Capital Structure and Regulation: Do Ownership and Independent Regulation Matter?

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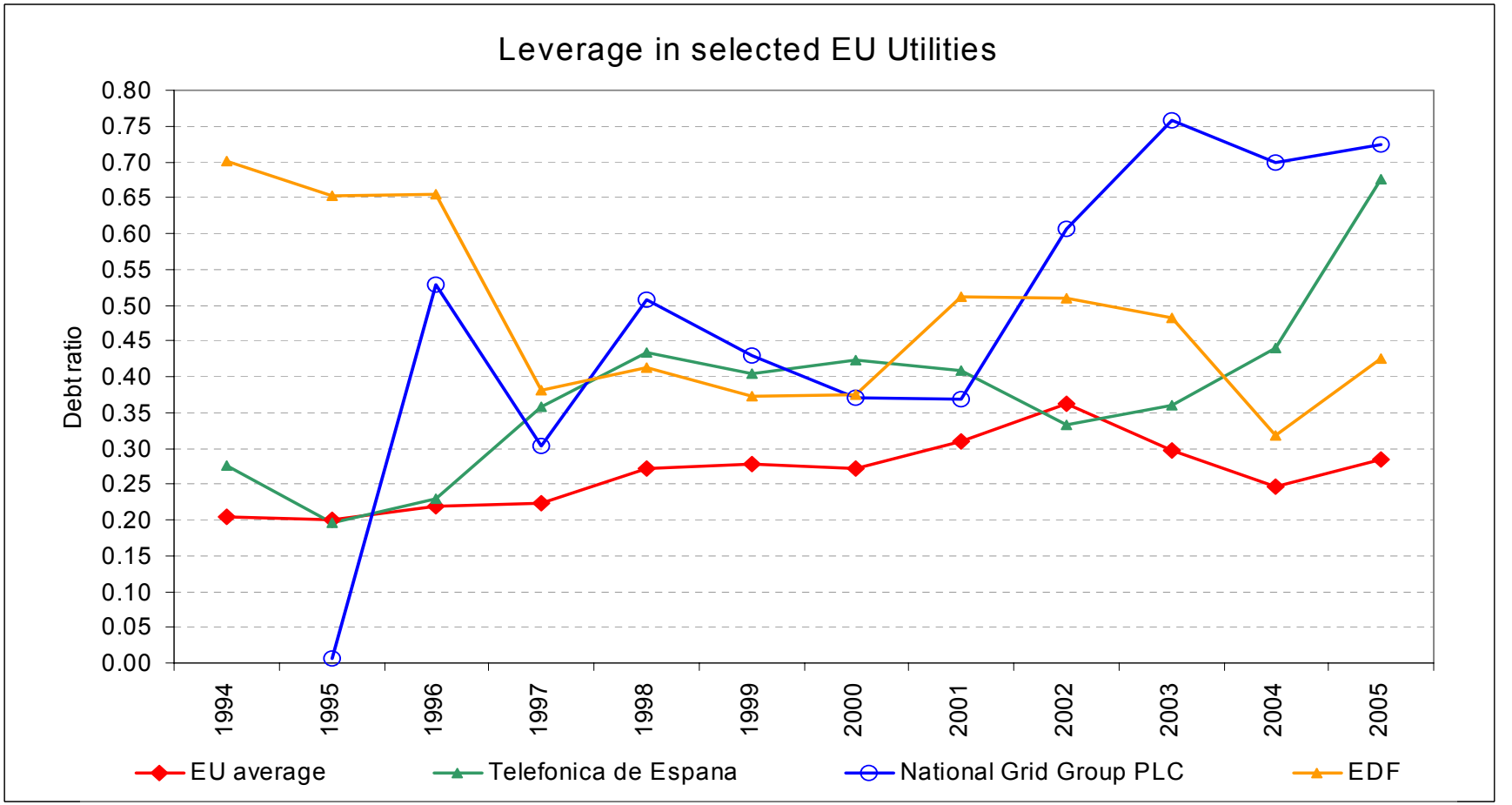
Background

- Ten years after the beginning of privatization and liberalization in network industries in Europe, regulated utilities have substantially increased their financial leverage

