Lecture 12: Corporate taxation

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Firms in tax policy

- **Firms are ubiquitous in tax debate**
  - e.g., "taxes harm business"
  - e.g., "corporations should pay their fair share"
- **Firms are largely absent of tax theory**
  - Firms are just mechanical vehicles to combine inputs into outputs (Diamond and Mirrlees, 1971)
- **Firms remit most taxes**
  - 90% of taxes are remitted by firms in OECD countries (OECD, 2017)
  - Optimal taxation should depend on enforcement structure (Kopczuk and Slemrod, AER 2006)
- **Extreme equity-efficiency trade-off**
  - Equities highly concentrated in top incomes
  - Investment decisions matter highly for growth

Opposite views in the debate

1. **Corporate taxes as tax on top incomes**
   - Equities highly concentrated in top incomes/top wealth
   - CIT to reduce tax avoidance on income tax
   - Dramatic increase in inequality fueled by untaxed corporate profit
2. **Corporate taxes as inefficient tax on labour**
   - CIT largely shifted to workers
   - CIT hinders investment hence growth
   - Cutting CIT is efficient and benefit large shares of the population

Firm taxation

1. **Taxes on individual payout**
   - Income tax on dividends, interest income
   - Capital gains tax
2. **Taxes on firms' profits**
   - Corporate income tax (CIT)
   - Income tax on non-incorporated firms
3. **International tax provisions**
   - Transfer pricing
   - Tax havens

Outline of the lecture

I. **Institutions**

1. What are corporations ?
2. Why corporate taxes ?
3. Typology of corporation taxes
4. Fiscal facts

II. **Incidence**

1. Shareholder approach
2. Closed economy : Harberger model
3. Open economy case
4. Empirical evidence

Outline of the lecture

III. **Efficiency costs**

1. Investment decisions
2. Payouts decisions
3. Elasticity of corporate taxable income

IV. **Policies**

1. Research tax credits
2. Tax base reforms
3. How to avoid race to the bottom ?

I. Institutions

1. What are corporations ?
2. Why tax firms ?
3. Typology of corporate taxation
4. Trends in firm taxation

What are corporations ?

- **Definition**
  - A *corporation* is a legal entity separate from the persons that form it
  - Owners of a corporation are called *shareholders*
- **Corporate firms : limited liability**
  - Shareholders are not required to use their personal assets to pay the debt of a failed company
  - They can only lose the amount they have invested

  $\Rightarrow$ Corporate firms subjected to corporate tax
- **Non corporate firms**
  - Liability for non corporated firms is linked to firm's owners i.e., liable for any outstanding debt on their personal wealth

  $\Rightarrow$ Non-corporate firms subjected to personal income tax

Why have corporation tax ?

1. **Corporation tax as a benefit tax**
   - Limited liability status as major benefit
   - State insurance for 'too big to fail'
   - Other benefits (infrastructure, education, etc.)
2. **Backstop for personal income taxation**
   - In order to escape income taxation, individuals could accumulate earnings tax-free within the corporation
   - Similar problem with capital gains
   - Corporate taxation is a way to limit income tax avoidance
3. **Taxation of pure profit or rents**
   - Returns that exceed the return to both labour and capital e.g., rent from extracting oil
   - Pure profit taxation does not distort investment decisions
   - Hence low efficiency cost of taxing rents

Corporate income tax (CIT)

- **CIT schedule**
  - Statutory corporation tax rate τ_{cit}
  - Corporate tax base Y = [Revenues - Expenses]

$$CIT = \tau_{cit} Y - ITC - RTC$$

  - Revenues are sales of goods and services
- **Investment tax credit (ITC)**
  - A tax credit amounting to a percentage of the firm's qualified investment expenditures
  - Equivalent to accelerated depreciation
- **Research tax credit (RTC)**
  - RTC is based on R&D spending, and can lead to negative CIT (i.e., subsidy to R&D)

CIT tax base : expenses

1. **Current costs** C
   - compensation to employees
   - intermediate inputs
2. **Depreciation costs,** Dep
   - Economic depreciation : capital investments lose value over time
   - Depreciation allowances are legally specified in CIT
     e.g., 5 years depreciation for computers
     e.g., 30 years for building
3. **Financing costs (return on capital)**
   - Interest payments, I
   - Opportunity cost of equity, OCE

Corporate income tax systems

- Three dimensions of corporation taxes
  1. Income included in the tax base
  2. Location of the tax base
  3. Relationship with personal income taxation

Corporate income tax systems

Income included in the tax base

1. **Full return to equity**
   - Tax base includes equity finance

$$Y = R - (C + Dep + I)$$

2. **Full return to capital**
   - Debt is treated like equity finance and not deducted

$$Y = R - (C + Dep)$$

3. **Economic rent**
   - Both debt and equity finance are deducted

$$Y = R - (C + Dep + I + OCE)$$

Corporate income tax systems

Location of the tax base

1. **Source-based taxation**
   - Tax base = corporate income earned in the country where productive activity takes place
   - 'Tax on investment'
2. **Residence-based taxation (corporate shareholders)**
   - Tax base = corporate income earned in the residence country of the corporate headquarters or the residence of shareowners
   - 'Tax on savings'
3. **Destination-based taxation**
   - Tax base = corporate income earned in the country where the goods and services are consumed

Corporate income tax systems

Relationship with personal income

1. **Classical system**
   - Tax liability of companies completely separated from tax liabilities of individual shareholders
   - No relief for distributed profits (dividends)
   - *"Double taxation" of dividends* : once through the corporation tax, once as income of the shareholders
2. **Imputation system**
   - Shareholders receive credits for the corporation tax paid on distributed profit.
   - "Full imputation" means all the domestic corporation tax paid on distributed profits is credited to shareholders

Corporate income tax systems

TABLE 1: Classical vs imputation system

	Classical	**Imputation**
Corporation		
Profits before tax	€1000	€1000
CIT 30%	€300	€300
Profits after tax	€700	€700
Shareholder		
Dividend income	€700	€700
Imputed CIT	-	€300
Taxable income	€700	€1000
Income tax 40%	€280	€400
Tax credit for CIT	-	€300
Net income	€420	€600
Total tax paid	€580	€400

TABLE 2: Characterizing corporate income tax systems

Location of tax base	Type of income subject to business tax		
	Full return to equity	Full return to capital	Rent
Source country	1. Conventional CIT with exemption of foreign source income	4. Dual income tax 5. Comprehensive Business income tax	6. CIT with Allowance for corporate equity 7. Source-based cash flow tax
Residence country of corporate head office	2. Residence-based CIT with credit for foreign tax		
Residence country of personal shareholder	3. Residence-based shareholder tax		
Destination country of final consumption			8. Full destination-based cash flow tax 9. VAT-type destination-based cash flow tax

Source : Devereux and Sørensen (2006), Tab. 1, p. 24.

Trends in corporate taxation

Trend 1 : Decrease in statutory corporate tax rates

- **Large cuts in the 1980s**

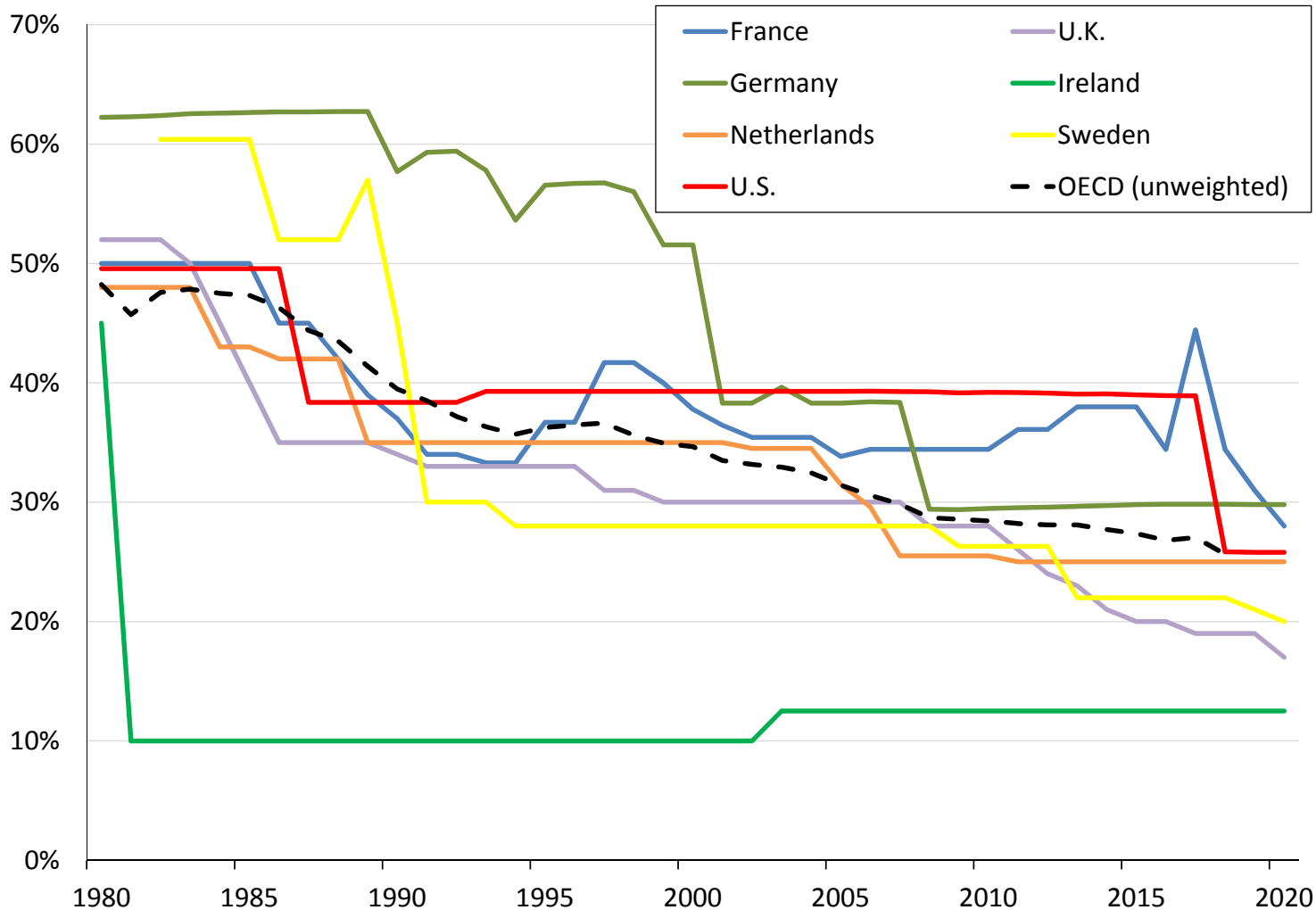
Ireland from 45% to 10% in 1981
U.K. from 50% to 35% in 1983-86
U.S. from 50% to 38% in 1986
Sweden from 57% to 30% in 1989-91

- **Recent cut in statutory CIT**

U.K. cut from 30% to 19% and planed cut to 17% (by 2020)
U.S. cut from 38.9% to 25.7% (Tax Cuts and Jobs Act, TCJA)
France planed cut from 33.3% to 25% by 2022
Sweden announced cut from 22% to 20%
Belgium announced cut from 29.6% to 25%

Trends in corporate taxation

FIGURE 1: Statutory rates in corporate tax



Source : Devereux, Griffith and Klemm (2002) ; OECD.stat from 2005 to 2018 ; planned changes up to 2020.

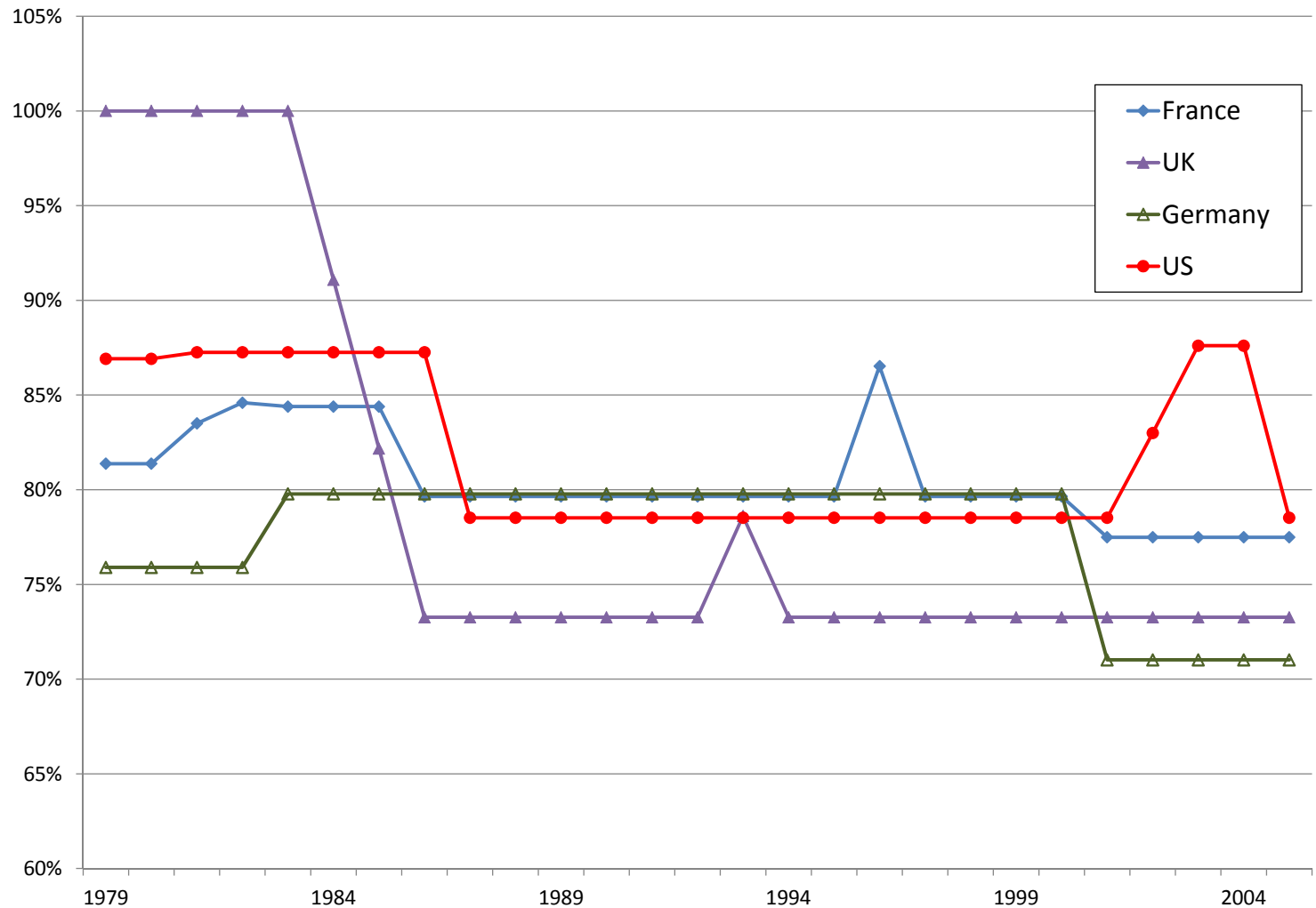
Trends in corporate taxation

Trend 2 : Decrease in depreciation allowances

- **Broadening of the tax base while reduction in rates**
  - Present discounted value (PDV) of allowances for investment reduced from 90-100% to 60-70%
  - In particular in the U.K. in the 1980s
- **Increase in R&D allowances**
  - Introduction of research tax credit (RTC)

Trends in corporate taxation

FIGURE 2: PDV of depreciation allowances



Source : Devereux, Griffith and Klemm (2002), updated 2005.

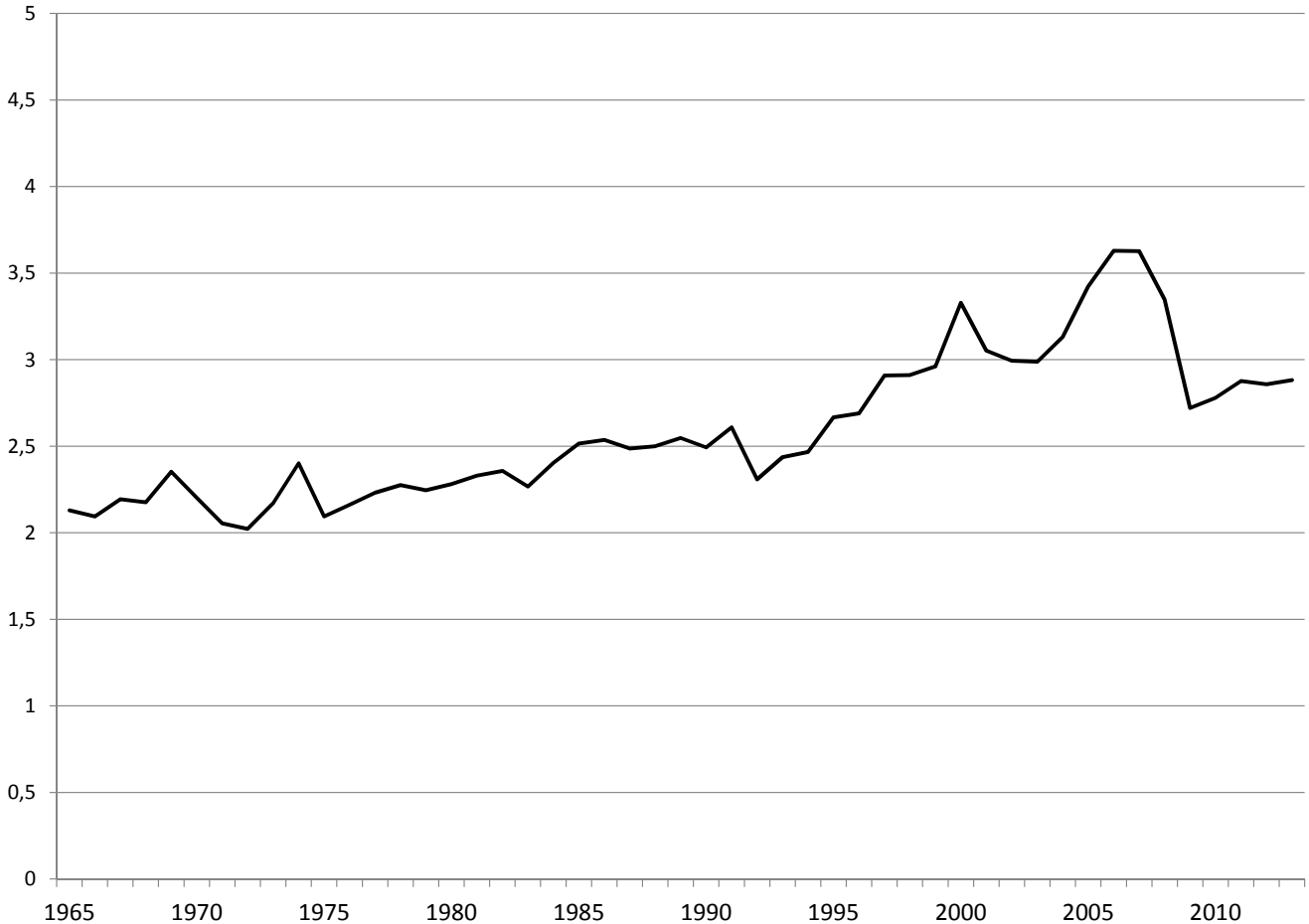
Trends in corporate taxation

Trend 3 : Little evidence of decrease in tax revenues

- **High volatility**
  - CIT represents between 1.5% to 3% of GDP
  - Corporation tax revenues have high volatility
  - Decrease during recession and increases during boom
- **Little decrease in tax revenues (except in the U.S.)**
  - Decrease in the U.S. during the 1960s and 1970s due to declined in profitability (Auerbach and Poterba, 1987)
  - No decrease in the U.K. with increased profitability (financial sector)
  - Little decrease in the E.U. (Devereux and Sørensen, 2006)

Trends in corporate taxation

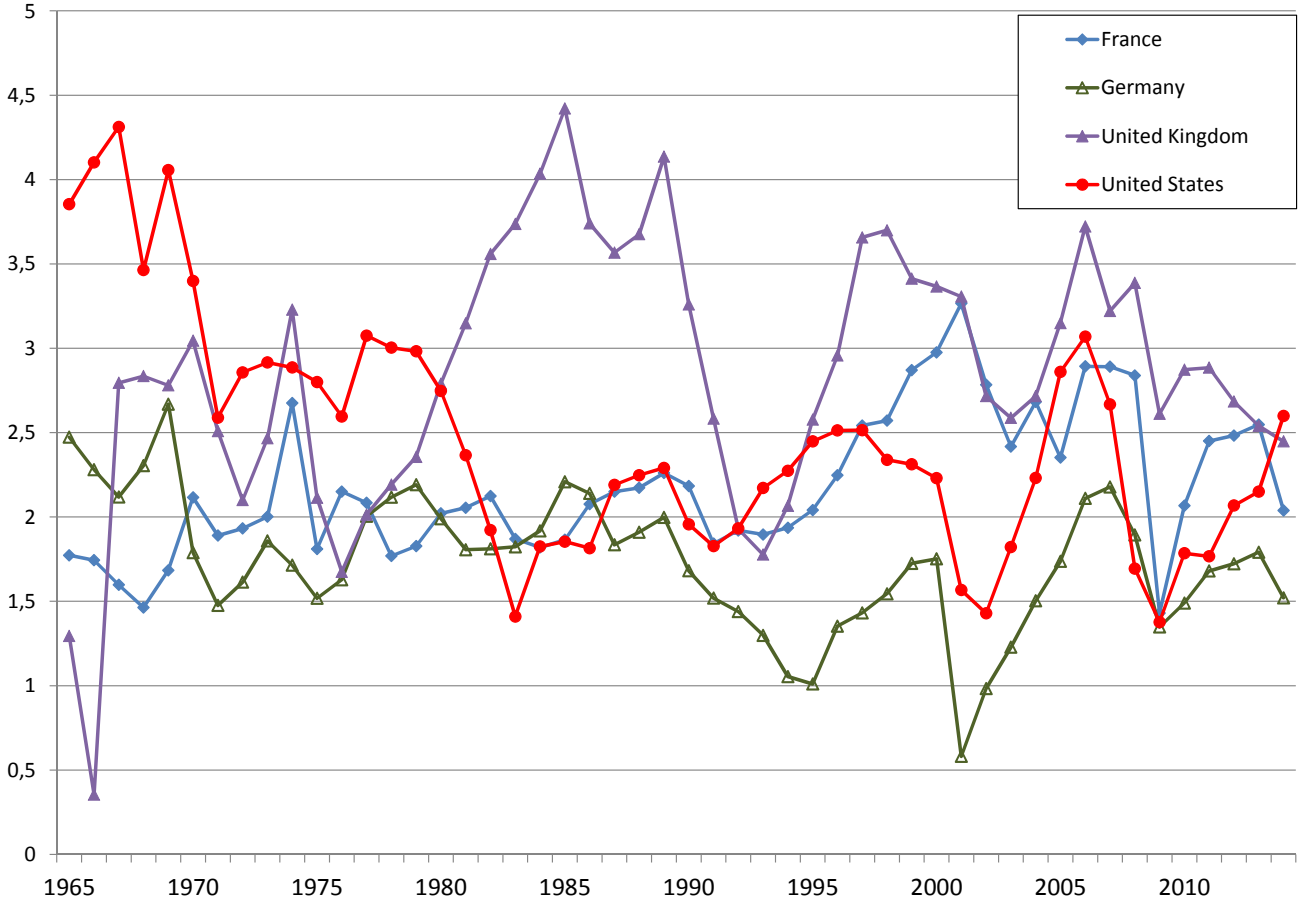
FIGURE 3: CIT revenues as a share of GDP (OECD unweighted average)



Source : OECD Revenue Statistics

Trends in corporate taxation

FIGURE 4: Corporate taxation as a share of GDP



Source : OECD Revenue Statistics

Effective tax rates

- Statutory corporate tax rates do not reflect the likely impact of the tax on investment
- Effective tax rates (ETR) try to account for all the deductions and credits

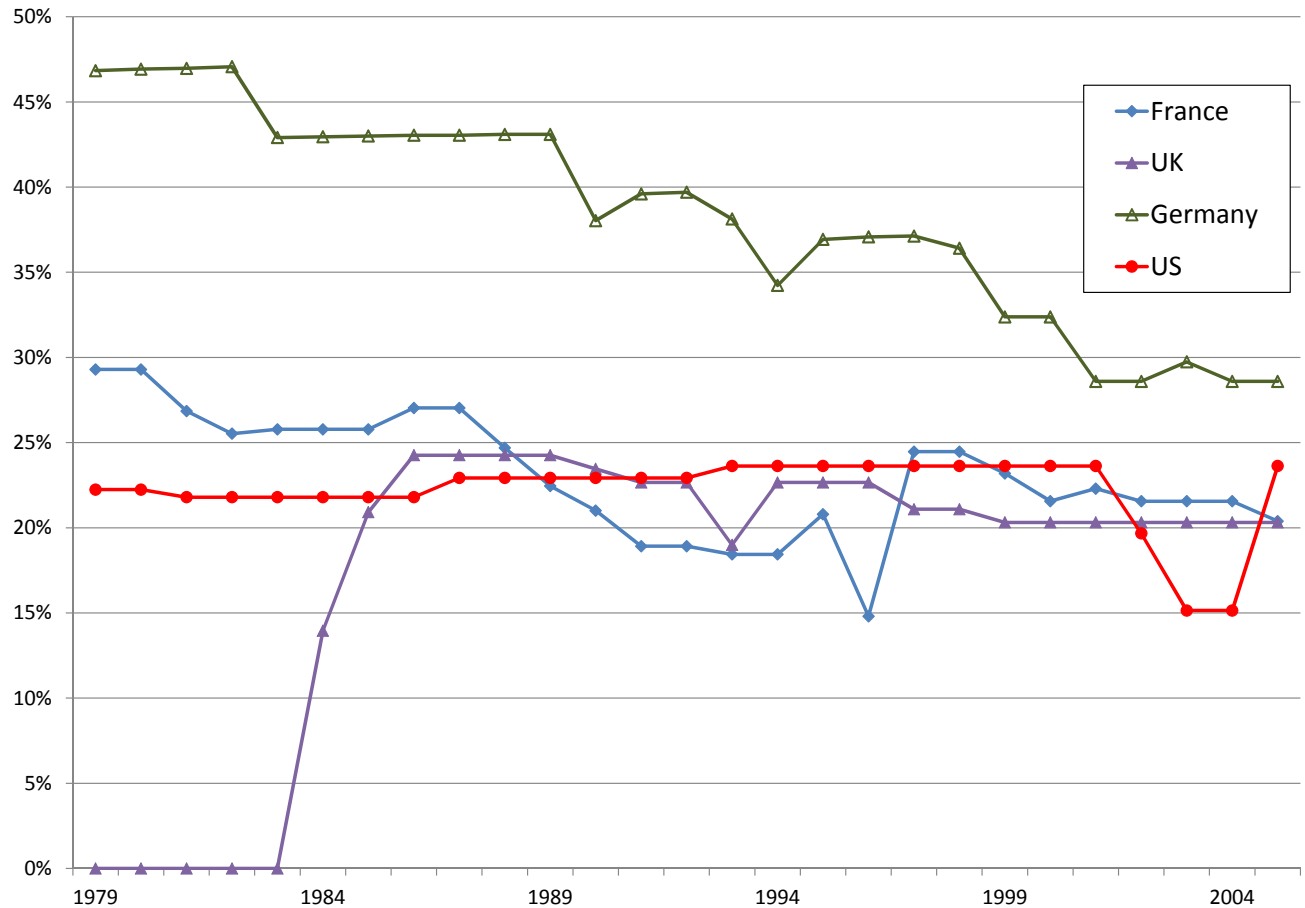
$$ETR = \frac{r^g - r^n}{r^g}$$

with r^g and r^n the rate of return gross and net of taxes

- Investment credit or high rate of depreciation reduce the difference between the gross and net rate of return
- ETR can even be negative

