 that became high-payout firms (type A firms) in 1936 were different from firms that paid low dividends in both years. The group that increased its dividend payout the most were large firms with lower pretax profit rates, lower Q values in 1935 and 1936, and lower debt ratios than the firms with low dividend payout in both 1935 and 1936. These findings are consistent with the view that the surtax was somewhat successful in encouraging low-profit firms to pay dividends, and they confirm our previous evidence that firms that chose to pay higher surtax rates in 1936 are best described as small, profitable firms with high debt ratios that faced high costs of external finance, rather than unprofitable firms with entrenched managers.

V. Investment Behavior and Costs of External Finance

Following the intuition of Fazzari, Hubbard, and Petersen (1988), we begin our empirical tests for the effects of differentially high costs of external finance on firm investment within the Q-theory approach.[17] It is well known (see, e.g., Hayashi 1982) that under assumptions of a constant-returns-to-scale technology and quadratic adjustment costs, the Euler equation for the firm's choice of its capital stock can be solved forward to obtain a linear relationship between the investment rate (investment I divided by the beginning-of-period capital stock K) and marginal Q (using average Q as a proxy):

$$(I/K)_{it} = a_i + bQ_{it} + e_{it}, \tag{1}$$

17. An alternative approach to such tests is to estimate directly the Euler equation for capital accumulation, as in Gilchrist (1991), Himmelberg (1991), Hubbard and Kashyap (1992), and Whited (1992). We did not pursue this strategy, owing to difficulties in constructing a balanced panel with data on firm financial and real variables for several consecutive years.

TABLE 7 **Subsample of Firms with Low Dividend Payout in 1935, Sorted by 1936 Surtax Margin**

	Type A	Type B	Type C	All Firms
Total assets:				
1936:				
Mean	88,024	22,303	24,291	44,055
Median	24,660	16,718	6,149	12,493
SD	134,015	21,965	59,940	89,824
N	29	25	37	91
Pretax profit divided by book value of net worth:				
1935:				
Mean	.035	.065	.070	.057
Median	.017	.047	.033	.032
SD	.053	.076	.128	.096
N	29	25	37	91
1936:				
Mean	.076	.134	.120	.110
Median	.063	.119	.087	.086
SD	.054	.094	.094	.086
N	29	25	37	91
Ratio of market-to-book value of assets:				
December 1935:				
Mean	1.214	1.128	1.329	1.237
Median	.864	.925	.947	.902
SD	1.068	.702	.924	.914
N	29	25	37	91
December 1936:				
Mean	1.654	1.570	1.733	1.633
Median	1.330	1.107	1.602	1.330
SD	1.559	1.082	.978	1.206
N	29	25	37	91
Ratio of debt to book value of equity:				
1935:				
Mean	.304	.423	.324	.345
Median	.160	.262	.291	.237
SD	.487	.560	.221	.424
N	29	25	37	91

NOTE.—Low dividend payout is defined as the ratio of dividends to aftertax profits of less than 20%.

where i and t denote the firm and time, respectively, a represents the normal or average level of the investment rate, b is the inverse of the coefficient on the quadratic adjustment cost term, and e is an estimation error. Under the efficient markets hypothesis, Q summarizes market expectations about the profitability of the firm's investment opportunities; e is an expectational error term. In particular, adding extra terms as proxies for internal funds (e.g., anticipated "cash flow") known to the stock market should add no marginal predictive content for investment. That is, denoting anticipated "cash flow" (net profit from operations less interest expense and taxes) by CF, one would expect, under the null hypothesis of efficient capital markets and no cost differential between internal and external funds, that the coefficient c in the augmented regression,

$$(I/K)_{it} = a_i + bQ_{it} + c(CF/K)_{it} + e_{it}, \quad (2)$$

should be zero. The Fazzari-Hubbard-Petersen approach grouped firms into a priori "constrained" and "unconstrained" sets based on long-run dividend payout patterns and tested for intergroup differences in the coefficients.

The surtax experiment gives a clear suggestion for identifying the source of cross-sectional heterogeneity: firms with low surtax margins are a priori less likely to face differentially costly external finance. Indeed, in many cases these firms turned to external markets to raise funds in order to increase dividend payments, thereby reducing surtax payments. As we show in the appendix, the maximum SUP margin can provide a measure of the shadow cost of external finance.