- In the U.K., DTI and HM Treasury (2004) have expressed a concern about the "*dash for debt*" "*flight of equity*" within the U.K. utilities sector from the mid-late 1990's

- They argue that high leverage "could imply greater risks of financial distress, transferring risk to consumers and taxpayers and threatening the future financeability of investment requirements"

The "Dash for debt"



The relevance of capital structure for regulated firms

- In the U.S., regulated rates are set so as to ensure the firm a "fair" rate of return on its capital
- In Europe, regulators often use *RPI-X* regulation, that ensure that the firm will earn a return on its capital which will induce it to enhance and maintain its network

⇒ The determination of regulated rates depends to a large extent on the firm's capital structure

⇒ By properly choosing its capital structure, a regulated firm can affect its rates and hence its profitability

Background/1: the Price-Cap rule

- Widely used mechanisms to set tariffs in *all* utilities (telecoms, energy, transports, water …)
- Regulator defines, for a certain period of time, a limit to the growth of price(s) of a (single or a weight average) set of goods or services:

$$P_t = (1 + RPI_t - X)\, P_{t-1}$$

RPI_t = *retail price index*

X = (estimated) growth in productivity $\Rightarrow$ reduction that regulator wants to pass to consumers

- Theory: this mechanism induces efficiency; in the long run tariffs tend to be in line with costs (see the survey by Sappington, 2003)

Background/2: the financial issues in Price Cap regulation

- In practical terms (Baldwin and Cave, 1999) how to set a price cap *(X)* in a monopolistic market?