Effective tax rates

FIGURE 5: Effective tax rates

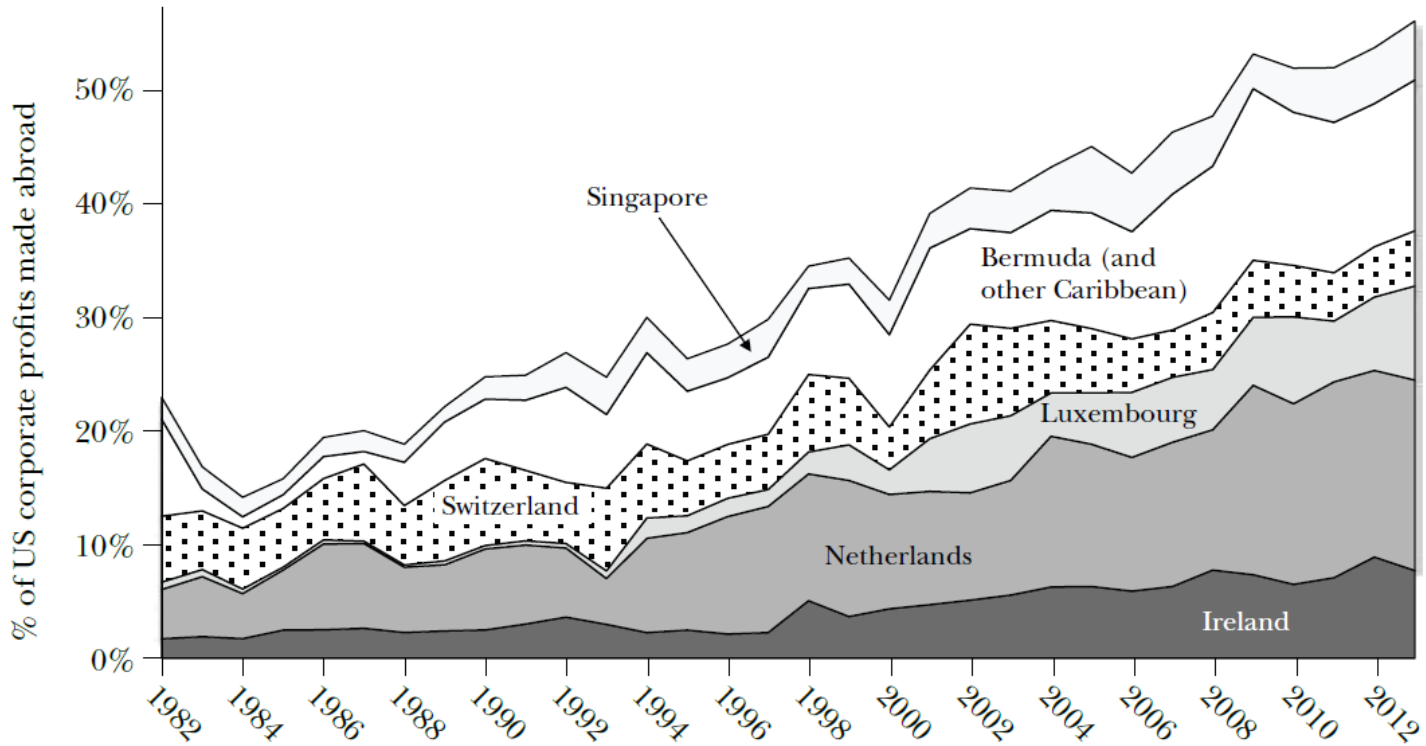


Source : Devereux, Griffith and Klemm (2002), updated.

Trends in corporate taxation

Trend 4 : Increase in tax avoidance and evasion

FIGURE 6: Share of Tax Havens in U.S. Corporate Profits Made Abroad



Source : Zucman (2014), Fig. 2.

II. Incidence of corporate taxation

- **Remittance vs. incidence**
  - Firms remit large amount of taxes
    e.g., CIT, SSCs, VAT, income tax, etc.
  - Economic incidence is about change in individual welfare
  - Corporations don't *pay* taxes !
- **Individuals potentially "paying" CIT**
  1. Capital owners (through lower profits)
  2. Workers (through lower wage)
  3. Consumers (through higher prices)
- One of the most contentious debate of tax policy !

II. Incidence of corporate taxation

1. Initial approach : assignment of ownership
2. Closed economy : Harberger model
3. Open economy case
4. Empirical approaches

Shareholder incidence theory

- **Simplest and oldest theory**
  - CIT falls on corporate shareholders in proportion of their ownership
  - With this theory, CIT is very progressive
  - Individual share ownership highly concentrated
    e.g., U.S. top 0.01% wealth, equity = 45%
    e.g., U.S. bottom 90% wealth, equity = 1%
- **Assignment not so simply applied**
  - Different class of shares, with different rights to firms' income
  - Indirect holding of equity (through other corporations, retirement funds, etc.)

Closed economy : Harberger model

- **Harberger (JPE, 1962)**
  - A static GE model in a closed economy
  - Two sectors : corporate X and non-corporate Y
  - Two factors : labour L and capital K
  - Pioneering work in GE incidence
- **Main assumptions**
  1. Fixed supply of factors (short-run, closed economy)
  2. Free factor mobility across sectors
  3. Full employment of factors
  4. Constant returns to scale in both production sectors
  5. Perfect competition
- See Atkinson and Stiglitz (1980, chap. 6) or Kotlikoff and Summers (1987, 2.2)

Closed economy : Harberger model

- Full employment condition

$$c_{LX}X + c_{LY}Y = L_0 \tag{1}$$

$$c_{KX}X + c_{KY}Y = K_0 \tag{2}$$

- Perfect competition (prices equals to marginal cost)

$$p_X = c_X(r, w) \tag{3}$$

$$p_Y = c_Y(r, w) \tag{4}$$

- Demand functions

$$X = X(p_X, p_Y, M) \tag{5}$$

$$Y = Y(p_X, p_Y, M) \tag{6}$$

- 6 unknowns, 6 equations

Closed economy : Harberger model

1. Changes in demand relates to changes in price ratio

$$\hat{X} - \hat{Y} = -\sigma_D(\hat{p}_X - \hat{p}_Y) \tag{7}$$

   - σ_D is the aggregate elasticity of substitution in demands

2. Changes in relative product prices to changes in factor prices

$$\hat{p}_X - \hat{p}_Y = \theta^*(\hat{w} - \hat{r}) \tag{8}$$

   - θ_{LX} is the share of labour in sector X
   - $\theta^* = \theta_{LX} - \theta_{LY}$ is a measure of factor intensity in terms of factor shares
   - If X is labour intensive ($\theta^* > 0$) then a rise in the relative factor prices ($\frac{w}{r}$) causes a rise in its relative price ($\frac{p_X}{p_Y}$)

Closed economy : Harberger model

3. Changes in quantities to changes in relative factor prices

$$\lambda^*(\hat{X} - \hat{Y}) = (\hat{w} - \hat{r})(\alpha_X \sigma_X + \alpha_Y \sigma_Y) \tag{9}$$

- σ_X is the elasticity of substitution in sector X
- λ_{LX} is the share of labour force L_0 in sector X
- $\lambda^* = \lambda_{LX} - \lambda_{KX}$ is a measure of factor intensity in terms of physical inputs
- If X is labour intensive ($\lambda^* > 0$) then a rise in output of X relative to Y is associated with a rise in the wage relative to the rate of profit

Closed economy : Harberger model

- **Increase in CIT**
  - Assume small tax $d\tau$ on capital in sector X
  - Harberger assumes that CIT is an additional tax on capital income from corporate sector on top of income tax

1. **Factor substitution effect : capital bears the tax**
   - Depending on elasticity of substitution between capital and labour ($\sigma_X > 0$)
   - Tax shifts production in sector X away from K
   - Aggregate demand for K decreases
   - As K is fixed, r decreases
     $\Rightarrow$ capital bears the burden of the tax

Closed economy : Harberger model

2. **Output effect : capital may not bear the tax**
   - Shift of demands towards other sector Y
   - Consequences for factor demands depend on relative factor intensities

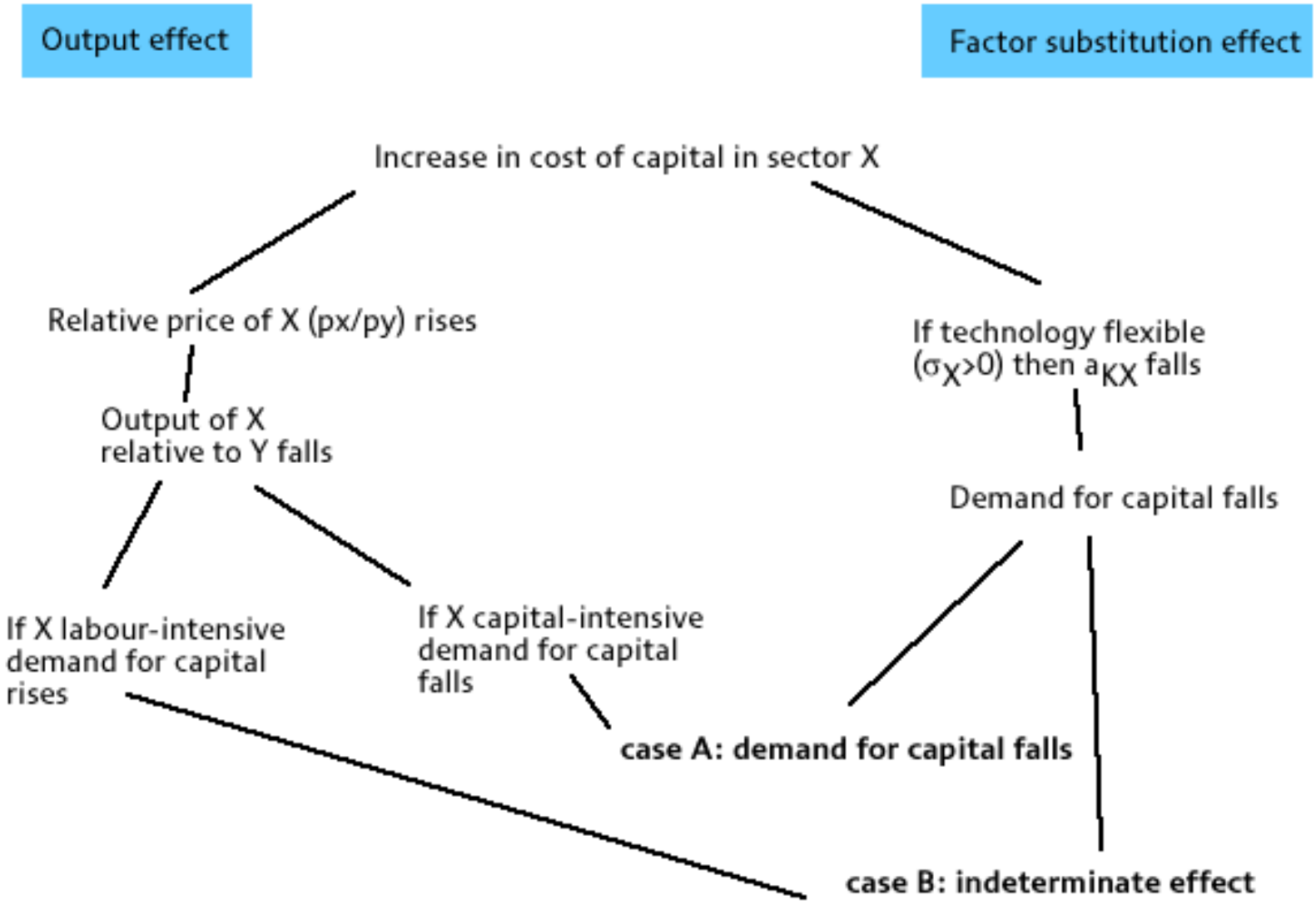
   (a) If X capital intensive
      - it reduces demand for capital
      - capital bears more of the tax

   (b) If X labour intensive
      - it increases demand for capital
      - labour may bear some or all the tax

3. **Substitution + output effects : overshifting effects**
   - If corporate sector capital intensive, could lead to more than 100% incidence (overshifting)
   - If corporate sector labour intensive, could lead to all incidence on labour

     $\Rightarrow$ Taxed factor may bear less than 0 or more than 100% of tax

Closed economy : Harberger model



Closed economy : Harberger model

- **A deceptive theoretical results**
  - In the Harberger model "anything goes"
  - Ultimate incidence depends on all the set of elasticities
- **Harberger's estimations**
  - Application in the case of two sectors (housing and corporate)
  - Estimates with plausible parameters for the U.S.
  - "*plausible alternative sets of assumptions about the relevant elasticities all yield results in which capital bears very close to 100 per cent of the tax burden*" (Harberger, 1962, p.234)

Closed economy : Harberger model

- **Implications**
  1. Capital bears the entire CIT (not shifted to labour or consumers)
  2. All capital bears CIT (not only corporate sector)
  3. CIT is less progressive than under the shareholder-incidence assumption but contributes still to tax progressivity
  4. CIT distorts allocation of capital between corporate and non-corporate sector
- **Limits to Harberger model**
  - CIT is not exactly an additional tax to income tax (cf. tax base and relationship with income tax)
  - Perfect competition
  - Closed economy assumption is key

Open economy case

- **Small open economy**
  - Survey by Kotlikoff and Summers (HPE, 1987, section 3.1)
  - Assume that capital is mobile internationally and labour immobile
    - Sector 1 (small open economy), L_1 fixed, and K_1 mobile
    - Sector 2 (rest of the world), L_2 fixed, and K_2 mobile
    - Total capital $K = K_1 + K_2$ is fixed
- **Introduction of tax on capital K_1**
  - After-tax returns must be equal

$$r^* = F_{2K} = (1 - \tau)F_{1K}$$

  - Capital moves until after-tax returns are equal
    $\Rightarrow$ Labour bears all the tax burden

Incidence of corporate tax : empirical evidence

- **Limited evidence**
  - Few variations : cross-country or local variations
  - Hard to identify direct effects and GE effects
- **Some recent evidence**
  - Arulampalam et al. (EER 2012) : cross-country
  - Suárez Serrato and Sidar (AER, 2016) : U.S. local variations
  - Fuest et al. (AER, 2018) : German local variations

Arulampalam, Devereux and Maffini (EER, 2012)

- **Empirical strategy**
  - Look at incidence of CIT in bargaining framework
  - Focus on direct effect of CIT (conditional on output) on rent bargaining
  - Baseline result : 50% of CIT incident on wages
- **Data**
  - Firm data from 9 countries over 1996-2005
  - 55,082 firms with accounting data (balance sheets, profits, loss)

Arulampalam, Devereux and Maffini (EER, 2012)

- **Methodology**
  - Aim to estimate impact of CIT on wages, conditional on output
  - Estimation of dynamic panel model

$$w_{i,t} = \sum_{j=1}^{2} \gamma_j w_{i,t-j} + \sum_{j=0}^{2} \beta_j x_{i,t-j} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$

  - $w_{i,t}$ average wage at firm i in period t
  - $x_{i,t}$ tax liability and other controls (e.g., value added)
  - Firm fixed effect α_i
- **Instruments**
  - Tax liability is endogeneous
  - Two sets of instruments used :
    1. Country and year specific EMTR and ATR
    2. Lagged firm specific variables (e.g., fixed/tangible assets, negative profits in the past)

Arulampalam, Devereux and Maffini (EER, 2012)

- **Estimation**
  - FE estimator with firm dummies is inconsistent
  - First difference removes FE
  - Estimate first diff. equation with generalized method of moment (GMM) and system estimator
  - Very demanding in terms of data structure
- **Results**
  - Headline elasticity are -0.120 in the short run and -0.093 in the long run
  - In terms of incidence : 64% and 49% of CIT on wages

Arulampalam, Devereux and Maffini (EER, 2012)

FIGURE 7: Basic specification with bargaining variables

Dependent variable: *log (wage rate)*	Basic specification (1)	Basic specification & union density (2)	Basic specification & all bargaining variables (3)
Log (wage rate)			
$t-1$	0.121***	0.116***	0.135***
	(0.022)	(0.024)	(0.024)
$t-2$	0.029***	0.024**	0.031***
	(0.010)	(0.011)	(0.011)
Log (tax per employee)	−0.095***	−0.118***	−0.120***
	(0.034)	(0.035)	(0.037)
$t-1$	0.033***	0.036***	0.036***
	(0.010)	(0.010)	(0.010)
$t-2$	0.006***	0.007***	0.007***
	(0.002)	(0.003)	(0.003)
Dummy: negative or zero tax bill	0.386***	0.376***	0.361***
	(0.078)	(0.091)	(0.088)
$t-1$	−0.096***	−0.094***	−0.089***
	(0.019)	(0.021)	(0.021)
$t-2$	−0.012**	−0.012**	−0.011*
	(0.005)	(0.006)	(0.006)
Log (value added per employee)	0.773***	0.849***	0.889***
	(0.069)	(0.069)	(0.067)
$t-1$	−0.136***	−0.145***	−0.155***
	(0.021)	(0.023)	(0.023)
$t-2$	−0.022***	−0.023**	−0.025***
	(0.008)	(0.009)	(0.009)

Source : Arulampalam, Devereux and Maffini (2012), Tab. 6.

Arulampalam, Devereux and Maffini (EER, 2012)

FIGURE 8: Estimated incidence and elasticities

	Table VI column (3)		Table VIII column (2)		Table VIII column (3)	
	Full sample		Stand — alone companies		Multinational group	
	Elasticity	Incidence	Elasticity	Incidence	Elasticity	Incidence
Short run						
Tax bill per employee t	−0.120(0.037)	−0.637 (0.195)	−0.118 (0.041)	−0.687 (0.239)	−0.117 (0.047)	−0.586 (0.237)
Value added per employee f	0.498 (0.121)	0.222 (0.054)	0.521 (0.151)	0.269 (0.078)	0.415 (0.155)	0.168 (0.063)
Long run						
Tax bill per employee t	−0.093 (0.031)	−0.493 (0.164)	−0.076 (0.029)	−0.439 (0.171)	−0.108 (0.046)	−0.543 (0.230)
Value added per employee f	0.558 (0.093)	0.249 (0.041)	0.611 (0.114)	0.315 (0.059)	0.531 (0.136)	0.214 (0.055)

Source : Arulampalam, Devereux and Maffini (2012), Tab. 7.

Arulampalam, Devereux and Maffini (EER, 2012)

- **Take-aways**
  - About 50% of direct CIT effects (conditional on output) in firms with wage bargaining on workers
  - Indirect effects of CIT should be added to direct effects
  - Robustness of results not obvious given identification techniques

Suáres Serrato and Zidar (AER, 2016)

- **Overview**
  - Open economy framework (local U.S. market)
  - Allow for monopolistically competitive and heterogeneously productive firms
  - Spatial equilibrium with firms
- **Main results**
  - Workers bear 30-35% (compared to 100% in benchmark case)
  - Firm owners bear 40%

Fuest, Peichl and Siegloch (AER, 2018)

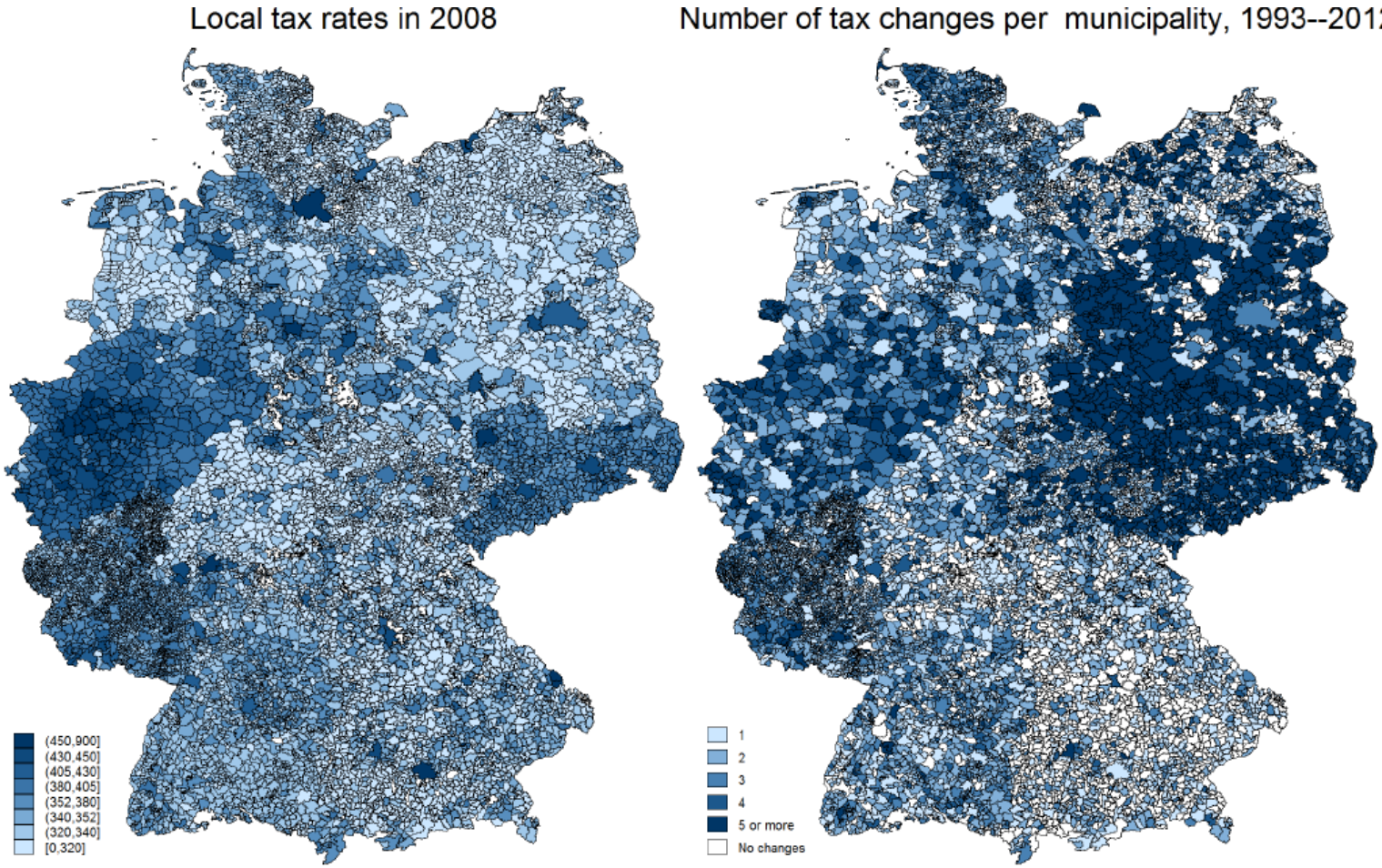
- **Overview**
  - Use German local business tax (*Gewerbesteuer*) to estimate incidence of corporate taxes on wages
  - Each year, 8% of the 11,441 municipalities change tax rate
  - Event study using administrative linked employer-employee panel data
- **Results**
  - Incidence of corporate tax on wages depends on wage setting institutions
  - For 1 euro increase in tax bill, wage bill grows 30 – 70 cents less
  - Much higher effect under wage bargaining
  - No wage bargaining : wage effect much smaller and close to zero

Fuest, Peichl and Siegloch (AER, 2018)

- **Local Business Tax (Gewerbesteuer)**
  - Most important tax instrument for municipalities
  - Applies to corporate and non-corporate firms, certain exemptions
  - Tax base : operating profits (federal level), same as for CIT
  - Basic tax rate set at the federal level (3.5 ; 5.0%)
  - City councils decide every year (only) on specific collection rate (cr ; multiplier to basic tax rate, 200-500%) for next year
- **Corporate tax (Körperschaftsteuer)**
  - Additional tax for corporate firms
  - Today at 15% (so that total CIT at 30%)
- **Personal Income Tax (Einkommensteuer)**
  - Additional tax for un-incorporated firms

Fuest, Peichl and Siegloch (AER, 2018)

FIGURE 9: Cross-sectional and time variation in local tax rates



Source : Fuest, Peichl and Siegloch (2015), Fig. 1.