In this reduced-form approach, firms in higher maximum SUP margins (those with higher costs of external finance) will have greater sensitivity of investment to shifts in internal funds, holding constant differences in cash flow and investment opportunities. We investigate this proposition in table 8, which reports results for regressions with investment relative to fixed capital as the dependent variable (i.e., the percentage change in fixed capital from 1935 to 1936).[18] In these regressions the market-to-book value ratio (Q) in 1935 is included as a proxy for investment opportunities;[19] the (CF/K) term is defined as cash flow during 1935 and 1936, divided by fixed capital in 1935. The first regression constrains the intercept, the coefficient on Q, and the cash flow responsiveness of investment to be identical across different types of firms, while the second regression allows them to vary across firm types. Regressions are adjusted for heteroscedasticity using White's (1980) procedure.

Our results provide broad support for the simple approach discussed above. In the aggregated regression, both Q and cash flow enter positively, but the cash flow effect is small and statistically insignificant. The coefficient on Q is large relative to previous estimates, indicating lower and more plausible adjustment costs than those implied in the estimates by Summers (1981), Salinger and Summers (1983), Fazzari,

18. One can also argue that the intercept terms should be lower for high-surtax-margin firms—i.e., that higher financing costs not captured by cash flow and Q should reduce investment for any given levels of cash flow and Q. Indeed, we find that the intercept for net investment is zero for type A and type B firms but substantially negative for type C firms.

19. We collected market-value data for firms in 1935 and 1936 only. Data for earlier years often were not available.

TABLE 8 Fixed Capital Investment Regressions, 1936

	Regressions	
	(1)	(2)
A. Summary statistics:		
Dependent variable	I_{1936}/K_{1935}	I_{1936}/K_{1935}
Number of observations	244	244
Adjusted R^2	.063	.217
B. Coefficients:		
Constant	−.019	.015
	(.022)	(.021)
Type B	. . .	−.037
		(.036)
Type C	. . .	−.112
		(.051)
Q_{1935}	.044	.024
	(.016)	(.011)
Q_{1935} × type B	. . .	.024
		(.019)
Q_{1935} × type C	. . .	.039
		(.051)
$[(CF_{1935} + CF_{1936})/K_{1935}$	.018	−.004
	(.016)	(.014)
$[(CF_{1935} + CF_{1936})/K_{1935}]$ × type B	. . .	.003
		(.018)
$[(CF_{1935} + CF_{1936})/K_{1935}]$ × type C	. . .	.248
		(.100)

NOTE.—Heteroscedasticity-consistent standard errors are presented in parentheses.

Hubbard, and Petersen (1988), and others. The results allowing for surtax-margin heterogeneity reveal that the sensitivity of investment to internal funds is concentrated in the type C firms. In all the regressions, type A and type B firms exhibit *no* responsiveness of investment to changes in cash flow after taking account of investment opportunities measured by Q. For type C firms the coefficient is large and statistically significant.[20] Allowing for heterogeneity in effects of internal funds on investment raises the adjusted R^2 of the regression from 0.06 to 0.22.

These results are not likely attributable to greater measurement error in Q for type C firms (and hence greater marginal information contributed by cash flow). If measurement error in Q were relatively large for type C firms, then one would expect the coefficients on Q for type C firms to be relatively small. However, the opposite is the case. In the regressions that allow the coefficient on Q to vary by type, type B and type C firms have larger estimated Q coefficients than type A firms.

There are potential problems with this simple reduced-form ap-

20. As we noted before, the only intercept term that is significantly difficult from zero is that for type C firms.

TABLE 9 **Fixed Capital Investment Regressions, 1936**

	Regressions (3)	Regressions (4)
A. Summary statistics:		
Dependent variable	I_{1936}/K_{1935}	I_{1936}/K_{1935}
Number of observations	244	244
Adjusted R^2	.075	.197
B. Coefficients:		
Constant	−.014	.014
	(.021)	(.021)
Type B	...	−.034
		(.035)
Type C	...	−.080
		(.057)
Q_{1935}	.038	.026
	(.014)	(.011)
Q_{1935} × type B	...	.019
		(.019)
Q_{1935} × type C	...	.061
		(.047)
CF_{1935}/K_{1935}	.059	−.019
	(.043)	(.028)
CF_{1935}/K_{1935} × type B	...	.023
		(.036)
CF_{1935}/K_{1935} × type C	...	.295
		(.129)

