The efficiency cost of dividend taxation:
A new approach and estimates for Canada

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May 2018
Preliminary version

Abstract

We study the effects of shareholder-level dividend taxes on payouts, investment, and corporate profits. A 2006 Canadian reform substantially reduced dividend tax rates, instituting a form of corporate-personal tax integration. We examine the effects of the dividend tax cut and subsequent corporate tax rate changes using administrative data on corporate tax returns. While affected domestic-controlled firms increased dividend payouts relative to unaffected foreign-controlled firms, there were no coinciding effects on corporate investment. We discuss the implications for theories of corporate finance and the optimal taxation of dividend income.

1 Introduction

The taxation of corporate dividends is often held to increase tax avoidance and deter corporate investment, thereby reducing long-run productivity. But this view is controversial, and the specific channels by which dividend taxes affect the economy remain unclear. Given the marked inequality in receipt of dividend income, moreover, existing dividend tax preferences may be extremely regressive. These issues are of special relevance in Canada, since a large tax reform in 2006 that increased the dividend tax credit (DTC) available to domestic taxable shareholders. The objective of this project is to use data observed around the 2006 tax reform in order to provide a new perspective on the optimal design of dividend tax policies.

We estimate the effects of Canadian tax reforms since 2006 on corporate behaviour, using administrative data on taxable Canadian corporations. Our research uses difference-in-difference regression methodologies to compare the effects of the reforms on domestically owned firms whose shareholders may receive the DTC, to a sample of foreign-controlled firms and wholly owned foreign subsidiaries, for which shareholders are generally not DTC-eligible. We focus on the effects of the reform on investment, dividend payouts, and corporate profit.

Our estimates will permit us to measure the extent to which the interests of domestic taxable shareholders or other, tax-exempt investors (like pension funds and non-residents) are decisive in corporate financial policy and investment decisions. This in turn will permit us to distinguish between competing theories of corporate finance that are debated in the academic literature.

Our research gives new insights into the competing views in the literature on the economic effects of dividend taxation. In the *traditional view*, a tax on dividends is a tax on investment: it decreases the return to investment received by shareholders. So the dividend tax should discourage investment, share issuance, and dividend payments, and also depress prices of existing shares (Black, 1976). In this view, the dividend tax therefore results in long-run economic costs—which motivates the existing policy of dividend tax preferences in Canada and elsewhere.

But there are reasons to doubt this view. The DTC subsidy is available only for dividends received by taxable Canadians. It does not affect the cost of investment that is financed by debt or by retained earnings. In the "new view" of dividend taxation (Auerbach, 1979), retained earnings may be paid to shareholders as dividends, or reinvested and paid as dividends later. Since retention affects only the timing of the dividend tax liability and not its present value, the dividend tax rate is neutral for investment. As well, in the "tax irrelevance" view, influential shareholders are tax-exempt, so that payout policies and the cost of equity capital are independent of by residence-based shareholder dividend taxes (Miller and Scholes, 1978). The tax irrelevance view has special relevance in a small open economy like Canada, where marginal shareholders may be non-residents (Boadway and Bruce, 1992). In the tax clientele theory of Miller (1977), taxable Canadian shareholders have a tax preference for dividends but are inframarginal investors, and the cost of capital is determined by the tax rates facing pension funds or foreign investors, both of which groups are ineligible for the DTC. In the tax-adjusted capital asset pricing model of Brennan (1970), all investors hold all assets in spite of their comparative tax advantages, and so all are in principle marginal investors. But the effect of domestic tax rates on the domestic cost of capital is proportional to the share of domestic taxable investors in the world market for capital – even if domestic taxable investors exhibit a strong home bias in their portfolios due to the effects of the dividend subsidy.[1] In both of these alternative models, a dividend tax subsidy for domestic taxable shareholders is essentially irrelevant to corporate financial and investment decisions.[2]

The choice between the traditional view of dividend taxation and the alternative views is ultimately an empirical matter, but the question is still unsettled in the empirical literature. There is evidence that domestic dividend tax rates do affect share valuations in Canada and elsewhere. But a dividend tax capitalization effect is consistent with both the traditional view and the new view of dividend taxation, and so need not imply that dividend taxes affect marginal investment decisions. There is extensive international research on how dividend taxes affect dividend payouts and corporate investment, but it has produced conflicting results. Chetty and Saez (2005) found the 2003 dividend tax reduction in the US caused substantial increases in dividends. But Yagan (2015), using administrative tax data for the US, found no impact on corporate investment. Also using a research design related to ours, Alstadsæter et al. (2015) found no investment effects of a

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[1] See the discussion in Bond et al. (2007).

[2] See Booth (1987) for the first estimates of tax capitalization for Canada. Also see McKenzie and Thompson (1995), which found significant share price effects of the 1986 dividend tax reform in Canada.

dividend tax reform in Sweden.[3,4] In the face of such mixed evidence, it is therefore difficult to say whether tax preferences for dividend income are a desirable policy or not.

The plan of the paper is as follows. Section 2 lays out our model of corporate financial policy and characterizes the efficiency cot of dividend taxes. Section 2 describes Canadian dividend tax policy and the 2006 reform we study. Section 3 describes data and empirical strategy, and Section 4 presents our results. Section 5 concludes.