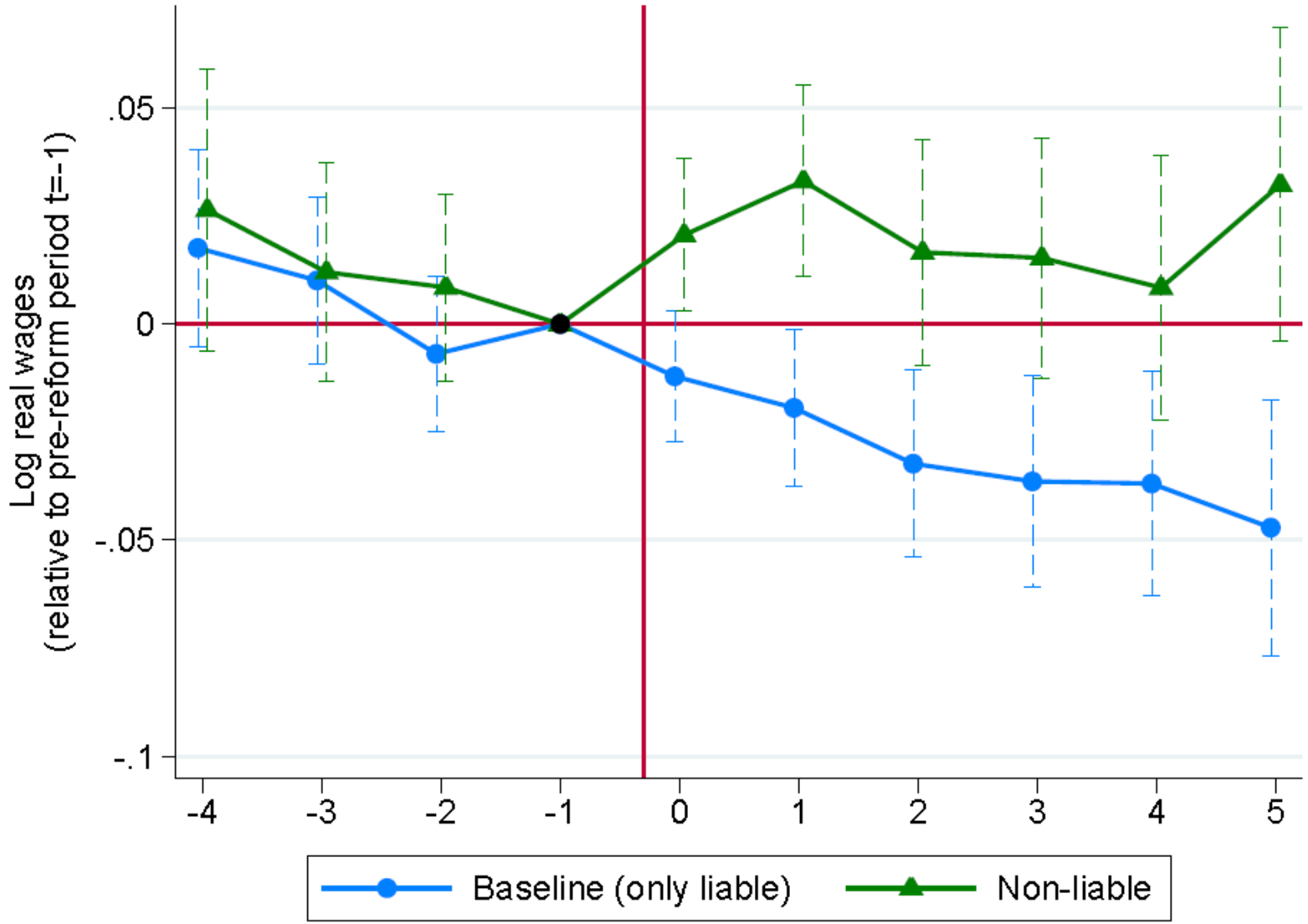
Event-study method

- **Principle**
  - Exploit multiple events (e.g., firm announcements, tax changes)
  - Include lags and leads with respect to reference year
  - Check endogeneity/reverse causality : no pre-trend
- **Econometric specification**

$$lnw_{f,m,t} = \gamma_{-b} \sum_{i=b}^{B-t} \Delta\tau m, t+i + \sum_{j=-b+1}^{a-t} \gamma_j \Delta\tau m, t+j + \gamma_a \sum_{k=a}^{t-A} \Delta\tau m, t-k + \mu_m + \psi_{m,t} + \varepsilon_{m,t}$$

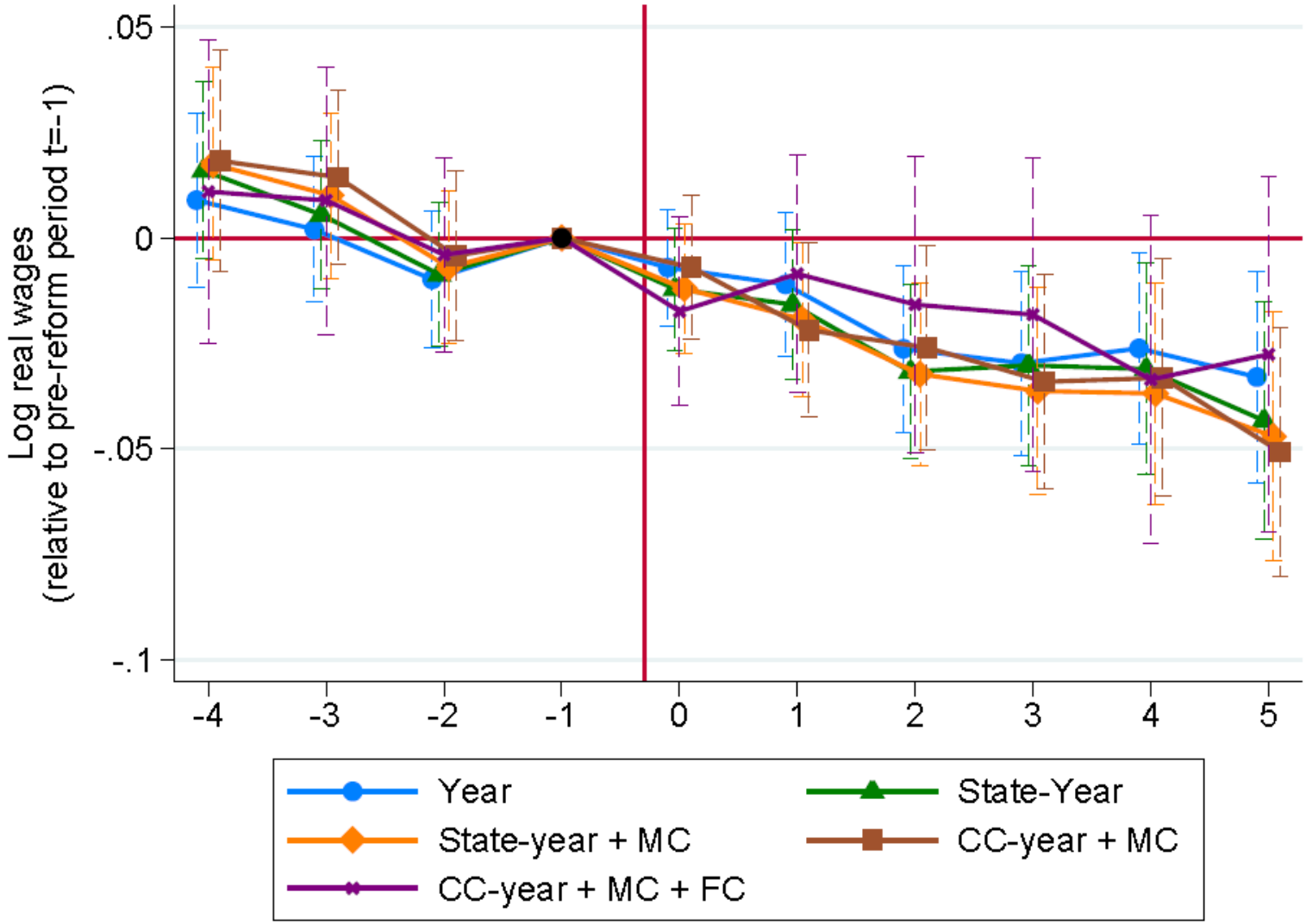
  - A first data year, B is last data year
  - b is start of event window, a is end of event window
  - μ municipal FE, ψ time trends FE

FIGURE 10: Effects on firm wages



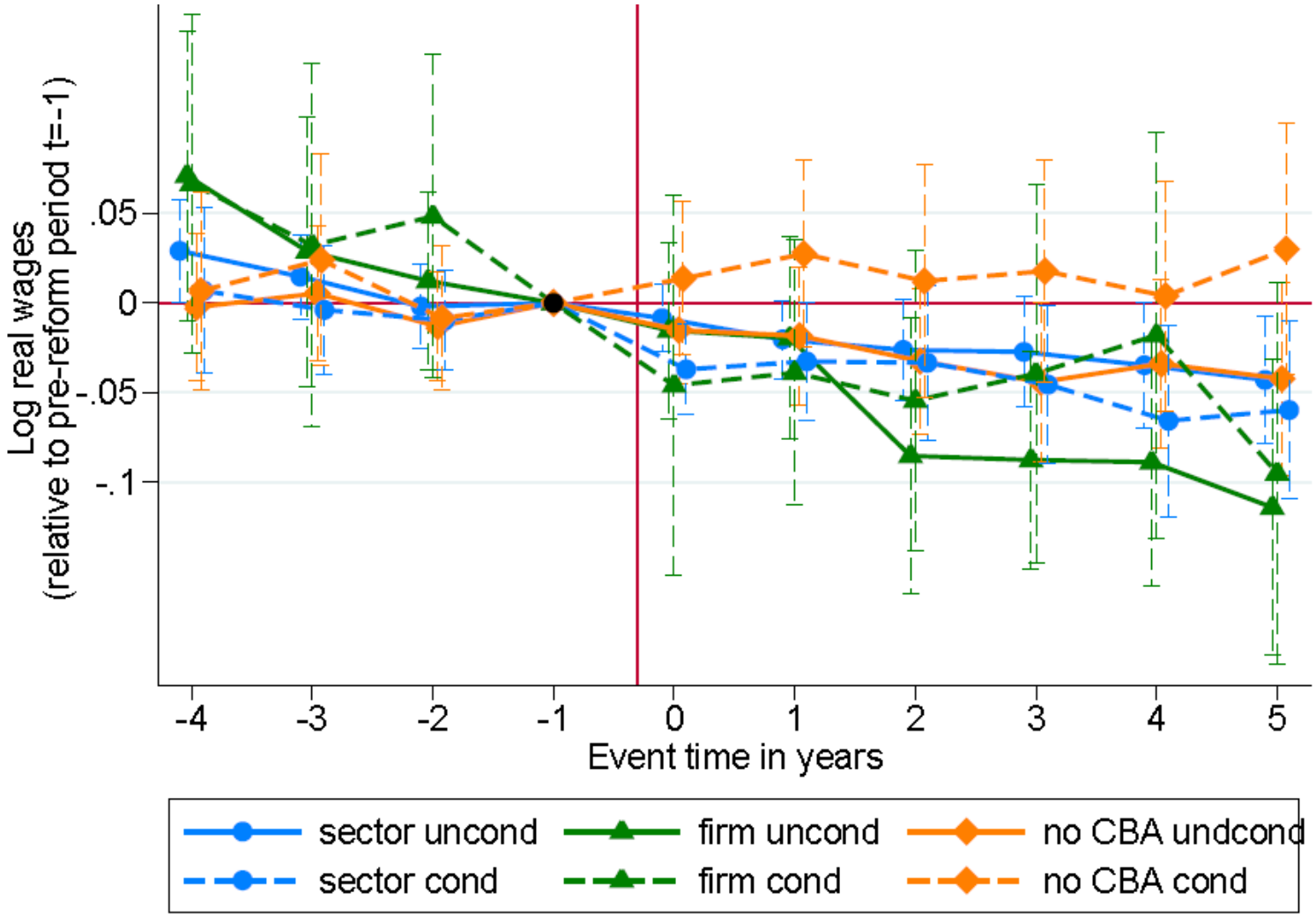
Source : Fuest, Peichl and Siegloch (2015), Fig. 2.

FIGURE 11: Effect on firm wages – robustness checks



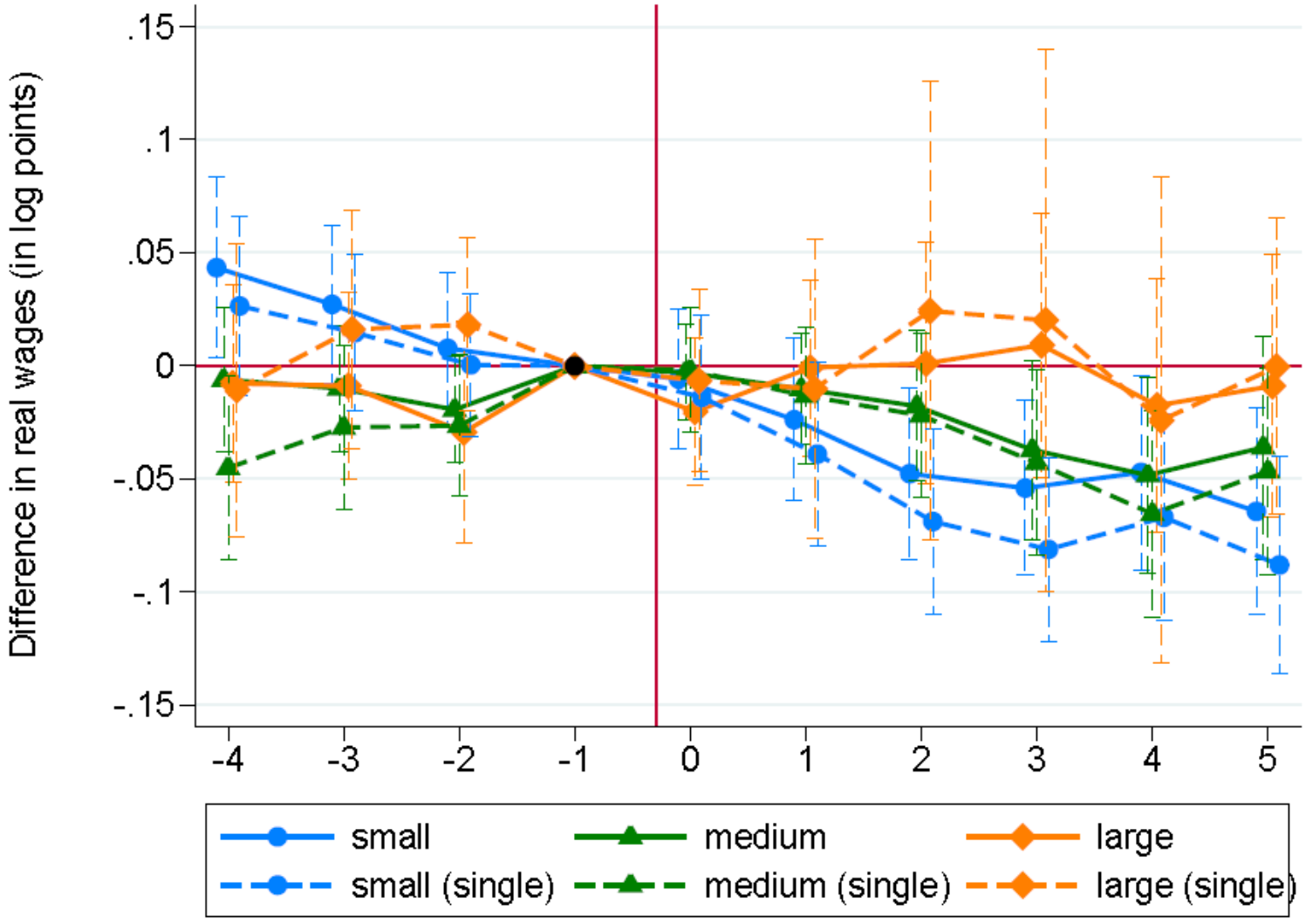
Source : Fuest, Peichl and Siegloch (2015), Fig. 3.

FIGURE 12: Effects on wages by collective bargaining



Source : Fuest, Peichl and Siegloch (2015), Fig. 5.

FIGURE 13: Effects on wages by firm size



Source : Fuest, Peichl and Siegloch (2015), Fig. 6.B

TABLE 3: DiD estimates : baseline wage effects

	(1)	(2)	(3)	(4)	(5)	(6)
Log net-of-LBT rate	0.388	0.229	0.386	0.396	0.343	0.399
	(0.127)	(0.110)	(0.127)	(0.128)	(0.164)	(0.118)
Incidence (I^w)	0.505	0.288	0.502	0.516	0.442	0.520
	(0.170)	(0.140)	(0.170)	(0.172)	(0.217)	(0.159)
State × year FE	✓			✓	✓	✓
Year FE		✓				
CZ × year FE			✓			
Municipal controls t-2				✓		
Firm controls t-2					✓	
Worker shares						✓
Observations	44,654	44,654	44,654	44,654	25,241	44,654

Source : LBT : local business tax, CZ : commuting zone.
Source : Fuest, Peichl and Siegloch (2017), Tab. 1.

Fuest, Peichl and Siegloch (AER, 2018)

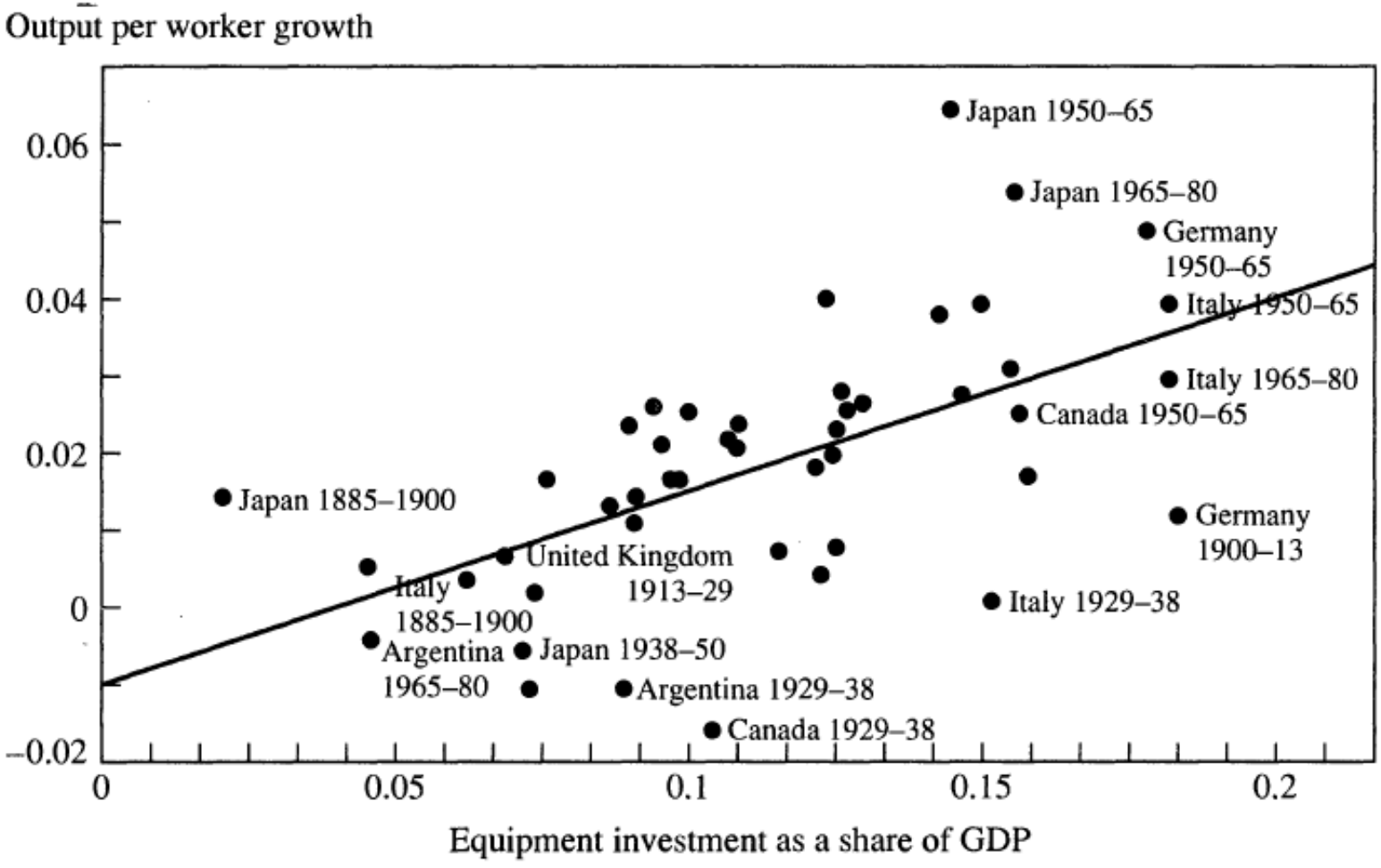
- **Take-aways**
  - CIT partially incident on wages
  - Estimates of 50% shifted to workers
  - Lower than in GE estimates of small open economy but larger than traditional Harberger closed economy results
  - It implies lower redistributivity of most tax systems
- **Further results**
  - Labour market institutions matter for incidence on wages
  - Effects on wages bigger for firms with firm-level bargaining (in line with rent bargaining theory)

III. Efficiency costs

1. **Investment decisions**
   - Theory of user cost of capital
   - Cross-country evidence (Djankov et al., 2010)
   - Natural experiment (House and Shapiro, 2008)
2. **Payouts decisions**
   - Theory : old vs new view
   - Chetty and Saez (2005)
   - Yagan (2015)
3. **Elasticity of corporate taxable income**
   - Devereux et al. (2014)

Investment matters

FIGURE 14: Growth vs. equipment investment



Source: Authors' calculations based on data underlying De Long (1992). See table 4 for corresponding regression results.

Source : De Long and Summers (1992), Fig. 1.

Theory of investment

- **Investment decision**
  - Determined by setting marginal benefits and costs of investment equal on a per-period basis
- **Model of firm behaviour**
  - Firm decides how much capital K_t to accumulate
  - Profit function $F(K_t)$ concave
  - Price of capital goods q_t
  - Depreciation rate δ
  - Required rate of return ρ
- **References**
  - Hassett and Hubbard (2002), Auerbach (2002)

User cost of capital

- **Equating marginal benefit to marginal cost**
  - Net present value (NPV) of new capital dK_{t+1}

$$-q_t - \delta q_t + \frac{F'(K_{t+1}) + q_{t+1}}{1+\rho}$$

  - Equating marginal benefit to marginal cost

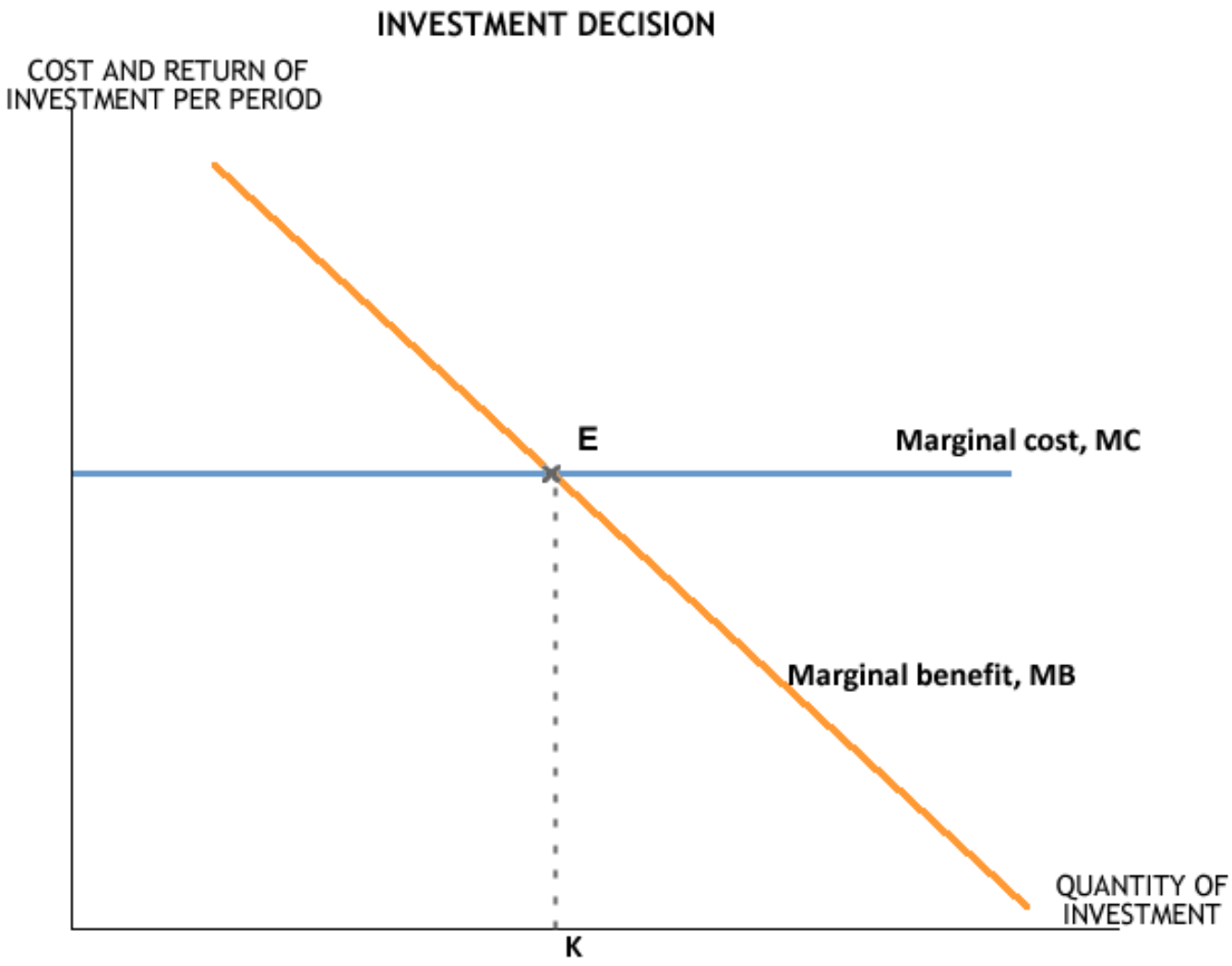
$$F'(K_{t+1}) = q_t \left[(1+\delta)(1+\rho) - \frac{q_{t+1}}{q_t} \right]$$

$$F'(K_{t+1}) \approx q_t \left[\delta + \rho - \frac{q_{t+1} - q_t}{q_t} \right]$$

- **User cost of capital (Hall-Jorgenson 1967)**
  - User cost of capital is $q_t \left[\delta + \rho - \frac{q_{t+1}}{q_t} \right]$
  - With constant investment prices ($q_{t+1} = q_t$), user cost of capital equals required rate of return plus depreciation

$$\frac{F'(K_{t+1})}{q_t} = \delta + \rho$$

Investment decision



User cost of capital

- **Introducing a corporate income tax** τ_{cit}
  - NPV of depreciation deductions D_t

$$\Gamma_t = \sum_{z=t}^{\infty} (1+r)^{-(z-t)} \tau_{div} D_{z-t}$$

- **User cost of capital with CIT**
  - Euler equation : $F'(K_{t+1})$

$$\approx q_t \frac{1-\Gamma_t}{1-\tau_{cit}} \left[\delta + \rho - \frac{q_{t+1}(1-\Gamma_{t+1}) - q_t(1-\Gamma_t)}{q_t(1-\Gamma_t)} \right]$$