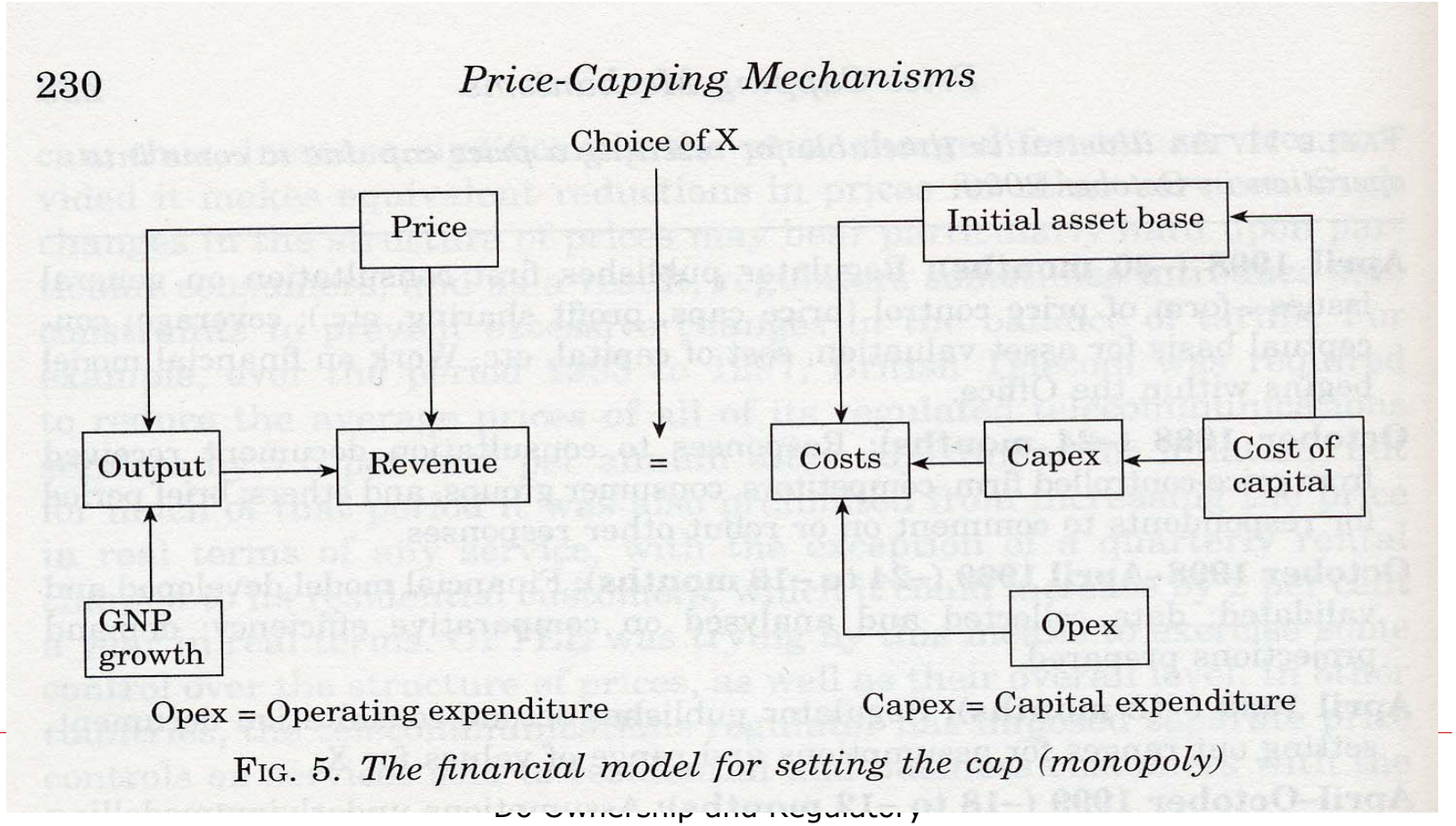


FIG. 5. *The financial model for setting the cap (monopoly)*

Background/3: the financial issues in Price Cap regulation

- Measure and index to be used to evaluate capital expenditure and a "fair return" on investment:
- Cost of capital (r_{it}): *CAPM*

$$r_{it} = r_{ft} + \beta\left(r_{mt} - r_{ft}\right)$$

where r_{ft} is the interest rate of free risk public bonds.