NOTE.—Heteroscedasticity-consistent standard errors are presented in parentheses.

proach, of course, stemming from difficulties in measuring marginal Q and identifying Q as a reasonable proxy for "fundamentals" owing to possible lapses of stock market efficiency (see, e.g., Gilchrist and Himmelberg 1994). Furthermore, alternative structural models may explain why internal net worth variables appear in the investment equation (Hubbard and Kashyap 1992). Nevertheless, we believe that significant intuition is gained from the reduced-form approach, given our identification of external finance cost differentials through firm-level responses to the surtax. In light of the potential problems with the reduced-form approach, we perform four additional tests to strengthen our conclusion.

First, we investigate whether the cash flow effect in the investment equation is attributable to contemporaneous cash flow. Contemporaneous cash flow may be related to investment through reverse causation or because it contains new information about firms' long-run earnings prospects. We confront this potential problem by estimating reduced-form equations excluding 1936 cash flow from our cash flow measure. Results from these regressions are reported in table 9. The results are similar to the regressions reported in table 8. As before, only type C firms show significant responsiveness to internal finance.

Second, to provide an additional examination of the possibility that the effect of cash flow on investment may be simply a proxy for effects of other variables, we incorporated a set of other right-hand-side variables in the reduced-form Q model, including sales growth, firm size (total assets), lagged I/K, and the change in Q from 1935 to 1936; results are reported in table 10. The inclusion of these additional variables reduced the sample size from 244 to 232 firms. The estimated sales growth coefficients in 1935 and 1936 do prove significant in these regressions, but the estimated coefficients on cash flow variables are essentially the same. While the standard errors are higher (owing to the smaller sample and the increased number of regressors), the cash flow effect remains large and statistically significant for type C firms.

Third, we tested for additional effects of cash flow on changes in working capital. Firms with high costs of external finance and excess sensitivity of investment to changes in cash flow will have an incentive to "self-insure" against variation in internal funds by accumulating working capital during periods when cash flow is high and decumulating working capital during periods when cash flow is low.[21] If working capital serves as a buffer to reduce the variation in fixed investment caused by variation in cash flow, then for type C firms, working capital investment will respond even more to changes in cash flow than fixed capital investment.

To test this, in tables 11 and 12 we estimate equations similar to those reported in tables 8–10, but with the change in working capital as the dependent variable (normalized, as throughout, by fixed capital). In these regressions there is no clear null hypothesis for the coefficient on cash flow (as there is in the Q-theory model for fixed investment), but we find the heterogeneity of our reduced-form coefficients on cash flow across the various types to be suggestive, particularly after controlling for sales growth and other variables. The coefficients on cash flow are much larger for type C firms than for others, and much larger than the comparable type C cash flow coefficients in tables 8–10. Interestingly, type B firms also show significant cash flow sensitivity of working capital accumulation, although the magnitude of the effect is much smaller than for type C firms. These results are consistent with the view that firms with high external finance costs rely on working capital as a buffer to reduce the effects of cash flow variation on fixed investment.[22]

21. Fazzari and Petersen (1993) and Calomiris, Himmelberg, and Wachtel (in press) argue that working capital plays an important role in allowing firms to avoid costs of adjustment in fixed capital investment.

22. Similarly, Calomiris, Himmelberg, and Wachtel (in press) find that firms with the lowest costs of external finance (commercial paper issuers) display no cash flow sensitivity of either fixed investment or working capital, while other firms which display no cash flow sensitivity of fixed investment often display significant sensitivity of working capital to cash flow.