User cost of capital

- **Common CIT**
  - Only partial expensing $D_0 < 1$
  - Not full deductibility of financing cost

$$\rho'(\tau_{cit}) > 0$$

  - Required rate of return needs to be higher to justify investment $\Rightarrow$ Investment will be reduced by CIT

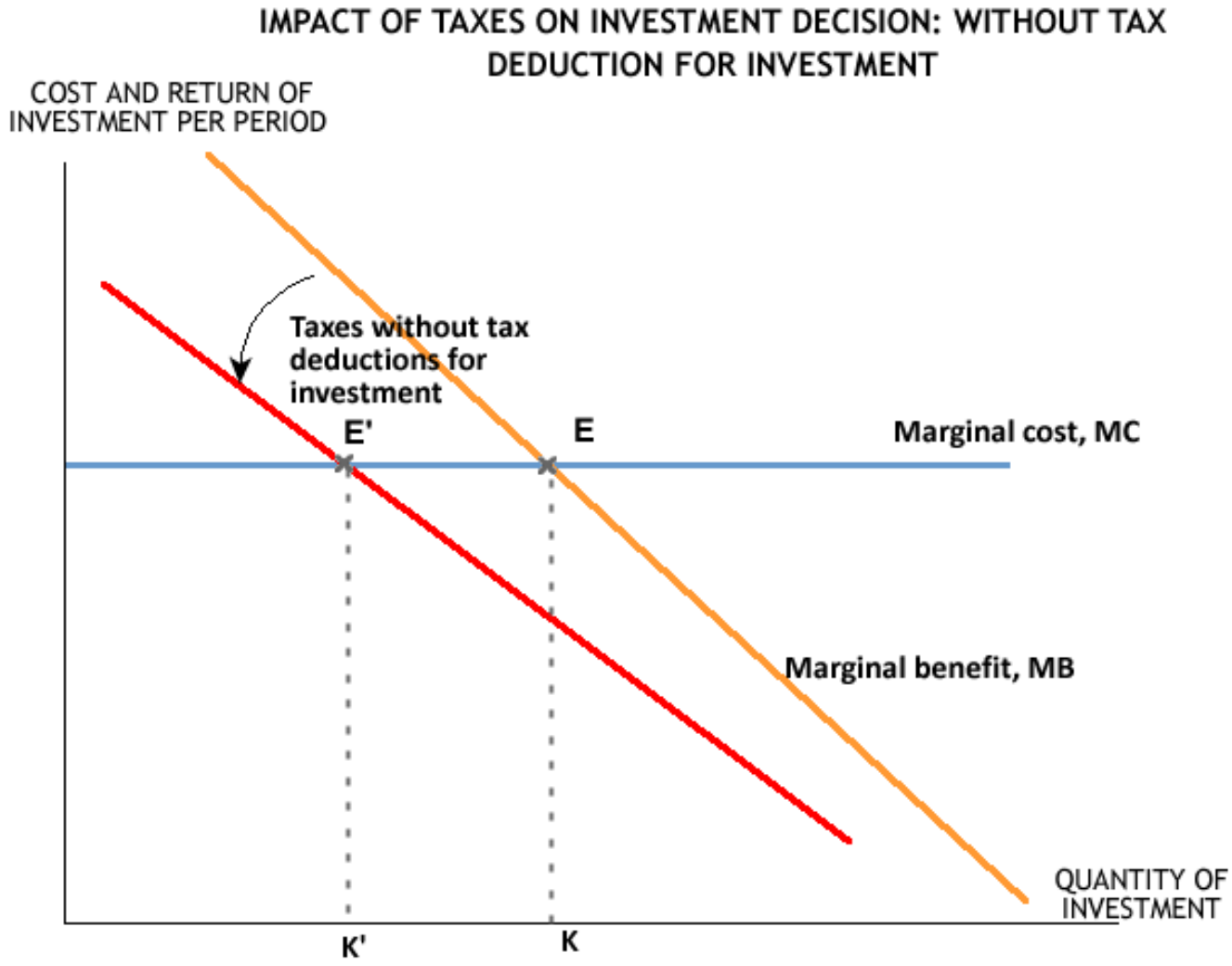
User cost of capital

- **Case of cash flow tax**
  - Immediate and full expensing : $D_0 = 1$
  - Then we have $\Gamma_{t+1} = \tau_{cit}$
  - Optimal investment does not depend on CIT

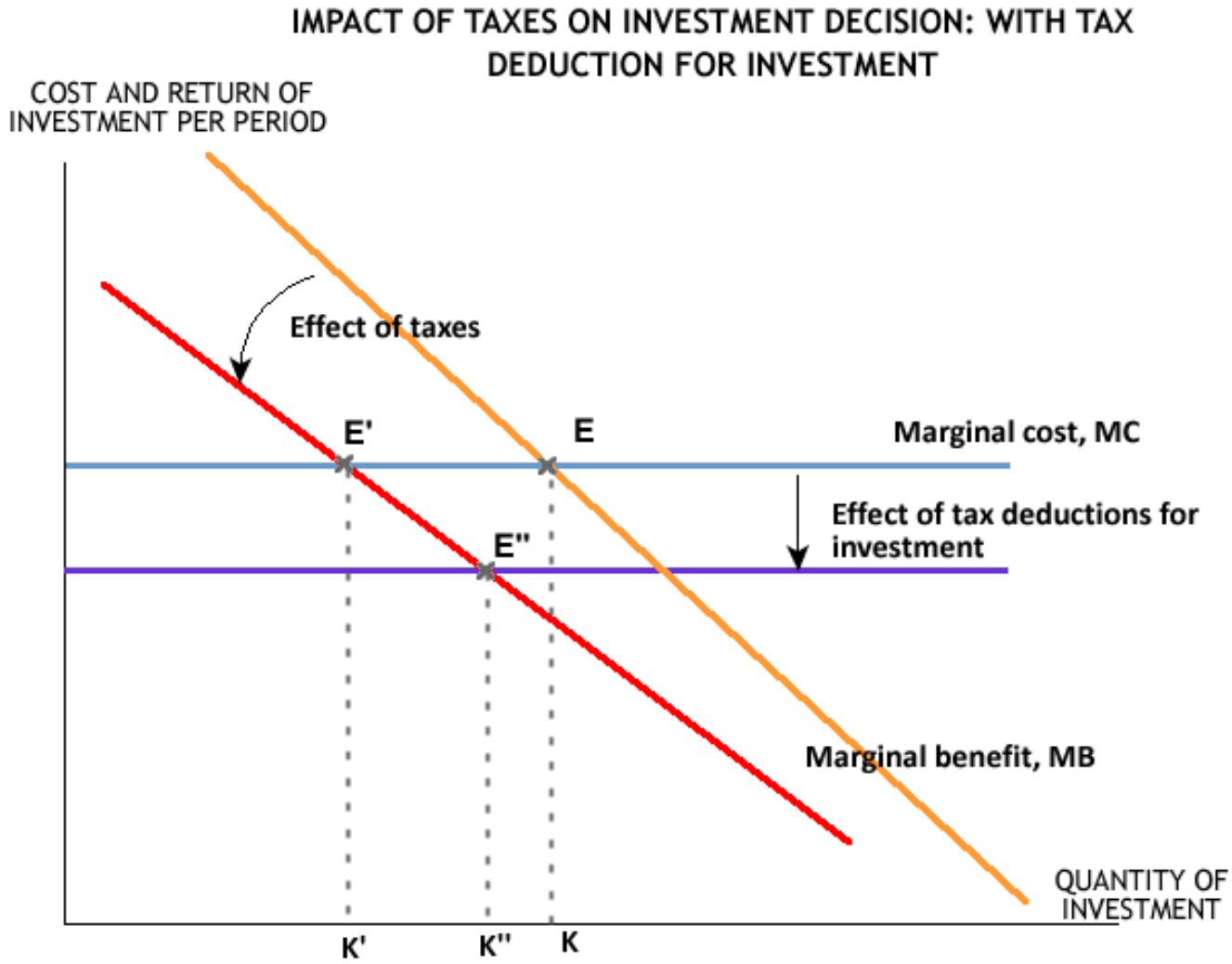
$$F'(K_{t+1}) \approx q_t \left[\delta + \rho - \frac{q_{t+1} - q_t}{q_t} \right]$$

$\Rightarrow$ When all costs are deductible, CIT is a tax on pure profit
$\Rightarrow$ Case for cash-flow tax reform (Auerbach, 2010)

Impact on investment



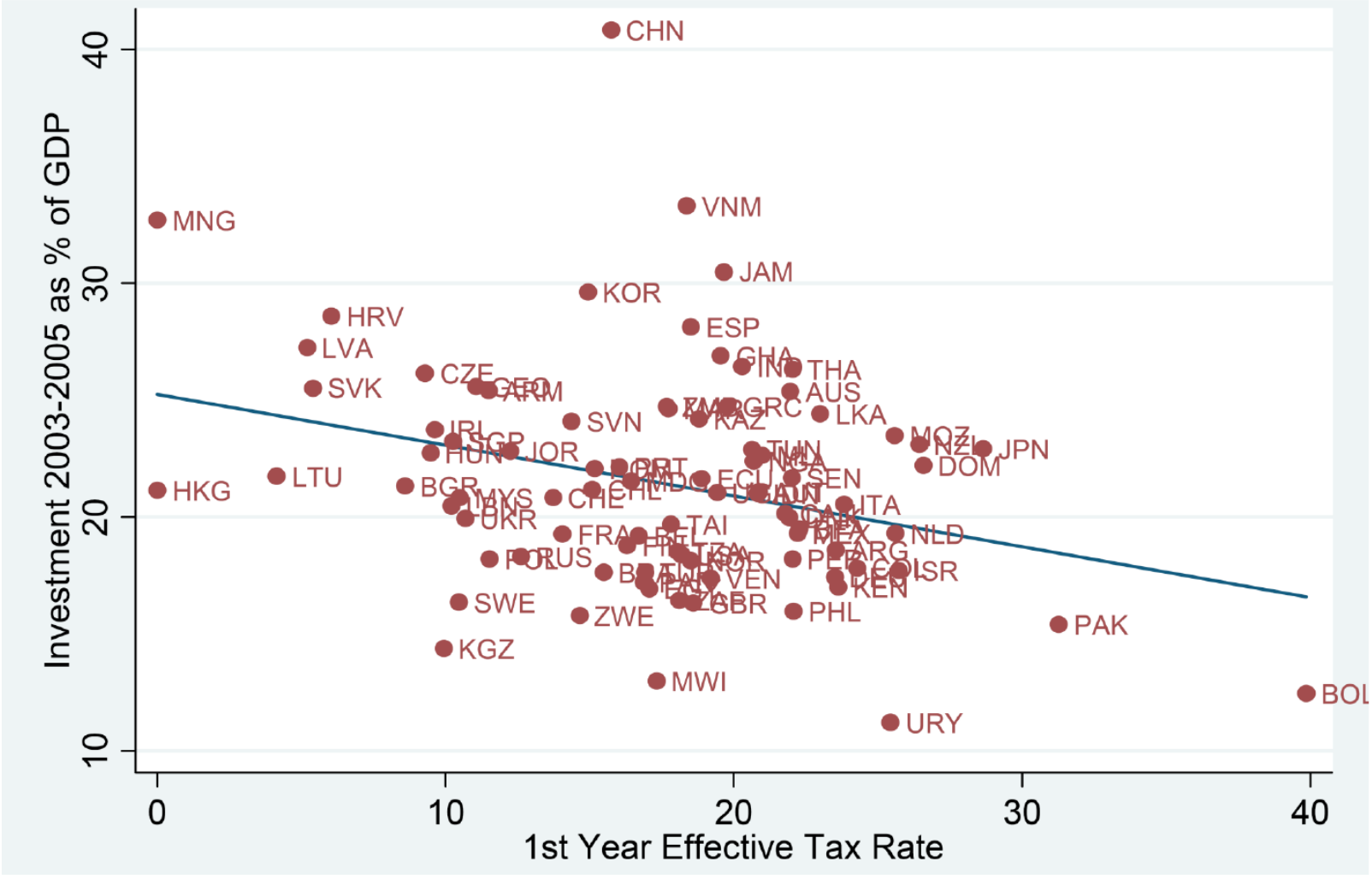
Impact on investment



Cross-country evidence

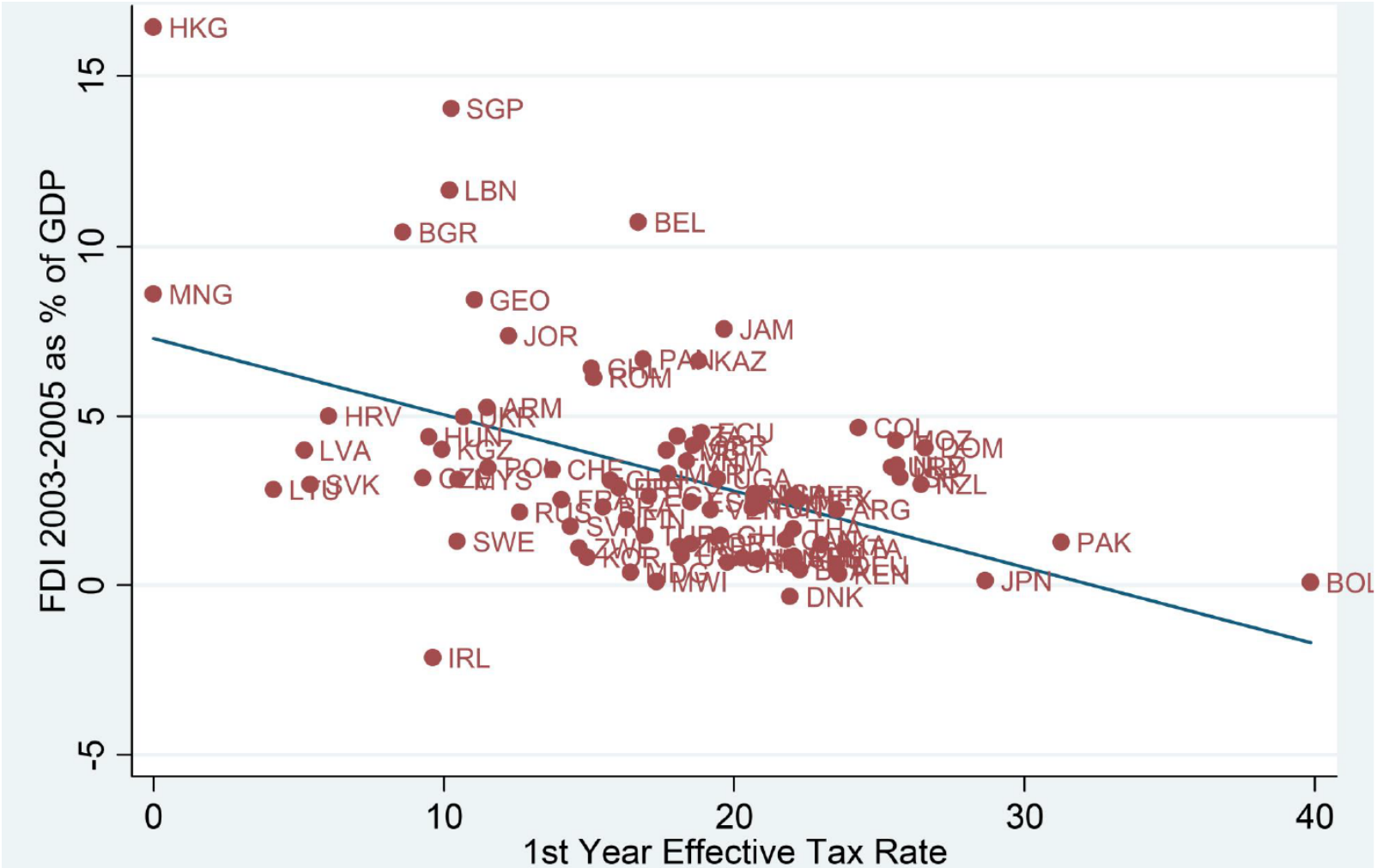
- **Djankov et al. (AEJ-M, 2010)**
  - Measure of effective corporate tax rate for an identical mid-sized firm using survey from PwC
  - Data from 85 countries for 2005-06
  - OLS regressions of investment and entrepreneurial activity on CIT rates
  - Identification : only controls for observables
- **Results**
  - Substantial impact of CIT on investment
  - 10 p.p. increase in CIT leads to 2 p.p. decrease in investment as a share of GDP

FIGURE 15: Effective Tax Rate and Investment



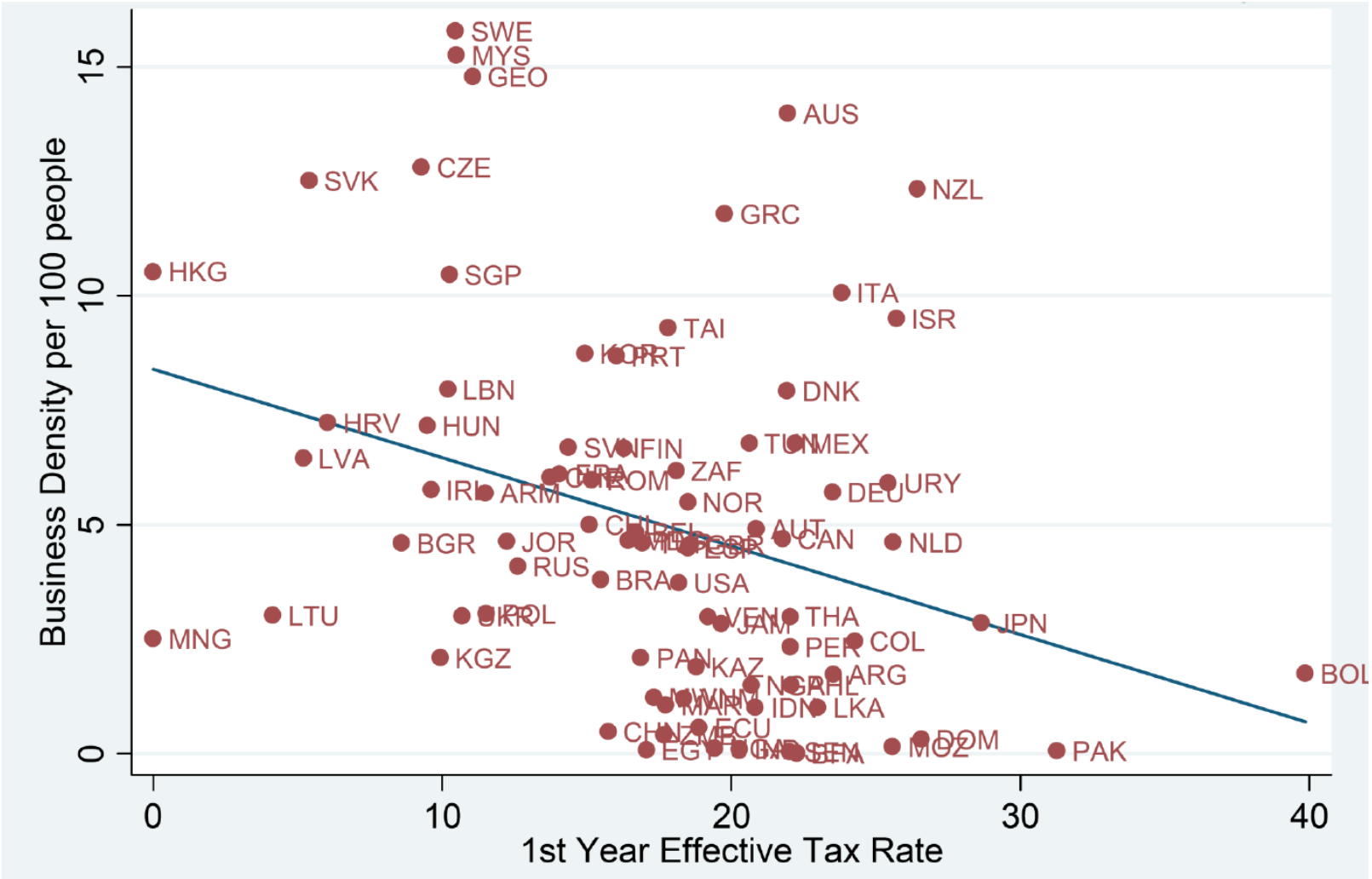
Source : Djankov, et al. (2010), Fig. 1.

FIGURE 16: Effective Tax Rate and Foreign Direct Investment



Source : Djankov, et al. (2010), Fig. 2.

FIGURE 17: Effective Tax Rate and Business Density



Source : Djankov, et al. (2010), Fig. 3.

FIGURE 18: Basic results

	Investment 2003–2005			FDI 2003–2005		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Investment						
Statutory corporate tax rate	−0.072			−0.195***		
	(0.076)			(0.046)		
First-year effective tax rate		−0.217***			−0.226***	
		(0.074)			(0.045)	
Five-year effective tax rate			−0.247***			−0.223***
			(0.080)			(0.050)
Constant	23.547***	25.239***	26.269***	9.044***	7.292***	7.718***
	(2.274)	(1.385)	(1.627)	(1.378)	(0.845)	(1.023)
Observations	85	85	85	84	84	84
R^2	0.01	0.09	0.10	0.18	0.23	0.20

Source : Djankov, et al. (2010), Tab. 5.A.

FIGURE 19: Basic results

	Business density			Average entry rate 2000–2004		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. Entrepreneurship						
Statutory corporate tax rate	−0.153**			−0.127**		
	(0.063)			(0.060)		
First-year effective tax rate		−0.193***			−0.137**	
		(0.062)			(0.057)	
Five-year effective tax rate			−0.200***			−0.136**
			(0.068)			(0.061)
Constant	9.473***	8.394***	8.913***	11.812***	10.452***	10.771***
	(1.864)	(1.162)	(1.375)	(1.790)	(1.048)	(1.262)
Observations	80	80	80	62	62	62
R^2	0.07	0.11	0.10	0.07	0.09	0.08

Source : Djankov, et al. (2010), Tab. 5.B.

House and Shapiro (AER, 2008)

- **Accelerated depreciation**
  - Depreciation rules are changed for higher expensing e.g., from 10 years to 5 years depreciation length
  - Common policy to stimulate investment (often used in recession)
  - Increasing expensing reduces user cost of capital and increases incentives to invest
  - How big is the effect ?
- **Temporary accelerated depreciation**
  - Exploit accelerated depreciation in U.S. in 2002 and 2003
  - 30%-50% bonus depreciation for assets with recovery periods less than 20 years
- **DiD methodology**
  - Controls : assets depreciated over more than 20 years, not granted accelerated depreciation
  - Treated : assets granted accelerated depreciation

House and Shapiro (AER, 2008)

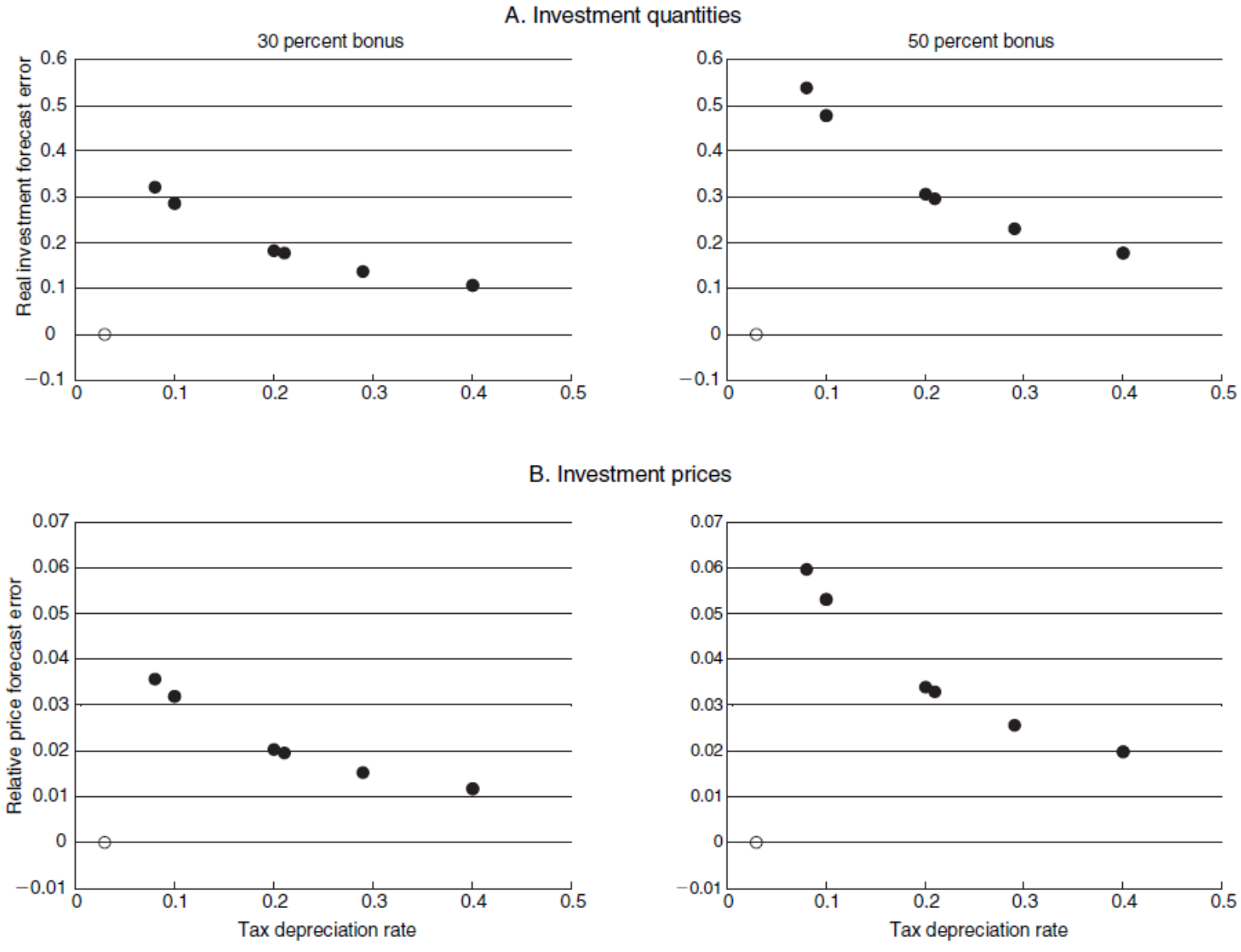
FIGURE 20: Recovery period and depreciation methods

Type of capital	Recovery period, R (years)	Tax depreciation rate, $\hat{\delta}$ (percent)	Method
Tractor units for over-the-road use, horses over 12 years of age or racehorses with over 2 years in service	3	66.7	200 DB
Computers and office equipment; light vehicles, buses and trucks	5	40.0	200 DB
Miscellaneous equipment, office furniture, agricultural equiment	7	28.6 or 21.4	200 DB or 150 DB
Water transportation equipment (vessels and barges); single-purpose agricultural structures	10	20.0 or 15.0	200 DB or 150 DB
Radio towers, cable lines, pipelines, electricity generation and distribution systems, "land improvements," e.g., sidewalks, roads, canals, drainage systems, sewers, docks, bridges, engines and turbines	15	10.0	150 DB
Farm buildings (other than single purpose structures), railroad structures, telephone communications, electric utilities, water utilities structures including dams, and canals	20	7.5	150 DB
Nonresidential real property (office buildings, storehouses, warehouses, etc.)	39	2.6	SL

Note: Tax depreciation methods are 200 percent declining balance (200 DB), 150 percent declining balance (150 DB), and straight line (SL).