2 Dividend tax reform in Canada

Canada has long operated a dividend gross-up-and-credit system that reduces the effective personal tax rate on dividend income to offset a portion of the corporate taxes deemed to have been paid on that income (Smart, 2017). In 2006, this dividend tax credit (DTC) was increased for dividends received from large Canadian corporations. The effect of the 2006 reform was to fully integrate corporate and personal taxes on dividends. That is, under post-2005 tax rules, personal tax rates on dividends are reduced, relative to ordinary income tax rates, to fully offset corporate taxes deemed to have been paid on the underlying corporate income. The 2006 reform therefore resulted in a large drop in the dividend tax rate for taxable investors. Fig. 1 illustrates this effect: the combined-federal–provincial tax rate on dividends for investors in the top tax bracket dropped from 30 to 23 per cent in 2006. Furthermore, as also shown in Fig. 1, statutory corporate income tax rates subsequently declined in Canada from about 32 to 26 per cent on average between 2009 and 2012.[5] Based on the integration principle established in the 2006 reform, the dividend tax credit rate therefore declined by an equivalent and offsetting amount over the same period (see Figure 1), leaving the combined corporate and personal tax on dividend income essentially unchanged for top-bracket taxpayers throughout the 2006-13 period.

The Canadian tax reforms therefore offer an ideal laboratory for examining alternative theories of the identity of the marginal investor and how taxes affect corporate decision-making. There are two key "tax clienteles" for equity investments. Pension funds and foreign investors are exempt from domestic personal taxes, so that their effective tax rate is simply the corporate tax rate, say τ_c. Domestic taxable investors pay a combined corporate and personal tax rate equal to

$$\tau_e = \tau_c + (1 - \tau_c)\tau_p$$

where τ_p is the personal tax rate on dividends, net of the DTC.

Our data feature independent variation in the two effective tax rates τ_c and τ_e:

- In 2006, τ_e declined due to the dividend tax credit enhancement, but the tax rate τ_c relevant to tax-exempt and foreign investors was unchanged.

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[3]For Canada, see Bird (2013), which finds that the 2006 dividend tax reform caused no significant change in dividend payout policies among publicly traded Canadian corporations in the immediate aftermath of the reform.

[4]Several recent studies examined Canadian income trusts (flow-through entities which permit avoidance of corporate taxation) and found evidence that corporate tax avoidance opportunities do affect corporate decision-making (e.g. Doidge and Dyck, 2015). But these results pertain to the effect of source-based corporate taxes, and are not informative about the effect of residence-based dividend taxes on the investor side of the market.

[5]The reported rates are for the average of the ten provinces, and apply to large corporations.

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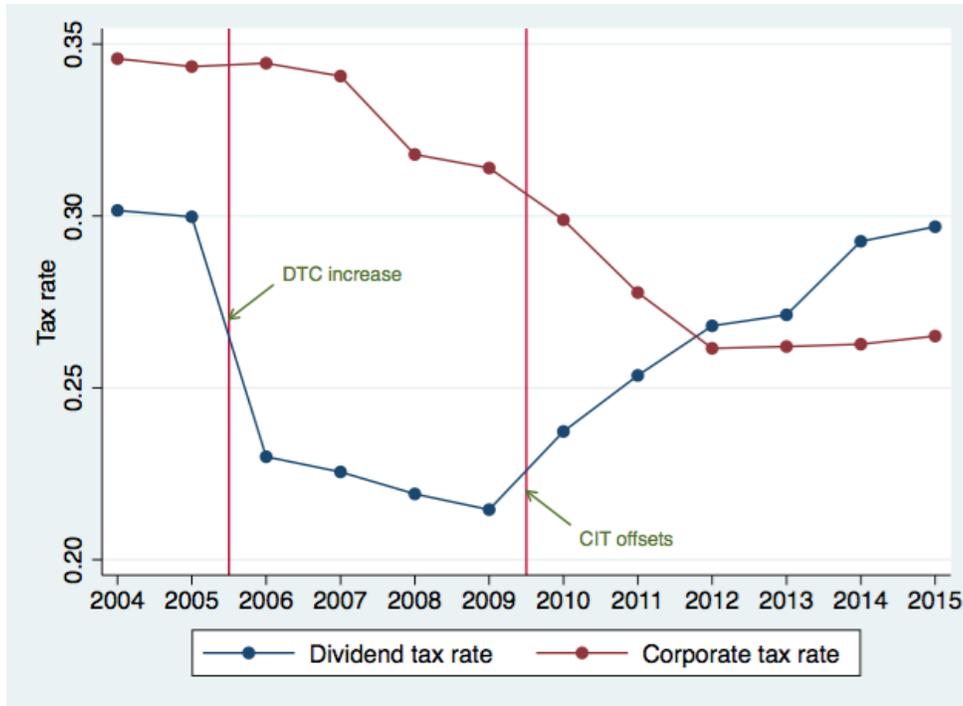
Figure 1: Personal and corporate dividend tax rates in Canada, 2004-2015

- During 2009-12, τ_c declined due to the corporate tax reform, but τ_e remained virtually unchanged because of the offsetting changes to the DTC.

