

Do Dividend Taxes Affect Corporate Investment?*

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ABSTRACT

We test whether dividend taxes affect corporate investments. We exploit Sweden's 2006 dividend tax cut of 10 percentage points for closely held corporations and five percentage points for widely held corporations. Using rich administrative panel data and triple-difference estimators, we find that this dividend tax cut does not affect aggregate investment but that it affects the allocation of corporate investment. Cash-constrained firms increase investment after the dividend tax cut relative to cash-rich firms. Reallocation is stronger among closely held firms that experience a larger tax cut. This result is explained by higher external equity in cash-constrained firms and by higher dividends in cash-rich firms after the tax cut. The heterogeneous investment responses imply that the dividend tax cut raises efficiency by improving allocation of investment.

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1. Introduction

There are contrasting views on whether dividend taxes affect corporate investment. Traditional models of dividend taxation assume that the cost of capital of firms, and thus corporate investment, depends on the level of dividend taxation (Harberger 1962, 1966, Feldstein 1970, Poterba and Summers 1985). In contrast, the new view of dividend taxation assumes that investments are funded by retained earnings rather than new equity (King 1977, Auerbach 1979, Bradford 1981). Chetty and Saez (2010) argue that a dividend tax cut has heterogeneous effects on the allocation of investment: Firms with excess cash holdings invest less while cash-constrained firms invest more following a dividend tax cut. Empirical evidence is, however, mixed. Becker, Jacob, and Jacob (2013) show that dividend taxes affect the allocation of investment across firms using an international sample of listed firms. In contrast, Yagan (2013) shows that for unlisted U.S. firms, there is no change in corporate investment around the 2003 tax act.¹

This raises the question whether the theoretical predictions hold only for listed firms. Listed U.S. firms exhibit behavior consistent with either the new view or the traditional view (Auerbach and Hassett 2002). However, little is known empirically about dividend tax effects on the investments of unlisted corporations. We contribute to this discussion by showing empirically that dividend taxation can have heterogeneous effects on corporate investments by unlisted firms. Unlisted firms represent a very important part of the economy in many OECD countries (e.g., Michaely and Roberts 2012, Yagan 2013). In Sweden, over 99% of all firms (corporations and unincorporated businesses) are unlisted. Our data sample comprises all Swedish corporations. These firms employ over 85% of all private sector workers and account for about 90% of private sector investment.

We use a quasi-experimental setting to analyze the effect of a dividend tax cut on corporate investment by unlisted firms. In 2006, Sweden cut its dividend taxes for shareholders in unlisted

¹ For a sample of listed U.S. firms, Campbell et al. (2013) find evidence of investment responses to the 2003 tax act consistent with the old and the new view of dividend taxation.

corporations. The magnitude of the cut depends on the ownership structure of the firm: a 5-percentage-point cut for widely held corporations and a 10-percentage-point cut for closely held corporations. According to Chetty and Saez (2010, p. 27), such “*a dividend tax cut raises efficiency by improving the allocation of capital: firms with excess cash holdings invest less following a tax cut, while cash-constrained firms invest more.*” We utilize rich administrative panel data for all Swedish corporations over the period 2000–2011 to generate empirical evidence for the Chetty and Saez theoretical result. We expect investment responses for both closely held and widely held corporations, however, *ceteris paribus*, the response is expected to be greater for closely held corporations than for widely held corporations.

Our empirical identification strategy of testing the dividend tax effect on the allocation of investments across firms is threefold. First, we use a difference-in-difference (DD) approach to test whether the 2006 dividend tax cut increases investment by cash-constrained closely held corporations relative to closely held corporations with internal resources. We use the average cash-to-assets ratio over the pre-reform period 2002–2005 as the measure of cash constraints. This ensures that our measure for availability of internal funds is exogenous to the reform. Second, we run the same DD analysis for widely held corporations. Finally, we exploit the difference in the dividend tax cut across firms and compare the investment response between closely held corporations and widely held corporations using a difference-in-difference-in-difference (DDD) approach.

Our empirical results show that, relative to cash-rich firms, cash-constrained firms increase their investments after the dividend tax cut. For closely held corporations, for which dividend taxes decreased by 10 percentage points, or 33% of the pre-reform dividend tax rate of 30%, the relative investment effect is 32% of the average pre-reform investment in our sample. For widely held corporations, which experienced a tax rate decrease of five percentage points the relative investment

effect is 18% of the sample average. These estimates account for other observable firm characteristics, industry–year fixed effects, and firm fixed. Since the tax cut is larger for closely held corporations than the dividend tax cut for widely held corporations, the relative investment effects are expected to be greater for closely held corporations. We find exactly this result. The magnitude of the DDD estimate corresponds to the relative dividend tax cut: We obtain a DD coefficient of 0.1495 for closely held corporations (10-percentage-point tax cut) and a DD coefficient of 0.0833 for widely held corporations (5-percentage-point tax cut). The DDD estimate of 0.0602 reflects the relative dividend tax cut difference of 5 percentage points. The result indicates that a five percentage point tax cut—a relative decrease in the tax rate of 17%—decreases the investment difference by 13% of the average pre-reform investment. Investment is shifted from cash-rich to cash-poor firms after a dividend tax cut.

However, we also show empirically that aggregate investment of closely held versus widely held corporations does not change around the reform. This result is in line with prior evidence from the U.S. (Yagan 2013) and from Finland (Kari, Karikallio, and Pirttilä 2009). At the same time, we find evidence of a large effect on the allocation of investment. The significant DDD estimate and the insignificant aggregate investment effect imply that the investment decrease of cash-rich firms corresponds to the increase in investments of cash-poor firms. The DDD estimate translates to an elasticity of investments with respect to the cost of capital for cash-poor firms between -0.36 and -0.98, depending on the definition of cash-constraints. These estimates are within range of prior estimates that vary between 0 and -2.0 (e.g., Caballero et al. 1995, Barnett and Sakellaris 1998, Chirinko et al. 1999, Bloom et al. 2002, Hassett and Hubbard 2002).

There are two potential explanations for the observed investment reallocation effect. First, following a dividend tax cut, we would expect cash-constrained firms to raise more equity to finance investments. In a DD framework, we test whether the dividend tax cut is associated with

increased external equity among previously cash-constrained firms. Our results support this explanation: Relative to cash-rich firms, the ratio of paid-in capital to assets ratio increases in cash-constrained corporations after tax reform. The magnitude of the increase in external equity explains about half of the investment increase as implied by our DD estimates. We further show empirically that, relative to cash-rich firms, cash-poor firms decrease their debt-to-equity ratio around the tax reform. This implies that cash-constrained firms rely more on the external equity channel than on external debt to fund additional projects after the tax cut. A second explanation relates to the use of funds. Following a dividend tax cut, Chetty and Saez (2010) predict that cash-rich firms increase dividend distributions. We find exactly this result for the sample of closely held corporations for which we have data on dividend payouts. In sum, the decrease in the investment difference between cash-rich and cash-poor firms can be explained by higher equity issuance from cash-poor firms and by higher dividend payouts from cash-rich firms.

Our paper contributes to the literature in several ways. We provide direct empirical evidence that dividend tax reforms generate heterogeneous investment responses, as predicted by theory (see, e.g., Feldstein 1970, Auerbach 1979, Poterba and Summers 1985, Chetty and Saez 2010). Our results imply that dividend taxes not only affect dividend payout decisions (see, e.g., Poterba 2004, Chetty and Saez 2005, Jacob, Michaely, and Alstadsæter 2014) and equity prices (see, e.g., Auerbach and Hassett 2006, Chetty, Rosenberg, and Saez 2007), but also corporate investments. High dividend taxation appears to lock in funds in cash-rich firms, more so than in cash-constrained firms that need more costly external financing. Dividend taxation effectively creates a wedge between the cost of internal equity and the cost of external equity. When dividend taxes are decreased, allocation of investment is improved, and thus efficiency increases. Overall, our empirical results are consistent with the theoretical results of Chetty and Saez (2010) that dividend taxation creates a first-order deadweight cost.

The remainder of this paper proceeds as follows. Section 2 describes Sweden's 2006 tax reform. Section 3 discusses how the reform changed investment incentives, and we present three testable hypotheses. Section 4 presents the data, while the empirical strategy and results are presented in Section 5. Finally, Section 6 sets forth our conclusions.

2. Swedish Dividend Taxation and the 2006 Reform

Sweden has a dual income tax, with a proportional tax on capital income and progressive taxation of labor income. During the 2000–2005 period, the corporate income tax rate was 28% and dividends were taxed at 30% at the shareholder level. Dividends to active shareholders in closely held corporations² were taxed at a rate of 30% if they were within a dividend allowance. Dividends exceeding the dividend allowance were taxed as wage income with a combined tax burden (corporate tax plus wage tax) of up to 68.8%.