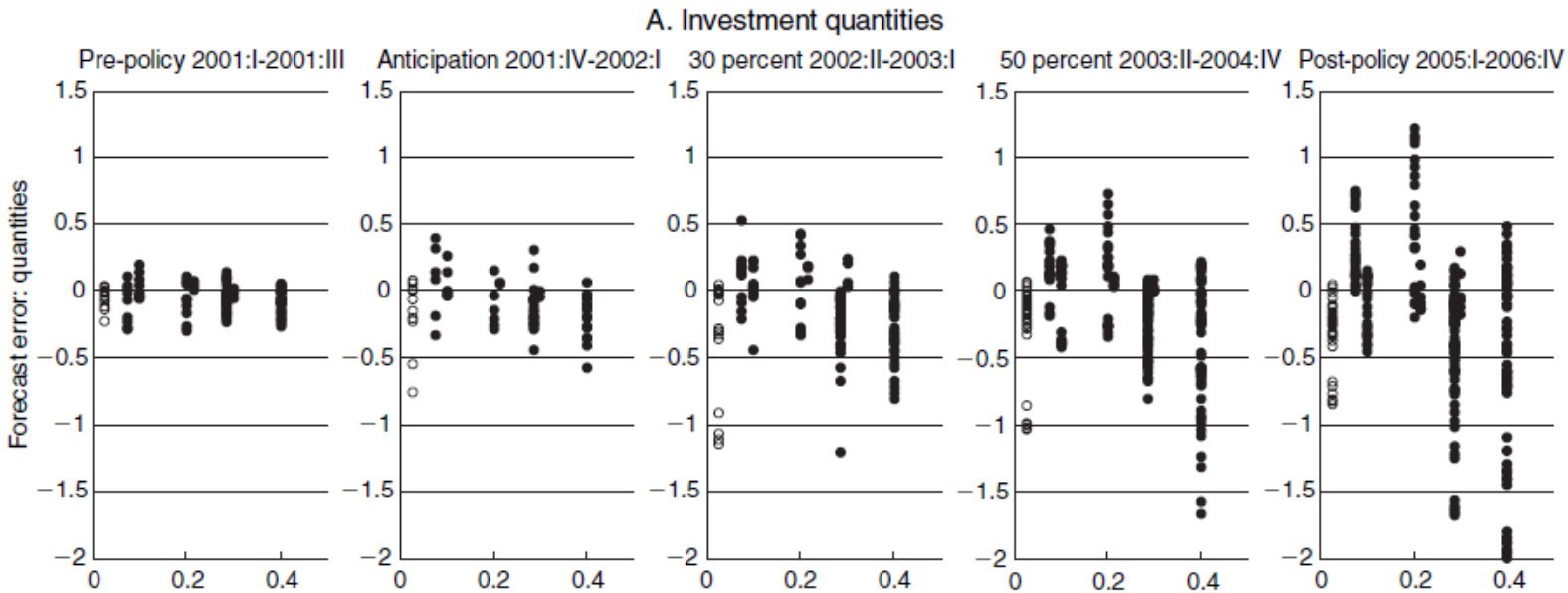
Source : House and Shapiro (2008), Tab. 2.

FIGURE 21: Simulated responses to bonus depreciation



Source : House and Shapiro (2008), Fig. 2.

FIGURE 22: Investment quantities



Source : House and Shapiro (2008), Fig. 3.

House and Shapiro (AER, 2008)

- **Results**
  - Cost-of-capital elasticity of investment between -6 and -14
  - Interpret results as intertemporal substitution elasticity
- **Discussion : liquidity constraints**
  - Literature in corporate finance on investment cash-flow sensitivity
  - Would imply that accelerated depreciation could raise investment through an income effect
  - Accelerated depreciation generates large effective subsidy if firm is liquidity constrained
  - See for instance Zwick and Mahon (AER 2015)

Payout policies

- **How to distribute profits ?**
  1. Dividends
  2. Share repurchase
  3. Retained earnings
- **Dividend puzzle**
  - With a classical system, dividends are likely to be taxed at higher rate
  - In the U.S. 20% of firms paid dividends
  - Why pay dividend when tax disadvantage ?

Why pay dividends ?

1. **Agency problem**
   - Shareholders are afraid that managers misuse large cash stockpiles
   - Equity holders prefer tax inefficiencies to reduce manager's control over the firms' assets
2. **Signaling theory**
   - Investors have imperfect information about the firm
   - By paying dividends, managers show that the firm has cash to burn...

Modeling firm behaviour

- **Source of financing**
  - Following Chetty and Saez (2010)
  - Firm has cash holding X in $t = 0$ (profits from past operations)
  - Issuing equity E
  - Chooses investment I with payoff of net profits $f(I)$ in $t = 1$
  - Distribute dividends D

$$D = E + X - I$$

- **Introduce taxes**
  - Dividend tax τ_{div}, net payout is $(1 - \tau_{div})D$
  - CIT τ_{cit} on corporate profits, $(1 - \tau_{cit} f(I))$
  - Net of tax payout in period 1 is

$$(1 - \tau_{div})[(1 - \tau_{cit})f(I) + X - D] + E$$

Modeling firm behaviour

- **Managers' objectives**
  - Manager maximizes value of the firm V

$$V = (1 - \tau_{div})D - E + \frac{(1 - \tau_{div})[(1 - \tau_{cit})f(I) + X - D] + E}{1 + r}$$

  - No tax benchmark : invest up to $f'(I) = r$
- **Two views**
  1. Traditional view : firms are cash constrained
  2. New view : firms are cash rich

Modeling firm behaviour

- **Cash constrained firms**
  - Marginal value of paying dividends is negative
  - More likely to characterize young firm
    e.g., Twitter
  - Pre-tax return on investment is above interest rate r
  - Firms should not pay dividends ($D = 0$) and fund investment by equity $I = X + E$

$$(1 - \tau_{div})(1 - \tau_{cit})f'(x + E) = r$$

- **Traditional view**
  - Marginal investments are funded out of equity
  - Dividend tax is similar to corporate income tax
  - Dividend tax cuts stimulate equity issues and investment

Modeling firm behaviour

- **Cash rich firms**
  - Marginal investments are funded out of retained earnings or riskless debt
  - Marginal value of issuing equity is negative
    e.g., Microsoft, with abondant past profits
  - Firms should not emit equity $E = 0$ and split cash between D and I according to :

$$(1 - \tau_{cit}) f'(X - D) = r$$

  - Invest to point where after-tax marginal product equals bond return r
- **New view**
  - Higher corporate tax rate lowers investment
  - Change in dividend tax rate has no effect on dividend or investment

Impact of dividend tax cuts

- **Empirical evidence**
  - Scarce literature for lack of proper identification
  - Idea to test between old and new view
- **Poterba and Summers (JoF, 1984)**
  - U.K. data for 1955-1981
  - Exploit differentiated treatment of capital gains and dividend payments
  - Policy changes : (1965, capital gains tax ; 1973 integrated corporate tax)
  - Inspect goodness of structural investment models (e.g., CAPM)
  - Evidence that taxes on dividends impact substantially dividend payouts
    $\Rightarrow$ argument in favour of old view

Impact of dividend tax cuts

- **Chetty and Saez (QJE, 2005)**
  - Exploit the U.S. 2003 dividend tax cut
  - Jobs and Growth Tax Relief Reconciliation Act implemented by the Bush administration in 2003
  - Sunset clause : tax cut planed to end in 2009
  - τ_{DIV} reduced from 38.6% to 15%
- **Methodology**
  - Simple diff : before/after in time series (dividend initiations are high frequency events)
  - Test for confounding trend using firms owned primarily by nontaxable institutions as a "control group"
    e.g., dividend income earned by government agencies, nonprofit organizations, and corporations are not affected by the tax change

Impact of dividend tax cuts

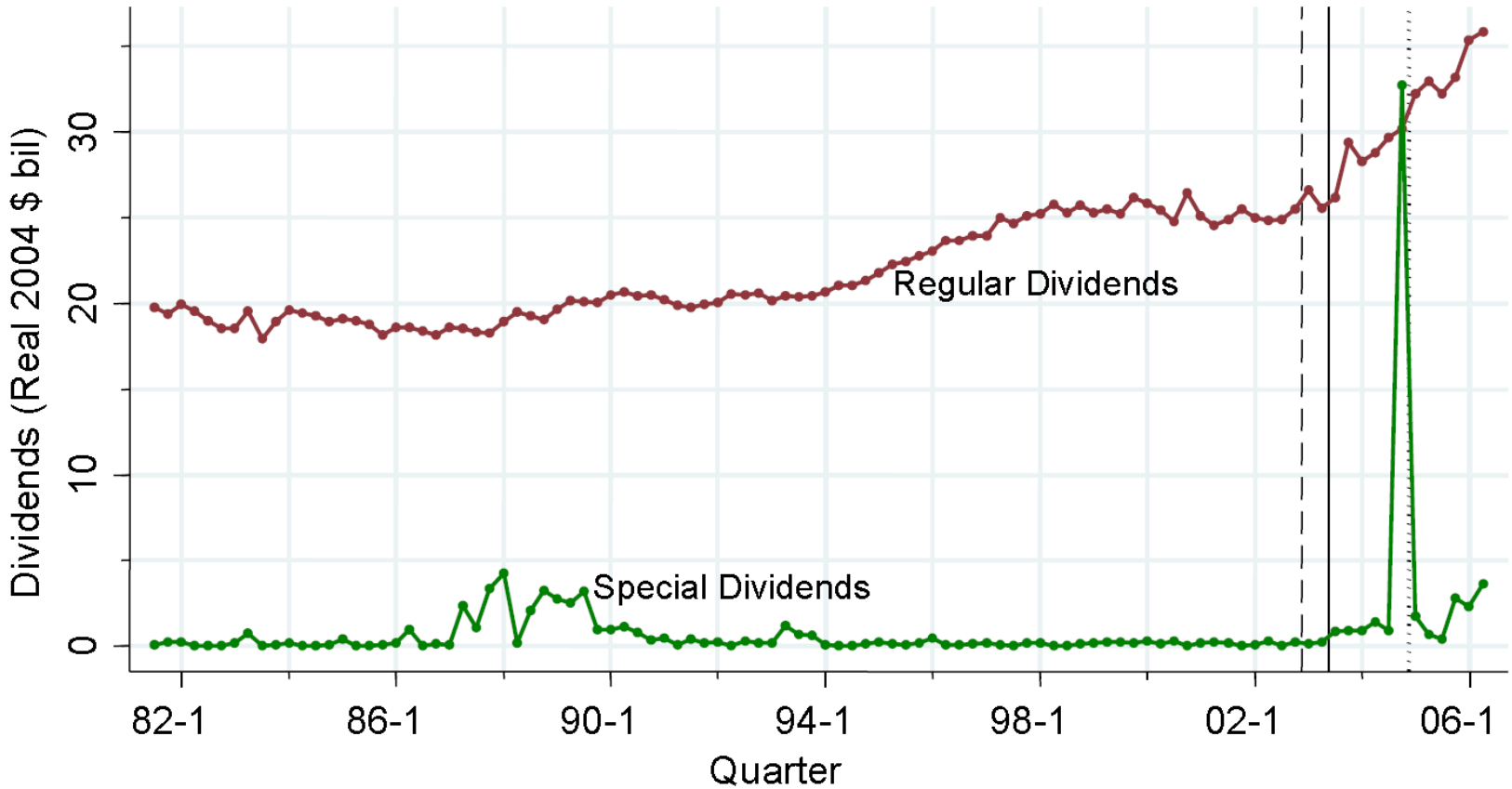
- **Data**
  - Data on dividend payments up to the second quarter of 2004 from the Center for Research in Security Prices (CRSP)
- **Results**
  - Large increase in dividend payouts : + 20% (+$20 bn p.a)
  - It implies an elasticity of regular dividend payments with respect to the marginal tax rate on dividend income of -0.5.
  - Largest response from firms with strong principals whose tax incentives changed (CEO with large dividends payout, large taxable shareholder, etc.)
  - Suggestive of agency issues matter for dividend behaviours

FIGURE 23: Dividend payments : summary statistics

Variables	Core Sample (all firms in CRSP)		Constant number of firms sample (top 3807 firms)	
	Mean	St. dev.	Mean	St. dev.
Regular dividend amount	4.52	40.34	5.80	45.67
Special dividend amount	0.11	10.73	0.14	12.16
Share repurchases amount	5.33	64.98	6.89	73.82
Fraction paying regular dividends	22.68%	41.88%	28.34%	45.07%
Fraction paying special dividends	0.58%	7.62%	0.67%	8.16%
Fraction initiations	0.24%	4.93%	0.29%	5.39%
Fraction terminations	0.46%	6.77%	0.46%	6.79%
Fraction dividend increases (20%+)	1.06%	10.25%	1.33%	11.44%
Fraction dividend decreases (20%+)	0.28%	5.29%	0.33%	5.75%
Fraction repurchasing (0.1%+)	15.08%	35.79%	16.71%	37.31%
Market capitalization	1125.82	8285.92	1444.76	9373.65
Assets	1137.36	8151.95	1442.00	9186.48
Cash and liquid assets	79.49	568.03	100.50	640.01
After-tax profits	9.88	160.26	12.90	180.15

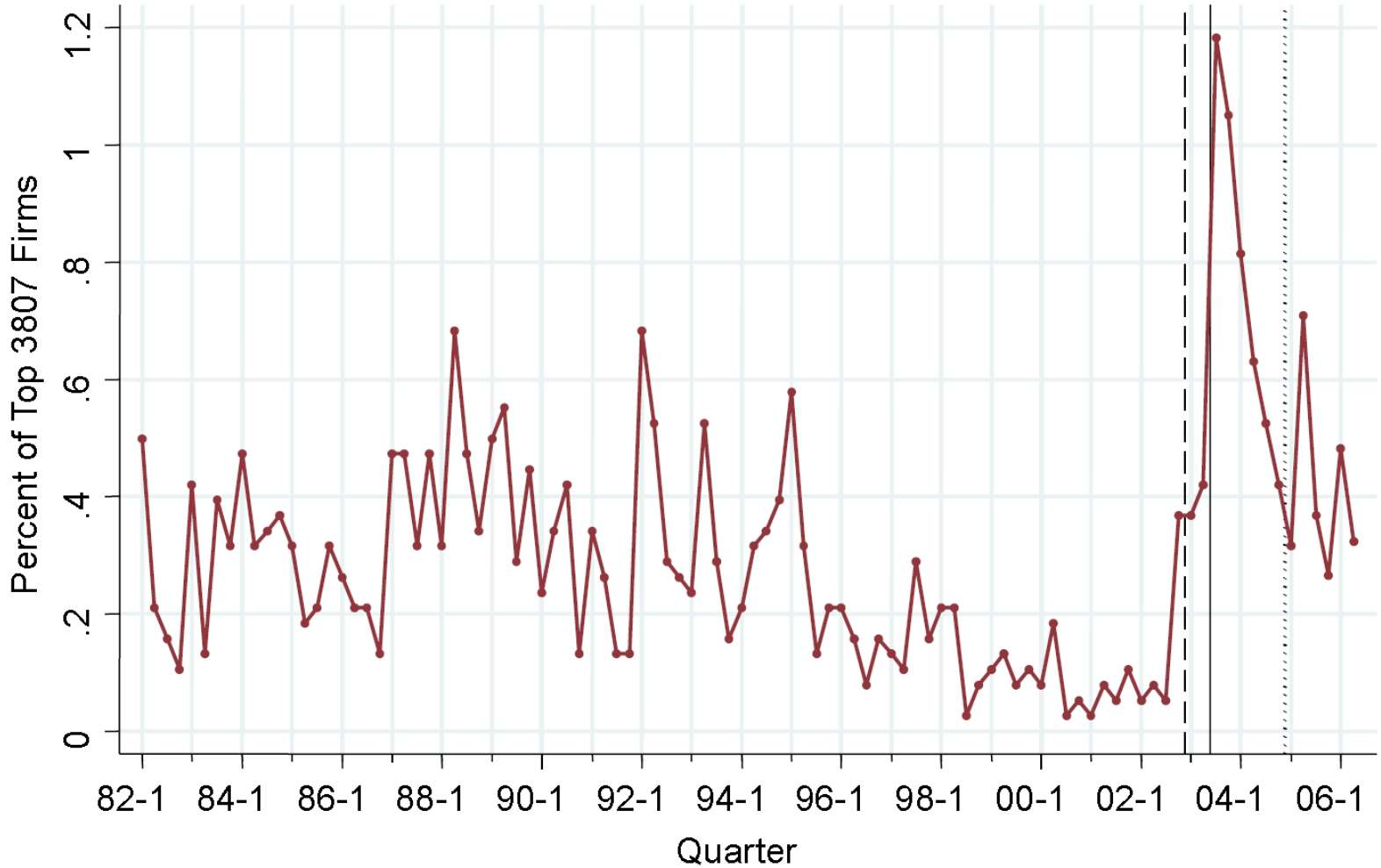
Source : Chetty and Saez (2005), Tab. 1.

FIGURE 24: Dividend payments : aggregate time series



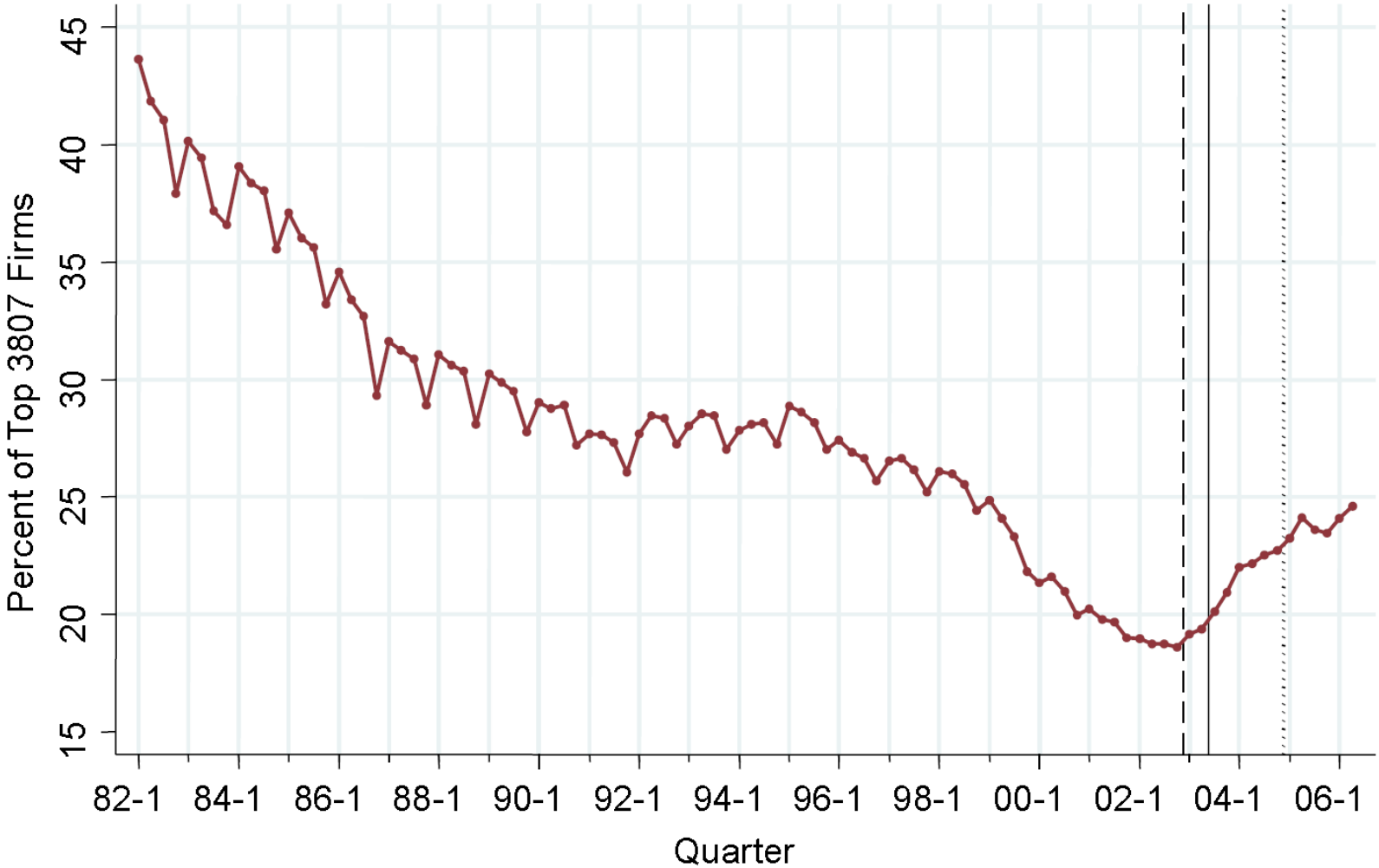
Source : Chetty and Saez (2005), Fig. 1, slides from Chetty 2012.

FIGURE 25: Regular dividend initiation time series



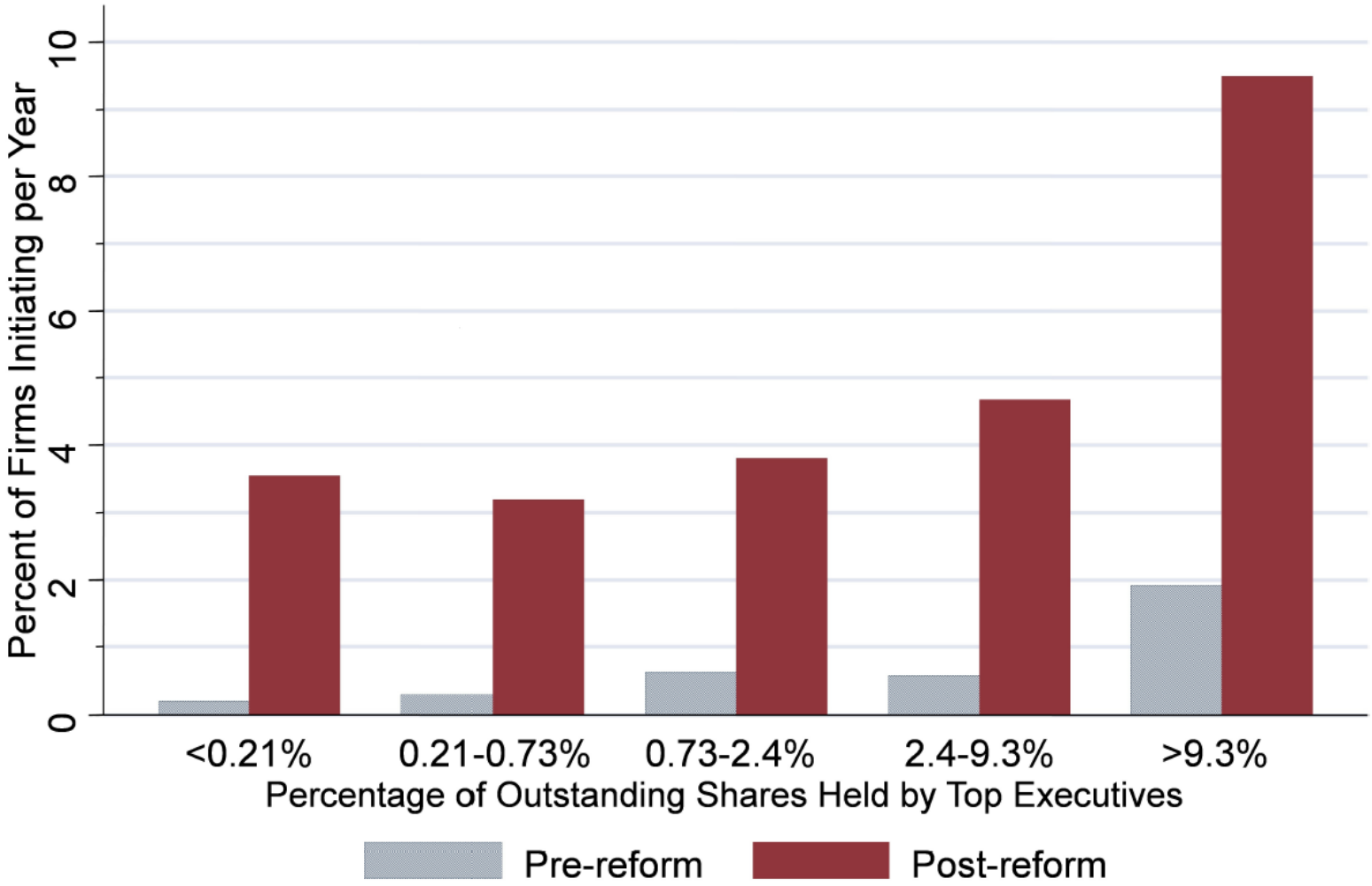
Source : Chetty and Saez (2005), Fig. 2, slides from Chetty 2012.