TABLE 10 Fixed Capital Investment Regressions, 1936

	Regressions (5)	(6)
A. Summary statistics:		
Dependent variable	I_{1936}/K_{1935}	I_{1936}/K_{1935}
Number of observations	232	232
Adjusted R^2	.268	.253
B. Coefficients:		
Constant	−.015	−.013
	(.021)	(.020)
Type B	−.060	−.061
	(.063)	(.063)
Type C	−.133	−.127
	(.093)	(.088)
Q_{1935}	.005	.008
	(.013)	(.013)
Q_{1935} × type B	.032	.024
	(.025)	(.025)
Q_{1935} × type C	.032	.055
	(.063)	(.057)
$(CF_{1935} + CF_{1936})/K_{1935}$	.005	. . .
	(.013)	
$[(CF_{1935} + CF_{1936})/K_{1935}]$ × type B	−3.43E−04	. . .
	(.020)	
$[(CF_{1935} + CF_{1936})/K_{1935}]$ × type C	.229	. . .
	(.122)	
CF_{1935}/K_{1935}	. . .	−.005
		(.024)
CF_{1935}/K_{1935} × type B	. . .	.027
		(.038)
CF_{1935}/K_{1935} × type C	. . .	.266
		(.172)
I_{1935}/K_{1934}	.284	.286
	(.158)	(.159)
I_{1935}/K_{1934} × type B	−.290	−.290
	(.166)	(.167)
I_{1935}/K_{1934} × type C	−.030	−.073
	(.299)	(.300)
$\%\Delta sales_{1935}$	.073	.072
	(.058)	(.059)
$\%\Delta sales_{1935}$ × type B	−.233	−.228
	(.174)	(.172)
$\%\Delta sales_{1935}$ × type C	.022	.053
	(.178)	(.178)
$\%\Delta sales_{1936}$	.192	.185
	(.091)	(.090)
$\%\Delta sales_{1936}$ × type B	.202	.214
	(.278)	(.279)
$\%\Delta sales_{1936}$ × type C	.001	.017
	(.290)	(.328)
$Q_{1936} - Q_{1935}$	−.007	−.008
	(.020)	(.020)
$(Q_{1936} - Q_{1935})$ × type B	.026	.029
	(.036)	(.037)
$(Q_{1936} - Q_{1935})$ × type C	.045	.072
	(.133)	(.144)
Total $assets_{1936}$	−3.34E−09	−4.48E−09
	(2.47E−08)	(2.48E−08)
Total $assets_{1936}$ × type B	6.24E−08	7.07E−08
	(9.45E−08)	(9.54E−08)
Total $assets_{1936}$ × type C	−7.96E−08	−1.97E−07
	(1.44E−07)	(1.88E−07)

NOTE.—Heteroscedasticity-consistent standard errors are presented in parentheses.

TABLE 11 Change in Working Capital Regressions, 1936

	Regressions	
	(1)	(2)
A. Summary statistics:		
Dependent variable	$\Delta WK_{1936}/K_{1935}$	$\Delta WK_{1936}/K_{1935}$
Number of observations	244	244
Adjusted R^2	.276	.209
B. Coefficients:		
Constant	−.016	−.017
	(.047)	(.048)
Type B	−.025	−.031
	(.076)	(.079)
Type C	−2.11	−.149
	(.385)	(.300)
Q_{1935}	.054	.046
	(.040)	(.037)
Q_{1935} × type B	−.026	.002
	(.067)	(.068)
Q_{1935} × type C	.171	.354
	(.257)	(.355)
$(CF_{1935} + CF_{1936})/K_{1935}$	−.028	. . .
	(.056)	
$[(CF_{1935} + CF_{1936})/K_{1935}]$ × type B	.214	. . .
	(.061)	
$[(CF_{1935} + CF_{1936})/K_{1935}]$ × type C	1.005	. . .
	(.737)	
CF_{1935}/K_{1935}	. . .	−.023
		(.093)
CF_{1935}/K_{1935} × type B	. . .	.390
		(.100)
CF_{1935}/K_{1935} × type C	. . .	.841
		(1.447)

NOTE.—Heteroscedasticity-consistent standard errors are presented in parentheses.

Finally, we also investigate whether the cash flow sensitivity of fixed capital and working capital can be explained by managerial-control costs, following a similar approach to Lang, Ofek, and Stulz (1994). They suggest that Q may be a useful conditioning variable for this purpose because managerial entrenchment should be more clearly identifiable in the behavior of low-Q firms. In contrast, according to the asymmetric information view of high external finance costs, cash flow sensitivity should be *higher* for high-Q firms because the shadow cost of external finance is an increasing function of the firm's true Q value (as shown in the appendix). We divide our type C firms into two groups of equal size—high-Q and low-Q—and test to see whether the cash flow sensitivity of investment in fixed capital and working capital is different for these two groups. The results for fixed investment are reported in table 13. Our results are striking. Only high-Q type C firms exhibit any cash flow sensitivity of investment, and these effects are larger and more statistically significant than for the class of type C