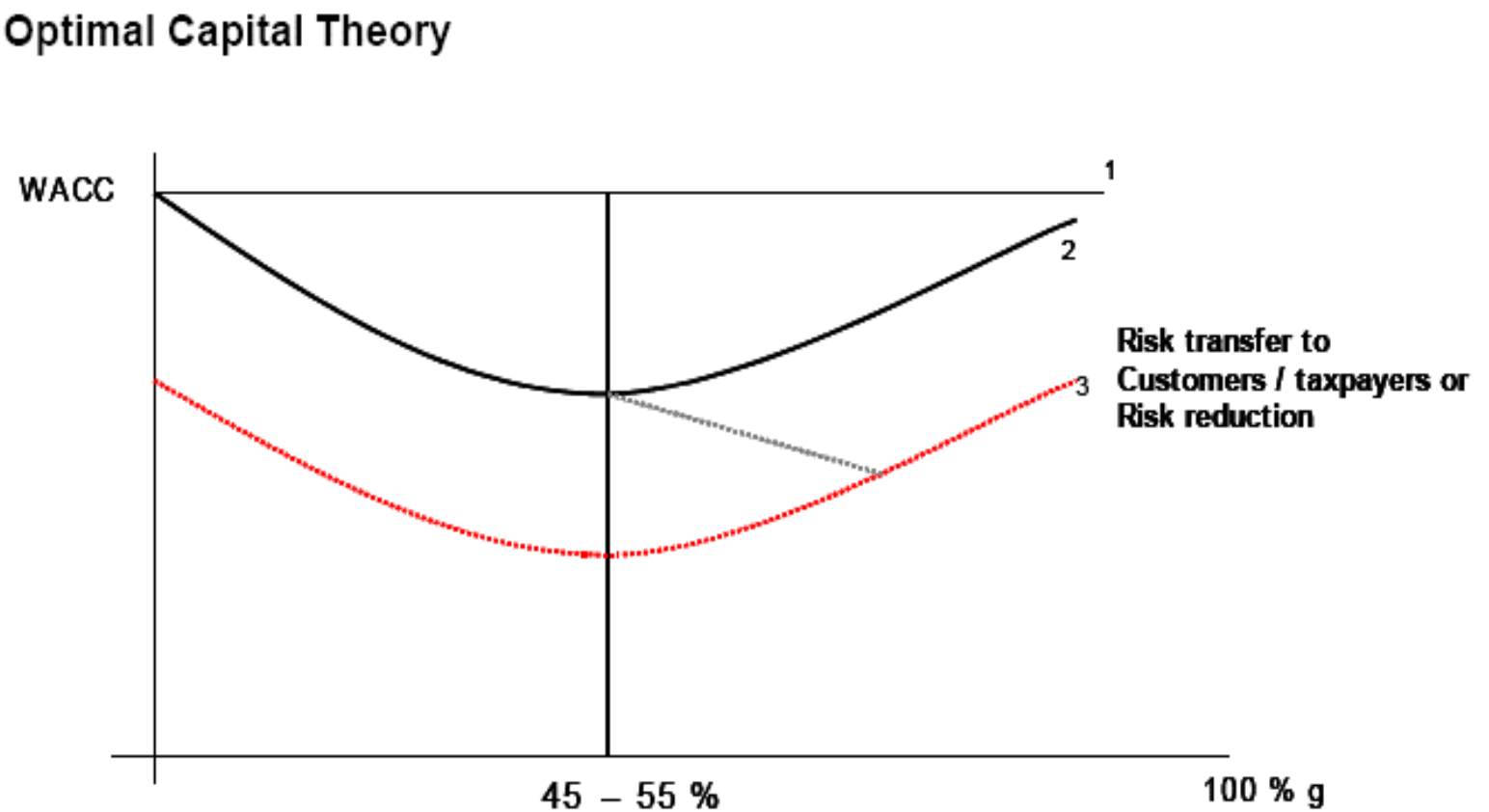
- *Weight Average cost of capital:*

$$WACC = [r_{it}\, E/(E+D)]/(1 - t) + rd\, D/(E+D)$$

- Where *E* level of Equity, *D* level of Debt, *rd* the cost of debt and *t* is the tax level (%).

Background/4: the financial issues in Price Cap regulation

- The Modigliani and Miller Theory (1958)



Literature: Theory

- Taggart (*JF*, 1981) – Rate regulation may induce firms to issue debt in order to "influence" the regulated price (not an equil. model)
- Besanko and Spulber (*RJE,* 1992) - Firms fear that regulators will behave opportunistically and lower their prices after the investment is sunk to shift some of the benefits to consumers ⇒ underinvestment
- Spiegel and Spulber (*RJE*, 1994) – Leverage mitigates regulatory opportunism as the regulator wishes to minimize the probability of financial distress
- Spiegel (*JRE*, 1994) – Debt financing boosts the regulated firm's incentive to invest
- Spiegel (*IJIO*, 1996) – Debt financing induces the firm to select a more efficient investment
- Spiegel and Spulber (*RJE*, 1997) – Regulated firms wish to signal high cost to regulators but signal low cost to the capital market – the equil. depends on the size of investment and can separating or pooling

Literature: The Evidence

Paper	Sample	Results
Taggart (*JIE*, 1985)	U.S. electric utilities in 1910's	Firms increased their leverage after the introduction of rate regulation in various states
Dasgupta and Nanda (*IJIO*, 1993)	Cross-section of U.S. electric utilities	Firms operating in more hostile regulatory environments have higher leverage
Klein, Phillips and Shiu (*JFSR*, 2002)	Cross-section of U.S. property-liability insurers	The degree of price regulation and its stringency have positive effects on leverage
Bulan and Sanyal (*Mimeo*, 2005)	Panel of U.S. investor-owned electric utilities, 1990-2000	Firms reduced their leverage in response to deregulation (they attribute it to greater uncertainty associated with deregulation)
Bulan and Sanyal (*Mimeo*, 2006)	Panel of U.S. investor-owned electric utilities, 1990-2000	Deregulated firms first accumulate financial slack and then use debt to finance growth opportunities
Correia da Silva, Estache and Jarvela (*Utilities Policy*, 2006)	121 regulated utilities in 16 LDC, 1991-2002	Leverage varies significantly across sectors - highest leverage in transportation and the lowest in water supply. Leverage steadily increases over time while investment levels fall

Europe and the U.S.