FIGURE 26: Fraction of dividend payers



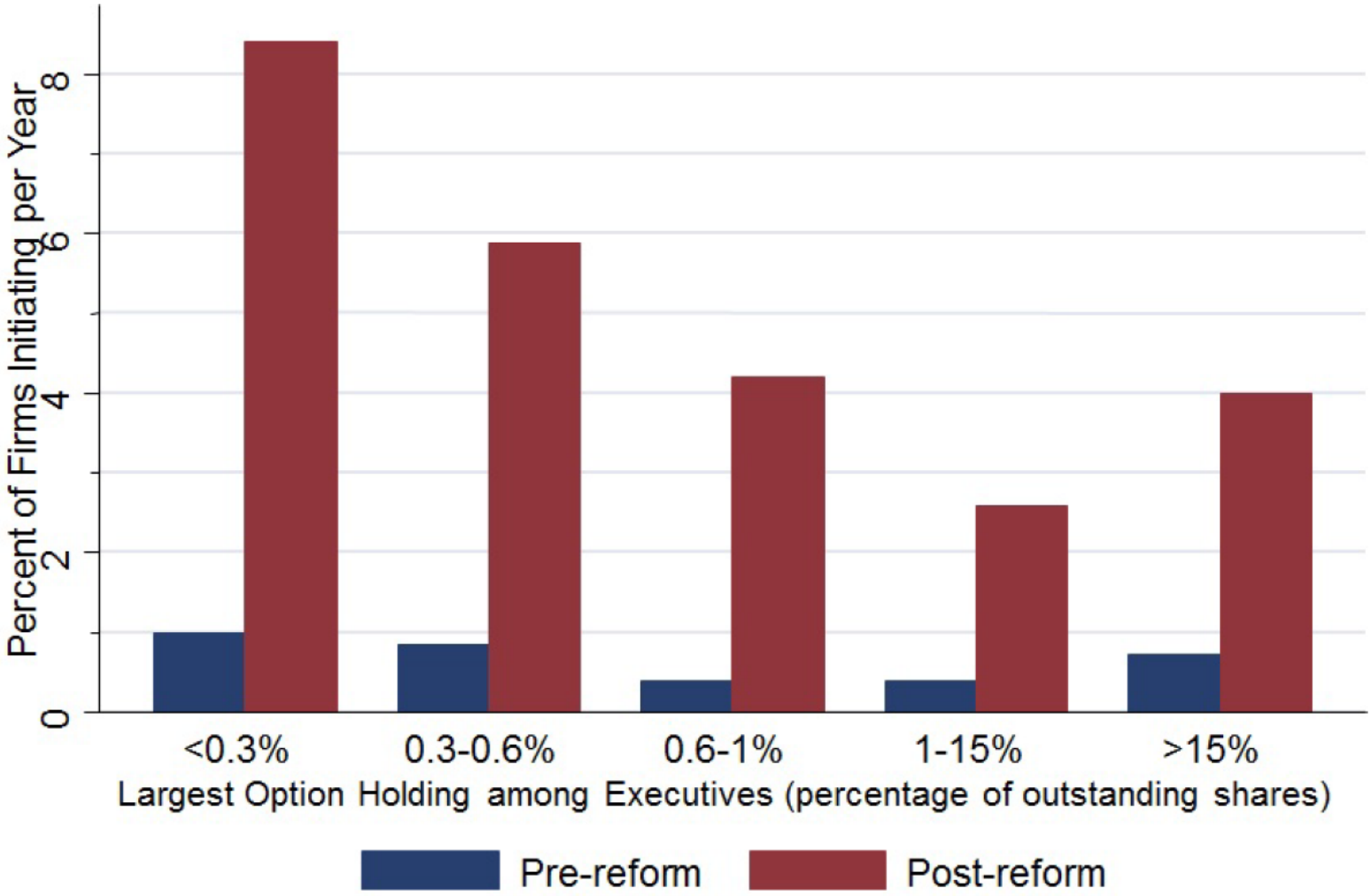
Source : Chetty and Saez (2005), Fig. 3, slides from Chetty 2012.

FIGURE 27: Effect of tax cut on initiations by executive shareholding



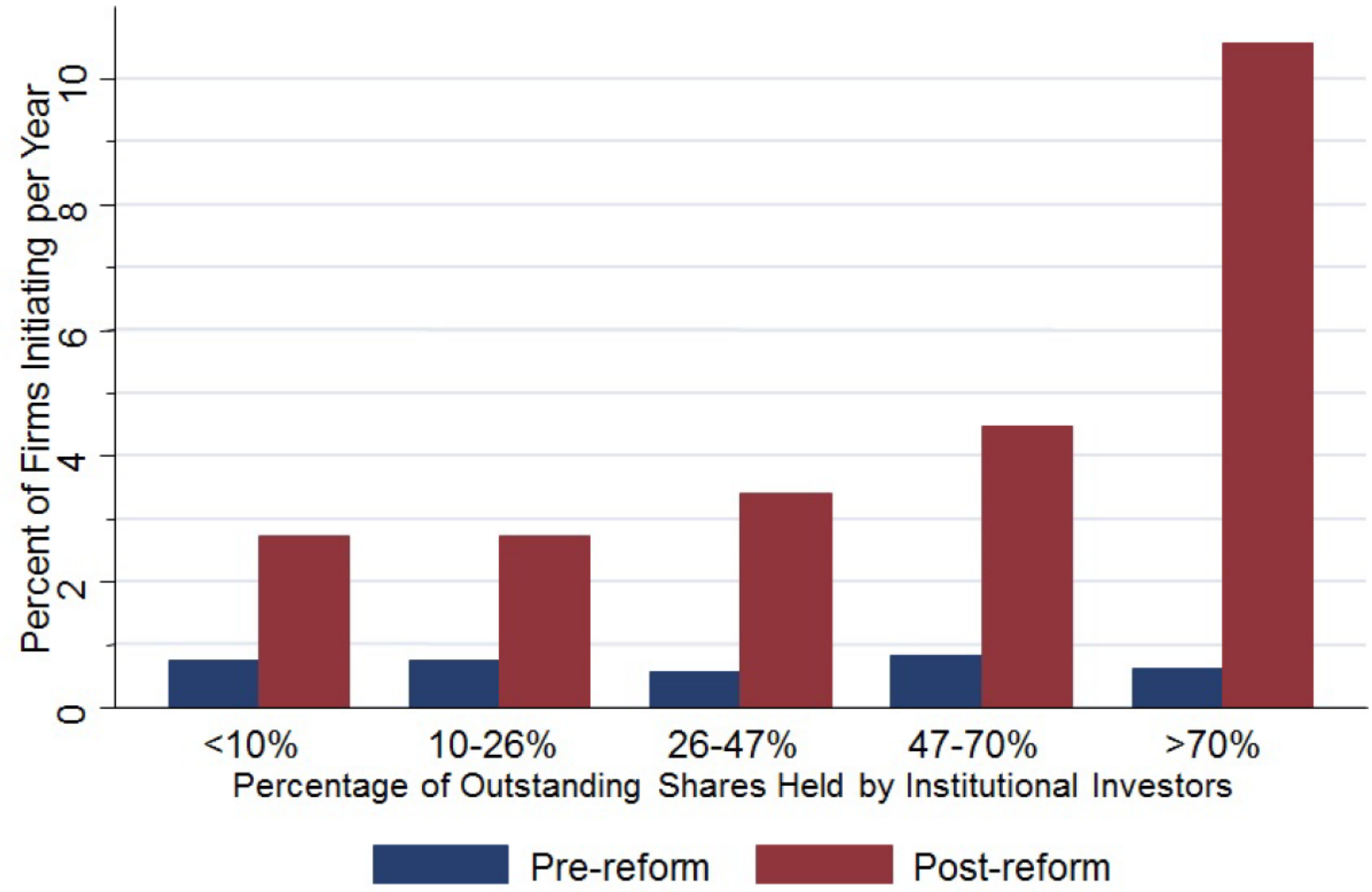
Source : Chetty and Saez (2005), Fig. 7, slides from Chetty 2012.

FIGURE 28: Effect of tax cut on initiations by executive option holding



Source : Chetty and Saez (2005), Fig. 7, slides from Chetty 2012.

FIGURE 29: Effect of tax cut on initiations by institutional ownership



Source : Chetty and Saez (2005), Fig. 8, slides from Chetty 2012.

Impact of dividend tax cuts

- **Chetty and Saez (2005) : take-away**
  - Significant impact of dividend tax cut on dividends
  - In line with the "old view"
  - But the dividend response appears too fast to be consistent with the old view mechanism
    i.e., savings supply side response $\Rightarrow$ more business activity and higher dividend payments
  - Temporary dividend tax cut could also be in line with new view
  - Chetty-Saez results consistent with positive, negative, or zero effect on investment

Yagan (AER, 2015)

- **Main idea**
  - Look at the effect of U.S. dividend tax cut in 2003 on investments
  - Impact on investment would confirm the "old view"
- **Results**
  - Zero effect on investment : reject traditional view
  - Zero effect on wages
  - Challenges leading estimates of user cost-of-capital elasticities w.r.t. to investments

Yagan (AER, 2015)

- **Methodology : DiD**
  - DiD using C-corporations vs. S-corporations
  - C-corps : pay CIT, shareholders pay dividend taxes, capital gains taxes on qualified share buybacks
  - S-corps : same legal structure but taxable income flows through shareholders individual tax returns (independent on whether it is retained or distributed)
- **Identification assumption**
  - C- and S-corps are different : C-corps are much larger
  - For identification : only necessary that both firm types would have followed the same trend absent the reform
  - Check whether proper control groups

FIGURE 30: C-corps vs. S-corps : Retail hardware chains

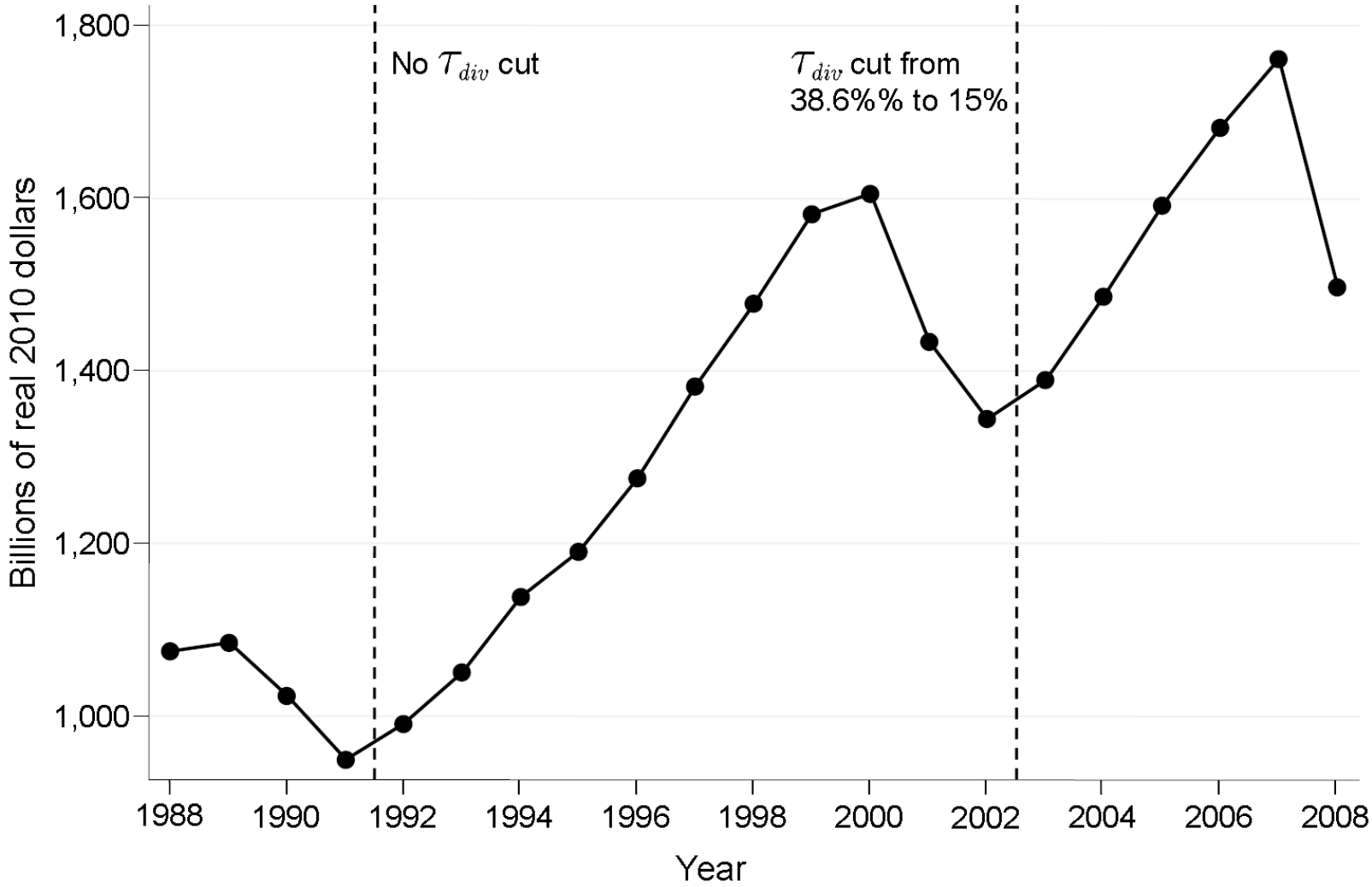
- Largest hardware chain
- C-corporation

- Third-largest hardware chain
- S-corporation

Source : Yagan (2015).

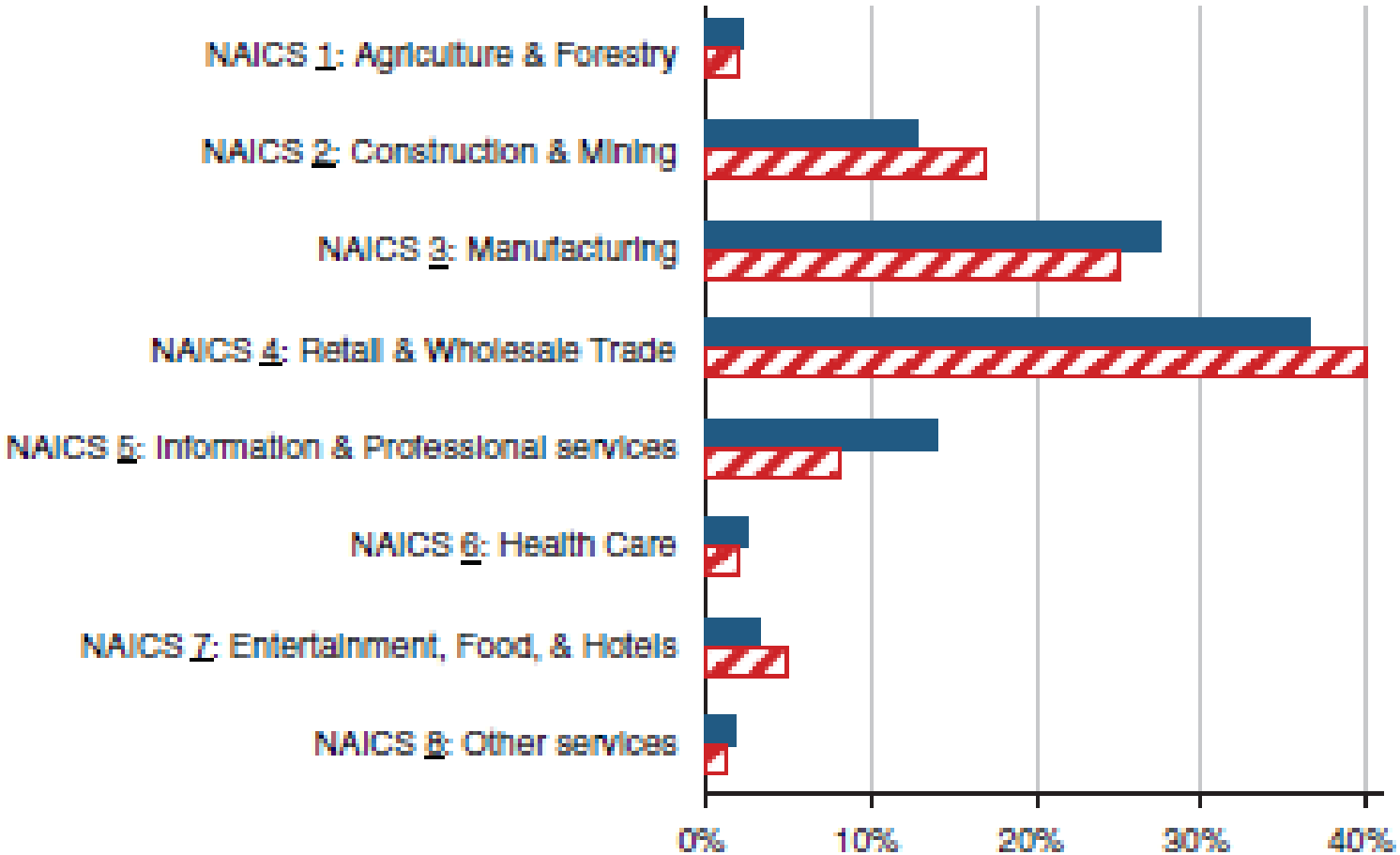
FIGURE 31: C-corps vs. S-corps : Retail hardware chains

FIGURE 32: U.S. corporate investment in national accounts



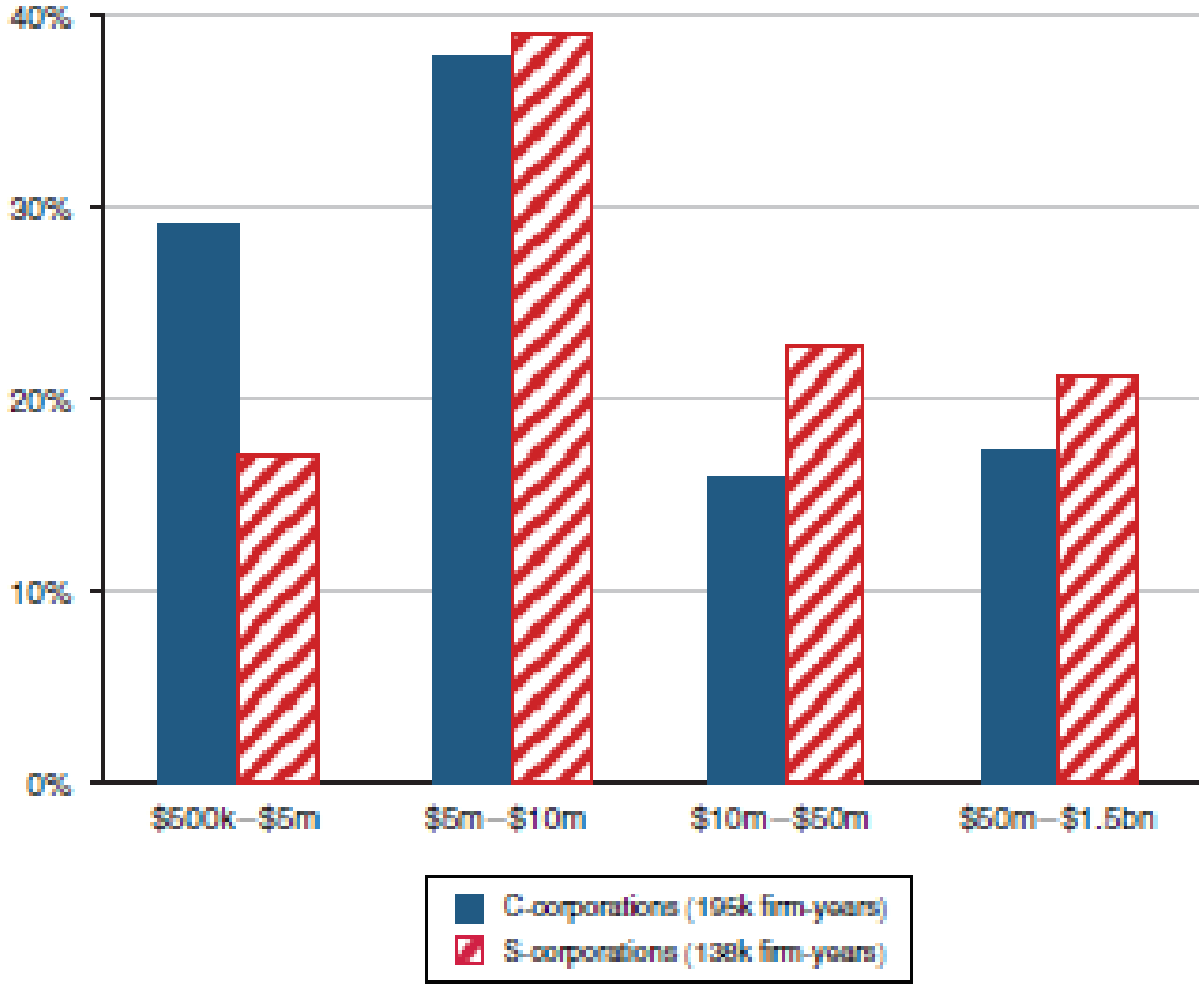
Source : Yagan (2013).

