Graduate Public Finance

Business Taxation Part III: Investment and Corporate Financial Policy

Owen Zidar
Princeton
Fall 2018

Lecture 10

Thanks to Alan Auerbach, Raj Chetty, Jim Poterba, Danny Yagan, and Terry Moon for providing their notes, some of which are reproduced here.

Outline

1. User Cost
   - Impact of TCJA (Barro Furman, BPEA 2018)
2. Corporate Finance and Investment Incentives
3. Payout Policy: Dividend Taxation
4. Payout Policy: Capital Gains Taxation
5. APPENDIX: Payout model and Old vs New View

Outline

1. User Cost
   - Impact of TCJA (Barro Furman, BPEA 2018)
2. Corporate Finance and Investment Incentives
3. Payout Policy: Dividend Taxation
4. Payout Policy: Capital Gains Taxation
5. APPENDIX: Payout model and Old vs New View

User Cost expression with taxes

Jorgenson's (1963) user cost of capital R_t is the classic way to analyze the effect of taxation on investment

$$R = \frac{q(1 - \tau z)(r + \delta - \pi)}{1 - \tau}$$

- q is the price of capital goods and π is the corresponding inflation rate
- τ is the corporate tax rate
- z is the present value of depreciation deductions per dollar of new capital
- Can also include an investment tax credit term (which would enter, e.g., $z = ITC/\tau$)
- r is the firm's nominal cost of funds (presumably a weighted avg of debat and equity costs)
- δ is the rate at which capital depreciates

Comments on User Cost expression with taxes

With immediate expensing, $z = 1$ so the tax terms cancel, yielding:

$$R = q(r + \delta - \pi)$$

- This expression is the continuous time version of what we had before without taxes
- Dynamics/expectations re path of q, τ, z, ITC change the expression
- See Hall and Jorgenson (AER,1967) for derivations or more recent notes by Poterba (MIT open course web 14.471 Fall 2012) or Auerbach (2005) paper "Taxation and Capital Spending"
- See Yagan (AER, 2015) appendix D for empirical implementation

Measuring User Cost in Practice

Measuring User Cost (Barro Furman, BPEA 2018)

Start by ignoring debt financing and assume τ and z are constant:

$$R = \frac{(1 - \tau z)(r + \delta)}{1 - \tau}$$

- τ and z summarize the tax system (note $\lambda \equiv z$ in BF)
- r is set to 8.2 (see paper for discussion); implicitly assumes horizontal supply of capital
- δ is the rate at which capital depreciates
  - Equipment $\delta = 8.8\%$
  - Structures $\delta = 2.0\%$
  - Rental residential property $\delta = 2.7\%$
  - R&D intellectual property $\delta = 12.3\%$
  - Other intellectual property $\delta = 19.5\%$

BF then add debt financing tradeoff between tax advantage and cost of higher default probability

Measuring User Cost (Barro Furman, BPEA 2018)

Adding this extra term for debt financing gives:

$$R = \frac{(1-\tau z)(r+\delta)}{1-\tau} - \frac{1}{2}\left(\frac{\tau}{1-\tau}\right) \textit{debtshare} \times i$$

- $\frac{1}{2}$ is from calibrated marginal cost of debt financing (see eq 5; fn 14)
- *debtshare* is the share of financing from debt, which they set to 1/3
- i is the nominal interest rate on corporate bonds

TCJA effect on C-corp tax rates

Barro and Furman (BPEA, 2018)

BF consider three scenarios:

1. **Baseline in 2017:** $\tau = 38\%$
   - Federal $(\frac{2}{3})35\% + (\frac{1}{3})31.85\%$ (from DPAD) $= 34\%$
   - Add 4% for state corporate tax
2. **Law as written (applicable as of 2027):** $\tau = 27\%$
   - Federal $= 21\%$
   - Adjust to reflect NOL limitations and smaller offsets (1.5pp)
   - Add 4% for state corporate tax
3. **Provisions permanent (applicable as of 2019):** $\tau = 26\%$
   - Federal $= 21\%$
   - Adjust to reflect NOL limitations and smaller offsets (0.25pp)
   - Add 4% for state corporate tax

TCJA effect on C-corp user costs

Barro and Furman (BPEA, 2018)

Table 5
Estimated Effects on C Corporations from 2017 Tax Law

	Baseline	Scenario I Law as written	Scenario II Provisions permanent
Corporate-profits tax rate, τ	38%	27%	26%
Effective expensing rate, λ			
Equipment	0.812	0.812	1.000
Structures	0.338	0.338	0.338
Rental residential property	0.336	0.336	0.336
R&D intellectual property	1.132	1.011	1.192
Other intellectual property	0.842	0.842	0.842
User cost of capital, Ω (% change from baseline)			
Equipment	0.186	0.180 (-3%)	0.168 (-10%)
Structures	0.139	0.125 (-10%)	0.124 (-11%)
Rental residential property	0.149	0.134 (-10%)	0.132 (-11%)
R&D intellectual property	0.185	0.202 (+10%)	0.189 (+2%)
Other intellectual property	0.300	0.291 (-3%)	0.290 (-3%)
Average		*(-4%)*	*(-8%)*

Source: (Barro Furman, BPEA 2018)

TCJA effect on pass-through tax rates

Barro and Furman (BPEA, 2018)

BF consider three scenarios:

1. **Baseline in 2017:** $\tau = 35.2\%$
   - Assumed value for average marginal tax rate for owners of non-C-corporate businesses
2. **Law as written (applicable as of 2027):** $\tau = 35.5\%$
   - Reflects elimination of DPAD and some bracket creep due to shifting to chained CPI
3. **Provisions permanent (applicable as of 2019):** $\tau = 31.1\%$
   - Reflects reduction in individual tax rates and allowable part of the 20 percent pass-through deduction
   - Partially offset with higher marginal rates from capping SALT

TCJA effect on pass-through user costs

Barro and Furman (BPEA, 2018)

Table 9

Estimated Effects on Pass-through Businesses from 2017 Tax Law

	Baseline	Law as written	Provisions permanent
Pass-through tax rate, τ	35.2%	35.5%	31.1%
Effective expensing rate, λ			
Equipment	0.812	0.812	1.000
Structures	0.338	0.338	0.338
Rental residential property	0.336	0.336	0.336
R&D intellectual property	1.000	0.785	1.000
Other intellectual property	0.842	0.842	0.842
User cost of capital, Ω (% change from baseline)			
Equipment	0.184	0.185 (0)	0.167 (-9%)
Structures	0.135	0.136 (+1%)	0.130 (-4%)
Rental residential property	0.145	0.146 (+1%)	0.139 (-4%)
R&D intellectual property	0.202	0.226 (+12%)	0.202 (0)
Other intellectual property	0.297	0.298 (0)	0.294 (-1%)
Average		*(+1%)*	*(-5%)*

Source: (Barro Furman, BPEA 2018)

Economic Impacts

From user cost changes to impacts on economic activity

Barro and Furman (BPEA, 2018)

1. **Production Function**
   - $Y = AK^{\alpha}L^{1-\alpha}$ where $\alpha = .38$
   - $K^{\alpha} = K_1^{\alpha_1} K_2^{\alpha_2} K_3^{\alpha_3} K_4^{\alpha_4} K_5^{\alpha_5}$ for each type of capital
2. **Elasticity of capital labor ratio (K/L) w.r.t user cost**
   - $MPK = \alpha A \left(\frac{K}{L}\right)^{-(1-\alpha)}$
   - Implies that the elasticity of (K/L) to user cost is $-1/(1-\alpha) \approx 1.6$
3. **Output per worker**
   - Elasticity of (Y/L) to user cost is $-\alpha/(1-\alpha) \approx .6$
   - With 5 types of capital, numerator is α_k-weighted average of user cost change
   - Also note that wages are proportional to Y/L from labor FOC

TCJA effect on C-corp economic activity

Barro and Furman (BPEA, 2018)

User cost of capital, Ω (% change from baseline)			
Equipment	0.186	0.180 (-3%)	0.168 (-10%)
Structures	0.139	0.125 (-10%)	0.124 (-11%)
Rental residential property	0.149	0.134 (-10%)	0.132 (-11%)
R&D intellectual property	0.185	0.202 (+10%)	0.189 (+2%)
Other intellectual property	0.300	0.291 (-3%)	0.290 (-3%)
Average		*(-4%)*	*(-8%)*
Percent change in capital-labor ratio, K/L			
Equipment		5.6%	14.3%
Structures		12.9%	16.1%
Rental residential property		13.0%	16.2%
R&D intellectual property		-7.1%	2.3%
Other intellectual property		5.4%	8.0%
Average		*6.6%*	*12.5%*
Percent change in output per worker, Y/L		2.5%	4.7%

Notes: The effective expensing rate, λ, is calculated as a present value, including tax credits. The economic and tax law parameters were listed in Tables 3 and 4 and are described in the text where appropriate. Averages reflect the average percent changes for each type of capital, weighted by the capital income shares.

Source: (Barro Furman, BPEA 2018)

TCJA effect on pass-through economic activity

Barro and Furman (BPEA, 2018)

User cost of capital, Ω (% change from baseline)			
Equipment	0.184	0.185 (0)	0.167 (-9%)
Structures	0.135	0.136 (+1%)	0.130 (-4%)
Rental residential property	0.145	0.146 (+1%)	0.139 (-4%)
R&D intellectual property	0.202	0.226 (+12%)	0.202 (0)
Other intellectual property	0.297	0.298 (0)	0.294 (-1%)
Average		*(+1%)*	*(-5%)*
Percent change in capital-labor ratio, K/L			
Equipment		-1.2%	12.2%
Structures		-1.5%	7.2%
Rental residential property		-1.5%	7.2%
R&D intellectual property		-13.1%	2.8%
Other intellectual property		-1.0%	4.2%
Average		*-2.1%*	*8.3%*
Percent change in output per worker, Y/L		-0.8%	3.1%

Note: Uses pass-through tax rates as shown. R&E credit assumed to be zero in all cases. See Tables 3, 4 and 5 on other aspects.