For many years, there was an ongoing discussion on how to change the calculation method for the dividend allowance to make it more beneficial for small business owners. However, policy makers could not agree on a compromise. In 2005, an expert committee presented a report that proposed changes in the calculation of the dividend allowance, which then were implemented by January 1, 2006.³ In late 2005, a last minute tax relief of SEK 1 billion was granted and the committee decided to spend these funds on dividend tax rate reductions.⁴ The tax relief was motivated to spur entrepreneurship and investment in general and not directly targeted at improving investment allocation across corporations. Since this dividend tax reduction was not included in the

² A corporation is considered closely held if four or fewer persons own more than half the votes and if at least one of the owners is active in the daily generation of the firm. A shareholder is considered active if the shareholder contributes to a considerable extent in the profit generation of the corporation. CHCs can have more than four active owners in case family members are active shareholders.

³ In 1999, an expert group was appointed to evaluate the calculation rules for the dividend allowance; it delivered a report in 2002. The report's suggestions were not implemented. A new expert group was appointed mid-2004, which reported in early 2005. Based on this report, the Government presented its proposal for changes in late 2005. These changes came into effect in January 2006. For more details and references on this process, see Alstadsæter and Jacob (2012).

⁴ Edin et al. (2005), Government Bills 2004/05:1, 2005/06:40, and 2006/07:1.

initial reform discussions, it was not anticipated by firms. The reform was implemented permanently and, due to Sweden's history of broad and long-lasting tax reforms, it is reasonable to assume that the reform was also perceived as permanent by corporations and owners.⁵ The 2006 reform implemented the following main changes that are relevant for our empirical analysis:

- 1) The dividend tax rate for shareholders in unlisted, widely held corporations was reduced by 5 percentage points to 25%.
- 2) The dividend tax rate for active shareholders in closely held corporations was reduced by 10 percentage points to 20% for dividends within the dividend allowance.⁶

In sum, the 2006 tax reform reduced dividend taxes by 10 percentage points for owners of closely held corporations and by five percentage points for owners of unlisted, widely held corporations.⁷ In our empirical analysis, we exploit both the tax rate changes over time and the difference in the tax rate change between closely held and widely held corporations. Table 1 summarizes tax rates and changes around the reform.

[Insert Table 1 about here]

3. Investment Incentives and the 2006 Reform

Theory predicts that dividend taxation has heterogeneous effects on investments across firms, depending on their marginal source of finance (Chetty and Saez 2010). The “old view” assumes that firms require external equity to fund investments (Harberger 1962, 1966, Feldstein 1970, Poterba and Summers 1985). Under this view, dividend taxation affects the cost of equity and consequently has an effect on corporate investment. The “new view” of dividend taxation assumes that firms have

⁵ The dual income tax was introduced in Sweden in 1991, followed by Norway in 1992 and Finland in 1993, and is still in place in Sweden and the other Scandinavian countries. Great emphasis is placed on the robustness and predictability of the tax system. In other words, there is a tradition that tax rules are sticky once they are introduced.

⁶ In addition, the imputed dividend allowance for closely held corporations was increased during the 2006 reform. However, very few owners of closely held corporations (3.6 percent) receive dividends that are taxed as wage income. Put differently, the vast majority of dividends are paid within the dividend allowance. One reason for this is that unused dividend allowances can be carried forward with interest.

⁷ See Alstadsæter and Jacob (2012) for a thorough description of the Swedish tax system and the 2006 tax reform.

internal funds to invest (King 1977, Auerbach 1979, Bradford 1981). In this case, dividend taxes have no effect on marginal investment.

However, firms are heterogeneous in their ability to internally fund investments. To illustrate intuitively how the 2006 dividend tax cut affects investment across different types of corporations, we use a highly simplified and stylized one-period model (e.g., Lewellen and Lewellen 2006, Becker, Jacob, and Jacob 2013).⁸ The firm has the opportunity to invest USD 1 in year t . If the firm invests in the project, it receives a rate of return, r , net of corporate taxes. We assume that the firm distributes all profits in year $t+1$ as dividends. Dividends are subject to dividend taxation at tax rate t^{Div} . Repaying paid-in capital to shareholders has no tax consequences.⁹ A firm chooses to undertake an investment if the after-tax return exceeds the net return of an alternative investment outside the firm. The required rate of return depends on which is the marginal source of funds for the corporation: new equity (Case 1) or retained earnings (Case 2).

3.1 Case 1: New Equity as the Marginal Source of Finance

If a cash-constrained firm is unable to finance new investments with internal capital, we assume that it relies on external equity to finance new investments. Investors decide between supplying the firm the required equity or pursuing an alternative investment. The firm needs to raise USD 1 of new equity in year t to make an investment that produces an after-corporate tax profit of $(1 + r)$ in year $t+1$. The equity component of this USD 1 is tax exempt and the investor pays dividend taxes on the return, r . In sum, the investor receives $1 + r \cdot (1 - t^{Div})$ after investing. Alternatively, the investor can directly invest in bonds instead of investing in the firm. In this case, the investor obtains $1 + i$, where i is the nominal after-tax interest rate. Therefore, the required rate of return for

⁸ We would obtain similar predictions in more complex models that include intertemporal aspects (Korinek and Stiglitz 2009).

⁹ We implicitly assume share repurchases are taxed at the same rate as is the case in Sweden. Hence, using share repurchases to distribute the final profit in $t=1$ would yield similar results. In practice, repurchases are very rare for the Swedish private firms in our sample.

investing new equity in the firm becomes $r_{req}^{NE} = i \cdot \frac{1}{1-t^{Div}}$. An increase in the dividend tax raises the required rate of return¹⁰: $\frac{\partial r_{req}^{NE}}{\partial t^{Div}} = i \cdot \frac{1}{(1-t^{Div})^2} > 0$.

For cash-constrained firms, a reduction in the dividend tax leads to increased investment as the marginal cost of external capital decreases. In a more comprehensive model that includes dividends, equity issuances, and agency issues, Chetty and Saez (2010) show that dividend taxation distorts the behavior of low-cash firms. A reduction in the dividend tax does not only increase investments but also leads to equity issuances of cash-constrained firms. They also show that dividend payments of low-cash firms are not affected by a change in dividend taxation. Taken together, our simple illustration as well as the Chetty and Saez model predict that cash-constrained firms increase investment in response to the 2006 Swedish dividend tax cut.

3.2 Case 2: Retained Earnings as the Marginal Source of Finance

A cash-rich firm chooses whether to distribute retained earnings as dividends to shareholders or to invest in the firm's capital stock. The firm chooses between an immediate payout and reinvestment in the firm. In case of immediate payout, shareholders receive a dividend of $(1 - t^{Div})$. Assuming that these proceeds are invested in a risk-free bond, investors yield a net-of-tax return of i . In year $t+1$, the investor obtains a final value of $(1 + i) \cdot (1 - t^{Div})$. Alternatively, the firm can retain USD 1 and reinvest. In this case, the firm distributes $(1 + r)$ to the shareholder in year $t+1$. After paying dividend taxes, the investor has a net wealth of $(1 + r) \cdot (1 - t^{Div})$. Comparison of the net proceeds of both alternatives yields a required rate of return for an investment financed by

¹⁰ Other theoretical approaches also derive the prediction that a dividend tax cut may result in a reduction in the required rate of return. In a small open economy, Apel and Södersten (1999), Lindhe and Södersten (2012), and Jacob and Södersten (2013) argue that a dividend tax cut for domestically held corporations can result in reduced required rate of return.

retained earnings of $r_{req}^{RE} = i$. This required rate of return does not depend on the dividend tax, as

$$\frac{\partial r_{req}^{RE}}{\partial t^{Div}} = 0.$$

A cash-rich firm can fund investments internally and will invest in new projects as long as the after-tax return exceeds the after-tax return to bonds. For these firms, a reduction in the dividend tax has no effect on investment. Our highly stylized illustration implies that we would not find an investment response among cash-rich firms to the 2006 Swedish dividend tax cut.

The Chetty and Saez (2010) agency model has more detailed predictions. If managers place high weight on profits vis-à-vis pet projects in their objective function, firms are expected to decrease investments in pet projects and to increase dividend payout if the dividend tax is reduced. As the manager's weight on profits relative to pet projects is higher in firms with close monitoring, we expect that managers place a higher weight on firm profits in private firms. However, also in closely held firms, there are potential agency issues as these firms may hire external managers or one of several shareholders in the firm is the manager. Consequently, the Chetty and Saez model predicts that around the 2006 dividend tax cut in Sweden, firms with large cash holdings initiate or increase dividends and decrease overall investments.