TABLE 12 Change in Working Capital Regressions, 1936

	Regressions	
	(3)	(4)
A. Summary statistics:		
Dependent variable	$\Delta WK_{1936}/K_{1935}$	$\Delta WK_{1936}/K_{1935}$
Number of observations	232	232
Adjusted R^2	.455	.421
B. Coefficients:		
Constant	−.130	−.136
	(.056)	(.062)
Type B	−.010	−.014
	(.089)	(.093)
Type C	.070	.190
	(.319)	(.359)
Q_{1935}	.032	.021
	(.037)	(.035)
Q_{1935} × type B	−.010	.009
	(.068)	(.065)
Q_{1935} × type C	.152	.180
	(.246)	(.259)
$(CF_{1935} + CF_{1936})/K_{1935}$	−.002	...
	(.055)	
$[(CF_{1935} + CF_{1936})/K_{1935}]$ × type B	.180	...
	(.058)	
$[(CF_{1935} + CF_{1936})/K_{1935}]$ × type C	1.313	...
	(.525)	
CF_{1935}/K_{1935}	...	.048
		(.081)
CF_{1935}/K_{1935} × type B	...	.312
		(.087)
CF_{1935}/K_{1935} × type C	...	2.636
		(1.038)
I_{1935}/K_{1934}	.007	−.006
	(.086)	(.082)
I_{1935}/K_{1934} × type B	−.047	.014
	(.209)	(.200)
I_{1935}/K_{1934} × type C	−.608	−1.309
	(.505)	(.783)
$\%\Delta sales_{1935}$	.182	.185
	(.139)	(.145)
$\%\Delta sales_{1935}$ × type B	.169	.186
	(.247)	(.250)
$\%\Delta sales_{1935}$ × type C	.991	1.095
	(.666)	(.716)
$\%\Delta sales_{1936}$	.609	.642
	(.281)	(.284)
$\%\Delta sales_{1936}$ × type B	−.210	−.209
	(.336)	(.334)
$\%\Delta sales_{1936}$ × type C	−.956	−1.271
	(.896)	(1.070)
$Q_{1936} - Q_{1935}$	−.062	−.061
	(.052)	(.052)
$(Q_{1936} - Q_{1935})$ × type B	−.106	−.103
	(.105)	(.105)
$(Q_{1936} - Q_{1935})$ × type C	−.706	−.353
	(.512)	(.517)
Total $assets_{1936}$	−5.23E−08	−4.99E−08
	(6.13E−08)	(6.38E−08)
Total $assets_{1936}$ × type B	2.30E−08	1.02E−08
	(1.36E−07)	(1.42E−07)
Total $assets_{1936}$ × type C	−9.86E−07	−1.29E−06
	(7.05E−07)	(8.32E−07)

NOTE.—Heteroscedasticity-consistent standard errors are presented in parentheses.

TABLE 13 Fixed Capital Investment Regressions, 1936

	Regression (1)	Regression (2)
A. Summary statistics:		
Dependent variable	I_{1936}/K_{1935}	I_{1936}/K_{1935}
Number of observations	244	232
Adjusted R^2	.240	.325
B. Coefficients:		
Constant	.014	.004
	(.021)	(.023)
Type B	−.034	−.070
	(.035)	(.064)
Type C	−.066	−.203
	(.056)	(.071)
Q_{1935}	.026	.001
	(.011)	(.013)
Q_{1935} × type B	.019	.039
	(.019)	(.021)
Q_{1935} × type C	.023	.039
	(.050)	(.043)
CF_{1935}/K_{1935}	−.019	−1.10E−04
	(.028)	(.023)
CF_{1935}/K_{1935} × type B	.023	.014
	(.036)	(.035)
CF_{1935}/K_{1935} × type CLQ*	.079	4.13E−04
	(.031)	(.035)
CF_{1935}/K_{1935} × type CHQ*	.471	.504
	(.132)	(.187)
I_{1935}/K_{1934}	. . .	.294
		(.151)
I_{1935}/K_{1934} × type B	. . .	−.306
		(.159)
I_{1935}/K_{1934} × type C	. . .	−.028
		(.211)
%Δsales$_{1935}$	. . .	.023
		(.041)
%Δsales$_{1935}$ × type B	. . .	−.121
		(.127)
%Δsales$_{1935}$ × type C	. . .	−.040
		(.127)
%Δsales$_{1936}$	. . .	.205
		(.095)
%Δsales$_{1936}$ × type B	. . .	.059
		(.182)
%Δsales$_{1936}$ × type C	. . .	.012
		(.150)
$Q_{1936} - Q_{1935}$	. . .	−.043
		(.025)
$(Q_{1936} - Q_{1935})$ × type B	. . .	.049
		(.054)
$(Q_{1936} - Q_{1935})$ × type C	. . .	.210
		(.184)
Total assets$_{1936}$	. . .	−5.07E−09
		(2.55E−08)
Total assets$_{1936}$ × type B	. . .	6.36E−08
		(9.68E−08)
Total assets$_{1936}$ × type C	. . .	9.57E−08
		(1.23E−07)