Source: (Barro Furman, BPEA 2018)

TCJA effect on overall economic activity, switching

Barro and Furman (BPEA, 2018)

Table 10
Estimated Effects on Economy-wide Output per Worker

		Percent change in output per worker, Y/L	
	Initial share	**Law as written**	**Provisions permanent**
C corporations	39%	2.5%	4.7%
Pass-throughs	36%	-0.8%	3.1%
Government, Households, and Institutions	25%	0.0%	0.0%
Percent change in overall output per worker		**0.9%**	**3.1%**
Sensitivity analysis when productivity rises by 10% for switchers			
Percent change in overall output per worker		*1.6%*	*3.5%*

Notes: The initial shares in value added are in Table 3. Values of change in output per worker for law-as-written and provisions-permanent scenarios are from Table 5 for C corporations and Table 9 for pass-through businesses. These values reflect changing capital-labor ratios within sectors. The change in output per worker is assumed to be zero for government, households, and institutions. The percent change in overall output per worker is the sum of the changes by sector weighted by the final shares, which are assumed because of shifting across

Open Questions from Barro Furman

1. **Tax rate vs base**
   - Effects of expensing vs interest deductibility
   - How to model NOLs, etc, and their impacts on user cost and growth
2. **Actual Investment responses**
   - Do estimates line up with predictions? Heterogeneity by type of capital
   - Where does investment come from? Extensive, intensive, FDI?
   - More broadly, what are the effects on the international provisions?
   - Crowd-out from deficits? How do responses change w/ higher r?
3. **Output per worker and wages**
   - How do these changes impact Y/L and wages? what are the distributional impacts?
4. **Others**
   - How much corporate form switching was there? Are there productivity gains from switching? Tax revenue impacts?
   - What do firms do with the windfalls to old capital?
   - How much reallocation of capital and labor is there?

Outline

1. User Cost
   - Impact of TCJA (Barro Furman, BPEA 2018)
2. Corporate Finance and Investment Incentives
3. Payout Policy: Dividend Taxation
4. Payout Policy: Capital Gains Taxation
5. APPENDIX: Payout model and Old vs New View

Liquidity and Corporate Investment

- Long empirical history: cash flow had substantial predictive value for investment at the firm level but was obviously endogenous
- Large literature in corporate finance (Myers "Pecking Order Hypothesis") suggests internal cash flow is less expensive for firms than either debt or new equity finances
- Cash flow is another channel - besides the user cost - through which tax policy can affect investment
- Focuses attention on average tax rate as well as marginal incentives

Source: Poterba

"Modern" Empirical Studies of Cash Flow and Investment

- Fazzari-Hubbard-Petersen (FHP, BPEA 1988) address omitted variable problem – current profitability is associated with future investment opportunities – by using Tobin's q to control for endogeneity of cash flow
- Subsequent studies use other creative identification strategies
  - FHP (1988) stratify firms by share of earnings paid out as dividends. High payout = little need for external capital
  - Kaplan/Zingales comment on FHP: low dividend firms in FHP sample are actually issuing new securities so appear to have access to capital markets
  - Owen Lamont MIT dissertation: investment decisions of multinational oil companies with chemical processing subsidiaries
  - Josh Rauh MIT dissertation: required pension contributions under ERISA as shocks to corporate cash flow
- Conclusion: access to internal cash flow appears to affect investment decisions

Source: Poterba

Effects of q and Cash Flow on Investment (FHP 1988)

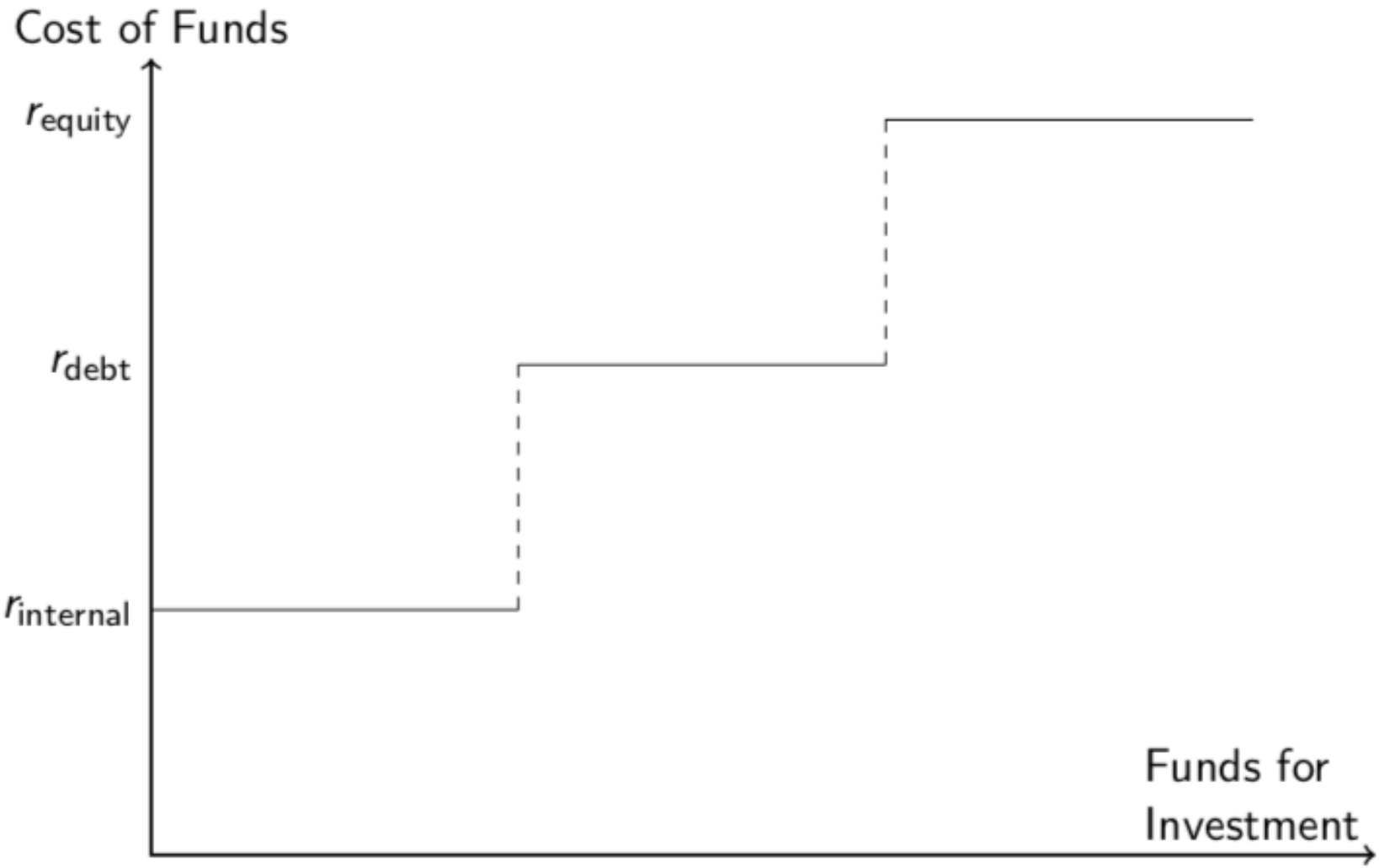
	Lowest Dividend	Middle Dividend	Highest Dividend
Tobin's Q	0.0008 (0.0004)	0.0046 (0.0009)	0.0020 0.0003
Cash Flow/K	0.461 (0.027)	0.363 (0.039)	0.230 (0.010)
R^2	0.46	0.28	0.19

Two key questions:

- Is the 0.23 coefficient for "Highest Dividend" Group a measure of misspecification?
- Are there other differences, besides capital market access, between high- and low dividend payout firms?

Source: Poterba

Cost of Funds from Retained Earnings, Debt, and Equity



Source: Poterba

Debt Finance

- Interest is deductible against corporate earnings when defining taxable profits
- Interest income is taxable for households and firms but not for pension funds, endowments
- If investors demand required return ρ, and investors' interest income tax rate is τ_{int}, then the firm must earn $\frac{\rho}{1-\tau_{\text{int}}}$ to deliver investors' required return
- $f'(K) = \frac{\rho}{1-\tau_{\text{int}}}$ for debt-financed project

Source: Poterba

Equity Finance: Dividend-Paying Firms

- Corporate earnings net of tax at rate τ_{corp} are available for payment of dividends
- Taxable investors - firms and individuals - are taxed at rate τ_{DIV} on dividends
- Return to investors when firm earns $f'(K)$ is therefore $(1-\tau_{DIV})(1-\tau_{corp})f'(K)$
- If investors' required return is ρ, then $f'(K) = \frac{\rho}{(1-\tau_{DIV})(1-\tau_{corp})}$
- Taxation of earnings at both firm and investor level is sometimes called "double taxation"

Source: Poterba

Equity Finance: Firms That Retain Earnings

- If firms retain earnings, investors derive returns as capital gains on shares rather than dividends
- Corporate tax is similar to that for a dividend-paying firm
- Capital gains are taxed at realization, not accrual
- Delaying payment of tax reduces the effective tax rate
- Some gains escape tax entirely if individual investor holds appreciated assets at death: "basis step up"
- Let τ_{cg} denote effective accrual-equivalent tax rate on gains
- Required return on firm projects is now $f'(K) = \frac{\rho}{(1-\tau_{cg})(1-\tau_{corp})}$

Source: Poterba

Corner Solutions for Corporate Financial Policy

- With fixed required returns, hurdle rates are not necessarily the same for projects financed by debt and equity
- If $(1-\tau_{cg})(1-\tau_{corp}) > (1-\tau_{int})$ choose retained earnings finance
- If $(1-\tau_{cg})(1-\tau_{corp}) < (1-\tau_{int})$ choose debt finance
- TCJA (2017) lowers τ_{corp} and may change preferred source of finance

Source: Poterba

Explaining Simultaneous Use of Debt and Equity Finance

- Allow required return on debt to change as debt/capital ratio changes
- Assume:

ρ_{eq} = required return on equity

ρ_{debt} = required return on debt, $\rho'_{debt} > 0$

- Borrow amount D^* :

$$\frac{\rho_{eq}}{[1-\tau_{eq}][1-\tau_{corp}]} = \frac{\rho_{debt}\left(\frac{D^*}{K}\right)}{[1-\tau_{int}]}$$

Source: Poterba

Outline

1. User Cost
   - Impact of TCJA (Barro Furman, BPEA 2018)
2. Corporate Finance and Investment Incentives
3. Payout Policy: Dividend Taxation
4. Payout Policy: Capital Gains Taxation
5. APPENDIX: Payout model and Old vs New View