3.3 Empirical Predictions

We next derive empirical predictions from these two cases. Our empirical predictions focus on the difference in investment between cash-constrained and cash-rich firms. Our simple illustration as well as the Chetty and Saez (2010) model arrive at the same conclusion for the investment of cash-rich versus cash-poor firms: A dividend tax cut is expected to reduce the wedge between the required rate of return of cash-poor and cash-rich firms. We therefore argue that a dividend tax cut—apart from any effects on aggregate investment—reduces the difference between investments of cash-poor and cash-rich firms. This conjecture should hold separately for both closely held and

widely held corporations. This would effectively improve the allocation of investment across firms and thereby raise efficiency (Chetty and Saez 2010). We also expect this allocation effect to be stronger for closely held firms than for widely held firms. The dividend tax cut for closely held firm owners is twice the magnitude as for widely held corporation owners. Based on these considerations, we formulate the following three hypotheses for the effect of the 2006 tax reform on allocation of investment:

Hypothesis 1: *The 2006 dividend tax cut decreases the difference in investment between cash-constrained and cash-rich closely held corporations.*

Hypothesis 2: *The 2006 dividend tax cut decreases the difference in investment between cash-constrained and cash-rich widely held corporations.*

Hypothesis 3: *The 2006 dividend tax cut has a stronger effect on the decrease in the difference in investment between cash-constrained and cash-rich closely held corporations than for widely held corporations.*

Empirical evidence on the effect of dividend taxes on corporate investment is scarce and mixed. Becker, Jacob, and Jacob (2013) use an international sample of listed firms over the period 1990–2008 and demonstrate that dividend and capital gains taxation affect allocation of investment. Using listed firms from the U.S., Campbell et al. (2013) find similar responses to the 2003 U.S. tax cut. However, both samples include only listed firms. In contrast, Yagan (2013) finds no empirical support for an aggregated investment effect around the 2003 dividend tax cut in the United States for a sample of unlisted corporations. This raises concerns that unlisted firms may have limited

access to funds. This friction could potentially mute any dividend tax effect on corporate investment of unlisted firms.

4. Data and Summary Statistics

This study utilizes the Firm Register and Individual Database (FRIDA), maintained by Statistics Sweden. This data set comprises a full sample of Swedish corporations for the period 2000–2011 and their tax returns. The tax returns include information on tax balance sheet items and the profit and loss statement. In line with Swedish tax law, we define a non-listed corporation as closely held if at least one of the shareholders is active and files a K-10 form. Otherwise, the corporation is defined as widely held.¹¹ The key advantage of our data is that all Swedish corporations are required to file corporate tax returns. This gives us standardized information on all Swedish corporations.

For the empirical analysis, we use the following firm-level variables.¹² Our dependent variable is investment, which we define as the change in fixed assets from the previous to current periods, plus depreciation, relative to prior-year fixed assets. This variable returns a measure of additions to fixed assets as a percentage of prior-year fixed assets. As a proxy for internal resources, we use the cash-to-assets ratio. We follow the approach of Becker, Jacob, and Jacob (2013) and sort our firms into quintiles based on the ratio of cash holdings to assets. To avoid that the tax reform affects the assignment of treatment and control groups, we base their definition on pre-reform outcomes. We denote firms as cash-rich (cash-constrained) if they are in the top (bottom) quintile of the 4-year, industry-adjusted cash-to-assets distribution over the 2002–2005 period. We use industry-adjusted

¹¹ In principle, closely held corporations can also have some passive owners who experience only a 5 percentage point tax cut. This makes our task of identifying a difference in tax responsiveness between widely and closely held corporations more difficult. However, this is not a critical issue in our study, since the vast majority (over 80%) of closely held corporations only have active owners. When excluding closely held corporations with passive owners, we obtain very similar results. We are thus confident that our segmentation into closely and widely held corporations is precise and that a few potential passive owners in closely held corporations do not bias our results.

¹² To prevent extreme values and outliers from distorting our estimates, we censor observations outside the 1st and 99th percentiles of our variables. We also exclude the few listed firms.

cash quintiles to account for differences in cash holdings across industries. We do this separately for closely held corporations and widely held corporations. Using the 4-year average over the 2002–2005 period also ensures that firms cannot move across groups or enter the sample after the reform.

As firm-level control variables, we include the ratio of working capital to total assets (*Working Capital*), debt-to-assets ratio (*Debt*), sales and turnover scaled by prior-year total assets (*Turnover*), retained earnings scaled by prior-year total assets (*Retained Earnings*), growth in sales from $t-2$ to t (*Sales Growth*), and the natural logarithm of total assets as a measure of size ($\ln(\text{Total Assets})$). Variable definitions and descriptive statistics are presented in Table 2. We restrict the sample to observations for which we have information on all control variables. Since *Sales Growth* requires two lags, our empirical analysis uses observations from the 2002–2011 period. The final sample consists of 353,272 firm–year observations.

[Insert Table 2 about here]

5. Empirical Analysis and Results

5.1 Graphical Evidence

The simplest way to test Hypotheses 1 and 2 is to track the difference in investment by cash-rich and cash-poor firms over time. If a dividend tax cut changes investment allocation, we would observe higher investment among cash-rich firms before the reform, relative to cash-constrained firms. After the tax cut, the investment difference should then drop to a lower level. Figure 1 plots the difference in real investment between cash-rich and cash-constrained firms over the 2002–2011 period. We plot the difference separately for widely and closely held corporations, since the tax cut depends on ownership structure. The gray line illustrates the investment difference for widely held corporations. The black line represents closely held corporations.

[Insert Figure 1 about here]

We observe a parallel trend in the investment difference before the reform for both widely and closely held corporations.¹³ The positive difference indicates that cash-rich firms invest more than cash-poor firms. The parallel trend makes us more confident that our DD estimates are not driven by other correlated, unobservable characteristics that affect allocation of investment around the tax reform. After 2006, we observe a drop in the difference in investment levels between cash-rich and cash-constrained firms. Relative to cash-rich firms, cash-poor firms invest more and, consequently, investment by these two groups converges. The implied economic magnitudes are large and statistically significant. For closely held corporations (widely held corporations), the investment difference decreases by 12 percentage points (7 percentage points) from about 19% (22%) to 7% (15%). This finding is in line with our Hypothesis 1 (Hypothesis 2).

Figure 1 also provides first indications in favor of Hypothesis 3. The response appears to be stronger among closely held corporations than among widely held corporations, since owners of closely held corporations experience the larger dividend tax cut. The difference in the response between the two sets of firms, that is, the implied unconditional triple difference, is about five percentage points.

5.2 Regression Analysis

To estimate the effect of the 2006 dividend tax cut on the allocation of investment, we use the following DD models:

$$(1) \quad Inv_{i,t} = \alpha_0 + \alpha_1 \cdot CashPoor \cdot Reform + \alpha X + \alpha_i + \alpha_{j,t} + \varepsilon_{i,t}, \quad \text{if } CHC = 1$$

$$(2) \quad Inv_{i,t} = \beta_0 + \beta_1 \cdot CashPoor \cdot Reform + \beta X + \beta_i + \beta_{j,t} + \varepsilon_{i,t}, \quad \text{if } WHC = 1.$$

¹³ Figure A.1 of the Online Appendix presents a more formal test of the parallel trend assumption prior to 2006. We add upper and lower confidence bounds to the differences. Except for year 2002, confidence intervals overlap and indicate that prior to the reform, the difference in investment between cash-rich and cash-constrained firms is constant over time.

We separately estimate each model for closely held corporations (Equation (1)) and for widely held corporations (Equation (2)). The dependent variable is $Inv_{i,t}$, which denotes real investment of firm i in period t . Vector \mathbf{X} denotes firm-level control variables and includes working capital to assets, retained earnings to assets, turnover to assets, debt to assets, sales growth, and firm size.¹⁴ We additionally include firm fixed effects (α_i and β_i) and industry-year fixed effects ($\alpha_{j,t}$ and $\beta_{j,t}$). Ideally, we would also control for governance variables. However, this information is not included in our data. The firm fixed effects at least control for a firm’s time-invariant governance characteristics. We use a DD approach to test the hypothesis that cash-constrained firms increase investment relative to cash-rich firms after 2006. We expect the estimated DD coefficient on $CashPoor \cdot Reform$ to be positive, that is, $\alpha_1 > 0$ and $\beta_1 > 0$. This result would imply that the difference in investment between cash-rich and cash-poor firms decreases. Note that the main effects of $CashPoor$ and $Reform$ are not included in the regression since they are captured by firm and industry-year fixed effects, respectively. In all regressions, our statistical inference is based on robust standard errors clustered at the firm level.