NOTE.—Heteroscedasticity-consistent standard errors are presented in parentheses.

* Type CHQ firms are type C firms with higher than median Q in December 1935. Type CLQ firms are those with lower than median Q in December 1935.

firms as a whole. We found similar differences in working capital regressions not reported here. These results provide strong evidence that the cash flow sensitivity of investment cannot be attributed to the waste of free cash flow by entrenched managers.

To summarize, we estimated versions of a neoclassical investment model controlling for firms' investment opportunities using Tobin's Q (and sales growth). The inclusion of proxies for internal funds could be rejected for firms that avoided high margins of the surtax on undistributed profits by increasing dividends. For profitable firms with low dividend payout and high surtax margins, we could not reject an effect on investment spending of internal funds, holding constant investment opportunities.[23] These results are robust to changes in the definition of internal funds—in particular the use of only lagged internal funds—in the regressions and are not easily explicable by appeal to measurement error in Tobin's Q. The results are much stronger for high-Q type C firms. Finally, high-surtax-margin firms show a much higher propensity to adjust working capital in response to changes in internal funds, in a manner consistent with a buffer-stock view of the function of working capital.

VI. Measured Capital Market Frictions and Growing Firms

Using firms' marginal surtax rates, we showed above that a simple formulation of the effects on investment of financing costs and investment opportunities (through the Q model) supports the economic and statistical significance of both. Consistent with models of capital market frictions, the investment of firms paying the highest rates of surtax was sensitive to shifts in both firms' opportunities and internal funds.

These results would have come as no surprise to critics of the surtax, who argued that young, growing firms with high costs of external finance bore the brunt of the tax. These critics (see, e.g., Merwyn 1942; and Butters and Lintner 1945), many of whom pushed for repeal of the surtax from its inception, were particularly concerned about the surtax's effect on growing industries. Table 14 reports the numbers of firms of types A, B, and C for each of the industries enumerated in the *Survey of Listed Corporations,* our data source. Also reported are (i) the fraction of firms in each industry that are in type C and (ii) the growth rate of the industry's fixed capital stock (measured in constant dollars) over the period from 1937 to 1948. We calculated the latter to examine whether the industries with significant representation of type C firms in fact were (ex post) the "growth industries" of the period.

23. It is not possible to offer a quantification of this effect without a structural model of the role of internal funds. Such models have been developed (see n. 17), but implementing this approach requires a panel data set of many years, which we lack.

TABLE 14 Industrial Composition of Sample Firms

Industry	Number of Firms				Fraction of Firms in C	Capital Growth, 1937–48 (%)
	Type A	Type B	Type C	Total		
Apparel	4	0	2	6	.33	63
Floor coverings	0	3	0	3	.00	36
Rayon yarn	2	1	0	3	.00	
Hosiery	2	1	3	6	.50	11
Textile fabrics	1	4	4	9	.44	
Paper and allied products	3	9	3	15	.20	20
Printing and publishing	2	2	3	7	.43	
Newspapers and periodicals	1	2	1	4	.25	3
Construction and mining machinery	5	2	1	8	.13	
Metalworking machinery	5	4	4	13	.31	71
General industrial machinery	10	6	7	23	.31	
Engines and turbines	1	0	2	3	.67	184
Iron and steel	6	8	8	22	.36	43
Agricultural machinery	1	2	3	6	.50	54
Automobiles	3	1	1	5	.20	44
Chemicals	10	5	0	15	.00	45