Payout Taxes

- So far: considered only annual business income taxes
- United States has "double taxation": taxes can be assessed also when net-of-income-tax profits are distributed (paid out) to shareholders
  - Dividends: paid pro rata to all shareholders (taxed at dividend tax rate)
  - Share buyback: paid out to shareholders who sell (taxed at capital gains tax rate)
  - Retained earnings: effectively paid out when shareholder sells (taxed at accrued capital gains tax rate $<$ statutory capital gains tax rate)

Source: Yagan

Evidence

- Original: inspect goodness of structural investment models (Poterba-Summers 1984) or cross-sectional behavior of investment and dividends (Auerbach-Hassett 2002)
- 2000s: Ignore investment and see what can be learned from payout behavior (Chetty-Saez 2005)
- 2010s: Quasi-experiments on investment (Yagan 2015)

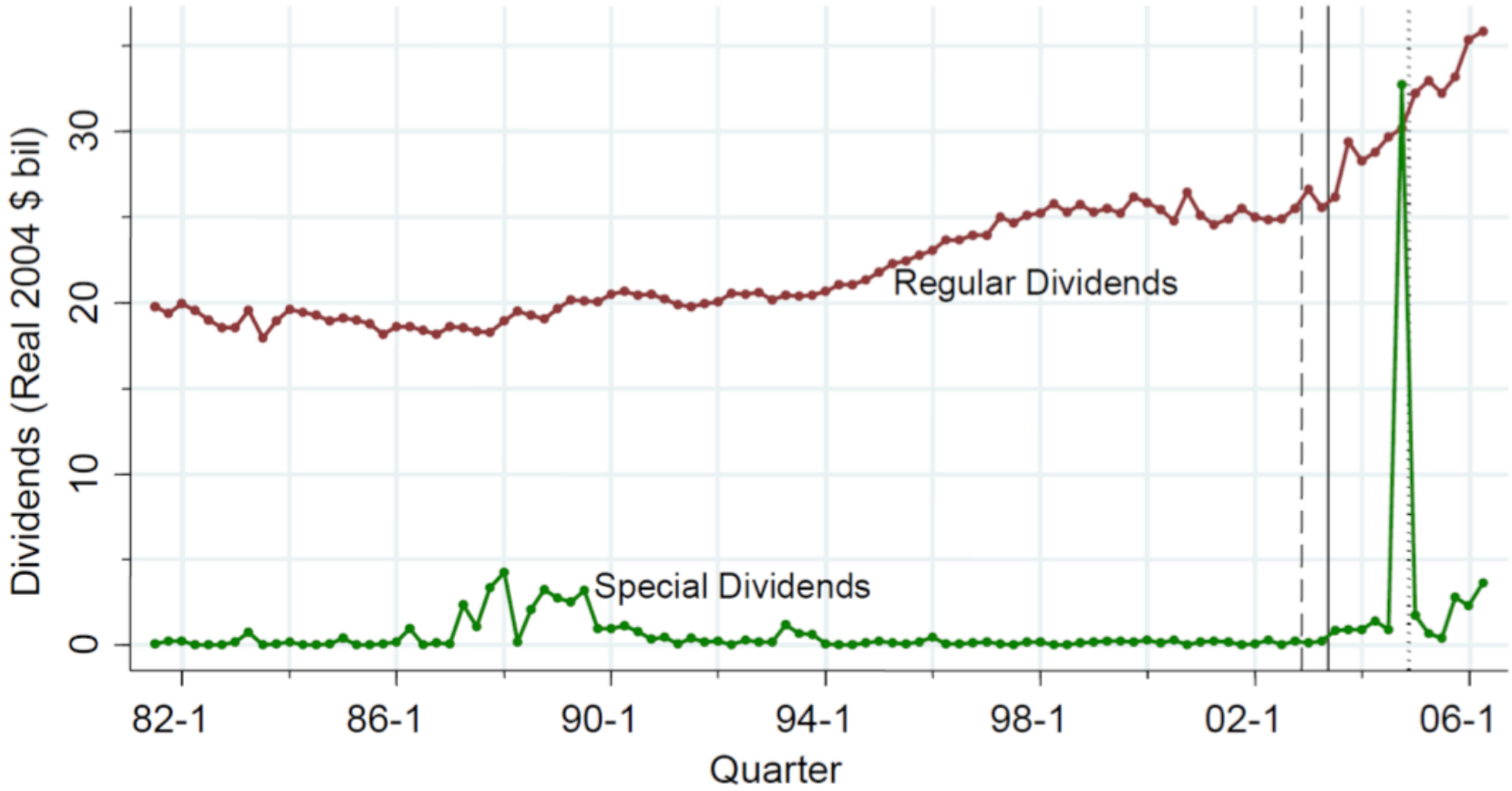
Source: Yagan

Chetty-Saez (2005)

- Analyze 2003 dividend tax cut: reduced top τ^{DIV} from 38.6% to 15%
- Design:
  - Basic effect: single diff in aggregate time series (only possible because dividend initiations are high-frequency outcome, unlike investment)
  - Mechanisms: DD across firms
- Results:
  - No ringing endorsement of either traditional or new view
  - But suggests that agency considerations (imperfect monitoring of managers by owners) matter