Table 3 presents the regression results for investment behavior around the 2006 tax reform in Sweden. Panel A uses the sample of closely held corporations. In Columns (1) and (2), we present average investment before and after the reform. We demean investment by year to account for time variation in average investment levels. In Column (3), we present the change in investment for cash-poor and cash-rich firms. Our results suggest that cash-poor firms increase investment by 6.6 percentage points after the reform. At the same time, cash-rich firms decrease investment by 6.0

¹⁴ Since our identification of tax effects is based on a DDD approach, our reduced-form model cannot directly test all the predicted effects of the control variables in the subsamples that are derived theoretically by Egger, Ehrhardt, and Keuschnigg (2014). As these authors demonstrate, a more sophisticated empirical approach that controls for selection into different classes is necessary to obtain the coefficients for the control variables. Specifically, the authors use a threshold regression combined with an endogenous switching regression. Since our identification strategy exploits an exogenous policy shock and since we base the assignment of treatment and control groups on pre-reform outcomes, identification of the tax effect—the effect of interest in our study—is not biased by selection.

percentage points. These observations are in line with the Chetty and Saez (2010) predictions. However, note that we do not control for observable firm characteristics; these are simple changes in average demeaned investment over time.

Our test of Hypothesis 1 relates to the α_1 coefficient. Following the dividend tax cut, we observe a change in investment behavior of closely held corporations. In our estimation without control variables, the investment difference between cash-rich and cash-poor firms decreases by 12.59 percentage points. In Column (4), we present the α_1 coefficient from Equation (1), where we additionally control for observable firm characteristics, firm fixed effects, and industry-year fixed effects. The positive DD coefficient is in line with our expectations (Hypothesis 1). Cash-constrained firms increase investment compared to cash-rich firms. These results are statistically significant and are large in economic terms. The investment gap between cash-rich and cash-poor firms decreases by 14.95 percentage points. In other words, the decrease in the dividend tax rate from 30% to 20%—a decrease of 33%—reduced the investment gap between cash-rich and cash-poor firms by 32% of the average pre-reform investment of 46.1% in our sample. Since results are very similar in specifications with and without control variables and fixed effects, observable firm characteristics as well as unobservable time invariant firm characteristics cannot explain our findings. In Table A.1 of the Online Appendix, we also show that the reform effect is significant in every post-reform year after 2006. This indicates that the investment response occurs right after the tax cut and is not a one-time event. It thus appears that the 2006 tax reform resulted in a long last improvement of the allocation of investment across closely held corporations (Hypothesis 1).

[Insert Table 3 about here]

Panel B of Table 3 presents results for widely held corporations. Again, we observe that investments by cash-poor firms increase after the reform. Similar to closely held corporations, cash-rich firms decrease investments. This is in line with the Chetty and Saez's predictions, but the

magnitude is smaller than for closely held corporations. However, note that these results are obtained by simply comparing the level of investment before and after 2006 without controlling for any firm-level characteristics or the macroeconomic trend. This single difference estimate without controls is potentially affected by observable characteristics and may, thus, only reflect a time trend. Therefore, our focus is on the DD estimate that compares the development of cash-rich relative to cash-poor firms and which controls for the overall macroeconomic trend. Also, for widely held corporations, we obtain a positive and significant DD coefficient, β_1 . This result holds for specifications with and without control variables and is in line with Hypothesis 2. The magnitudes of the coefficients are very similar across the two specifications. Most importantly, the results are statistically and economically significant. Following the tax rate decrease from 30% to 25%, a tax rate reduction of 16.7%, the investment gap decrease amounts to 8.3 percentage points, about 18.0% of the average pre-reform investment. We thus conclude that the 2006 tax reform has also improved investment allocation across widely held corporations (Hypothesis 2).

The dividend tax cut apparently changed the allocation of investment and induced more investment by cash-constrained firms relative to cash-rich firms. Consistent with Hypothesis 3, the β_1 coefficient is smaller than the α_1 coefficient. That is, the reallocation effect appears to be more pronounced for closely held firms than for widely held corporations. We argue that this is due to the nature of the tax reform: The dividend tax cut for closely held corporations is twice the magnitude as for widely held corporations (10 versus 5 percentage points). To test this empirically, we more closely examine change in the investment difference between cash-poor and cash-rich firms across these two types of corporations. More specifically, we analyze whether the 2006 dividend tax cut had a stronger effect on the decrease in the investment difference between cash-constrained and cash-rich firms for closely held corporations than for widely held corporations. In short, the DDD approach compares three differences: The *first difference* compares investment before and after the

tax reform (*Reform*). The *second difference* compares cash-poor and cash-rich firms (*CashPoor*). The *third difference* (*CHC*) examines the difference in the tax cut between widely-held corporations and closely-held corporations. We use the following DDD estimation:

$$(3) \quad \begin{aligned} \text{Inv}_{i,t} = & \gamma_0 + \gamma_1 \cdot \text{CashPoor} \cdot \text{Reform} \cdot \text{CHC} + \gamma_2 \cdot \text{CashPoor} \cdot \text{CHC} \\ & + \gamma_3 \cdot \text{Reform} \cdot \text{CHC} + \boldsymbol{\gamma X} + \gamma_i + \gamma_{j,t} + \varepsilon_{i,t} \end{aligned}$$

where we again include firm-level controls (\mathbf{X}), firm fixed effects (γ_i), and industry-year fixed effects ($\gamma_{j,t}$). The coefficient of interest is the DDD estimate, γ_1 . If our hypothesis holds, γ_1 will be positive. Since we additionally include interactions $\text{CashPoor} \cdot \text{CHC}$ and $\text{Reform} \cdot \text{CHC}$, γ_1 captures the reallocation effect for closely held corporations in addition to the baseline reform-induced reallocation effect for widely held corporations. We present empirical results in Panel C of Table 3. Again, DDD estimates with and without controls are quite similar (0.0647 versus 0.0602). This result is statistically and economically significant and supports Hypothesis 3. The DDD estimate corresponds to the dividend tax cut difference of 5 percentage points. To be more precise, the difference between α_1 (0.1495) and β_1 (0.0833), that is, γ_1 (0.0602), reflects the difference in the tax cut between cash-rich versus cash-poor closely held corporations (10 percentage points) and cash-rich versus cash-poor widely held corporations (5 percentage points).

One interpretation of our result is that a 5-percentage-point tax cut decreases the investment difference by about 6.0 percentage points, or 13% of average pre-reform investment. Assuming a required rate of return before dividend taxation of 10%, a 5 percentage points dividend tax cut from 25% to 20%—or the difference between widely and closely held firms—decreases the user cost of capital from 13.3% ($=10\%/(1-25\%)$) to 12.5% ($=10\%/(1-20\%)$). For a user cost of capital reduction of 0.83 percentage points—6.7% of 12.5%—the implied elasticity amounts to -1.96 ($=13\%/-6.7\%$, see also Column (1), Table 4). This elasticity is large and is in the upper range of prior estimates.

For example, Caballero et al. (1995) report long-run elasticities of investment with respect to the cost of capital between -0.01 and -2.0. Other studies (e.g., Chirinko et al. 1999 and Hassett and Hubbard 2002) report elasticities between 0 and -0.5 and -0.5 and -1.0., respectively.

There are two potential explanations for the large implied elasticity of our DDD estimate. The first explanation relates to the restrictive definition of cash-poor and cash-rich firms. In our baseline regression, we use rather extreme groups—top and bottom quintiles of cash holdings. Table 4 presents DDD estimates, the treatment effect (defined as the DDD estimate divided by the pre-reform average), and the implied elasticity. The results show that the less restrictive is the definition of treatment and control groups, the lower is the implied elasticity. For example, when using the top versus the bottom tercile of cash holdings to define treatment and control groups, the elasticity reduces to -1.4. When comparing the two bottom to the two top quintiles of cash to assets, we obtain an implied elasticity of about unity. The elasticity decreases further to -0.73 if we use a median split to include all firms from our database.