We therefore seek to examine the effects of these two tax changes on corporate behaviour. Firms owned by domestic and foreign shareholders therefore serve as natural "treatment" and "control" groups for studying reforms over the two periods. If domestic taxable shareholders are decisive within domestic firms, then firm behaviour should respond to τ_e but not to independent changes in τ_c. (For foreign-controlled firms, the predictions are reversed.) In contrast, if the decisive investors in both groups are tax exempt, then all firms should respond to τ_c but not τ_e. Examining changes in corporate taxable income and other measures of corporate behaviour is therefore informative about which tax rates matter to corporate decision-making, and distinguishes between competing theories of corporate finance.

The competing theories of the role of dividends in corporate finance offer different predictions about the effects of these reforms on domestic and foreign firms. In the traditional view, new equity is the marginal source of finance, and the marginal effective tax rate on investment depends on τ_e for firms with a domestic taxable investor clientele, and τ_c for firms with a tax-exempt clientele. This implies that investment should rise for domestically controlled firms, relative to foreign-controlled firms with the 2006 reform, with the reverse prediction applying to the 2009-12 period, when τ_c fell but τ_e was held constant due to the offsetting changes in the dividend tax credit.

Under the new view, the marginal source of finance is retained earnings, and the marginal tax rate on investment reflects the (accrual-equivalent) tax rate on capital gains income, as well

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as the corporate tax rate, and shareholder-level taxes on dividends are irrelevant. Thus the new view predicts that neither the 2006 or subsequent reforms should have any differential effect on investment by domestic-controlled firms compared to foreign-controlled ones.

Under both these leading theories, dividends are instrumental or are determined as a consequence of investment choices. Neither theory predicts an immediate, sharp response of dividend payouts to a change in dividend taxes. Chetty and Saez (2005) have emphasized alternative "agency cost" theories of dividends in which retained earnings may be more easily diverted by corporate managers to low-NPV pet projects than is possible with new equity issuance. A tax on dividends in the agency model is predicted to reduce payouts, increase retentions, and increase investment in low-NPV projects. Building on this view, Chetty and Saez (2010) provide formulas for the marginal deadweight cost of dividend taxation that depend on the elasticity of payouts and corporate profits with respect to the dividend tax rate. Based on the high responsiveness of payouts to the 2003 dividend tax reform estimated in Chetty and Saez (2005), they conclude that dividend taxes may have high deadweight costs through the agency channel.

An alternative perspective emphasizes that dividend taxes may reduce payouts as corporations substitute lightly taxed share repurchases for taxable dividends, or retain earnings in the expectation of future reductions in dividend tax rates, or to take advantage of "surplus stripping" opportunities in future (e.g. Albertus, et al., 2017). In this perspective, the marginal deadweight cost of dividend taxes may be small, even if dividend payouts are highly responsive to dividend taxes, because the effective wedge between the tax rate on dividends paid in the present and dividend and capital gains taxes ultimately paid on retained earnings may be lower than in the standard models. All this suggests the need for further estimates of the response of payouts, investment, and profits to dividend tax reforms.

3 Data and estimation

Our primary data source is administrative corporate tax records from a data set maintained by the Centre for Data Dissemination and Economic Research (CDER) at Statistics Canada. The data set includes line items from T2 tax returns for the universe of corporate taxpayers for the 2000-2015 period, as well as mandatory balance sheet items from the General Index of Financial Information (GIFI) that accompanies tax returns. Our analysis in particular uses measures of total assets, tangible assets, total leverage and dividends declared from the GIFI balance sheets, as well as total revenue, operating revenue, net profit, and gross investment from tax returns. For the sake of comparability to the previous literature, where possible we employ the same measurement and data selection conventions as in Yagan (2015). Details follow.

Our analysis uses data on all corporations, with certain ex ante exclusions. In particular, we exclude government-owned business enterprises and corporations that ever claim the small business deduction, since these corporations face different corporate tax rates and were not eligible for the enhanced dividend tax credit beginning in 2006. As is customary, we exclude utilities (two-digit NAICS classification 22), which may be affected by other regulations, in finance (NAICS classification 52) where most investment is intangibles, and public administration (NAICS classification 91). Additionally, we drop observations where the number of days in the tax year is less than

Table 1: Summary statistics

	mean	p10	p50	p90
A. Domestic Firms				
Total Assets	8,452,965	5,000	189,000	3,023,000
Total Revenue	2,900,859	5,000	106,000	1,218,000
Operating Revenue	2,228,759	-	25,000	784,000
Net Income for Tax Purposes	412,232	-	-	126,000
Losses Carried Forward	50,178	-	-	9,000
Total Tangible Assets	2,194,841	-	17,000	1,114,000
Gross Investment	167,640	-	-	22,000
Dividends Declared	193,874	-	-	-
B. Foreign Firms				
Total Assets	22,473,757	3,000	85,000	3,211,000
Total Revenue	12,849,423	4,000	105,000	2,217,000
Operating Revenue	11,480,186	-	66,000	1,537,000
Net Income for Tax Purposes	1,233,411	-	-	75,000
Losses Carried Forward	684,125	-	-	10,000
Total Tangible Assets	5,416,533	-	19,000	791,000
Gross Investment	477,998	-	-	27,000
Dividends Declared	403,979	-	-	-

Notes: Real 2016 dollars. Order statistics have been rounded to nearest $1,000.
- Suppressed

360 or more than 370, and where Total Revenue or Total Assets is missing or non-positive. Each observation is associated with the calendar year in which the corporation's tax year ends.