Cigarettes	4	0	0	4	.00	39
Containers	4	4	1	9	.11	N.A.
Meatpacking	1	0	0	1	.00	2
Office machinery	5	2	1	8	.13	30
Steel products	6	1	3	10	.30	N.A.
Tires	1	2	4	7	.57	82
Distilled beverages	2	1	0	3	.00	32
Paints and varnishes	0	4	2	6	.33	N.A.
Vegetable oils	2	2	0	4	.00	N.A.
Drugs and medicines	6	4	0	10	.00	69
Toilet preparations	3	2	2	7	.29	N.A.
Cement	1	2	1	4	.25	
Clay products	2	1	2	5	.40	8 (Cement, Clay products, Building materials combined)
Building materials	8	2	4	14	.29	
Building equipment	6	4	3	13	.23	N.A.
Aircraft	3	1	5	9	.56	270
Nonferrous metals	11	4	1	16	.06	−21
Oil refining	13	1	0	14	.00	72
Total	134	87	71	292	.24	41

SOURCE.—Fixed capital stock data used in the calculations in the last column are taken from U.S. Department of Commerce, Series P123-P176 (1975), 2:685.

It is not possible to make precise statements about the correlation of the importance of type C firms and industry growth because the industry classification reported in the data does not match exactly the U.S. census Standard Industrial Classification definition of industries. Nonetheless, some patterns are noteworthy. The fixed capital stocks of the four industries with at least 50% of sample firms in type C (agricultural machinery, aircraft, engines and turbines, and tires) grew significantly faster than the average for the manufacturing sector.[24] It is also possible that other type C firms were in relatively fast-growing segments of their respective industries. To summarize, the characterization of type C firms (the investment behavior of which is affected by financial constraints) as being disproportionately concentrated in growing industries appears to be accurate, providing support for concerns of contemporary chroniclers.[25]

VII. Conclusion

Recent theoretical models have linked firms' internal funds and investment spending in environments where external funds are more costly than internal funds. An important impediment to convincing tests of these models has been the identification of firm-level differences in the costs of external finance. The surtax on undistributed profits in the 1930s offers a rare opportunity to measure the shadow price differential between internal and external finance and thereby measure the importance of external finance constraints associated with a "financing hierarchy" in determining investment behavior. In addition, firm-level analysis of investment and financing costs for the 1930s provides complementary evidence to Bernanke's (1983) time-series analysis and can help to verify whether recovery from the Depression was likely to have been delayed by high costs of financing investment.

Our results make some progress on both fronts. Nearly one-fourth of publicly traded manufacturers in our sample had maximum SUP margins of 22% or 27%. The cash flow sensitivity of fixed investment

24. This does not imply that firms in types A or B were only in slow-growing industries. The capital stock of the petroleum industry grew rapidly over the period, and only relatively large, mature oil firms were in the sample.

25. Using the Euler equation approach to estimating impacts on financing constraints on capital spending, Hubbard, Kashyap, and Whited (in press) find effects of cash flow on investment, holding constant investment opportunities, only for firms with low presample dividend payouts. To test whether low payout was symptomatic of mature firms with high current profitability, they constructed a sample of mature, low-payout firms (large firms in the mature, concentrated industries, identified by Domowitz, Hubbard, and Petersen 1987); there was no effect of cash flow on investment for these firms. Of course, while the entrenched management problem does not appear to explain the effect of internal funds on new investment in plant and equipment, it may explain other types of non-value-maximizing behavior (for a detailed discussion, see Jensen 1986; and Blanchard, Lopez-de-Silanes, and Shleifer 1994).

by these firms alone accounts for the overall sensitivity of investment to cash flow in our data, after controlling for investment opportunities. Many firms with high surtax margins were concentrated in the growing industries of the day. The sensitivity of capital spending to internal funds for high-surtax-margin firms appears to reflect information-related capital market frictions as opposed to the waste of corporate cash flows by entrenched managers.

Our results also contain implications for fiscal and monetary policy. Our finding that internal finance can have an important allocative role in investment implies that the social costs of taxing firms' profits may include allocative distortions from reductions in internal finance for some firms. These costs are borne disproportionately by young, growing firms which suffer asymmetric information problems. The high costs of external finance and the existence of a financing cost hierarchy also lend credence to viewing changes in the credit supply of intermediaries specializing in monitoring firms as an important channel of monetary policy.[26]

Appendix

Approximating External Finance Cost Using the Surtax

It is possible to obtain an estimate of the cost differential between external and internal finance using estimates of the maximum surtax rate paid and other data. Consider the case of an all-equity-financed firm, in which dividend payments do not affect the required rate of return on the firm's equity (the ''tax capitalization'' model of dividends and investment formulated by King 1977; Auerbach 1979; and Bradford 1981). Define the following variables:

p = taxable profits,
D = dividends,
v = personal income tax rate,
c = accrual-equivalent capital gains tax rate,
t = corporate income tax rate,
y = dividend payout rate $(D/(1 - t)p)$,
u = average surtax rate on undistributed profits,
s = cost of raising a dollar in external funds,
q = shadow value of an additional dollar's investment, and
V = value of the firm.