[Insert Table 4 about here]

Second, as the DDD estimates captures the response of two sets of firms—cash-poor firms increase and cash-rich firms decrease investments—our estimates reflect a relative elasticity. To this end, we test whether there is an overall investment response. If the increase in investments of cash-poor firms mirrors the decrease in investment of cash-rich firms, we would not observe an overall investment response. To test this, we compare the overall investment effect on closely held corporations relative to widely held corporations around the reform. This effect is defined as the sum of γ_1 and γ_3 coefficients. The result is presented in Table 5. The aggregate investment effect is insignificant for all five definitions of cash constraints. This is consistent with prior evidence from

the U.S. (Yagan 2013) and Finland (Kari, Karikallio, and Pirttilä 2009).¹⁵ It also implies that the investment decrease of cash-rich firms is equal to the increase in investments of cash-poor firms. Consequently, the actual elasticity for a cash-poor firms is about half of the estimate presented in Table 4 and is between -0.36 and -0.98. These estimates are close to prior results of Bloom et al. 2002 (about unity), Barnett and Sakellaris (1998) (about -0.84), and the aforementioned studies.

[Insert Table 5 about here]

Finally, there could be concerns that owners of closely held corporations do not invest in productive investments, but rather in perks (Jensen and Meckling 1976). While we do not have data on consumer durables, we can test whether funds are going to productive investments that increase expenditures on labor input. To this end, we estimate the DDD model from Equation (3) and use labor input defined as the sum of employees' wages to total assets as dependent variable. Table 6 shows that labor input increases for cash-poor widely held corporations relative to cash-rich widely held corporations ($Reform * Cash\ Poor > 0$). The positive DDD coefficient ($Reform * Cash\ Poor * CHC > 0$) further shows that the effect is more pronounced for closely held corporations. This result supports our baseline estimates and indicates that investments are related to an increase in productive activity in the firm.

We present further robustness tests in Table A.2 of the Online Appendix. Our main DDD results from Equation (3) are similar when we use retained earnings as measure of financial constraints, when we use a different measure of investment incorporating intangible assets, or when we restrict the sample to the top 40% of the firm-size distribution to address concerns that for small firms, minor investments could lead to high relative investments.

¹⁵ This result is also consistent with evidence that, on average, the 2006 dividend tax reform in Sweden did not increase pre-tax income of business owners of closely held corporations; it only changed the mix of dividends and wages (Alstadsæter and Jacob 2014, Jacob, Michaely, and Alstadsæter 2014). While pre-tax dividends and wages are constant, the substitution of wages and dividends, however, increased after-tax income.

[Insert Table 6 about here]

From the results of our DD and DDD analysis, we conclude that dividend taxation has a large effect on allocation of corporate investment. There are heterogeneous investment responses across firms to a dividend tax cut but, in line with prior evidence (e.g., Yagan 2013), there is no effect on aggregate investment. Our results suggest that funds and, consequently, investments are shifted from cash-rich to financially constrained firms. Assuming that the return of the marginal investment of a cash-poor firm is higher than the return of the marginal investment of a cash-rich firm, the shift of funds from cash-rich to cash-poor firms improves the allocation of investment and raises efficiency (Chetty and Saez 2010).

5.3 *Effect of 2006 Reform on Firm Growth*

Our main test from Table 3 shows that the investment gap between cash-rich and cash-poor firms decreased around the 2006 dividend tax cut. The question remains whether this change in investment allocation across firms also translates into firms' growth. We therefore test whether cash-poor firms also experienced higher growth in sales and turnover after the reform than cash-rich firms. We measure firm growth through sales growth from $t-2$ to t . Table 7 presents the regression results from estimating our main DDD model from Equation (3) with sales growth as the dependent variable. We find positive and significant DD ($Reform * Cash\ Poor > 0$) and DDD estimates ($Reform * Cash\ Poor * CHC > 0$). Again, the results are economically significant. For example, the DDD estimate suggests that a 5 percentage point tax cut increases the growth in sales and turnover of cash-poor firms by about 3 percentage points relative to cash-rich firms. In Table A.1, we additionally show that the effect on sales growth is delayed by one year (two years for widely held corporations) relative to the investment effect. It thus appears that increased investment of cash-poor firms relative to cash-rich firms (see Table 3) also translates into higher growth in turnover and

sales. Taken together, the results in Table 3 and Table 7 suggest that efficiency in the economy is raised as the increase in investments is associated with an increase in sales growth in cash-poor relative to cash-rich firms. Further, the results in Table 7 are evidence that owners invest in productive investment as labor input (see Table 6) as well as sales and turnover increase in cash-poor firms relative to cash-rich firms.

[Insert Table 7 about here]

5.4 Effect of 2006 Reform on Equity Issuances by Cash-Constrained Firms

We next turn to two potential explanations for the observed effect that dividend taxation affects corporate investment allocation. Our first explanation refers to the source of financing. The underlying assumption of the old view is that cash-constrained firms finance new investments with new equity (Harberger 1962, 1966, Feldstein 1970, Poterba and Summers 1985). The dividend tax cut reduces the costs of financing investments with equity and makes it more attractive for an investor to invest new equity, since the investor's after-tax dividends increase for a given dividend distribution from the firm. In a DD framework, we test to what extent this assumption holds empirically. We would expect cash-constrained firms to raise more external equity after the 2006 dividend tax cut relative to cash-rich firms.

We present the regression results in Table 8. Again, we run this regression separately for closely held and widely held corporations. Results are in line with the underlying assumptions of the old view. Cash-constrained firms are able to raise new external capital and increase their paid-in equity (or contributed capital) after the reform compared to cash-rich firms. Results are significant in specifications both with and without control variables. For cash-poor closely held corporations, the ratio of paid-in capital to assets increases by 1.7 percentage points relative to cash-rich firms. This is equivalent to an increase of about 8.5% of the average pre-reform paid-in-equity-to-assets ratio of

19.5% in our sample. To put this into perspective, the DD estimate from our investment model for closely held corporations amounts to 0.1495, or 15% of fixed assets. Given an average ratio of fixed assets to total assets of 19% in our sample, this translates into an increase in investments of 3% of total assets ($=15\% \times 19\%$). As paid-in capital of cash-poor firms increased by 1.7% of total assets around the reform, about half of the investment effect (3% of total assets) can be explained by the increase in external equity. Therefore, one explanation for the finding that investment by cash-rich and cash-poor firms converges after the dividend tax cut is that cash-constrained firms increased financing with new equity.

[Insert Table 8 about here]

We next test whether the debt margin of cash-poor versus cash-rich firms also responds to the 2006 tax reform. The dividend tax cut now makes external equity cheaper and thus the cost difference between external equity and debt becomes smaller and debt should decrease (see also Faccio and Xu 2013). In our setting, we expect cash-poor firms to reduce debt-to-equity ratios following the tax reform relative to cash-rich firms. If, however, the increase in external equity implies that a firm has more collateral and consequently a higher credit line, the debt-to-equity ratio may not respond at all, since firms extend the equity margin as well as the debt margin.

To test whether firms can also extend the debt margin, we repeat the test from Table 8 but use the debt-to-equity ratio as dependent variable. If the debt and equity margins respond similarly, we would not observe a change in the debt-to-equity ratios. However, we find significant reform responses in line with Faccio and Xu's (2013) results for listed firms. The negative DD estimates in Table 9 show that the 2006 dividend tax cut in Sweden led to a reduction in the debt-to-equity ratios of cash-poor firms relative to cash rich-firms. This effect is consistent with the view that the tax advantage of debt decreases if the dividend tax rate is reduced. Taken together, the positive DD

coefficients in Table 8 and the negative DD coefficients in Table 9 imply that cash-poor firms increase funds more through the external equity channel and less through raising new external debt.

[Insert Table 9 about here]

5.5 *Effect of 2006 Reform on Dividend Payout by Cash-Rich, Closely Held Corporations*

The second explanation for the effect that dividend taxation has on allocation of corporate investment refers to the use of internal funds in firms. The Chetty and Saez (2010) model predicts that cash-rich firms decrease investments and increase or initiate dividends. Hence, the use of (some) funds in cash-rich firms changes from investment to dividend payout. In contrast, we do not expect cash-poor firms to increase dividends. If cash-poor firms do not change dividends while cash-rich firms use their cash holdings to increase dividends, the investment difference between cash-poor and cash-rich firms should decrease. Our data, unfortunately, only include information on dividends of closely held corporations (see, also, Jacob, Michaely, and Alstadsæter 2014). Therefore, we can test only the Chetty and Saez prediction for closely held corporations. We use a DD approach and test whether cash-rich firms increase dividend payouts after the reform. Table 10 reports the DD coefficient *Reform*Cash Rich*, which captures the increase in dividend payout of cash-rich firms relative to cash-poor firms.