The resulting analysis sample is an unbalanced panel of 5,541,586 observations (firm–year pairs) on approximately 1 million firms in the 2002-2015 period.[6] Firms in the data are identified by administrative Business Numbers assigned by the Canada Revenue Agency, which may be reassigned following changes in mailing address or in organization of the firm's activities, even where there was no substantial change in activities. This makes it challenging to construct a balanced panel or exploit the longitudinal structure of the data, and these options were therefore not pursued in the analysis. Compared to non-financial aggregates reported in Statistics Canada's benchmark Financial and Taxation Statistics for Enterprises (AFTS), the analysis sample together comprises 71.6 per cent of total tangible assets (capital), 51.4 per cent of sales of goods and services (operating revenue), and 60.5 per cent of taxable income. The largest portion of the difference is due to the exclusion of corporations claiming the small business deduction, which as noted previously were not affected by the 2006 dividend tax reform or the subsequent corporate tax rate changes that are the subject of this paper.

The tax data are supplemented with administrative information on corporate ownership struc-

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[6]Because our control variable strategies require two lags of variables, to maintain comparability of the sample across specifications we exclude 2000 and 2001 observations from the regression sample in all cases.

ture in order to identify foreign and domestic corporate groups. The country of control data are derived from ownership questionnaires filed annually with Statistics Canada by corporations liable under the Corporations Returns Act, and from information obtained from the Canada Revenue Agency's administrative records. Under these procedures, country of control is identified by the country of residence of the ultimate corporate parent of a corporate group operating in Canada. Majority control of a corporation in turn is defined where a person or corporation holds directly or indirectly more than 50 per cent of the voting equity of a corporation. Where majority control cannot be assigned, effective control is defined where a majority of the board of directors of a group of corporations coincides, or where effective control is asserted by the corporation itself. [7] In our analysis, a corporation is identified as foreign if it has foreign control in any of the years for which it is observed.

The key dependent variables used in the analysis are dividends paid, capital investment, and profitability. In addition, we use other variables to scale these outcomes and to serve as control variables, based on total and tangible assets, short-term assets, short-term and long-term debt, total and operating revenue and expense, and age since incorporation. The following describes these variables in more detail. Dividends declared is the sum of cash dividends, liquidating dividends, premium paid on redemption of shares, and stock dividends declared on shares. Capital investment is defined as the sum of the dollar value of acquisitions of assets eligible for Capital Cost Allowances (CCA) as reported on Schedule 8 of the corporation's tax return.[8] Profitability is defined as net income for tax purposes from Schedule 1 of the tax return, which is essentially accounting net income, plus amortization and other adjustments, less capital cost allowance (tax depreciation) and other adjustments.

Table 1 presents summary statistics for these and other variables, for domestic and foreign corporations in the full 2002-2015 analysis sample. All dollar variables are converted to real 2016 dollars based on the Consumer Price Index. Domestic firms have mean total assets of $8,452,965 and total revenues of $2,900,859. Foreign firms are larger, with mean total assets of $22,473,757 and mean total revenues $22,473,757. Furthermore, the unconditional mean annual dividend payment of domestic firms was $193,874 and of foreign firms was $403,979. Most variables in the analysis are right-skewed, as demonstrated by the 10th, 50th, and 90th percentile quantile statistics also presented in the table. (In accordance with Statistics Canada confidentiality procedures, these figures are rounded to the nearest thousand dollars.) Of particular note, dividend payouts are comparatively rare in the data, with the no dividends paid up to the 90th percentile of the distribution for both domestic and foreign firms. To address this highly censored distribution, we present regression results below for both the unconditional mean dividend and a linear probability model for positive dividend payments.

For the microdata regression analysis below, outcome variables are measured as ratios. In particular, dividends declared and net income for tax purposes are divided by total revenues, and investment is is divided by total assets. Outcome variables (dividends and net income as a proportion of revenues, and investment as a proportion of assets) are trimmed at the first and 95th

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[7]See Statistics Canada, *Corporations Returns Act: Concepts and Methods*, Survey No. 2503.

[8]We get similar results if we use net investment defined as acquisitions less dispositions from Schedule 8. An alternative measure of net investment defined as the change in balance sheet Total Tangible Assets net of amortization shows much greater volatility than the CCA measures of investment, and it was not pursued in this analysis.

Table 2: Asset size distribution

| | | Percentage of: | |
| | | Domestic | Foreign |
Quintile	mean	Firms	Firms
1	5,986	20.0	20.2
2	38,885	20.1	19.4
3	110,027	20.1	19.6
4	296,862	20.3	18.9
5	23,633,629	19.5	21.9

Table 3: Industry distribution

| | | Percentage of: | |
| | | Domestic | Foreign |
NAICS	Industry	Firms	Firms
1	Primary	1.7	1.7
2	Mining, oil and gas, and construction	8.7	11.0
3	Manufacturing	3.7	6.9
4	Wholesale and retail trade	14.6	22.9
5	Business services	36.8	32.9
6	Education, health and social services	3.9	2.3
7	Arts, accommodation, food services	7.4	10.0
8	Other services	8.0	7.1
	Unspecified	15.3	5.3

percentile. Robustness checks suggest no significant difference in results if Winsorization is at the 95th or 99th percentile.