Note that since after-tax profits are given by

$$(1 - t)p - u(y)\,[(1 - t)p - D],$$

26. We have argued that the SUP offers a way to identify the incidence of ''financing constraints'' across firms. Firm heterogeneity in investment, employment, or production responses to monetary policy would provide another example (see Gertler and Hubbard 1989; and Gertler and Gilchrist 1994).

an increase in dividends (dD) reduces the surtax liability of the firm by

$$[u(y) + (y - 1)u'(y)]dD.$$

Consider an experiment in which a firm increases dividend payments by one dollar, while raising an additional dollar of equity. The effect on firm value is given by

$$(1 - v) + q(1 - c)[u(y) + u'(y)(y - 1)] - (1 + s).$$

The first term reflects the value to shareholders of an additional dollar of dividends. The second term represents the value of reinvested savings from reduced surtax liability. The cost of an additional dollar of external finance is $(1 + s)$. Note that if $u = s = 0$, a firm would issue new shares only if q were greater than one.

For our purposes, an interesting benchmark is the responsiveness to the surtax on undistributed profits of firms initially paying zero dividends, for which $[u(y) + (y - 1)u'(y)]$ is at its maximum of 0.27. If the dividend payout ratio does not change ex post, it must be the case that

$$(0.27)q(1 - c) - v < s.$$

Poterba's (1987) estimates of c and v for 1935 (just prior to the imposition of the surtax) are 0.06 and 0.24, respectively. Assuming $q = 1.5$, the implied cost premium is roughly 15%. A value of 1.5 for q may be conservative for many zero-dividend firms. As we have argued, type C firms were often young, high-growth firms. Moreover, estimates of market-to-book value reported in table 5 show an average for type C firms of 1.3 in December 1935 and 1.7 in December 1936. Replacement cost for producer durables was much lower than book value for these firms, whose equipment would have been purchased prior to the great deflation of 1929–33. Kuznets (1961, p. 480) estimates that the cost of producer durables was 15% lower in 1936 than it was in 1929. Adjusting for this decline would raise the estimated market evaluation of q for type C firms in December 1935 to a median of 1.16 and a mean of 1.5, assuming all capital was purchased in 1929. Finally, in the presence of asymmetric information, as Myers and Majluf (1984) argue, the true q, as known to insiders, could be substantially greater than the market estimate. Thus, a q value of 1.5, and an implied value for s of 15% for zero-dividend firms, seems conservative.

Our approach to estimating s may be conservative for two additional reasons. First, we do not allow any direct effect from dividend policy to firm valuation (as models based on dividend valuation for purposes of signaling or managerial discipline would imply). Second, for firms paying zero dividends, our estimates are a lower bound because those firms are at a corner solution.

One potentially offsetting effect, which could lead us to overestimate s, is the possibility that stockholders of high-margin firms faced unusually high personal tax rates on dividends. As implied by our calculations above, the higher is the personal tax rate on dividends, the lower is the estimate of s. Some closely held, credit-constrained firms with low expected dividend payout may have been controlled by stockholders facing higher than average marginal dividend rates. However, data on stockholders' marginal tax rates are not available on a firm-specific basis.

The possibility that some high-surtax-margin firms may have not faced high shadow costs of finance may help to explain the results reported in table 13.

If high-surtax-margin firms controlled by high-personal-tax-margin stockholders had lower q values than the other high-surtax-margin firms (because their true s values were lower and therefore they were less constrained in their ability to invest), then that could contribute to the lower estimated cash flow sensitivity of investment for high-surtax-margin firms with lower than median q. Of course, even if all high-surtax-margin firms' stockholders faced the same marginal tax rates on dividends, we would still expect high-surtax-margin firms with higher q to display greater cash flow sensitivity of investment, as we found in table 13—our formula for estimating s predicts that high-margin firms with higher q have greater shadow costs of external finance.

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