FIGURE 33: Control vs. treated : industry



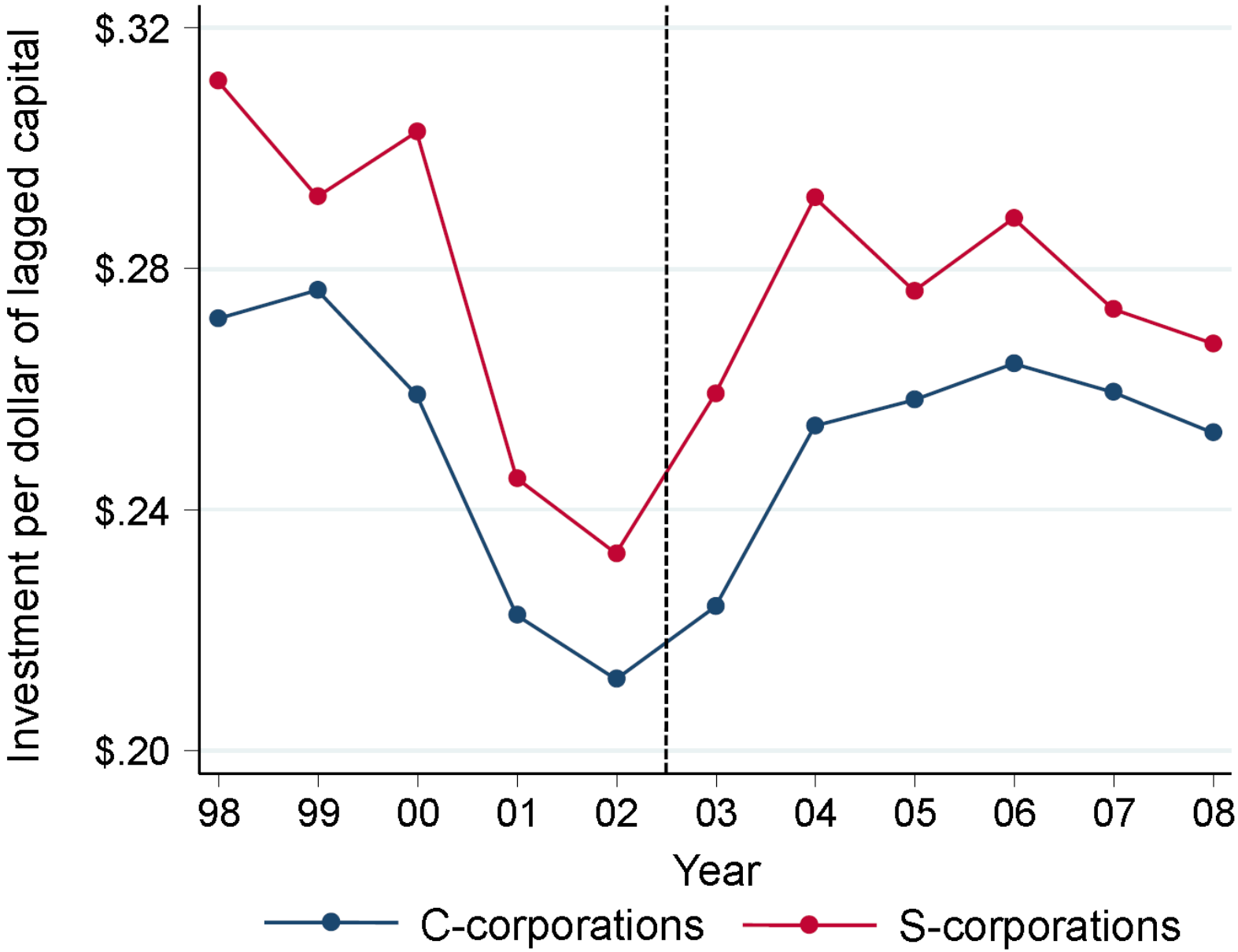
Source : Yagan (2015), Fig. 1.A

FIGURE 34: Control vs. treated : size



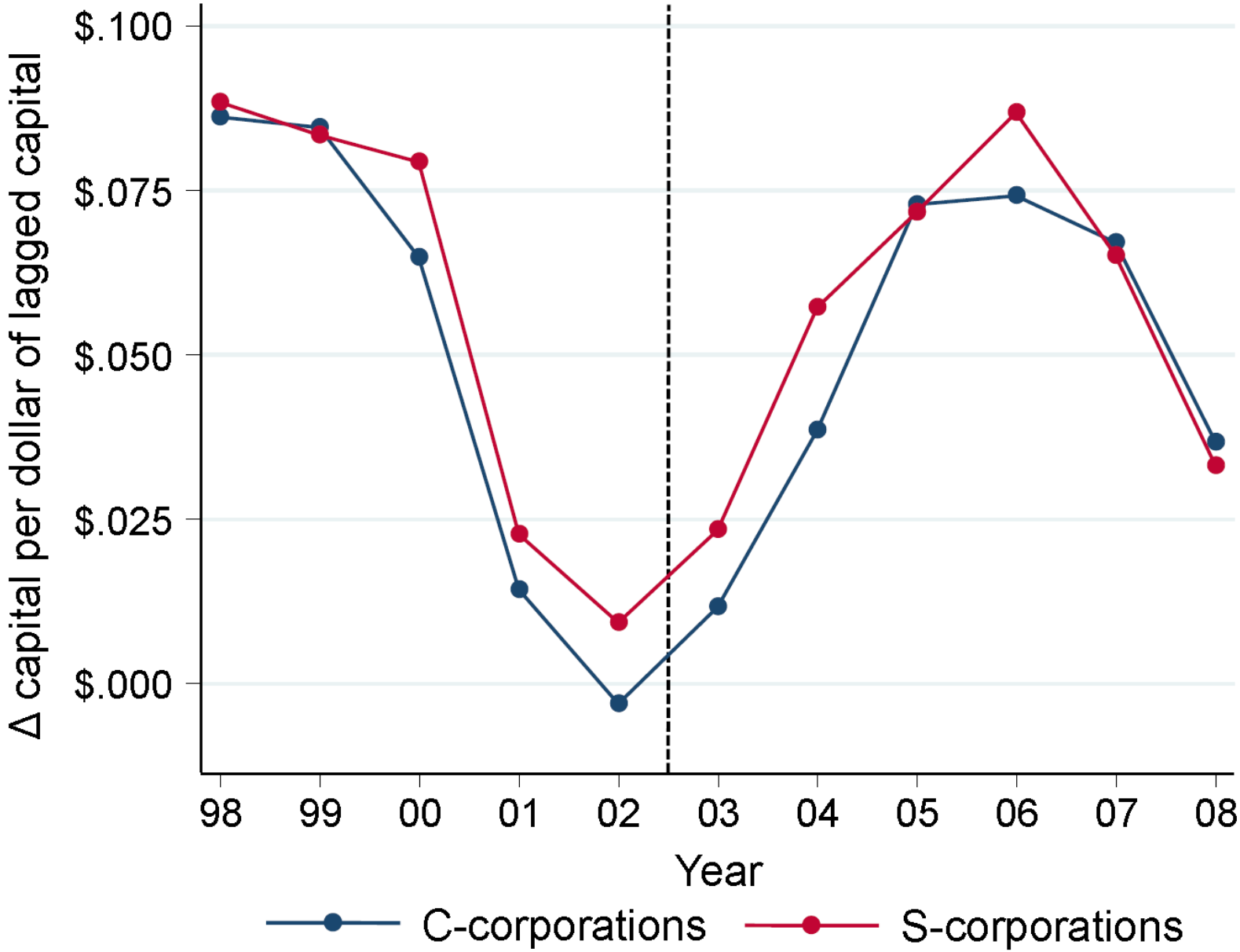
Source : Yagan (2015), Fig. 1.B

FIGURE 35: Investment



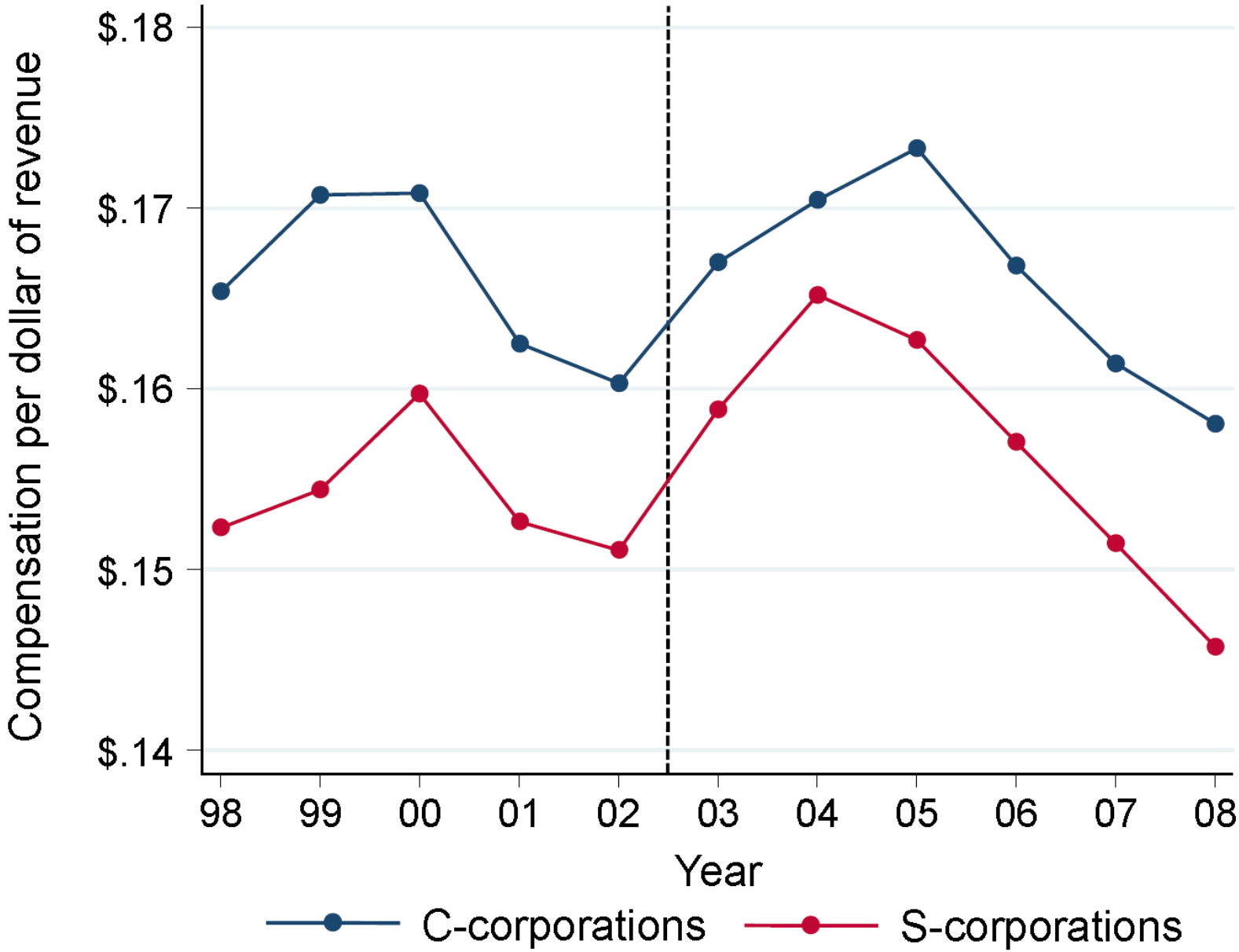
Source : Yagan (2015), Fig. 2.A

FIGURE 36: Net investment



Source : Yagan (2015), Fig. 2.B

FIGURE 37: Employee compensation



Source : Yagan (2015), Fig. 2.C

FIGURE 38: Effect of dividend tax cut on investment

Dependent variable:	Investment					
Dep. var. winsorized at:	95th percentile			99th percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96–97 cap.)	($ per lagged capital)		($ per 96–97 cap.)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Investment						
C-Corp × Post-2003	0.0008	−0.0002	−0.0063	−0.0104	−0.0118	−0.1884
	(0.0044)	(0.0042)	(0.0226)	(0.0068)	(0.0066)	(0.1483)
Lagged controls		X			X	
Firm FE's			X			X
Observations (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.07	0.53	0.01	0.05	0.55
Pre-2003 C-corp mean	0.2428	0.2428	0.2939	0.2828	0.2828	0.3682
Pre-2003 C-corp SD	0.2514	0.2514	0.3070	0.4181	0.4181	0.6478
Implied ε wrt $(1 - \tau_{div})$	0.01	0.00	−0.05	−0.09	−0.10	−1.18
	[−0.08, 0.09]	[−0.08, 0.08]	[−0.4, 0.3]	[−0.19, 0.02]	[−0.2, 0.01]	[−3.01, 0.64]

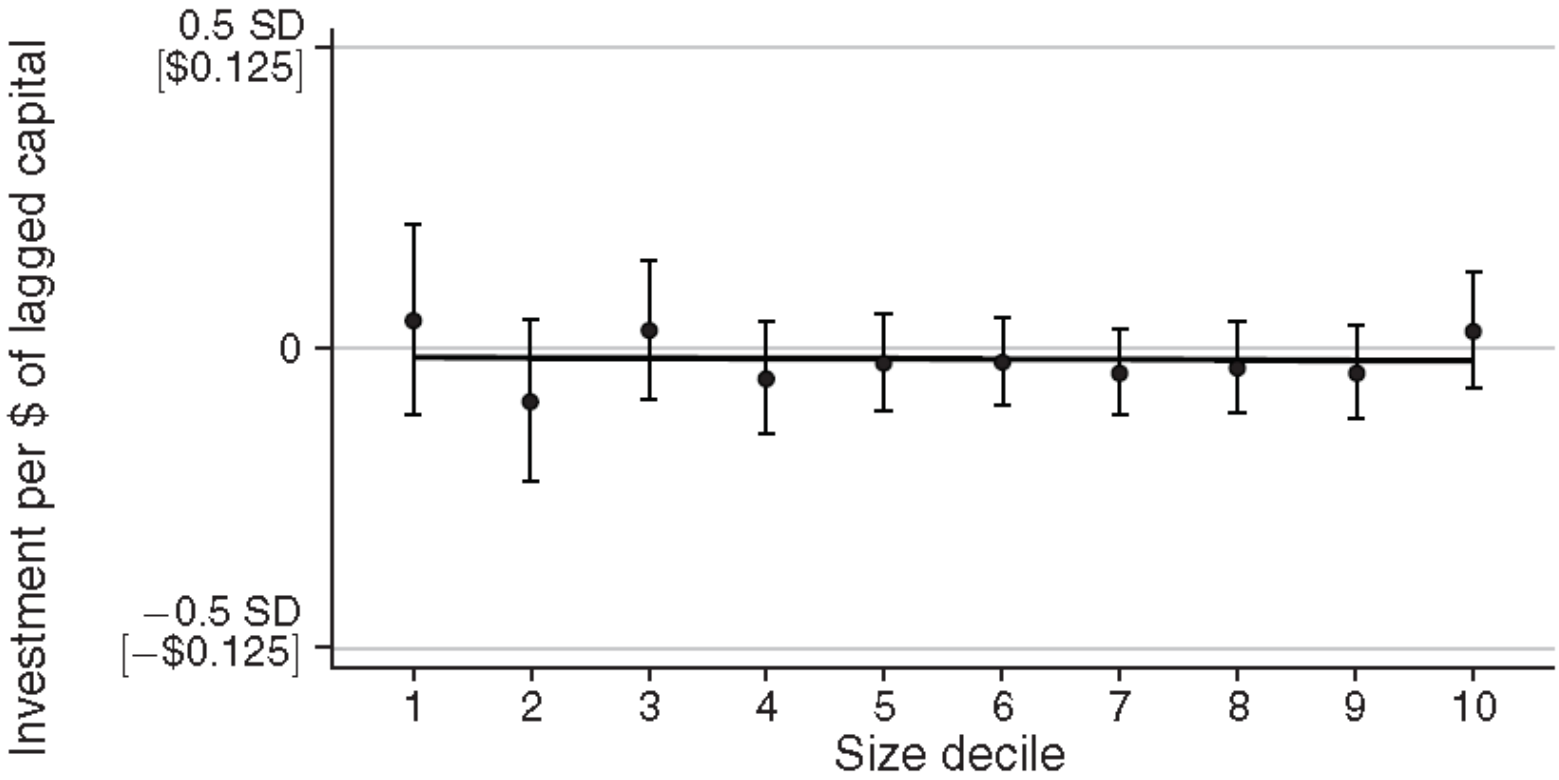
Source : Yagan (2015), Tab. 2.A

FIGURE 39: Effect on net investment and employee compensation

Dependent variable:	Net investment			Employee compensation		
Dep. var. winsorized at:	95th percentile					
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96–97 cap.)	($ per lagged revenue)		($ per 96–97 rev.)
	(7)	(8)	(9)	(10)	(11)	(12)
B. Net investment and employee compensation						
C-Corp × Post-2003	0.0048	0.0042	−0.0110	−0.0013	−0.0013	0.0083
	(0.0041)	(0.0039)	(0.0116)	(0.0025)	(0.0020)	(0.0062)
Lagged controls		X			X	
Firm FE's			X			X
Observations (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.04	0.20	0.00	0.37	0.87
Pre-2003 C-corp mean	0.0421	0.0421	0.0885	0.1647	0.1647	0.1727
Pre-2003 C-corp SD	0.2541	0.2541	0.2732	0.1415	0.1415	0.1450
Implied ε wrt $(1 - \tau_{div})$	0.26	0.23	−0.29	−0.02	−0.02	0.11
	[−0.18, 0.71]	[−0.19, 0.66]	[−0.88, 0.3]	[−0.09, 0.05]	[−0.07, 0.04]	[−0.05, 0.27]

Source : Yagan (2015), Tab. 2.B

FIGURE 40: Effect on investment by size decile



Source : Yagan (2015), Fig. 3.A

Yagan (AER, 2015)

- **Results**
  - 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)
- **Possible interpretations**
  1. New view is correct and most firms fund marginal investments out of retained earnings (e.g., median U.S. firm is 22 years old)
  2. Traditional view is technically correct, but tax code features blocked effects
     - Low expected permanence (originally set to expire in 2009)

Elasticity of corporate taxable income

- **Devereux, Liu and Loretz (AEJ-EP 2014)**
  - Estimate the elasticity of corporate taxable income (ECTI) with respect to the statutory tax rate in the U.K.
  - Bunching in the distribution of taxable income at kinks in the marginal rate schedule
  - Using U.K. tax return data provided by HMRC for 2001-2008
- **Results**
  - Fairly low elasticities
  - 0.15 for small firms
  - 0.50 for very small firms (e.g., tax drivers, etc.)

Elasticity of corporate taxable income

- **ECTI**
  - Similar measure to ETI for personal income tax
  - ECTI measures the response of corporate taxable income to a 1% change in the statutory CIT rate
  - Various behavioral adjustments : location, investments, profit shifting, finance structure
- **Methodology**
  - Kinks in U.K. tax rate schedule at £300K and at £10K
  - Variation over time in the kinks at £10K
  - Bunching estimation method (Saez, 2010)

Elasticity of corporate taxable income

- **Firms' problem**
  - Firms maximise net of tax profit π

$$\pi = y - c(y) - T$$

  - $c(y)$ is cost of producing y
  - Total tax $T = t_c(B_c - A_c) + E$
  - tax rate t_c
  - tax base $B_c = y - \alpha c(y)$, with α share of deductible costs
  - A_c lowest point of relevant bracket
  - E taxes paid in lower brackets

$$\pi = y - c(y) - t_c(y - \alpha c(y) - A_c) - E$$

- **FOC**

$$c'(y) = \frac{1 - t_c}{1 - \alpha t_c}$$

Elasticity of corporate taxable income

- **Social welfare**
  - Welfare $W = \pi + T$
- **Impact of CIT on total welfare**
  - Increase in net of tax rate $1 - t_c$
  - Apply the envelope theorem to ignore any indirect effects of the change in $1 - t_c$ on π through y
  - Direct effects of tax change cancel out

$$dW = \left(\frac{\partial \pi}{\partial y} \frac{\partial y}{\partial (1 - t_c)} - t_c (1 - \alpha c') \right) d(1 - t_c)$$

$$dW = \frac{t_c B_c}{1 - t_c} e d(1 - t_c)$$

  - With e the elasticity of corporate taxable income

Elasticity of corporate taxable income

- **Excess burden of CIT**
  - Mechanical change in tax burden for given y

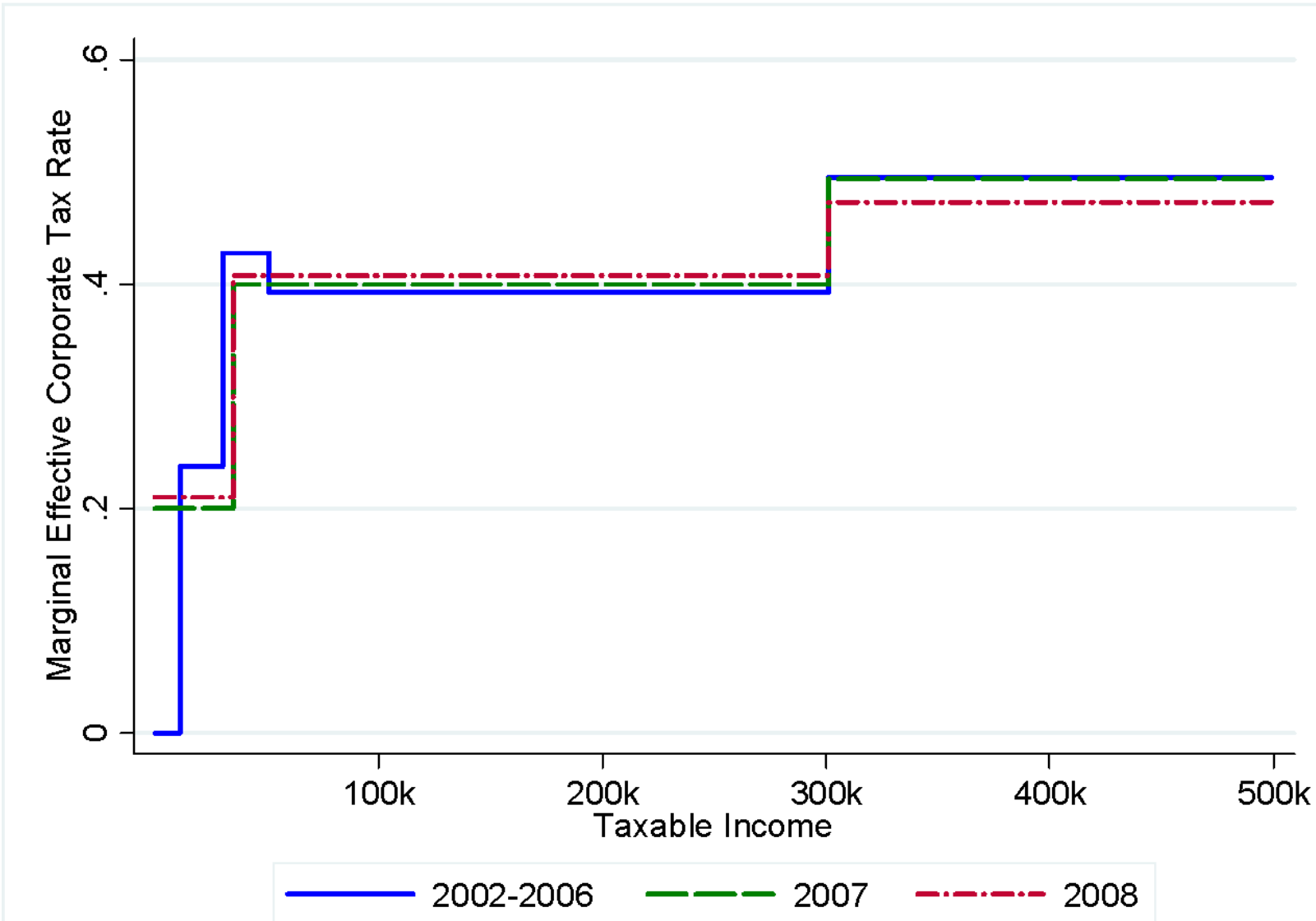
$$dM = -(B_c - A_c)d(1 - t_c)$$

  - Compare the change in welfare to the mechanical change in tax revenue in the absence of any behavioral response

$$\frac{dW}{dM} = -\frac{B_c}{B_c A_c}\frac{t_c}{1 - t_c}e$$

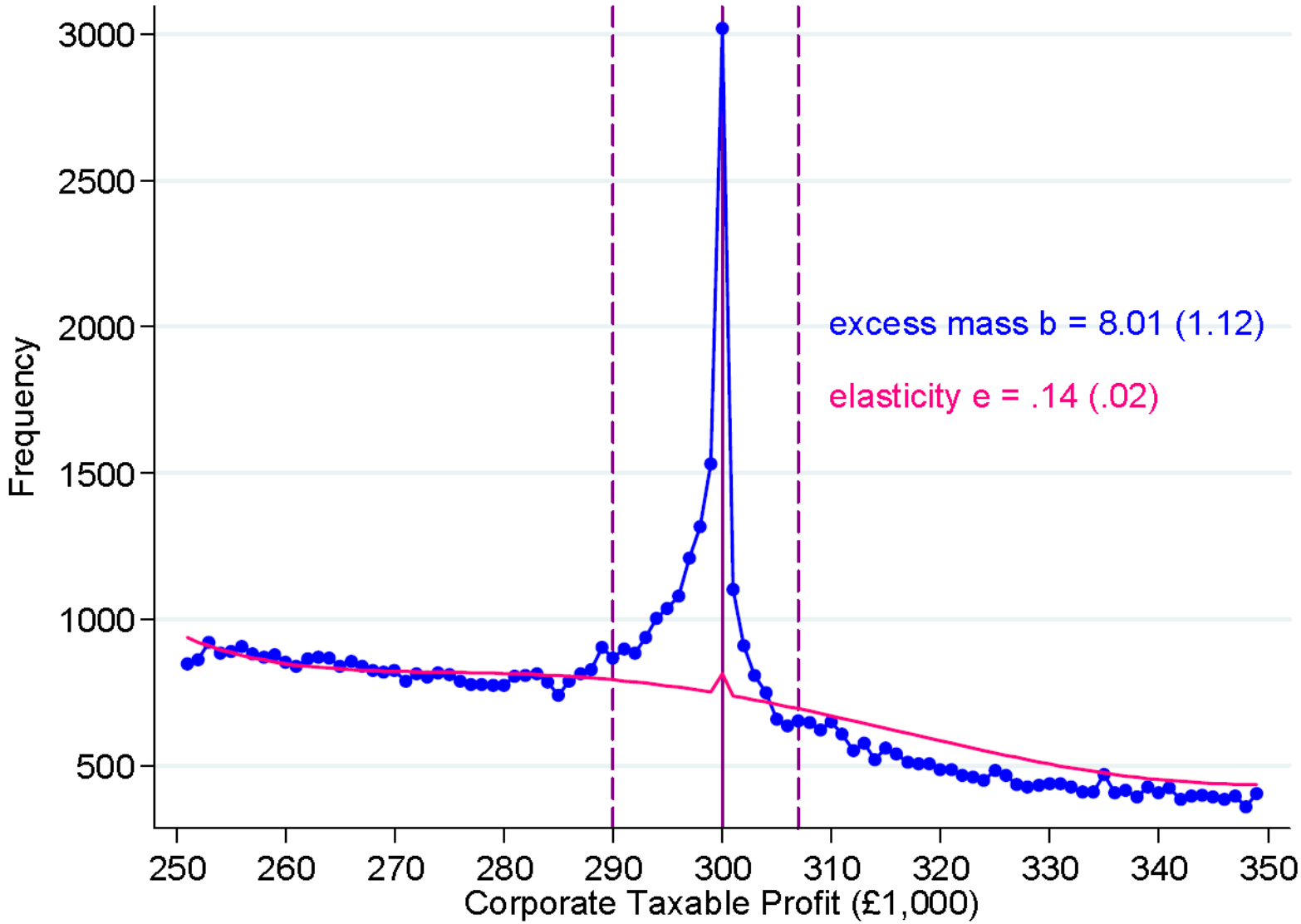
- **ECTI as sufficient statistics**
  - $\frac{dW}{dM}$ gives the marginal deadweight loss of tax increase
  - ECTI e is a measure of the efficiency loss due to corporate taxation

FIGURE 41: U.K. corporate income tax schedule



Source : Devereux, Liu and Loretz (2014), Fig. 1.

FIGURE 42: Bunching at £300K



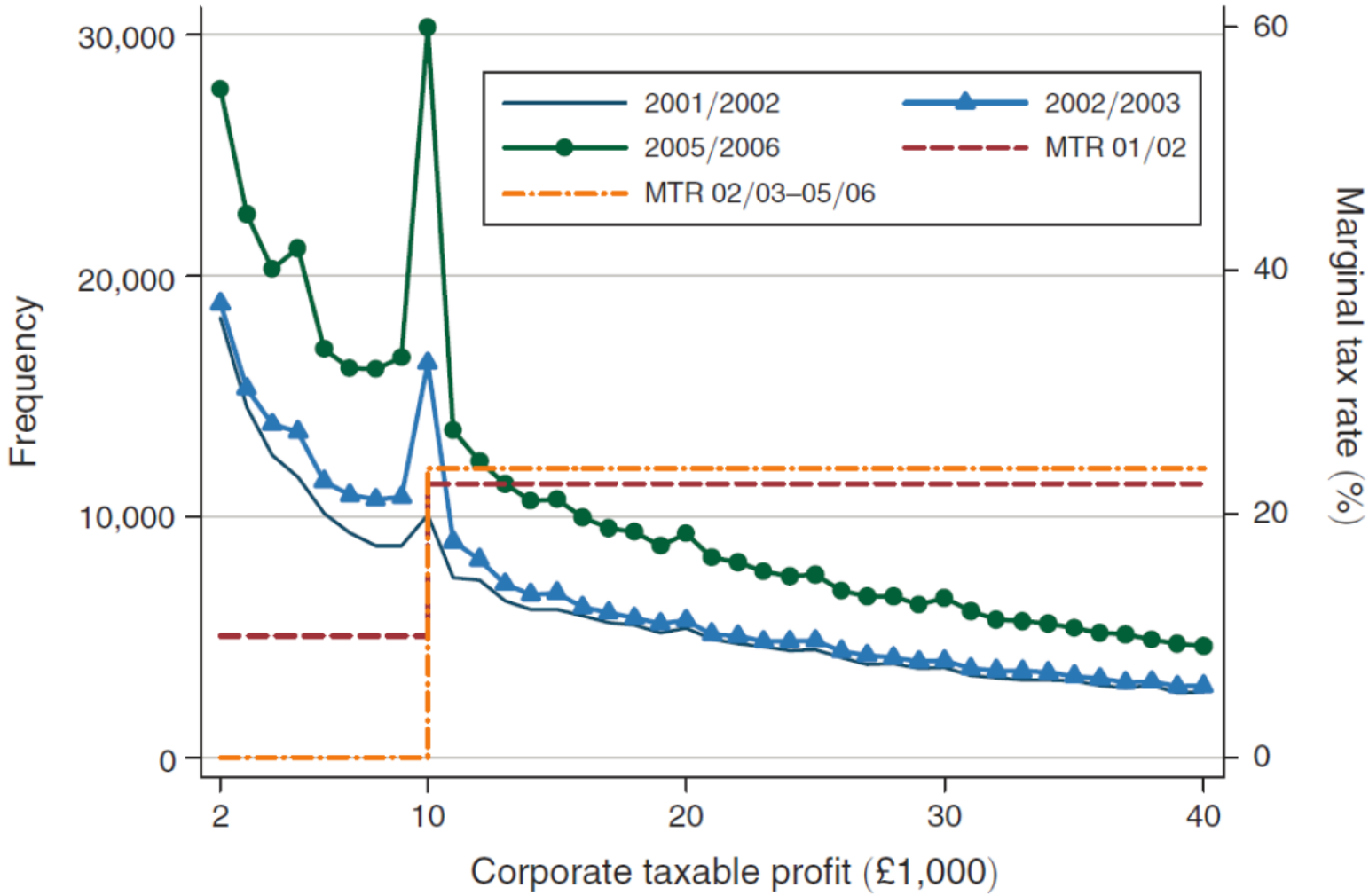
Source : Devereux, Liu and Loretz (2014), Fig. 2.