Our empirical approach relies on the comparability of domestic and foreign firms in the data and in particular the "parallel trends" assumption that outcomes for the two categories would have evolved in the same way but for the tax reforms after 2005. Since the regression sample is unbalanced, differences in the observed sample might occur over time in a way that is correlated with the tax reforms. As noted, foreign firms are somewhat larger on average and may differ in other ways. Table 2 shows the proportion of domestic and foreign firms respectively that fall in each quantile of the size distribution of total assets of all firms in the data. By this measure, the two distributions are fairly comparable: for example, 19.5 per cent of domestic firms are in the top quintile of assets, compared to 21.9 per cent of foreign firms. This suggests, consistent with ancillary evidence, that the main difference is in higher quantiles of the distribution, and that there are more foreign than domestic firms of extremely large sizes. To deal with size differences, we have assigned each

Figure 2: Aggregate dividends over time
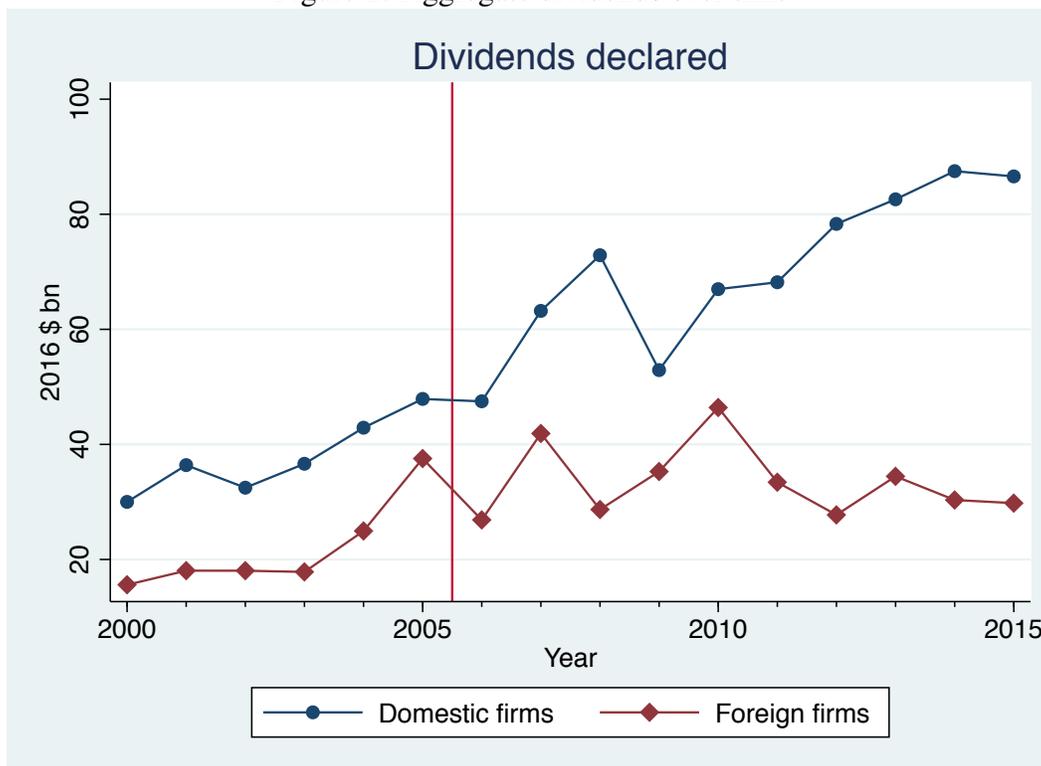
observation to its decile of total assets within each two-digit NAICS industry, and we control for a full set of industry-size dummies in regressions.

A parallel concern is with the industrial composition of domestic and foreign firms and the impact of industrial shocks over time. Table 3 presents the distribution of domestic and foreign observations across broad (one-digit NAICS) industry categories. There are somewhat more foreign firms in the manufacturing and wholesale and retail trade sectors, and somewhat more domestic firms where NAICS codes are missing (a residual category in our analysis). To deal with these differences, we include two-digit industry fixed effects and linear trends in all specifications (including the base specifications where parametric controls are excluded).

4   Results

4.1   Aggregate evidence

First we describe the evolution of dividends, investment, and profits in the aggregate around the 2006 reform. Figure 2–3 present the visual evidence. The first figure shows a marked rise in aggregate dividends of domestic-controlled firms, from $47.9 billion in 2005 for the analysis sample to $86.6 billion in 2015, an increase of 80.7 per cent in real terms. In contrast, dividends of foreign-controlled firms were roughly stable over the same period. More the differences in trends since the