We use two alternative dependent variables. In Columns (1) and (2) of Table 10, we use an indicator variable, *Dividend Payer*, which is equal to 1 if the firm pays a dividend in the current year, and zero otherwise. In Columns (3) and (4), we use the ratio of dividend payout to prior-year total assets (*Dividend-to-Asset Ratio*) as the dependent variable. Our DD estimates show that relative to a cash-poor firm, the likelihood that a cash-rich firm pays a dividend after the tax reform increases by 4.1 percentage points—about 11% of the sample average. This effect is much stronger for the level of dividend payout. Relative to cash-poor firms, the dividend-to-asset ratio of cash-rich

firms increases by 2.17% of total assets. Such a large response is not surprising, since, for closely held firms, dividend taxation is often the main friction in the payout decision process (Jacob, Michaely and Alstadsæter 2014). Further, the change in the dividend to assets ratio reflects part of the overall relative investment response (3% of total assets) estimated for closely held corporations.

The results for closely held corporations support the empirical predictions of Chetty and Saez (2010). Following a dividend tax cut, cash-poor firms invest more. Cash-rich firms invest less and increase dividend payout. Overall, the allocation of investment improves as investment between cash-poor and cash-rich firms converges. The decrease in the investment difference can be explained by (i) higher equity issuance by cash-poor firms and (ii) by higher dividend payouts by cash-rich firms.

[Insert Table 10 about here]

6. Conclusion

We generate, using proprietary administrative tax data on all Swedish unlisted corporations, empirical evidence that dividend taxes affect investment. Our identification strategy exploits heterogeneous investment responses to the 2006 dividend tax cut using difference-in-difference as well as triple-difference estimators. We find that the reform improved allocation of investment in capital stock across firms. Relative to cash-rich firms, cash-constrained corporations increase investment following the reform. Investments thus appear to have shifted from firms with sufficient internal funds to firms with investment opportunities that, prior to the reform, did not have the necessary funds to carry out the investment. These results are consistent with prior theoretical predictions that dividend tax reforms spur heterogeneous investment responses across firms (Chetty and Saez 2010).

Allocation of investment is improved through at least two channels. First, following a dividend tax cut, cash-constrained firms increase external equity as costs of external equity decrease. Second, cash-rich firms, who are prone to agency problems (Jensen 1986), increase dividend payout after the dividend tax cut. High dividend taxation appears to lock in funds in cash-rich firms. Thus, both channels (partly) explain why investment activities of cash-constrained firms and cash-rich firms converge after a dividend tax cut.

One implication of our results is that dividend taxes are a substantial cost to some firms with respect to financing investment. By reducing dividend taxes, governments can improve the allocation of investment across firms. Efficiency would then increase (Chetty and Saez 2010). It appears as if larger gains from a capital tax reform can be obtained from policy changes targeted at constrained firms, for example, by introducing a partial deduction for dividends paid (e.g., Auerbach 2002).¹⁶ However, a dividend tax reduction potentially comes at the cost of income shifting across tax bases (see, e.g., Slemrod 1995, Gordon and Slemrod 2000, Alstadsæter and Jacob 2014, Harju and Matikka 2014). This potential trade-off should be taken into account when developing reform proposals.

¹⁶ Such a system was, for example, implemented in Sweden in the 1970s and 1980s and removed in 1994. This scheme was called the Annell deduction (see King and Fullerton 1984, Auerbach 2002).

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Figure 1: Difference in Investment between High-Cash Flow and Low-Cash Flow Firms, 2002–2011

This figure shows the difference in investment between low-cash flow firms and high-cash flow firms. We use the quintile of the four-year average cash flow-to-assets ratio over the period 2002–2005 as a measure of cash constraints. We denote the bottom (top) quintile as low-cash (high-cash) firms. We separately present the difference for closely held corporations (black line) and for widely held corporations (gray line).

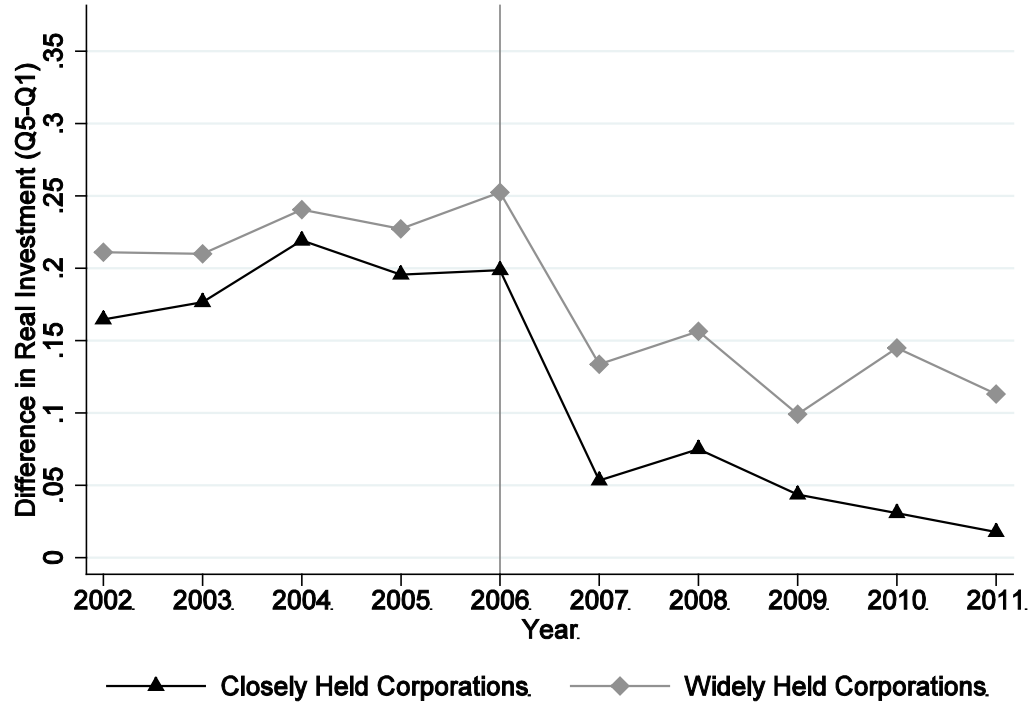


Table 1: Tax Rates on Corporate Income and Dividends Around 2006

Period	Corporate income tax	Dividend tax	
		Closely held corporations*	Widely held corporations
2000–2005	28	30	30
2006–2011	28 / 26.3**	20	25

* Tax rate for dividends within the dividend allowance. Dividends exceeding the dividend allowance are taxed as wage income.

**The corporate income tax rate was reduced to 26.3% in 2009.

Table 2: Summary Statistics of Main Variables

This table presents descriptive statistics of our main variables over the 2000–2011 period. *Investment* is the change in fixed assets from $t-1$ to t plus depreciation relative to prior-year fixed assets. *Paid-in Capital* is the SEK book value of paid-in capital scaled by prior-year total assets. *Dividend-to-Asset Ratio* is the ratio of dividend payout to prior-year total assets. *Dividend Payer* is a dummy variable equal to 1 if the closely held corporation (CHC) distributes dividends. Information on dividend payout is restricted to closely held corporations. *CHC* is a dummy variable equal to 1 if the firm is closely held, 0 otherwise. *Cash* is the ratio of cash holdings to prior-year total assets. *Working Capital* is SEK working capital amount in year t scaled by prior-year total assets. *Debt* is the ratio of long-term and short-term liabilities to prior-year total assets. *Turnover* is SEK sales and turnover in year t scaled by prior-year total assets. *Retained Earnings* is SEK retained earnings amount in year t scaled by prior-year total assets. *Sales Growth* is the percentage change in turnover from $t-2$ to t . We use the natural logarithm of total assets (in SEK) as the measure of size ($\ln(\text{Total Assets})$).