- It is well-documented that U.S. regulated utilities (which were always private and subject to rate regulation by state and by federal commissions since the 1910's) are highly leveraged (Bowen, Daly and Huber (*FM*, 1982), Bradley, Jarrell, and Kim (*JF*, 1984) and Barclay, Marx, and Smith (*JCF*, 2003))

- The European situation is different because:
  - Private ownership and control of utilities is still the exception rather than the rule (Bortolotti and Faccio, 2008)
  - The degree of liberalization varies considerably across countries, and is still incomplete in most sectors
  - Not all European utilities are regulated by an independent regulatory agency (IRA): in some sectors regulation is performed directly by ministries, governmental committees, or local governments

Contribution of our paper

- To our knowledge,
  - First comprehensive empirical study on the determinants and effects of capital structure of EU public utilities
  - First empirical analysis of the strategic role of debt where the impact of public vs. private ownership is taken into account

A Strategic Explanation of Leverage 1/2

- In Public Utilities, regulatory choices (and political stance) change over time
- Typical problems are regulators' lack of committment leading to firms' underinvestment (Armstrong and Sappington, 2006; Guthrie, 2006)
- To provide investment incentives, regulators choose the "fair" rate of return
- But firms fear that the regulator will reduce the price after the investment is sunk

A Strategic Explanation of Leverage 2/2

- May firms "use" capital structure to influence the regulators' decisions? … and may regulators "use" capital structure to *tie their own hands* and discipline their own opportunism?
- A welfare maximizing regulator has the incentive to set a high regulated price so as to reduce the probability that the firm will become financially distressed (Spiegel and Spulber, 1994)
- The firm's leverage mitigates regulatory opportunism
- The regulator allows the firm to choose its leverage in order to commit not to engage in opportunistic behaviour

Ownership matters…

- Public ownership lowers the risk of financial distress, but it can also work as an alternative *commitment* device
  - Politicians support *high tariffs* to cash in dividends, but also *high investment ("broad service")* to bring in votes
  - Politicians would not act opportunistically against the firms they own via regulation

⇒ Thus state-controlled firms do not need to issue debt to hedge regulatory risk

- In EU, no IRA before privatization, only informal regulation
  - Evidence that IRAs take a tougher stance towards regulated firms (Guasch, Laffont, Straub (2003) Edwards and Waverman (2006))

Augmented model (future agenda)

- In a companion paper we extend the basic framework of Spiegel and Spulber by introducing:
  - Ownership issues, by using the *managerially-oriented public enterprise (MPE)* approach, due to Sappington and Sidak's (2003, *RIO;* 2004)
  - The commitment power of the Regulator via a parameter measuring the degree of regulatory independence, inspired by Levy and Spiller (1994, JLEO)
- Theory and empirical evidence focused on investment

Hypotheses

- **Hypothesis 1:** *Regulated firms will increase their leverage once they become regulated by an Independent Regulatory Authority (IRA)*
- **Hypothesis 2:** *Leverage leads to higher regulated prices*
- **Hypothesis 3:** *Leverage boosts the firm's market value*
- **Hypotheses 1-3 hold in the case of privately owned firms but not necessarily in the case of state-controlled firms**
- We can test the theory by examining whether there is a significant difference between privately-controlled and state-controlled firms

The data

- Unbalanced panel of virtually all 92 publicly traded utilities and transportation infrastructure operators during 1994-2005 (927 firm-year observations) in 14 EU member states:
  - 44 firms in electricity and gas distribution
  - 13 water supply companies
  - 15 telecoms (mainly vertically integrated operators)
  - 8 freight roads concessionaires
  - 12 transportation infrastructure operators
- We excluded airlines, oil and refinery companies, wireless telecoms, and electricity generators because typically their prices are not regulated
- 67 firms in our sample have been privatized by 2005. Of these firms 24 have been privatized during 1994-2005 period. 25 firms in our sample are still state-controlled in 2005.
- Privatization is still incomplete: the state's UCR in the firms in our sample are 37% on av.