Figure 3: Aggregate investment and profit over time
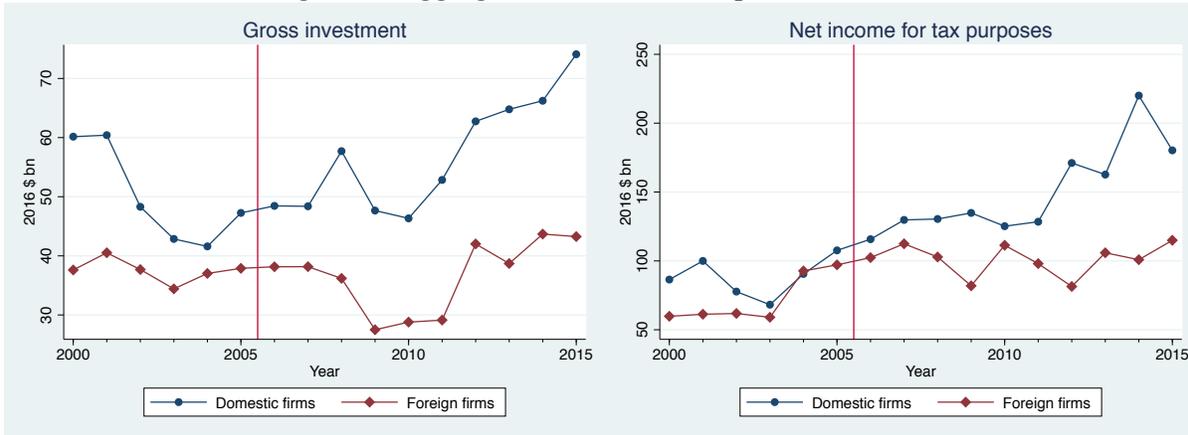
2006 reform are in contrast to patterns in the pre-reform period, in which aggregate investment in treatment and controlled groups evolved similarly.

Aggregate time series for investment and profit in Figure 3 show patterns that are similar to that of the dividend series, though much less pronounced. Aggregate investment rose 56.7 per cent for domestic firms between 2005 and 2015, compared to 14.2 per cent among foreign firms, albeit with a pronounced business cycle effect during 2008-11. The corresponding figures are 67.4 per cent and 18.3 per cent for the profit measures.

4.2 Dividend payments

We turn next to the evidence in the firm-level data based on regression estimates. Panel A of Table 4 reports estimates of the treatment effect of the 2006 reform on dividends paid by domestic firms, i.e. the key coefficient γ from the regression

$$Y_{it} = \alpha_t + \beta DOM_i + \gamma DOM_i \times POST_t + X_{it}\theta + u_{it}$$

In the first two columns of the Table 4, the dependent variable Y_{it} is the ratio of dividends to total revenues. In order that estimates reflect the aggregate impact of the reform, observations in regressions are weighted by total revenues. In the first column, we control for linear trends in the dependent variable at the two-digit industry level as well as year fixed effects, but there are no other firm-level control variables. The estimated coefficient γ is 0.011, i.e. an increase in 1.1 percentage points. Since the mean of the dependent variable is 0.048, this increase is substantial—equal to 22.7 per cent relative to the mean. The second column adds controls for cubic polynomials in lagged operating margin, lagged sales growth, and firm age, plus categorical variables for asset size decile, and for public (i.e. listed) companies and non-operating companies. The estimated coefficient drops to 0.0082 (17.1 per cent of the mean) but remains statistically significant ($p = 0.05$).

As noted, dividend payments are rare in the data, with fewer than 10 per cent of firm-year observations associated with positive dividends. Likewise, previous research has shown that regular

Table 4: Estimated reform effect on domestic firms

Estimated effect of:	Total Dividends		Pct. Positive Dividends	
	(1)	(2)	(3)	(4)
A. Domestic firms				
Post-2005 x Domestic	0.0109**	0.00822*	0.0438	0.0408
	(0.0037)	(0.00358)	(0.0299)	(0.0327)
R2	0.105	0.195	0.068	0.131
B. Private vs. public domestic firms				
Post-2005 x Private	0.0037	0.0057	.0537*	0.0796**
	(0.0027)	(0.0030)	(0.0237)	(0.0275)
Post-2005 x Public	0.0140*	0.0152*	0.0156	0.01183
	(0.0060)	(0.0060)	(0.0406)	(0.0455)
R2	0.111	0.196	0.098	0.135
Mean of dependent variable	0.048		0.085	
Year fixed effects	y	y	y	y
Industry trends	y	y	y	y
Parametric controls	n	y	n	y
N	5541586	4402189	5541586	4402189

All specifications include year fixed effects and industry specific linear trends.
In parentheses are obust standard errors clustered by firm.
Parametric controls are cubic terms in lagged operating margin, lagged revenue growth, and age of firm, plus dummy variables for deciles of total assets within two-digit NAICS industry, and dummy variables for non-operating companies and public companies
* p<0.05, ** p<0.01, *** p<0.001

dividend payments are persistent over time, at least for publicly traded securities. Examining the 2003 US dividend tax reform, Chetty and Saez (2005) no general evidence of dividend increases in aggregate, but did find effects of initiation of new dividend payments, and intensive margin effects for subsets of firms. For evidence on the extensive margin response to the Canadian reform, the third and fourth columns of the table present results from corresponding specifications where the dependent variable Y_{it} is an indicator variable for positive dividend payments, i.e. a linear probability model. Results indicate a large increase in the probability of dividend payments for domestic firms of about 4 percentage points regardless of the control variables included, although this effect is statistically insignificant.

For the US reform, Chetty and Saez (2005) find a larger response for closely held companies with taxable dominant shareholders, the tax clientele with the most to gain from increasing dividends. Our data do not identify shareholders, but they do distinguish between publicly traded firms. Panel B of Table 4 reports separate treatment effect estimates for public and private domestic firms. In our data, we also find evidence that the extensive margin response of dividend initiation is strongest among private firms (columns 3 and 4). But the total effect dividends here is essentially confined to public firms, where unconditional expected dividends increased 1.5 percentage points following the reform. The absence of a significant effect for private firms in columns 1 and 2 however may reflect censoring, if private firms initiating dividends following the reform had below-average dividend payout rates. In all, the results are consistent with substantial dividend responses at the extensive or intensive margins in both groups of domestic firms.