Source: Yagan

Effect of 2003 dividend tax cut on dividend payouts

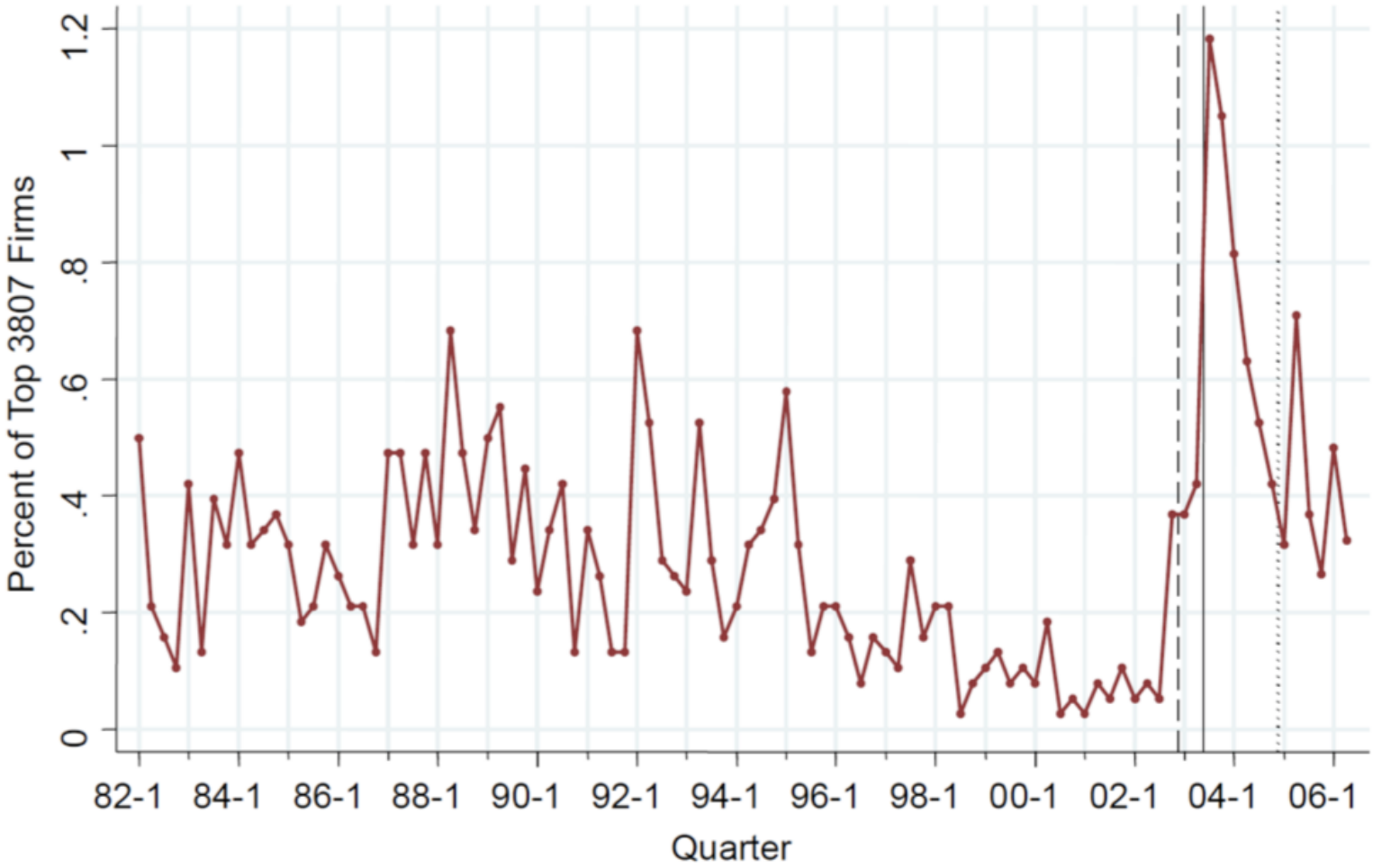


Source: Chetty-Saez (2005), updated through 2006

Source: Chetty-Saez (2005), updated through 2006

Source: Yagan

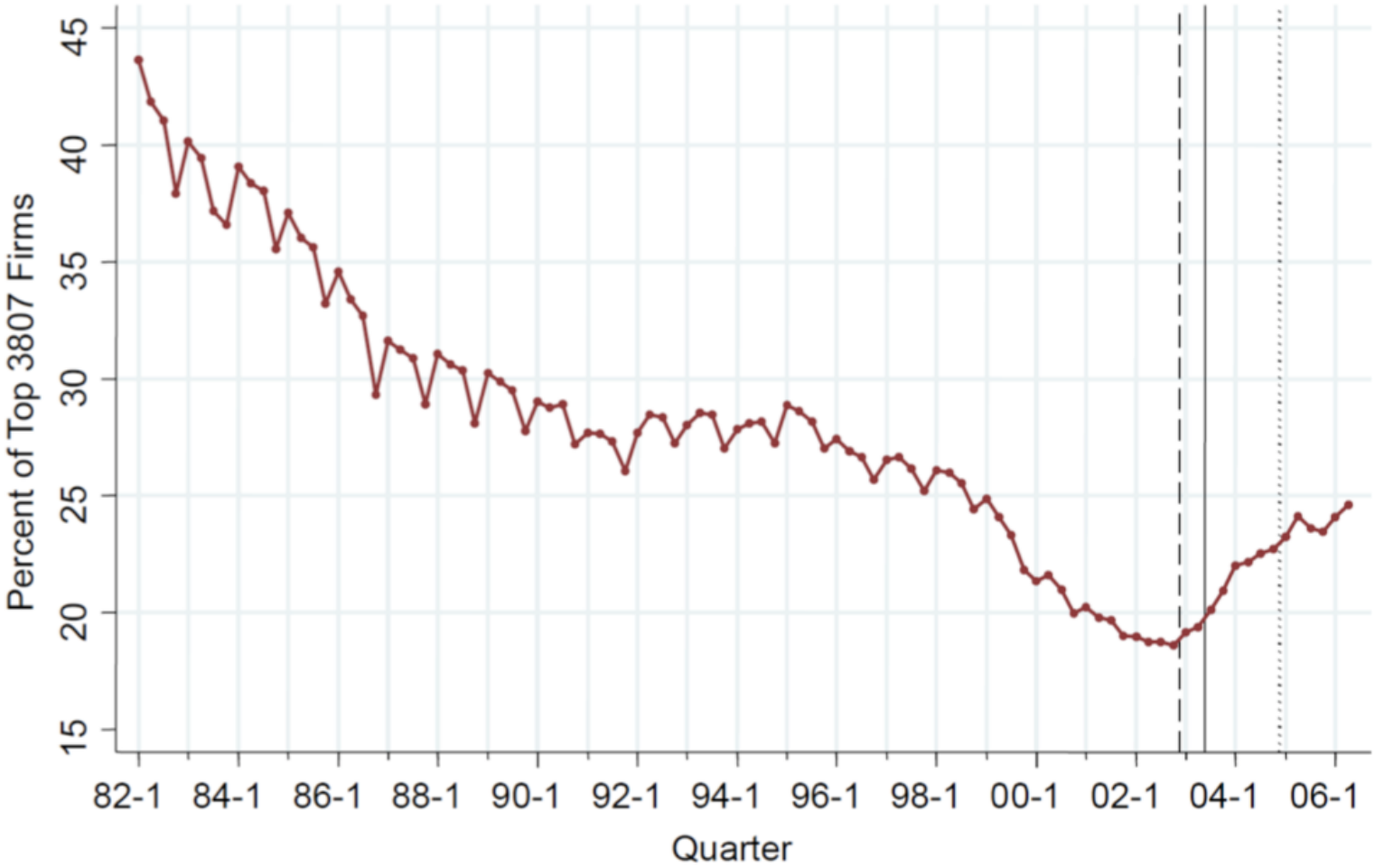
Effect of '03 div. tax cut on initiations of regular dividends



Source: Chetty-Saez (2005), updated through 2006

Source: Yagan

Effect of 2003 dividend tax cut on dividend-paying fraction

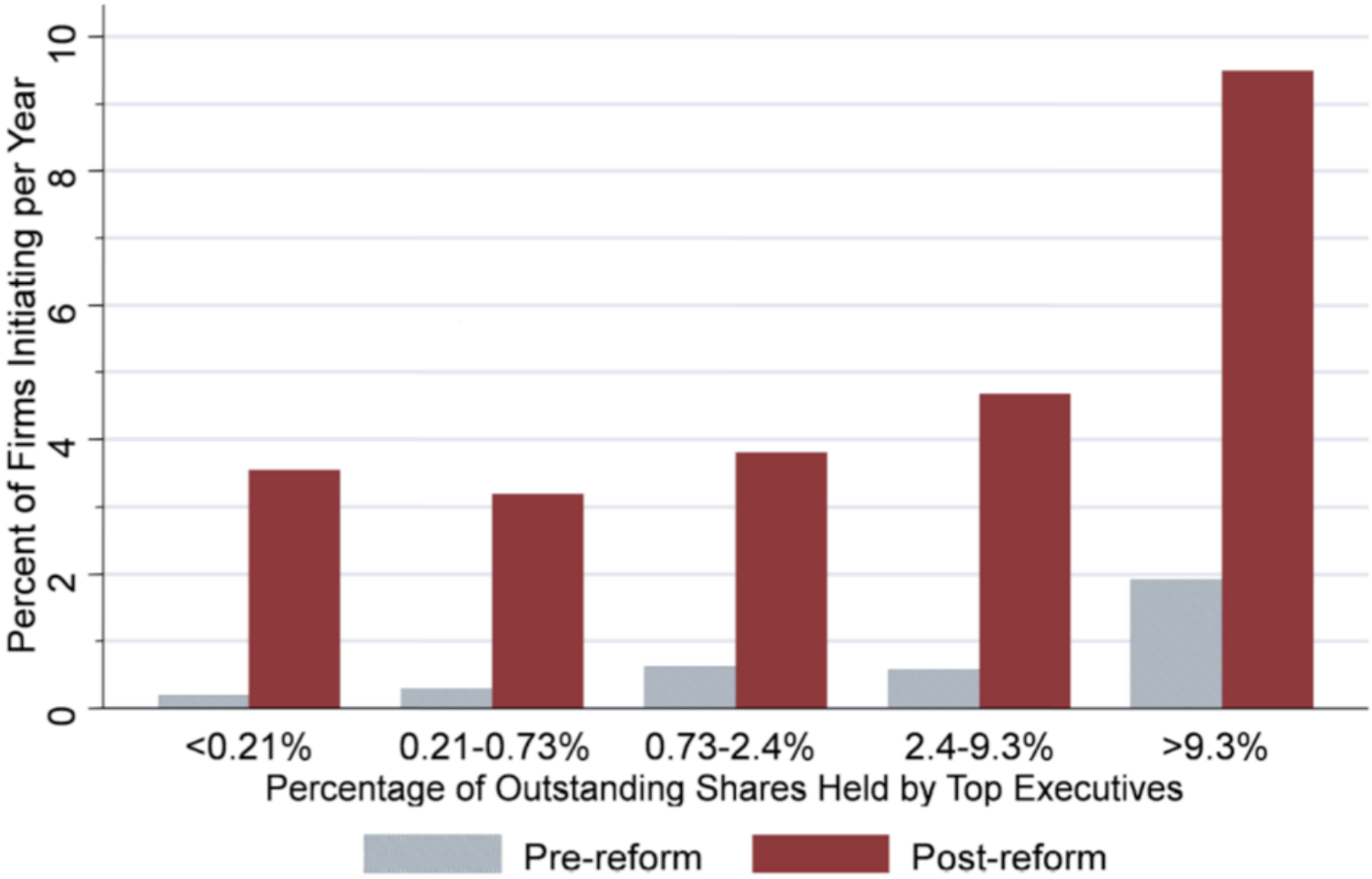


Source: Chetty-Saez (2005), updated through 2006

Source: Chetty-Saez (2005), updated through 2006

Source: Yagan

Heterogeneity suggestive of agency problems



Source: Chetty-Saez (2005)

Source: Yagan

Yagan (AER, 2015)

- Chetty-Saez results consistent with positive, negative, or zero effect on investment
- Key challenge for identifying investment effects: must control for business cycle
- Design:
  - DD between C-corporations (directly affected by 2003 dividend tax cut) and S-corporations (not directly affected because never subject to dividend taxation)
- Results:
  - Zero effect that rejects basic traditional view
  - Alternative dividend tax cuts unlikely to have substantially larger effects (either new view is largely correct, or traditional view channels are inoperative in practice)

Source: Yagan (AER, 2015)

Must control for business cycle

Source: Yagan (2015)

Source: Yagan (AER, 2015)

Yagan (AER, 2015)

- After incorporating, a corporation elects either C or S tax status

	Tax rate on annual income	Tax rate on dividends
C-corporations (treatment)	35%	15%
S-corporations (control)	35%	0%

- S-corporations: $<$ 100 non-institutional investors, one stock class
- Operate in same narrow industries and at the same scale throughout United States $\rightarrow$ common trends

Source: Yagan (AER, 2015)

Example: Retail hardware chains

- Largest hardware chain
- C-corporation

- Third-largest hardware chain
- S-corporation

Source: Yagan (2015)

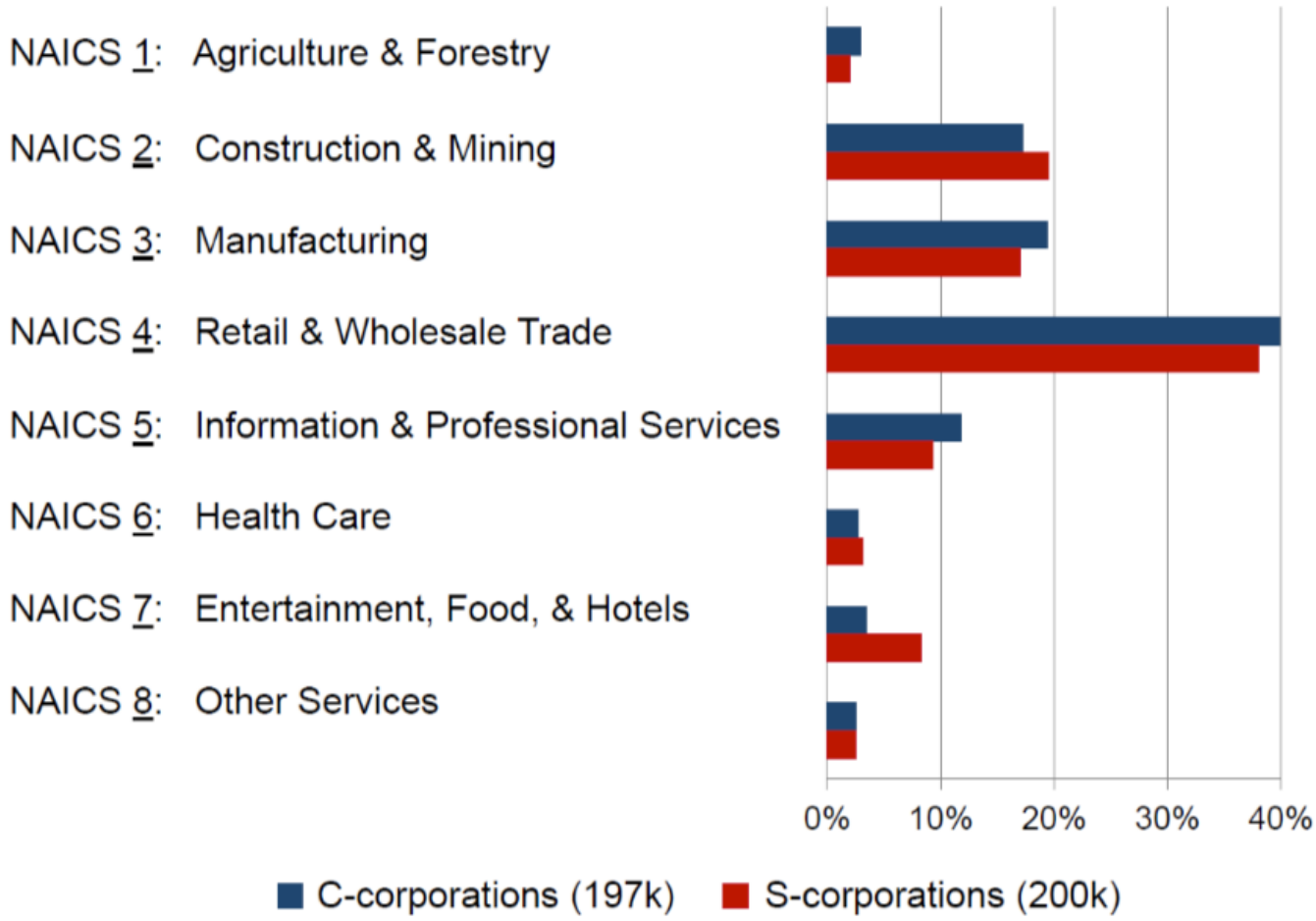
Source: Yagan (AER, 2015)