Variable	N	Mean	Standard Deviation	25 th Percentile	Median	75 th Percentile
<i>Investment</i>	353,272	0.4272	1.2263	0.0000	0.0347	0.3850
<i>Paid-in Capital</i>	343,080	0.1468	0.1826	0.0336	0.0806	0.1847
<i>Dividend-to-Asset Ratio</i>	202,259	0.0257	0.5922	0.0000	0.0000	0.0229
<i>Dividend Payer</i>	202,259	0.3923	0.4883	0.0000	0.0000	1.0000
<i>CHC</i>	353,272	0.7050	0.4561	0.0000	1.0000	1.0000
<i>Cash</i>	353,272	0.2954	0.3343	0.0101	0.1532	0.5246
<i>Debt</i>	353,272	0.5441	0.3768	0.2510	0.5045	0.7792
<i>Working Capital</i>	353,272	0.4047	0.3519	0.1217	0.3208	0.6127
<i>Turnover</i>	353,272	1.6720	1.7195	0.3674	1.2828	2.4037
<i>Retained Earnings</i>	353,272	0.2406	0.3136	0.0479	0.2064	0.4373
<i>Sales Growth</i>	353,272	-0.0292	0.6144	-0.1724	0.0232	0.2049
<i>Ln(Total Assets)</i>	353,272	14.6472	1.6040	13.5180	14.5096	15.5979

Table 3: Dividend Taxes and Corporate Investment, 2002–2011

This table presents regressions results for investment behavior around the 2006 tax reform in Sweden. Panel A uses the sample of closely held corporations and Panel B uses widely held corporations. We present DD estimates around the reform. We demean investments by average investment in the respective year. We compare low-cash flow firms and high-cash flow firms. We use the quintile of the four-year industry-adjusted average cash flow-to-assets ratio over the period 2002–2005 as a measure of cash constraints. We denote the bottom (top) quintile as cash-poor (cash-rich) firms. In Column (4), we present DD estimates and DDD estimates with control variables. The dependent variable is investment. We define investment as the difference between current fixed assets and prior-year fixed assets plus depreciation, scaled by prior-year fixed assets. As control variables, we include working capital to assets, retained earnings to assets, turnover to assets, debt to assets, and sales growth. We further include industry-year fixed effects and firm fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

Panel A: Closely Held Corporations—10-Percentage-Point Dividend Tax Cut

	Pre-Reform 2002–2005 (1)	Post-Reform 2006–2011 (2)	Time Difference for Group (3)	Estimates with Controls and FE (4)
Cash-Poor Firms	-0.1287	-0.0624	0.0663*** (0.0062)	
Cash-Rich Firms	0.1150	0.0554	-0.0596*** (0.0075)	
Difference Cash- Poor–Cash-Rich in t	-0.2436*** (0.0070)	-0.1178*** (0.0073)		
DD Estimate		0.1259*** (0.0098)		0.1495*** (0.0122)

Panel B: Widely Held Corporations—5-Percentage-Point Dividend Tax Cut

	Pre-Reform 2002–2005	Post-Reform 2006–2011	Time Difference for Group	Estimates with Controls and FE
Cash-Poor Firms	-0.1576	-0.1181	0.0395*** (0.0091)	
Cash-Rich Firms	0.1241	0.1024	-0.0217* (0.0125)	
Difference Cash- Poor–Cash-Rich in t	-0.2817*** (0.0117)	-0.2205*** (0.0114)		
DD Estimate		0.0612*** (0.0155)		0.0833*** (0.0257)

Panel C: Difference between Closely Held Corporations and Widely Held Corporations

DDD Estimate	0.0647*** (0.0184)	0.0602*** (0.0220)
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Table 4: Dividend Taxes and Corporate Investment, Sensitivity Analysis

This table presents regressions results for investment behavior around the 2006 tax reform in Sweden using the DDD model from equation (3). We compare low-cash flow firms and high-cash flow firms. Column (1) uses the sample from Table 3. In Column (2), (3), and (5) we use the quartile, tercile, and median, respectively of the four-year industry-adjusted average cash flow-to-assets ratio over the period 2002–2005 as a measure of cash constraints. We denote the bottom (top) quartile, tercile, and median, respectively as cash-poor (cash-rich) firms. In Column (4), denote the two bottom (top) quintiles as cash-poor (cash-rich) firms. The dependent variable is investment. As control variables, we include working capital to assets, retained earnings to assets, turnover to assets, debt to assets, and sales growth. The *Treatment Effect* is calculated as the increase in investment relative to the pre-reform sample mean of 46.10%. The *Implied Elasticity* is calculated as the ratio of the treatment effect to the 6.67%-change in cost of capital around the tax reform. We further include industry-year fixed effects and firm fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

	Baseline Result (1)	Quartile Split (2)	Tercile Split (3)	Top 40% vs. Bottom 40% (4)	Median Split (5)
DDD Estimate	0.0602*** (0.0220)	0.0457** (0.0194)	0.0435*** (0.0167)	0.0311** (0.0148)	0.0223* (0.0130)
Treatment Effect	13.06%	9.91%	9.44%	6.75%	4.84%
Implied Elasticity	-1.96	-1.49	-1.42	-1.01	-0.73
Controls & FE	Yes	Yes	Yes	Yes	Yes
Observations	353,272	451,129	632,682	738,400	943,346
R-squared	0.1968	0.1949	0.2216	0.1943	0.1953

Table 5: Dividend Taxes and Corporate Investment, Overall Investment Effect

This Table presents the overall investment effect of CHCs versus WHCs around the 2006 tax reform. The overall investment effect is based on equation (3). This table presents the joint effect of γ_1 and γ_2 , that is, the aggregated investment effect of CHCs relative to WHCs. We use the sample splits as in Table 4. As control variables, we include working capital to assets, retained earnings to assets, turnover to assets, debt to assets, and sales growth. We further include industry-year fixed effects and firm fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

	Baseline Result	Quartile Split	Tercile Split	Top 40% vs. Bottom 40%	Median Split
<i>Reform*CHC</i>	0.0144 (0.0127)	0.0148 (0.0115)	0.0141 (0.105)	0.0006 (0.0095)	0.0006 (0.0084)
Controls & FE	Yes	Yes	Yes	Yes	Yes
Observations	353,272	451,129	632,682	738,400	943,346
R-squared	0.1968	0.1949	0.2216	0.1943	0.1953

Table 6: Dividend Taxes and Labor Input

This table presents the regressions results for changes in labor input around the 2006 tax reform in Sweden. The dependent variable is the ratio of employees' wages and salaries to total assets. We compare low and high-cash flow firms. We use the quintile of the ratio of the four-year industry-adjusted average cash flow to assets over the period 2002–2005 as a measure of cash constraint. We denote the bottom (top) quintile as cash-poor (cash-rich) firms. As control variables, we include the ratios of working capital to assets, of retained earnings to assets, and of debt to assets, sales growth, and firm size. We further include industry–year fixed effects and firm fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

	Estimates without Controls	Estimates with Controls
	(1)	(2)
<i>Reform*Cash Poor</i>	0.0379*** (0.0040)	0.0181*** (0.0027)
<i>Reform*Cash Poor*CHC</i>	0.0561*** (0.0051)	0.0351*** (0.0032)
Controls & FE	No	Yes
Observations	243,437	243,437
R-squared	0.0117	0.8366

Table 7: Dividend Taxes and Sales Growth

This table presents the regressions results for sales growth around the 2006 tax reform in Sweden. We compare low and high-cash flow firms. We use the quintile of the ratio of the four-year industry-adjusted average cash flow to assets over the period 2002–2005 as a measure of cash constraint. We denote the bottom (top) quintile as cash-poor (cash-rich) firms. The dependent variable is the increase in sales from $t-2$ to t . As control variables, we include the ratios of working capital to assets, of retained earnings to assets, and of debt to assets. We further include industry–year fixed effects and firm fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

	Estimates without Controls	Estimates with Controls
	(1)	(2)
<i>Reform*Cash Poor</i>	0.0340*** (0.0087)	0.0784*** (0.0098)
<i>Reform*Cash Poor*CHC</i>	0.0242** (0.0103)	0.0304*** (0.0115)
Controls & FE	No	Yes
Observations	353,273	353,273
R-squared	0.0011	0.3074

Table 8: Dividend Taxes, Cash Holdings, and Paid-in-Capital

This table presents the regression results of equity behavior around the 2006 tax reform in Sweden. The dependent variable is the ratio of paid-in-capital to total assets. As control variables, we include working capital to assets, retained earnings to assets, turnover to assets, debt to assets, and sales growth. We further include industry–year fixed effects and firm fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

	Closely Held Corporations		Widely Held Corporations	
	(1)	(2)	(3)	(4)
<i>Reform</i> * <i>Cash Poor</i>	0.0327*** (0.0016)	0.0166*** (0.0010)	0.0550*** (0.0030)	0.0147*** (0.0023)
Firm Controls	No	Yes	No	Yes
Firm FE	No	Yes	No	Yes
Industry–Year FE	No	Yes	No	Yes
Observations	242,247	242,247	100,833	100,833
R-squared	0.0274	0.8821	0.0288	0.9067

Table 9: Dividend Taxes, Cash Holdings, and Debt-to-Equity Ratios

This table presents the regression results for capital structure around the 2006 tax reform in Sweden. The dependent variable is the ratio of total debt to equity. As control variables, we include the ratios of working capital to assets, of retained earnings to assets, and of turnover to assets and sales growth. We further include industry–year fixed effects and firm fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