To provide evidence on pre-trends in the data and the timing of responses, we next estimate annual treatment effects γ_t from the model

$$Y_{it} = \alpha_t + \beta DOM_i + \gamma_t DOM_i + X_{it}\theta + u_{it}$$

for each year $t = 2003, \ldots, 2015$, relative to the 2002 base year. The estimates represent the average change in dividends since 2002 of domestic firms in year t, relative to foreign firms, and are graphed in the top panel of Figure 4. (These estimates include the full set of firm-level parametric controls.) The figure depicts point estimates together with 95% confidence intervals constructed from standard errors that are computed taking each year as an independent treatment effect. Observe that dividends in the two groups follow similar trends during the pre-reform period, rise slightly among domestic firms beginning in 2006, and the difference trends upwards beginning only in 2012. The next two panels show corresponding annual treatment effects for the subsample of private and public firms. These follow similar patterns, but as expected from Table 4 the treatment effect beginning in 2006 is more pronounced for public firms.

4.3   Investment and profit

We turn next to the effect of the reform on investment and profit. In the first two columns of Table 5, the dependent variable is gross investment, defined as acquisitions of depreciable capital reported on tax schedules, expressed as a ratio to lagged total assets on the corporation's balance sheet. In Panel A, a single treatment effect is estimated for all domestic firms. Here again we find a positive treatment effect of the reform equal to 1.4 per cent of assets, albeit of a smaller magnitude

Table 5: Estimated reform effect on investment and profit

Estimated effect of:	Dependent variable:			
	Gross Investment		Net Income for Tax Purposes	
	(1)	(2)	(3)	(4)
A. Domestic firms				
Post-2005 x Domestic	0.0150*	0.0139*	0.0253*	0.0106
	(0.0073)	(0.0078)	(0.0102)	(0.0074)
R2	0.064	0.096	0.061	0.205
B. Public vs. private domestic firms				
Post-2005 x Private	0.0056	0.0057	0.0156	0.0032
	(0.0062)	(0.0030)	(0.0080)	(0.0055)
Post-2005 x Public	0.0238*	0.0241*	0.0341*	0.0178
	(0.0101)	(0.0110)	(0.0162)	(0.0124)
R2	0.067	0.098	0.061	0.205
Mean of dependent variable	0.085		0.128	
Year fixed effects	y	y	y	y
Industry trends	y	y	y	y
Parametric controls	n	y	n	y
N	5541586	4402189	5541586	4402189

All specifications include year fixed effects and industry specific linear trends.
In parentheses are obust standard errors clustered by firm.
Parametric controls are cubic terms in lagged operating margin, lagged revenue growth, and age of firm, plus dummy variables for deciles of total assets within two-digit NAICS industry, and dummy variables for non-operating companies and public companies
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Figure 4: Annual treatment effects for dividends