Example: Retail hardware chains

Source: Yagan (2015)

Source: Yagan (AER, 2015)

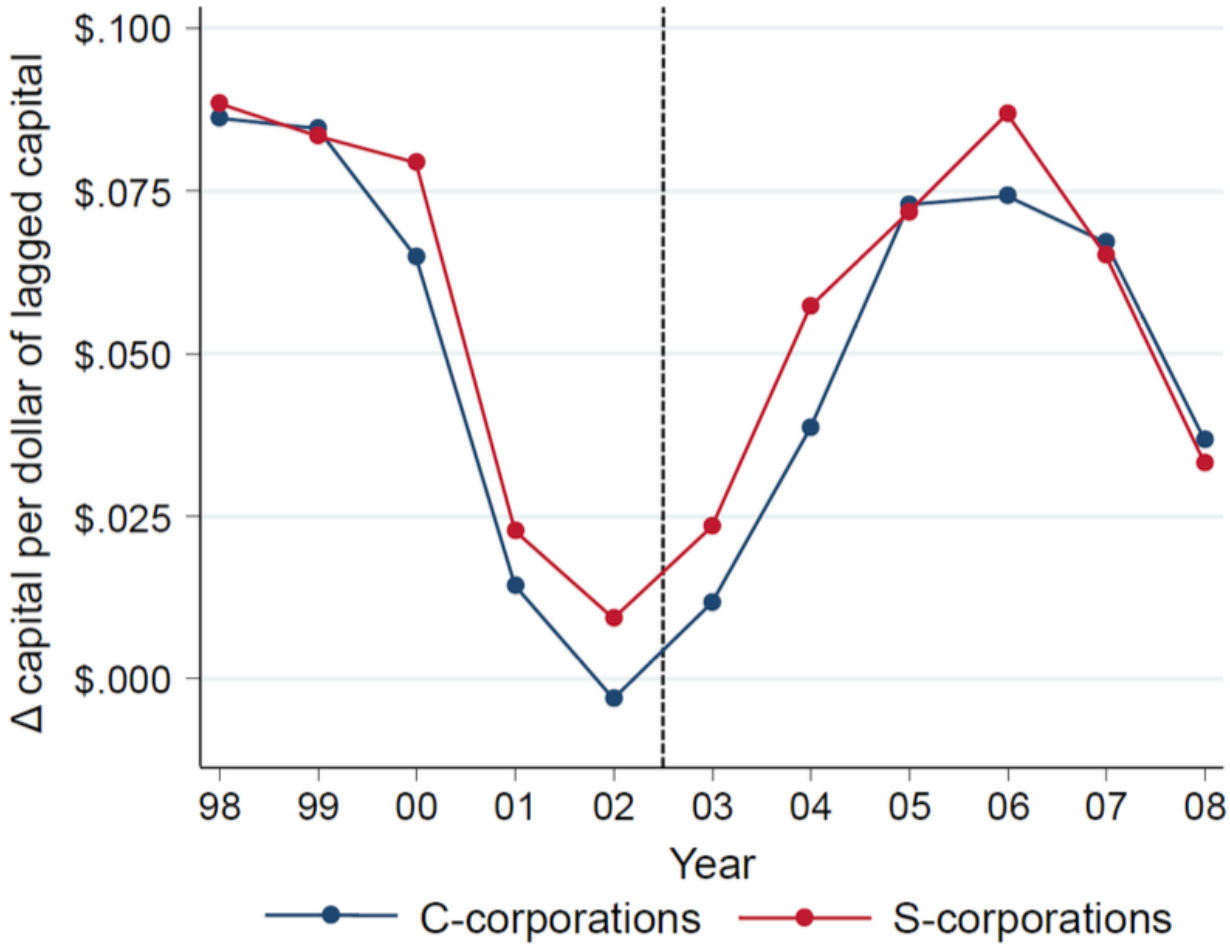
Balanced across industries and size in $1m-$1bn size range



Source: Yagan (2015)

Source: Yagan (AER, 2015)

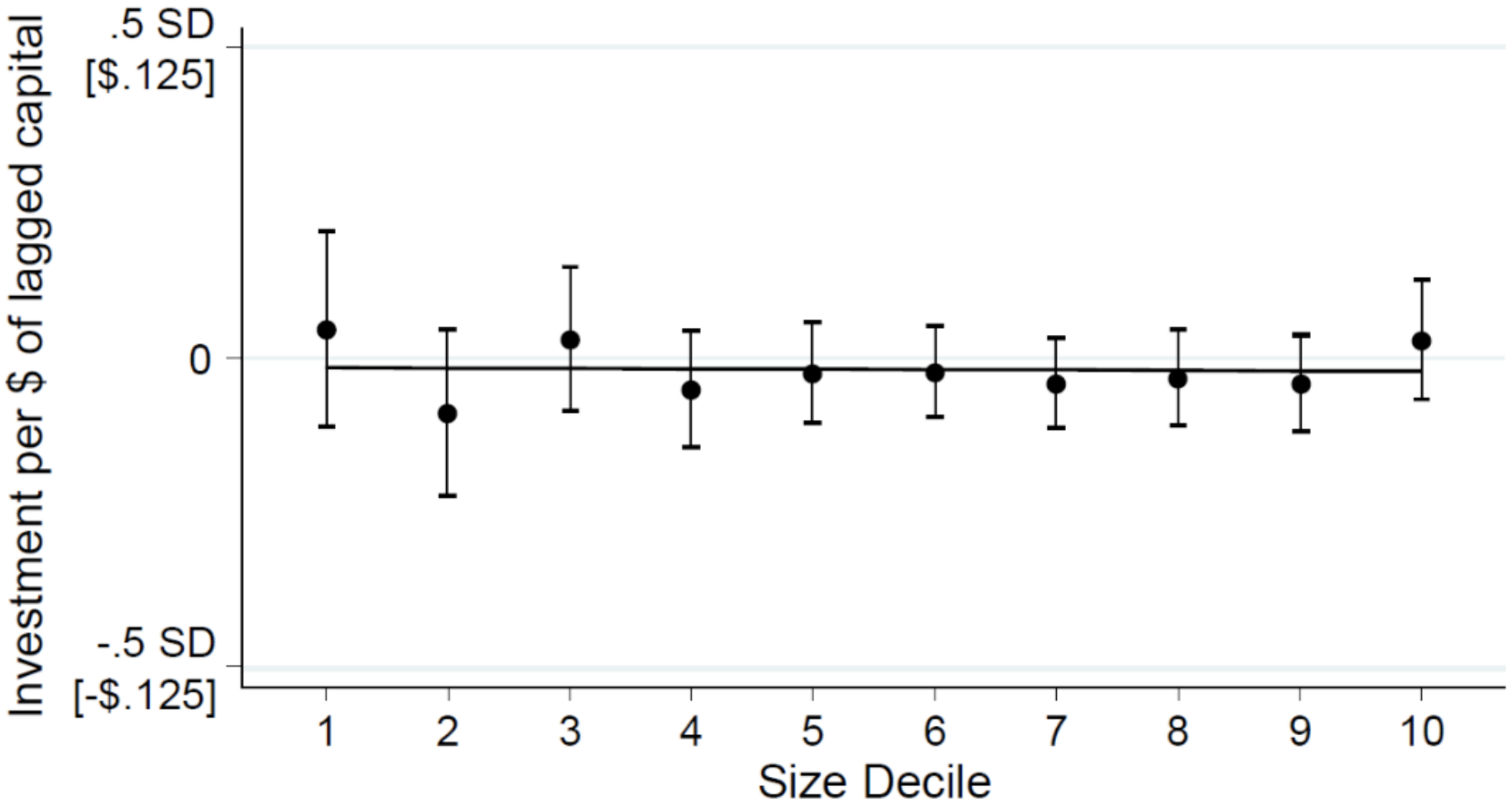
Zero effects on investment and employee compensation



Source: Yagan (2015)

Source: Yagan (AER, 2015)