FIGURE 43: ECIT at £300K

Year (1)	Increase in 1-MTR (percent-points) (2)	$\hat{e}$ (3)
2001	0.170	0.134*** (0.019)
2002–2006	0.186	0.132*** (0.016)
2007	0.170	0.134*** (0.017)
2008	0.117	0.167*** (0.021)

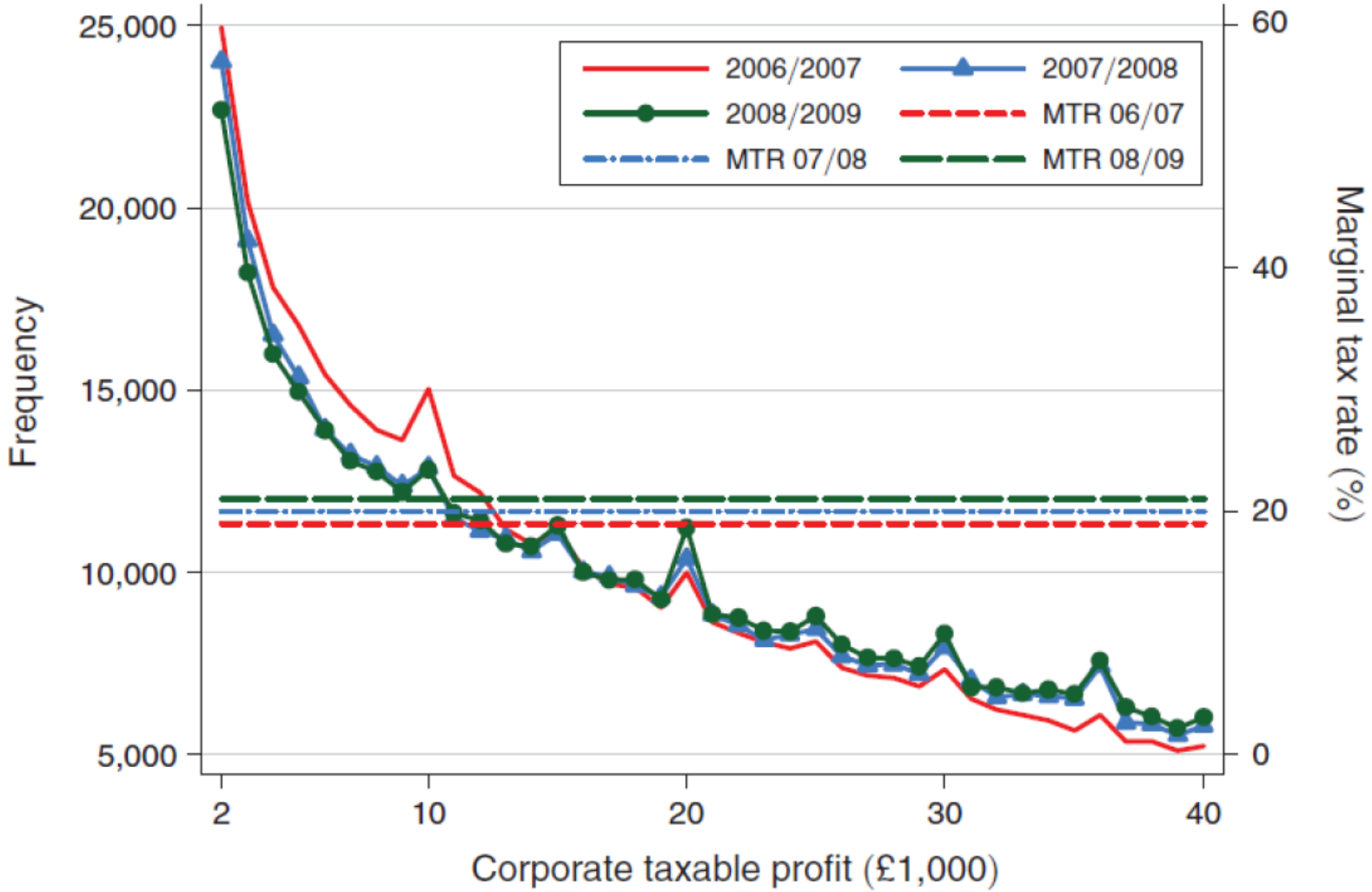
Source : Devereux, Liu and Loretz (2014), Tab. 2.

FIGURE 44: Bunching at £10K



Source : Devereux, Liu and Loretz (2014), Fig. 4.

FIGURE 45: De-Bunching at £10K



Source : Devereux, Liu and Loretz (2014), Fig. 4.

FIGURE 46: ECIT at £10K

Year (1)	Increase in 1-MTR (percent-points) (2)	NCDR (percent-points) (3)	Full sample (4)	New entries (5)	Exisiting firms (6)
2001	0.150	0	0.366***	—	—
			(0.056)	—	—
2002–2003	0.271	0	0.556***	0.475***	0.558***
			(0.140)	(0.156)	(0.142)
2004–2005	0.271	0.190	0.528***	0.230***	0.538***
			(0.145)	(0.072)	(0.150)

Source : Devereux, Liu and Loretz (2014), Tab. 4.

IV. Policies

1. Research tax credits
2. Cash-flow vs broad base
3. Facing tax competition

Research tax credit

- **Innovation and growth**
  - TFP main factor of growth over time
  - Technological innovation critical factor for TFP growth, especially in countries at technological frontier
- **Supporting R&D**
  - Endogenous growth theory gives room for policy makers
  - Two main policies
    1. Direct subsidies : grant for R&D
    2. Indirect subsidies : tax incentives

Research tax credit

- **Research tax credit (RTC)**
  - Tool allowing higher deduction of corporate tax base for R&D expenses
  - Government does not have to choose which project to subsidy
  - Mitigate risk of political capture
- **Potential issues**
  - Very blunt tool : not well targeted at high externality ideas
  - Re-labelling Problem
  - R&D is hard to define
  - Costly scheme in terms of revenues

Research tax credit

- **User cost of capital**
  - Reminder
  - Euler equation : $F'(K_{t+1})$

$$\approx q_t \frac{1-\Gamma_t}{1-\tau_{cit}} \left[\delta + \rho - \frac{q_{t+1}(1-\Gamma_{t+1}) - q_t(1-\Gamma_t)}{q_t(1-\Gamma_t)} \right]$$

  - RTC reduce user cost of capital $\Gamma_t = \tau_{cit}$
- **RTC should boost R&D investment**
  - Depending on elasticity of investment to user cost of capital
  - Empirical question

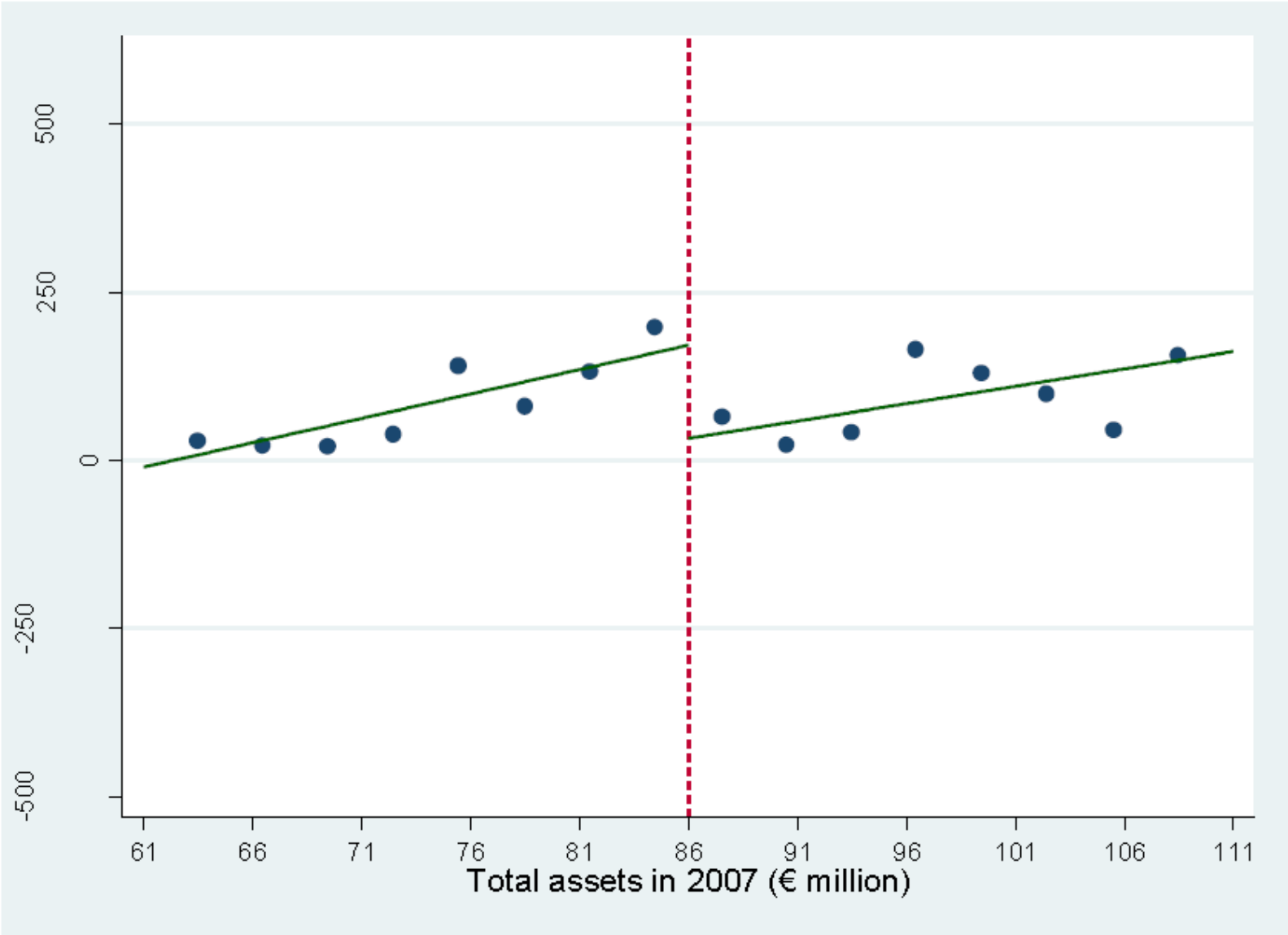
Research tax credit

- **What effects of RTC ?**
  - Earlier literature showed limited effects
  - More recent papers suggested high elasticity, and relatively efficient RTC schemes
  - Cross-country : Bloom, Griffith and Van Reenen (2002)
  - Hall and Van Reenen (2000)
  - Large effects on R&D spending, but few evidence on innovation (e.g., patents)
- **Change in the generosity of RTC**
  - Change from incremental to volume-based systems : more costly
    e.g., French RTC reform in 2008 (*crédit d'impôt recherche*)

Research tax credit

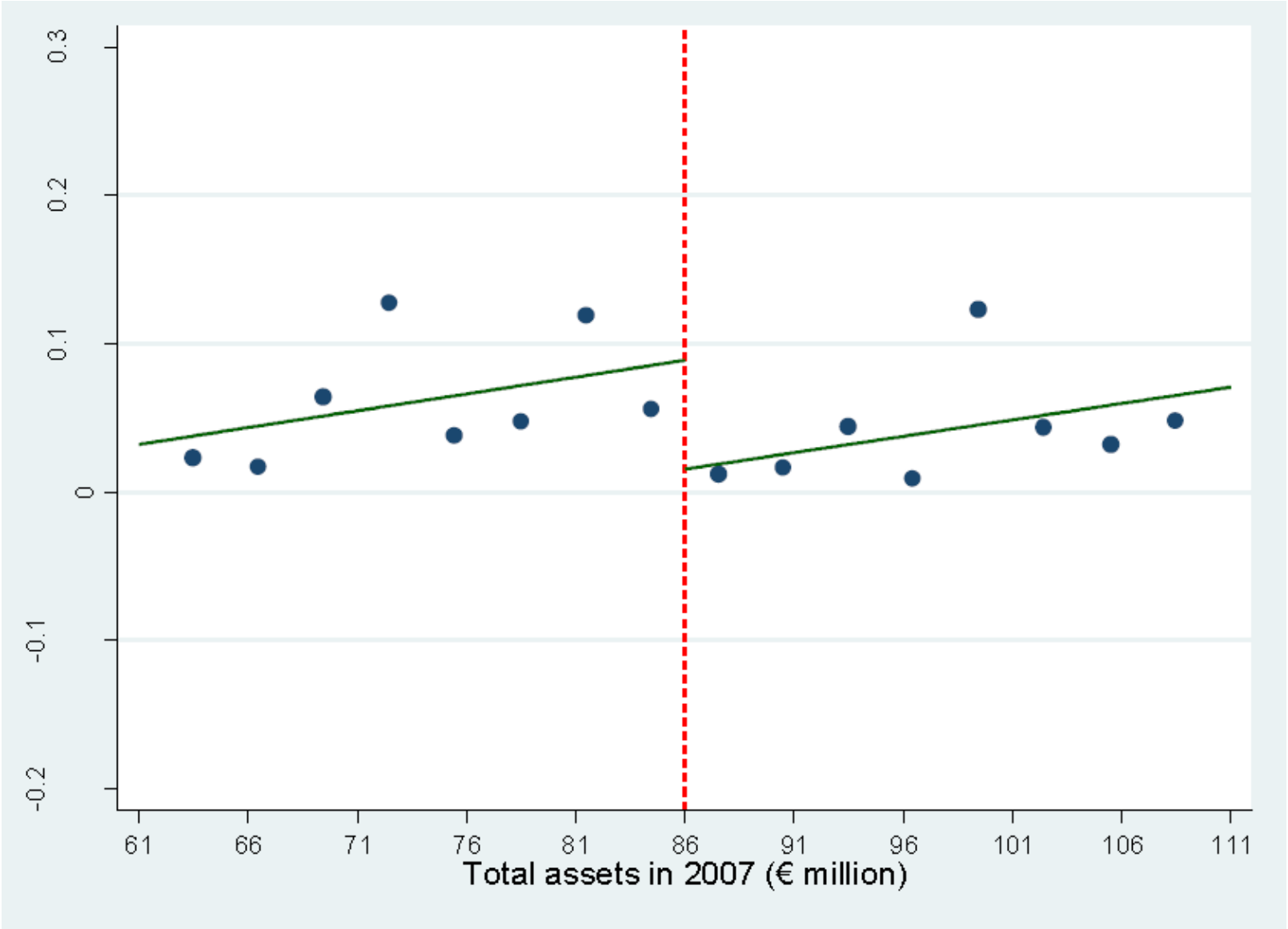
- **U.K. research tax credit**
  - Introduction in 2000 of an R&D Tax Relief Scheme for SME
  - Volume-based scheme
  - Additional deduction of 50% of qualified R&D expenditures
  - Tax credit of 24% of R&D expenditures
- **Dechezleprêtre et al. (2016, R&R AER)**
  - Exploit change in the U.K. to asset threshold to qualify to Tax Relief Scheme
  - In 2008, SME assets threshold was increased from €43m to €86m
  - Use admin tax data + patent data
  - Apply RDD strategy

FIGURE 47: Discontinuity in average R&D expenditure over 2009-11



Source : Dechezleprêtre, et al. (2016), Fig. 2.

FIGURE 48: Discontinuity in average number of patents over 2009-11



Source : Dechezleprêtre, et al. (2016), Fig. 3.

Research tax credit

- **Results**
  - Increase of 100% in R&D spending
  - Increase of 60% in patenting
  - Large elasticity of R&D spending relative to its user cost at 2.6 (usual estimate between 1 and 2)

Facing tax competition

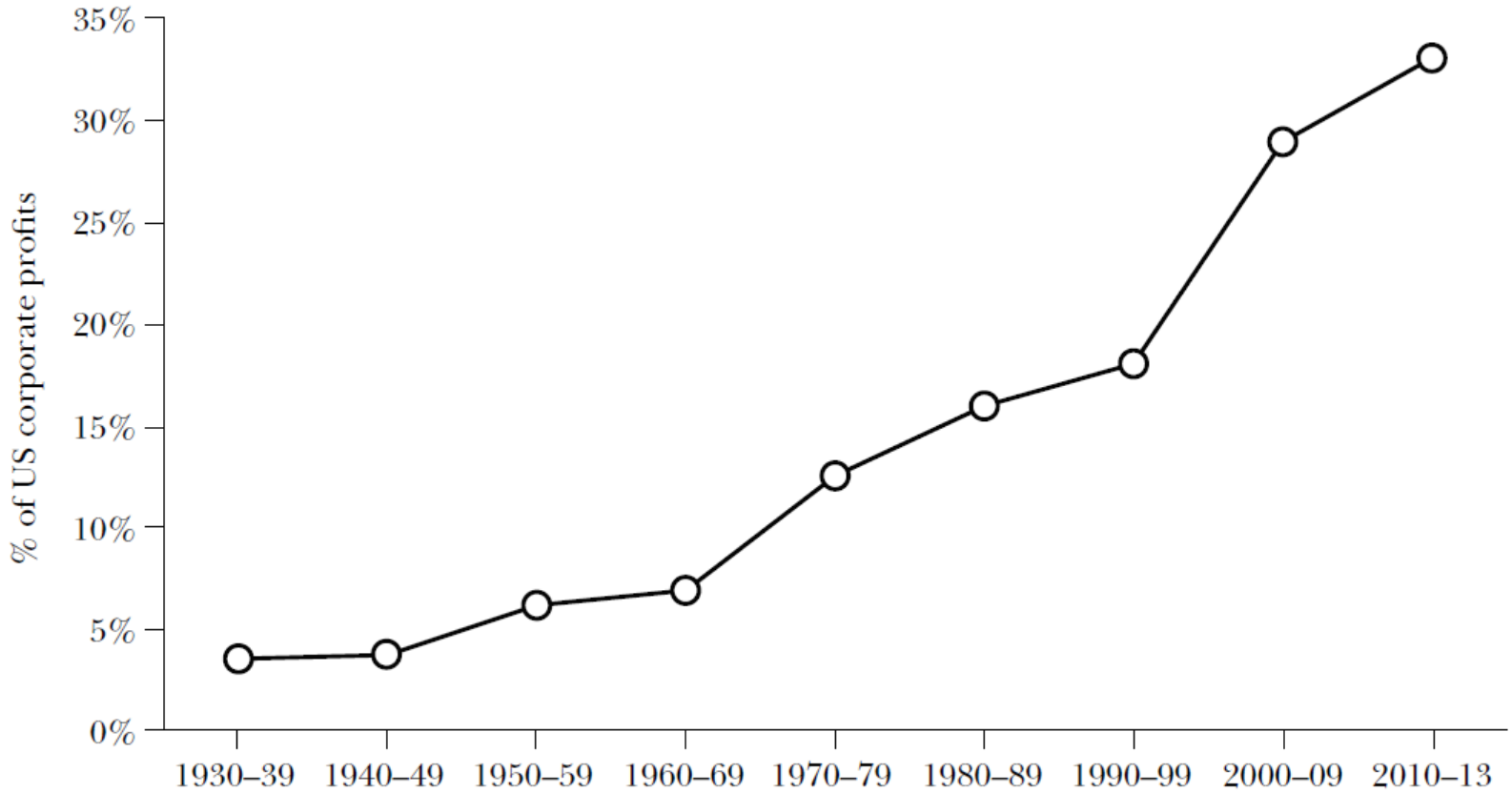
- **The capital flight problem**
  - Most countries use a source-based corporation tax
  - A source-based tax system is vulnerable to tax competition (through profit shifting)
- **Different aspects of the tax matter for each decision :**
  - Average tax rate explains investment location decision
  - Marginal tax rate explains how much to invest
  - Statutory tax rate determines profit location

Profit-shifting to low-tax jurisdictions

- **Transfer pricing**
  - Develop property in foreign subsidiary, which then leases it at high price to domestic parent
  - Domestic parent enjoys cost deductions while foreign subsidiary pays little tax on lease earnings
- **Earnings stripping**
  - Domestic parent borrows heavily from foreign subsidiary in Caymans
  - Domestic parent enjoys interest deductions while foreign subsidiary pays little tax on interest earnings

Profit-shifting to low-tax jurisdictions

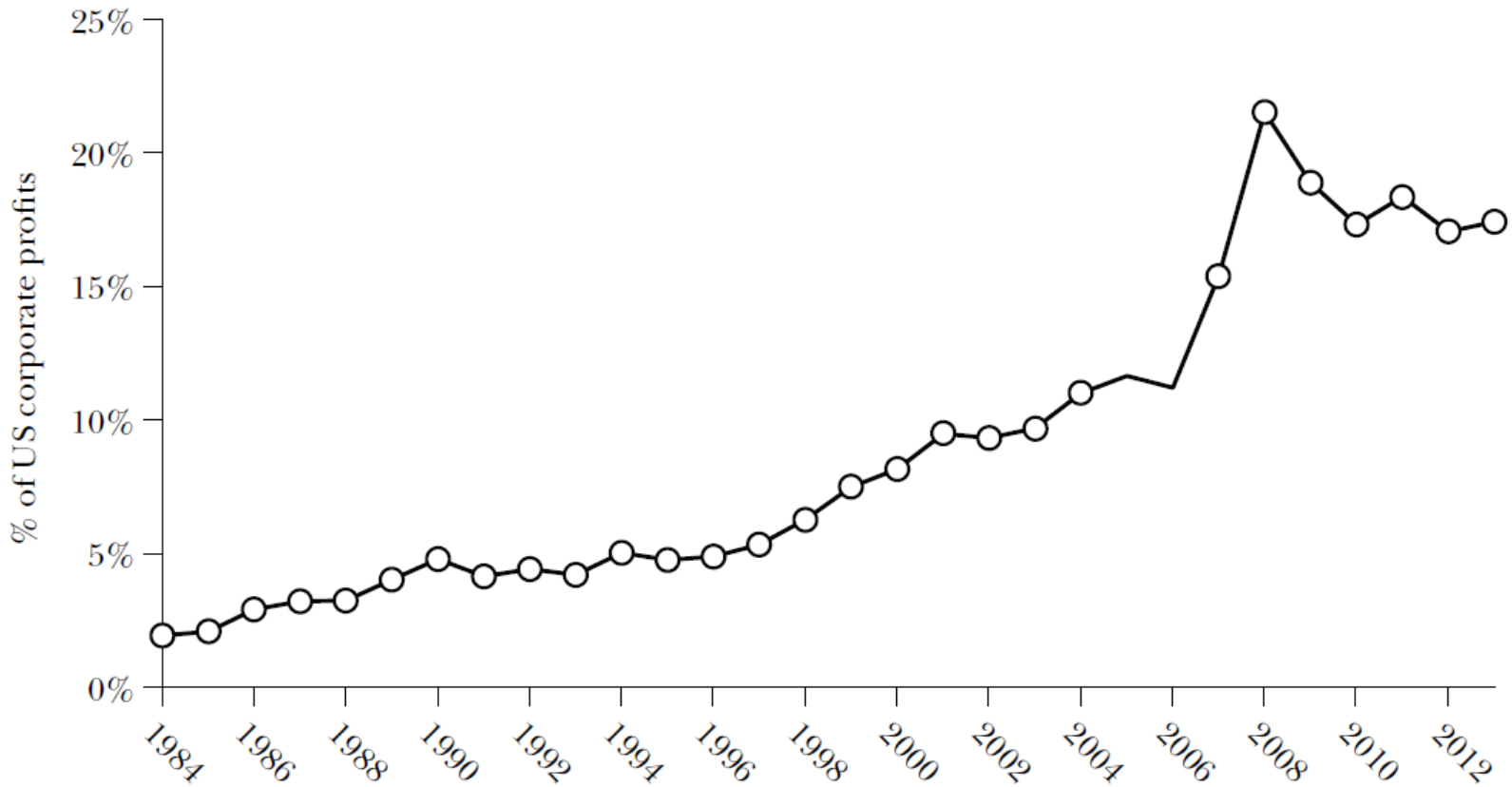
FIGURE 49: The Share of Profits Made Abroad in US Corporate Profits



Source : Zucman (2014), Fig. 1.

Profit-shifting to low-tax jurisdictions

FIGURE 50: The Share of Tax Havens in US Corporate Profits



Source : Zucman (2014), Fig. 3.

Facing tax competition

- **Two options**
  1. Cut CIT statutory rates to attract profits
  2. Reform CIT tax base towards less mobile base
     e.g., final consumption (sales)
- **Race to the bottom**
  - Cut in statutory CIT to compete for profits from multinationals
    e.g., French president Macron announced cut to 25%
    e.g., U.S. President Trump promised a cut to 20%
    e.g., Former U.K. Chancellor Osborne announced planed cut to 15%

Tax base reforms

The cash-flow tax

- **Cash-flow corporation tax**
  - Tax base = revenues - expenses
  - Need to carry forward tax losses
- **A tax on pure profit**
  - Investment decisions are not altered by the tax
  - No need to define depreciation allowances
  - Deduct equity cost as well as interest cost
  - Tax on economic rent but not full return to capital
- **Issues**
  - No tax advantage to investments
  - Tax base smaller, i.e. rates have to be higher

Tax base reforms

- **Auerbach (2010)**
  - Proposal to move to cash-flow tax in the U.S.
  - Positive impact on investment
  - Argue for positive impact on redistribution
  - Cash-flow tax is equivalent of a tax on consumption minus wage income
- **Economics vs policy**
  - Prescription from neoclassical cost-of-capital model : narrow base and then increase rate as much as you want
  - Apparent policy consensus : leave base broad, lower the rate
  - One rationalization : large perceived costs to corporations with rents moving headquarters abroad

TABLE 4: Characterizing corporate income tax systems

Location of tax base	Type of income subject to business tax		
	Full return to equity	Full return to capital	Rent
Source country	1. Conventional CIT with exemption of foreign source income	4. Dual income tax 5. Comprehensive Business income tax	6. CIT with Allowance for corporate equity 7. Source-based cash flow tax
Residence country of corporate head office	2. Residence-based CIT with credit for foreign tax		
Residence country of personal shareholder	3. Residence-based shareholder tax		
Destination country of final consumption			8. Full destination-based cash flow tax 9. VAT-type destination-based cash flow tax

Source : Devereux and Sørensen (2006), Tab. 1, p. 24.

Alternative options

- **Other options**
  - Harmonization of treaty rules (cf. OECD)
  - EU initiative for harmonization of CI tax base (ACISS)
  - Shifting from source-based to destination-based taxation (Auerbach 2010)
- **Zucman (NYT, 2017)**
  - Proposal to move to sales' apportionment of global profit
  - Idea to drastically reduce profit shifting, hence tax competition
  - Integrate personal and corporate income tax systems with the help of a world financial registry (Zucman, 2014)

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