	Closely Held Corporations		Widely Held Corporations	
	(1)	(2)	(3)	(4)
<i>Reform</i> * <i>Cash Poor</i>	-1.3653*** (0.0509)	-1.2031*** (0.0514)	-1.1552*** (0.1094)	-0.8399*** (0.1373)
Firm Controls	No	Yes	No	Yes
Firm FE	No	Yes	No	Yes
Industry–Year FE	No	Yes	No	Yes
Observations	239,116	239,129	98,008	98,008
R-squared	0.1511	0.7148	0.0796	0.7296

Table 10: Dividend Taxes, Cash Holdings, and Dividend Payout

This table presents regression results of payout behavior of closely held corporations around the 2006 tax reform in Sweden. The dependent variable is a dummy variable equal to 1 if the firm pays dividends (Columns 1 and 2). In Columns (3) and (4), we use the ratio of dividends to prior-year total assets as the dependent variable. As control variables, we include working capital to assets, retained earnings to assets, turnover to assets, debt to assets, and sales growth. We further include industry–year fixed effects and firm fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

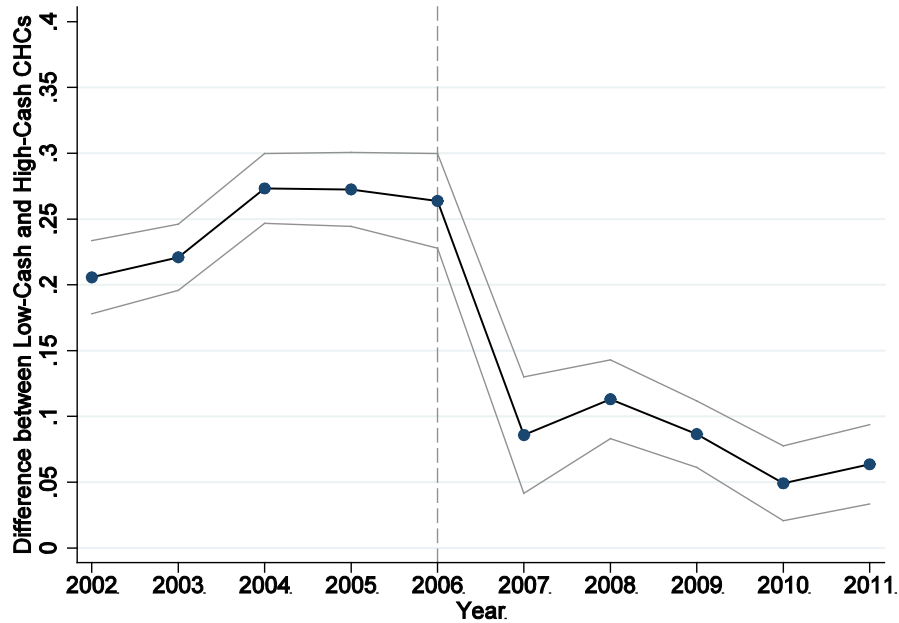
	Dividend Payer		Dividend-to-Asset Ratio	
	(1)	(2)	(3)	(4)
<i>Reform</i> * <i>Cash Rich</i>	0.0502*** (0.0048)	0.0414*** (0.0054)	0.0201*** (0.0006)	0.0217*** (0.0007)
Firm Controls	No	Yes	No	Yes
Firm FE	No	Yes	No	Yes
Industry–Year FE	No	Yes	No	Yes
Observations	202,259	202,259	202,259	202,259
R-squared	0.0530	0.5286	0.0794	0.4611

Online Appendix – Not for Publication

Figure A.1 Difference in Investment between High-Cash Flow and Low-Cash Flow Firms,

This figure shows the difference in investment between low-cash flow firms and high-cash flow firms. We use the quintile of the four-year industry-adjusted average cash flow-to-assets ratio over the period 2002–2005 as a measure of cash constraints. We denote the bottom (top) quintile as low-cash (high-cash) firms. We separately present the difference for closely held corporations (Panel A) and for widely held corporations (Panel B) with the 95% confidence bounds.

Panel A: Closely Held Corporations



Panel B: Widely Held Corporations

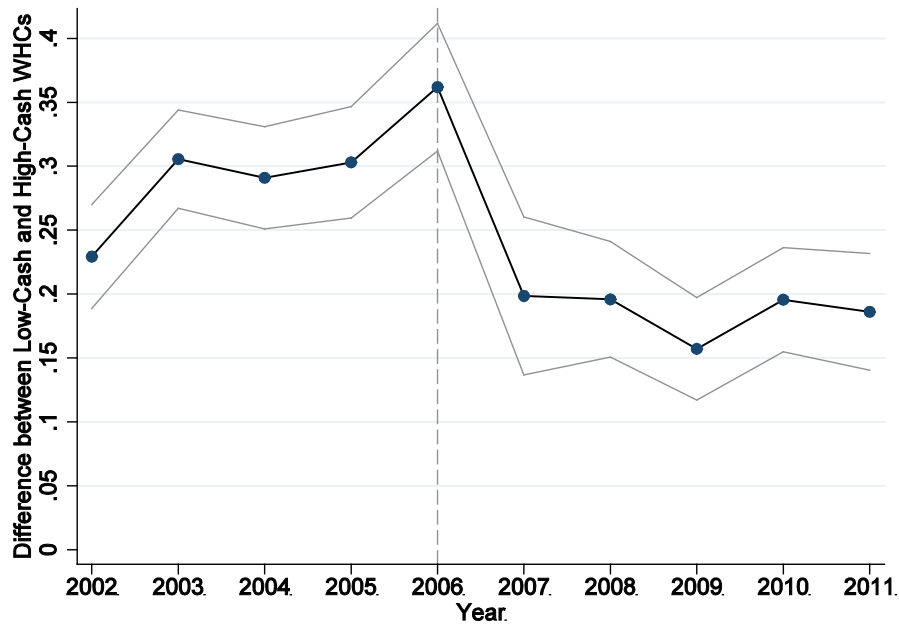


Table A.1: Investment, Sales Growth, and the 2006 Reform, Breakdown by Years

This table replicates the DD results from Table 3 and Table 10 but presents regressions results, which estimate the reform effect separately for each year. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

	Investment		Sales Growth	
	CHC Sample (1)	WHC Sample (2)	CHC Sample (3)	WHC Sample (4)
<i>2006*Cash Rich</i>	-0.0058 (0.0224)	-0.0579 (0.0387)	0.0064 (0.0080)	-0.0197 (0.0160)
<i>2007*Cash Rich</i>	0.1714*** (0.0268)	0.1023** (0.0488)	0.0091 (0.0095)	0.0236 (0.0175)
<i>2008*Cash Rich</i>	0.1539*** (0.0194)	0.1041*** (0.0390)	0.0197** (0.0099)	0.0200 (0.0185)
<i>2009*Cash Rich</i>	0.1975*** (0.0173)	0.1606*** (0.0363)	0.0427*** (0.0106)	0.0442** (0.0194)
<i>2010*Cash Rich</i>	0.2418*** (0.0194)	0.1278*** (0.0379)	0.0361*** (0.0112)	0.0344* (0.0201)
<i>2011*Cash Rich</i>	0.2404*** (0.0200)	0.1815*** (0.0406)	0.0490*** (0.0117)	0.0277 (0.0209)
Firm Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry–Year FE	Yes	Yes	Yes	Yes
Observations	249,046	104,226	249,046	104,226
R-squared	0.2008	0.3275	0.3978	0.4788

Table A.2: Dividend Taxes and Corporate Investment, Robustness tests

This Table reports difference-in-difference-in-difference estimates (DDD estimates) for three sets of robustness tests. Columns (1) and (2) use retained earnings as a proxy for financial constraints. We denote the bottom (top) quintile of the retained earnings distribution as constrained (non-constrained) firms. Columns (3) and (4) includes intangible assets in the investment definition. Columns (5) and (6) restrict the sample to firms in the top 40% of the firm-size distribution. Columns (2), (4), and (6) include control variables, industry-year fixed effects, and firm fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. We report robust standard errors clustered at the firm level in parentheses.

	Quintiles of Retained Earnings		Control for Intangibles		Robustness to Firm Size	
	(1)	(2)	(3)	(4)	(5)	(6)
DDD Estimate	0.0930*** (0.0161)	0.0714*** (0.0228)	0.1264*** (0.0082)	0.0407*** (0.0138)	0.0616*** (0.0188)	0.0652** (0.0302)
Controls	No	Yes	No	Yes	No	Yes
Firm FE	No	Yes	No	Yes	No	Yes
Industry-Year FE	No	Yes	No	Yes	No	Yes
Observations	344,784	344,783	339,348	339,348	152,875	160,195
R-squared	0.10%	20.02%	0.0159	26.03%	0.0150	0.2322