Dividends declared - Domestic firms

Dividends declared - Private firms

Dividends declared - Public firms
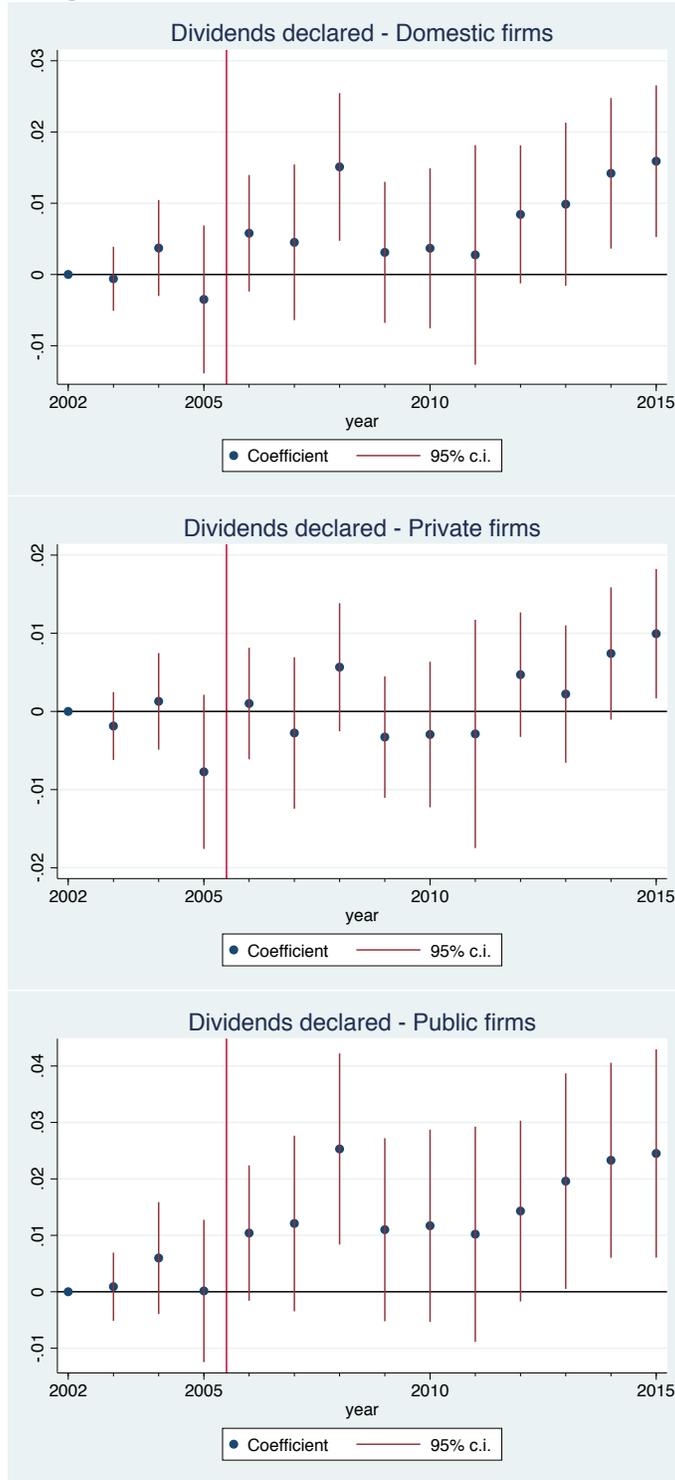
Figure 5: Annual treatment effects for investment and profit
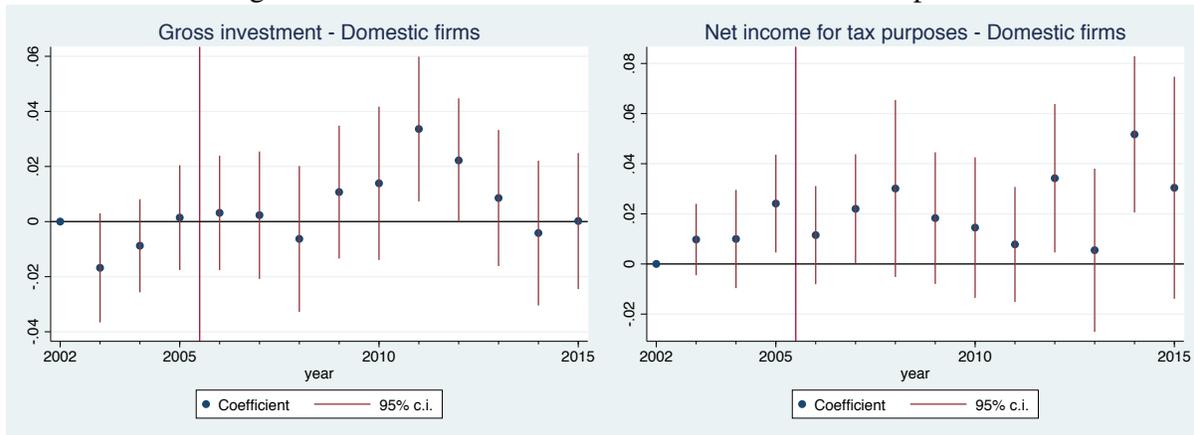
than in the case of dividends, and of marginal statistical significance. In Panel B, separate estimates of treatment effects are reported for public and private firms, showing that the effect is confined to public companies. The effect on profitability is reported in the two rightmost columns of Table 5. (Profitability is measured as the ratio of net income for tax purposes, expressed as a percentage of total revenues.) While a positive effect is evident in column 3 for public firms, it becomes insignificant with the addition of firm-level control variables in column 4. All this suggests at best limited evidence of an impact of the reform on investment and profit.

Further evidence comes from the estimates year-by-year treatment effects, presented visually in Figure 5. While no effect on investment is discernable in the immediate aftermath of the 2006 reform, except perhaps a reversal of pre-reform trends, investment by domestic firms rose above foreign counterparts in the 2009-13 period. It seems difficult to attribute such a change to the causal effects of the earlier dividend tax reform. Indeed, personal taxes on dividends were in fact increasing after 2009, due to the reduction in corporate tax rates and the effects of unrelated increases in personal tax rates on ordinary income. (See Figure 1 and the discussion in Section 2.) Moreover, as suggested by the aggregate evidence in Figure 4, the estimated treatment effect reflects declines in investment among foreign firms, rather than increases among domestic firms. On the basis of this evidence, it is difficult to reject the proposition that the dividend tax reform had no causal effect on investment of domestic firms.

These conclusions parallel those of Yagan (2015) who examined investment effects on a sample of US private firms around the 2003 US dividend tax reform. Using administrative tax data similar to ours but a different identification strategy, he also concludes there was no discernable impact on investment.

5 Concluding remarks

Our results show a significant impact of the 2006 reform on dividend payouts. Dividends declared by domestic-controlled firms rose substantially following the 2006 reform compared to foreign-controlled firms, and the difference persisted over time, even as dividend tax rates rose again

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following corporate tax cuts since 2009. The payout response is observed both at the extensive margin, as some firms appeared to initiate new dividend payments after 2006, and in total dividend payments. Payout responses are observed both for private firms (many of which are presumably closely held) and publicly-traded firms. While our difference-in-difference methodology does suggest a rise in corporate investment for domestic firms in the post-reform period, the effect is small, and appears to coincide with the 2009-12 period when domestic dividend tax rates were rising (due to corporate tax cuts).

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