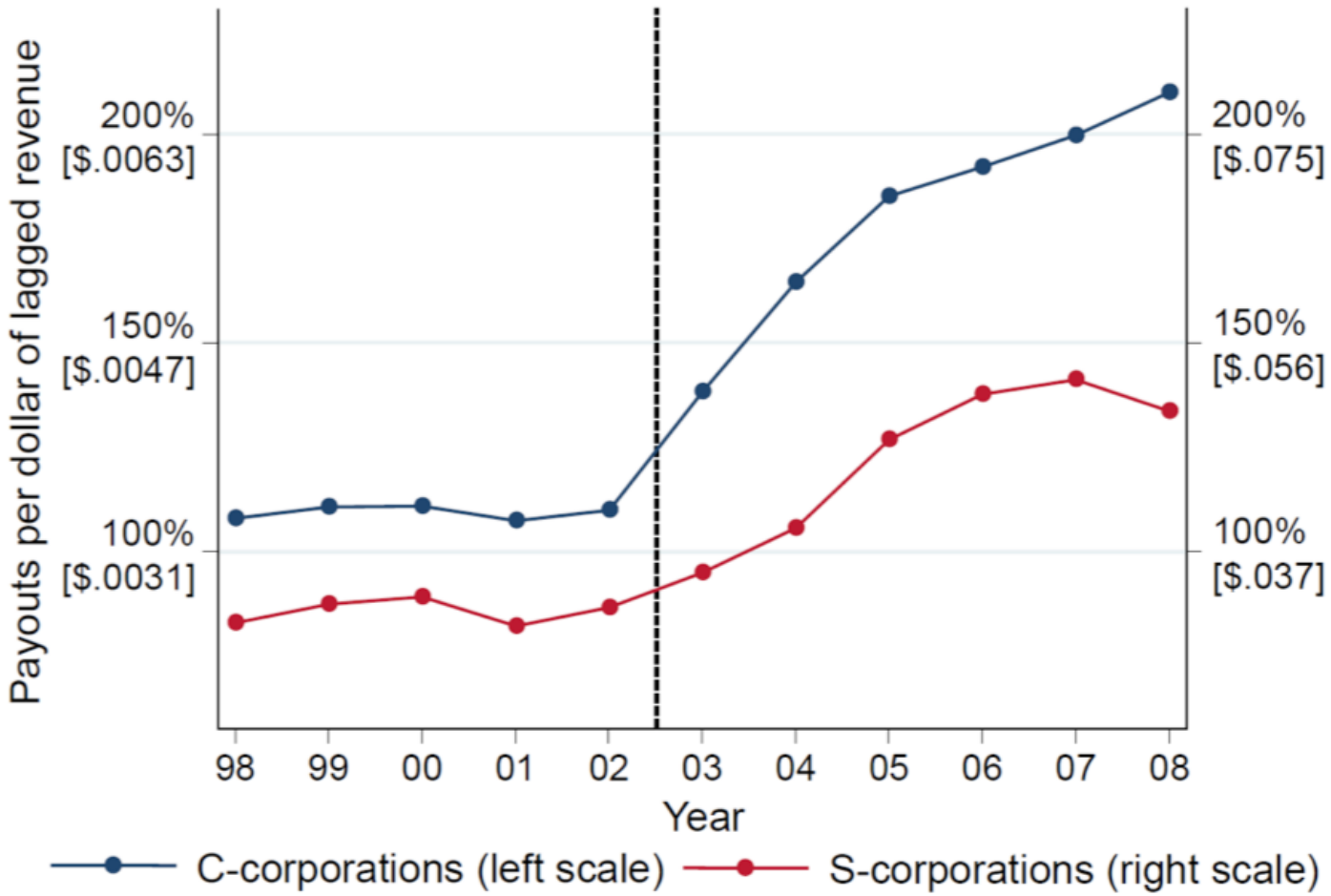
Effects constant across firm size distribution



Source: Yagan (2015)

Source: Yagan (AER, 2015)

Immediate financial response confirms relevance/salience



Source: Yagan (2015)

Source: Yagan (AER, 2015)

Yagan (AER, 2015)

- Net-of-dividend tax elasticity of investment: 0.00, with 0.08 95% confidence upper bound
- Traditional view prediction: $[0.21, 0.41]$ depending on cost-of-capital elasticity of investment (based on Hassett-Hubbard consensus range)

Source: Yagan (AER, 2015)

Yagan (AER, 2015)

- One explanation: New view is correct and most firms fund marginal investments out of retained earnings (e.g. median firm is 22 years old) $\rightarrow$ perhaps sizeable effect in very long-run when Facebook/Twitter take over U.S. production

- Alternative: Traditional view is technically correct, but tax code features blocked effects
  - Ex: Low expected permanence (originally set to expire in 2009)
  - But most investment is in short-lived assets (so six years is effectively forever)
  - And governments never commit to long-run path for tax policy: dividend tax cut has largely outlasted many "permanent" reforms, and four of the G-7 countries have substantially changed their dividend tax rates in last 10 years

Source: Yagan (AER, 2015)

Outline

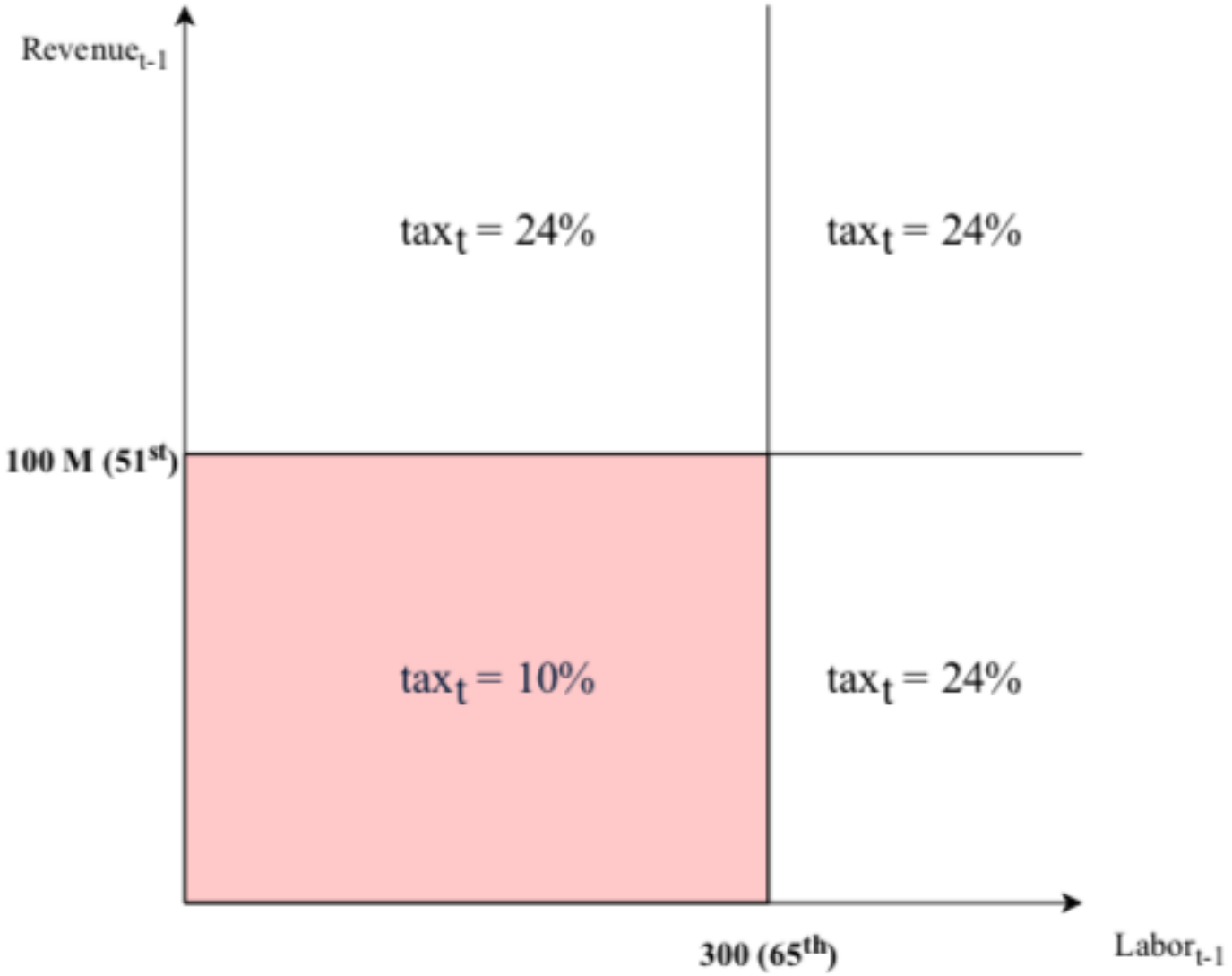
1. User Cost
   - Impact of TCJA (Barro Furman, BPEA 2018)
2. Corporate Finance and Investment Incentives
3. Payout Policy: Dividend Taxation
4. Payout Policy: Capital Gains Taxation
5. APPENDIX: Payout model and Old vs New View

Capital Gains Taxes and Real Corporate Investment

Moon (2018)

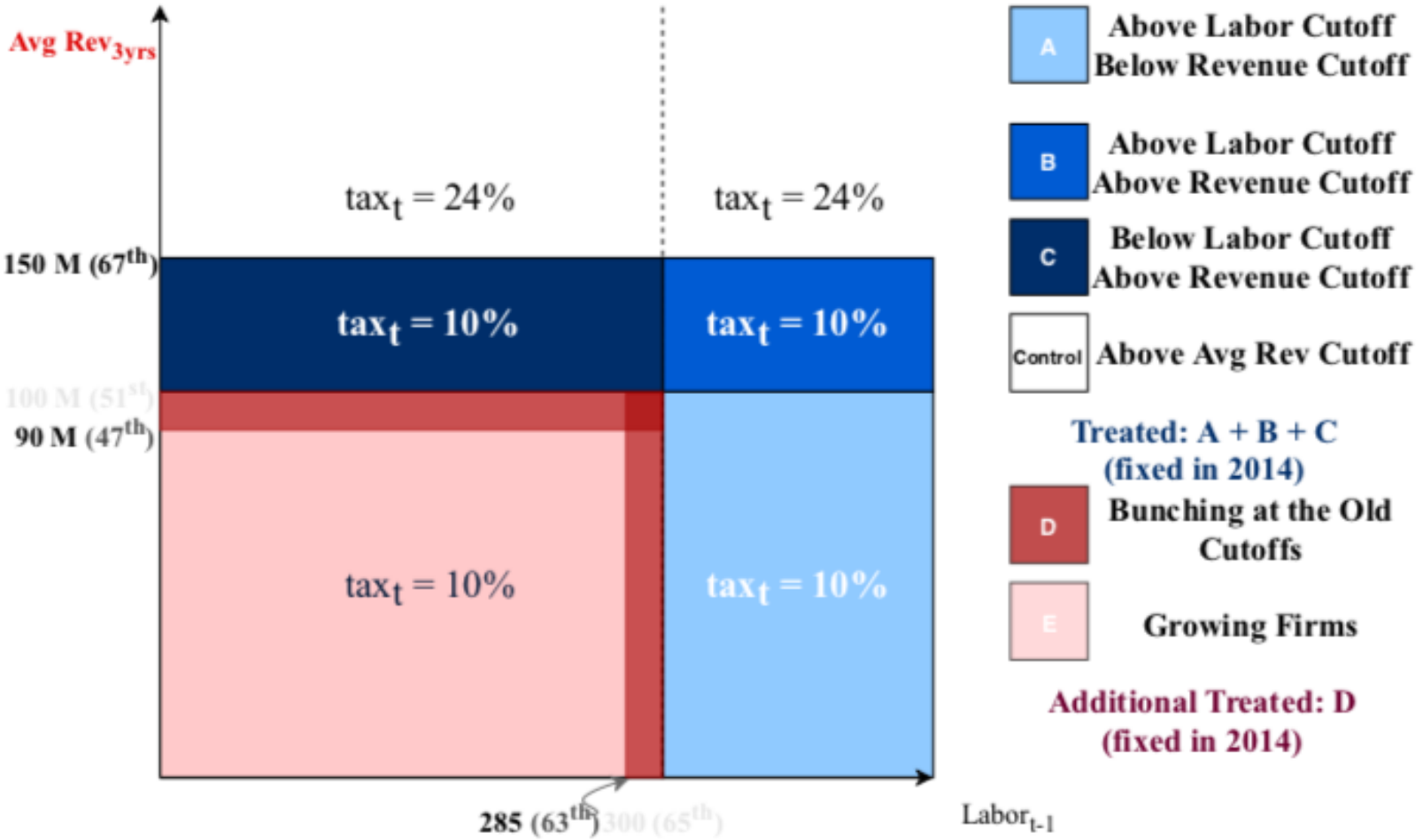
- Question: What is the effect of capital tax cuts on firm investment and stock prices?
- Data: South Korean pubilc and private firms
- Design: firm size specific capital gains tax cut from 24% to 10%
- Outcomes: Investment, Stock Prices, Equity Issuance

Moon (2018)



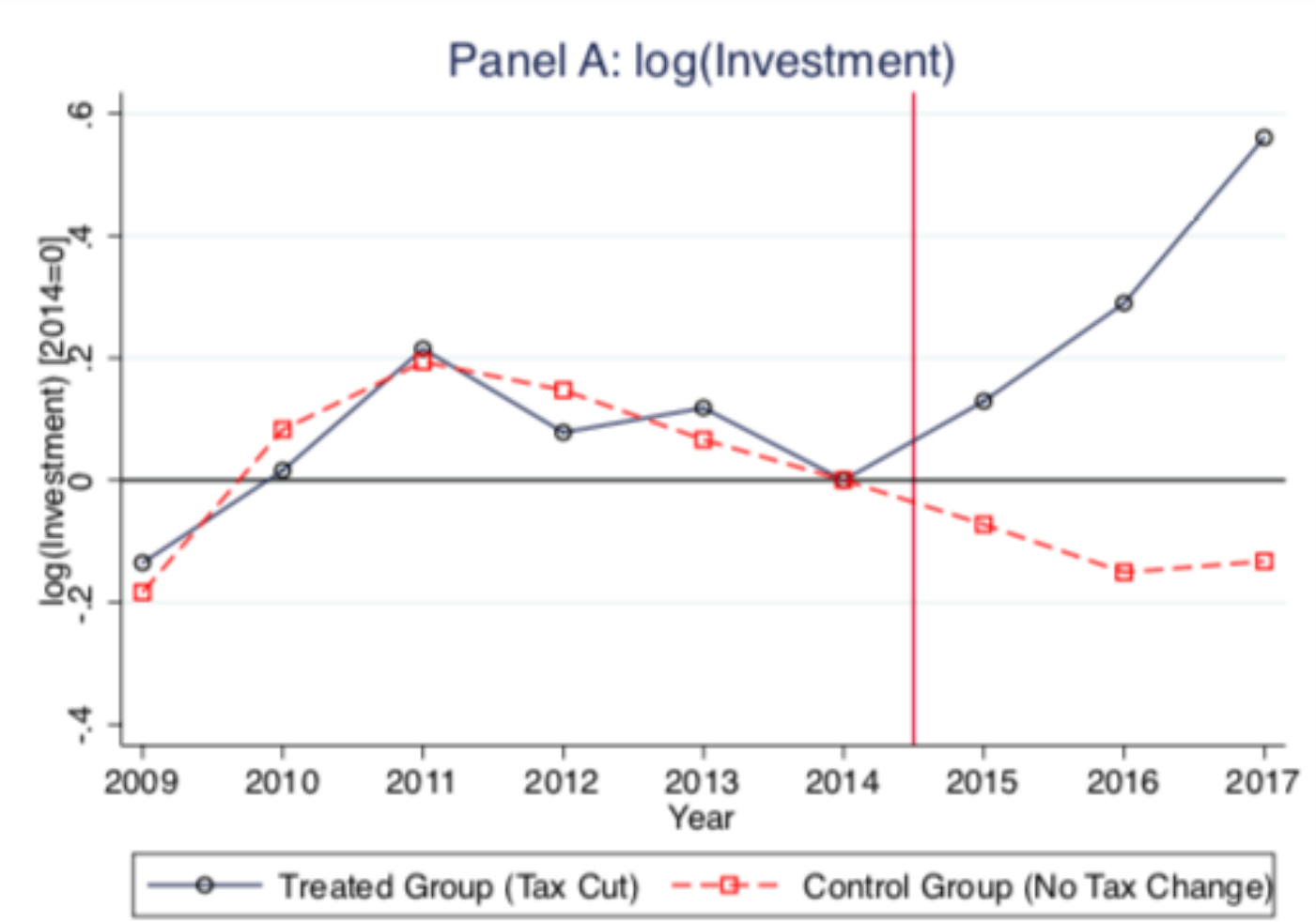
Source: Moon (2018)

Moon (2018)



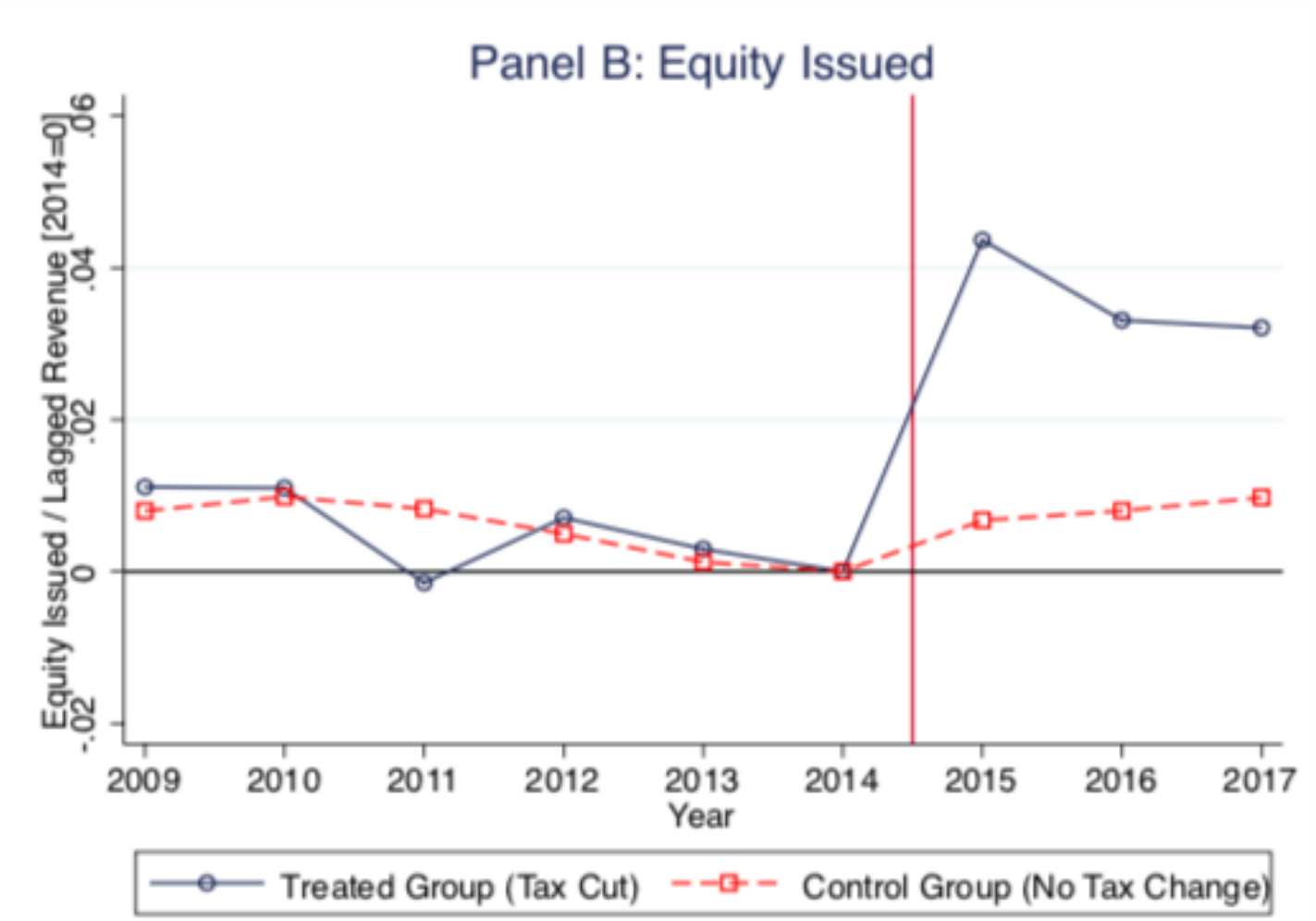
Source: Moon (2018)

Moon (2018)



Source: Moon (2018)

Moon (2018)



Source: Moon (2018)

Moon (2018)

Figure 6: Tax Effects on *ln*(Investment) by Cash Constraints

Source: Moon (2018)

Moon (2018)

Table 3: Results on Investment (Publicly Listed and Private Firms)

	Listed and Private Firms	Listed Firms	Private Firms
	(1)	(2)	(3)
	ln(CAPEX)	ln(CAPEX)	ln(CAPEX)
Treated x Post	0.356***	0.511***	0.239***
	(0.068)	(0.110)	(0.087)
Basic Control	Yes	Yes	Yes
Profit Quintile x Time FE	Yes	Yes	Yes
Time and Firm FE	Yes	Yes	Yes
Pre-reform Treated Mean	14.140	14.525	13.992
Implied Elasticity wrt (1-tau)	1.93	2.77	1.30
R-squared	0.72	0.68	0.73
Observations (firm-years)	12496	4732	7764
Clusters (firms)	1477	541	936

Notes: This table reports the tax effects on investment based on specification (8). The dummy for $Treated_i$ equals 1 if a firm i had a tax reduction of 14 percentage points, as explained in Section 4. The dummy for $post_t$ equals 1 if the time period is after the end of the reform year (2014). Investment is defined as log of expenditures on physical capital assets. Basic controls are quartics in firm age and industry dummies interacted with time dummies. Additional controls are dummies for pre-reform (2014) operating profit quintile interacted with time dummies. The main outcomes are winsorized at the ninety-ninth level. Each time period is a year, and the sample period is from 2009 to 2017. The reform was announced in the middle of 2014 and implemented by the end of 2014. The sample includes both publicly listed companies and

How big should these effects be?

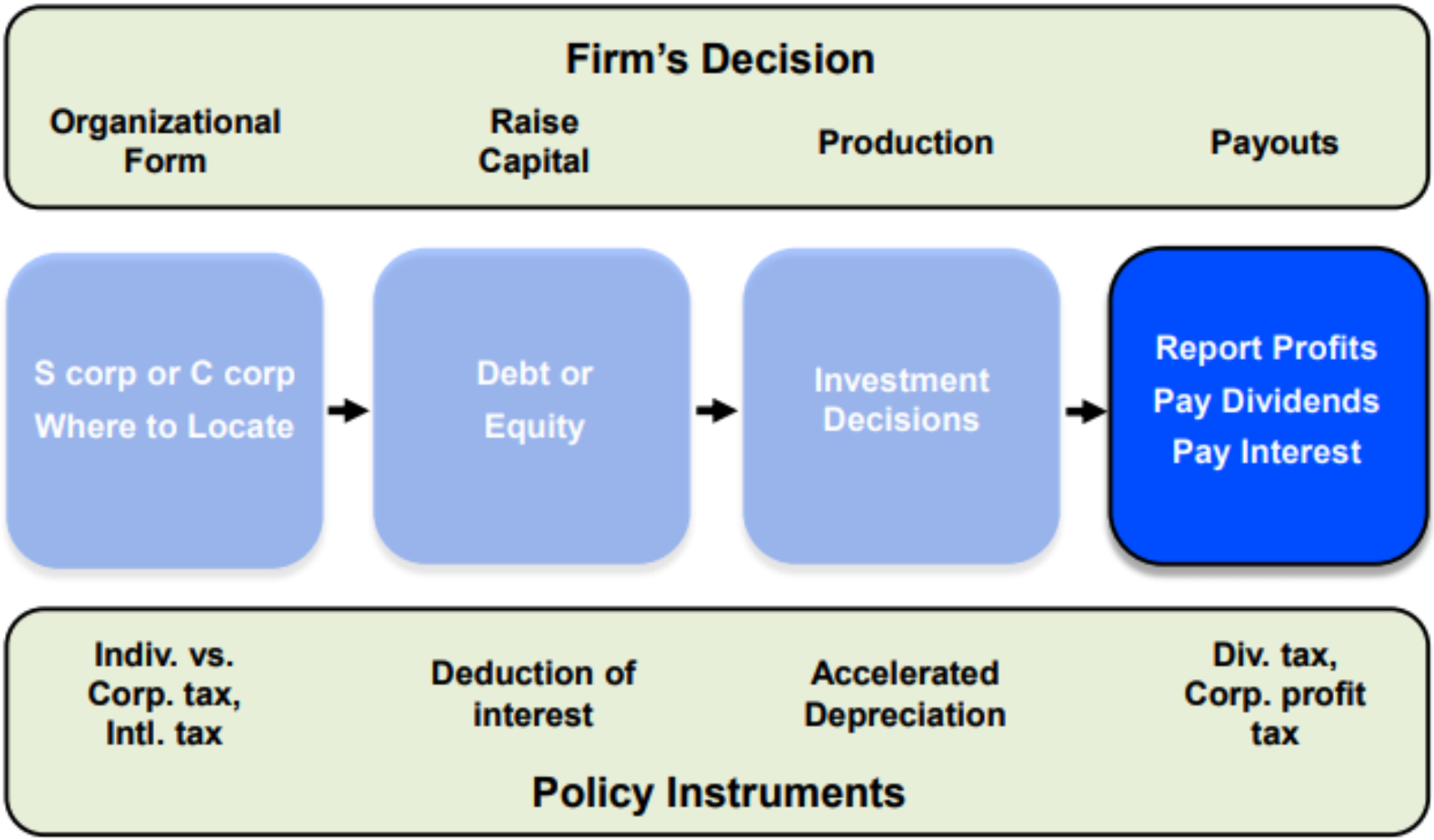
Important to think hard about magnitude of estimated effects

- See appendix B.4 of Moon (2018)

Outline

1. User Cost
   - Impact of TCJA (Barro Furman, BPEA 2018)
2. Corporate Finance and Investment Incentives
3. Payout Policy: Dividend Taxation
4. Payout Policy: Capital Gains Taxation
5. APPENDIX: Payout model and Old vs New View

Corporate Decisions and Tax Policies



Neoclassical Model of Firm Behavior

- Structure analysis using stylized two period model of firm behavior (Chetty and Saez 2010)
- Results generalize to continuous time model (Auerbach 2001)
- Firm has cash holdings of X at $t = 0$
- Can raise more funds by issuing equity E, so total cash is: $X + E$
- Chooses level of investment, I, with concave payoff $F(I)$ at $t = 1$

Neoclassical Model of Firm Behavior

- Pays out remaining cash as a dividend in period 0 :

$$D = X + E - I$$

  - Rule out share repurchases for now, return to this below

- Tax τ_d levied on dividend payments in all periods
- Tax τ_c on corporate profits
- Investors can also purchase a govt. bond that pays fixed rate r

Neoclassical Model: Manager's Objective

- Manager maximizes value of the firm:

$$\max_{E,D} V = (1-\tau_d)D - E + \frac{(1-\tau_d)[(1-\tau_c)f(X+E-D)+X-D]+E}{1+r}$$

  where $f(I) = F(I) - I$ denotes net profit from investing I

- No tax benchmark: invest up to point where $f'(I) = r$

- To characterize behavior with taxes, divide firms into two types:

  - 1. Cash-Rich [new view]: X s.t. $(1-\tau_c)f'(X) < r$
  - 2. Cash-Constrained [old view]: X s.t. $(1-\tau_c)f'(X) > r$

Cash-Rich Firms: "New View"

- Marginal value of issuing equity is negative for cash rich firm (e.g., Microsoft)
    - Even pre-tax return on investment is below interest rate
- Therefore $E = 0$ and firm splits cash between D and I according to:

$$(1 - \tau_c) f'(X - D) = r$$

- Invest to point where after-tax marginal product $(1 - \tau_c) f'(I)$ equals bond return r
- Higher corporate tax rate lowers investment

Cash-Rich Firms: "New View"

- Change in dividend tax rate has no effect on dividend or investment behavior (Auerbach 1979, Bradford 1981, King 1977)
  - τ_d factors out of V b/c investment financed from retained earnings
- \$1 of investment + dividend tomorrow yields $(1-\tau_d)(1-\tau_c)f'(I)$
- \$1 of dividend yields $(1-\tau_d)$ today
- Relative price of investment tomorrow vs. today unaffected by τ_d

Cash-Constrained Firms: "Old View"

- Marginal value of paying dividends is negative for cash-constrained firm (e.g., Twitter)
  - Pre-tax return on investment is above interest rate r
- Therefore $D = 0$ and $I = X + E$. Optimal equity issue E satisfies:

$$(1 - \tau_d)(1 - \tau_c)f'(X + E) = r$$

- Invest to point where marginal net-of-tax return $(1 - \tau_d)(1 - \tau_c)f'(I)$ equals interest rate

Cash-Constrained Firms: "Old View"

- Key result: E, I fall with both τ_d and τ_c
- Dividend tax cuts stimulate equity issues and investment, and dividend payout in period 1 (Poterba and Summers 1985)
- τ_d does not factor out of value function because marginal investment is financed from external capital

Efficiency Analysis: Neoclassical Model

- Denote total dividend payout over 2 years by

$$P_d = D + [(1 - \tau_c)f(I) + X - D]/(1 + r)$$

- Total surplus in the economy is firm value plus tax revenue is

$$W = V + \tau_d P_d$$

- Using envelope theorem (manager optimization), deadweight cost is

$$\frac{dW}{d\tau_d} = -P_d + P_d + \tau_d \frac{dP_d}{d\tau_d} = -\frac{\tau_D}{1 - \tau_D} \cdot \epsilon_{P_d} \cdot P_d$$

Efficiency Analysis: Neoclassical Model

- Under old view, $\epsilon_{P_d} > 0$, so dividend taxes reduce efficiency
- New view: Dividend tax has no efficiency cost and simply takes money from wealthy shareholders, which may be desirable for redistribution
- Old view and new view concur that taxes on corporate profits are distortionary
- Sinn (1991): lifecycle view. Old view applies to young firms (entrants) while new view applies to mature firms
- Distinguishing between competing views important for policy

Empirical Evidence on Dividend Taxation

- Several studies examine effects of tax cuts on dividend payouts to test between old view and new view
  - Poterba and Summers (1985) find a positive link between div payout ratio and $(1 - \tau_d)$ in U.K. time series
  - Poterba (2004) reports time series evidence in the U.S.
  - Mixed results from studies of Tax Reform Act of 1986