Dependent Variables

- Leverage: (LT+ST Fin Debt)/(LT + ST Fin Debt + Market/Book value of Equity)
- Regulated Prices: retail price indices from OECD or Eurostat for all sectors except ports and docks and airports (intermediate rather than final services)
  - Limited competition and little price dispersion → the price indices appropriately reflect the prices of the regulated firms in our sample
- Market-to-Book ratio: (Total Assets – Book Equity + Market Equity)/Total Assets

Explanatory and Control Variables

- Private Control dummy = 1 when Government UCR< 50% (or <30%)
  - Ultimate GCR are measured using the "weakest link concept" as in La Porta et al. (1999), Faccio and Lang (2002)
- IRA dummy = 1 when the IRA is set up and thereafter (Gilardi, 2005)
- Country controls: Financial Markets controls (Investor Protection and Stock Markets Indexes), Political Orientation (Bortolotti and Faccio, 2008)
- Company controls: Size, Tangibility, Profitability, Non-debt tax shields (source: Worldscope)

Measuring UCR

- The state's UCR are measured using the "weakest link concept" as in La Porta et al. (*JF*, 1999) and Faccio and Lang (*JFE*, 2002)
- An example:

- According to the weakest link approach, the gov't holds 25% of Firm B

Estimation Methods

- Leverage equation → Random effects with country, sector and year dummies
- Dynamic Leverage equation → Instrumental variable methods → one-step system GMM
- Granger Causality Tests of the *Price-Leverage* relationship → one-step system GMM
  - Regulation and investment in OECD countries (Alesina *et al.* 2005, JEEA)
  - Access regulation and regulatory independence in the EU (Edwards and Waverman 2006, JRE)
  - The quality of political institutions and the performance of regulation in developing countries (Gasmi *et al,* 2007, World Bank)

Results
and Robustness

Results /H1 – Explaining Leverage

Market Leverage	*(1)*	*(2)*	*(3)*
Log of real total assets	0.035***	0.034***	0.033***
	(0.010)	*(0.010)*	*(0.009)*
Fixed-to-Total Assets	-0.131**	-0.120**	-0.131**
	(0.055)	*(0.057)*	*(0.052)*
GDP Growth	-0.029***	-0.028***	-0.029***
	(0.008)	*(0.008)*	*(0.008)*
EBIT-to-Total Assets	-0.322***	-0.332***	-0.317***
	(0.079)	*(0.079)*	*(0.079)*
Non-debt tax shield	-1.187***	-1.202***	-1.259***
	(0.405)	*(0.403)*	*(0.374)*
Political Orientation	-	-	-0.015**
	-	-	*(0.007)*
Private Control	-0.020	-	0.002
	(0.028)	-	*(0.028)*
Private Control_30	-	-0.003	-
	-	*(0.026)*	-
IRA	-0.064*	-0.045	-0.028
	(0.037)	*(0.030)*	*(0.038)*
Private Control*IRA	0.077**	-	0.067**
	(0.035)	-	*(0.033)*
Private Control_30*IRA	-	0.063**	-
	-	*(0.032)*	-
R squared	0.257	0.255	0.269
Wald-test $\chi 2$ (p-value)	(0.00)	(0.00)	(0.00)
Hausman test $\chi 2$ (p-value)	2.49(0.999)	9.58(0.945)	18.31 (0.502)
N. Firms [N. Obs.]	92 [755]	92 [755]	92 [755]

Results /H1 – Dynamic Model and Long run effects

Market Leverage	**(1) Full sample**	**(2) Full sample**	**(3) Privately- or state-controlled throughout our sample**	**(4) Privately- or state-controlled throughout our sample**
Market Leverage$_{t-1}$ (β)	0.358*	0.381**	0.404*	0.361
Log of Real Total Assets	0.018**	0.019***	0.012**	0.016**
Fixed-to-Total Assets	-0.133**	-0.129**	-0.126**	-0.140***
EBIT-to-Total Assets	-0.268***	-0.254***	-0.239**	-0.241**
Non-debt Tax Shield	-1.802*	-1.582	-1.384***	-1.523***
GDP Growth	-0.004	-0.005	0.000	-0.004
Private Control	0.0017	-0.040	0.0009	-0.076
IRA (α_2)	0.030*	-0.025	0.043**	-0.0395
Private Control*IRA (α_3)	-	0.069*	-	0.111*
$\alpha_2/(1-\beta)$	0.05*	- 0.040	0.07**	- 0.061
$\alpha_3/(1-\beta)$	-	0.11*	-	0.17*

Results H1 and Robustness tests

- Evidence that utilities increase their leverage following the introduction of price regulation, provided they are privately controlled holds after controlling for:
  - Alternative measures of leverage: book leverage and debt to asset
  - Heterogeneity across sectors
    - Sector-country clustering for common sectoral shocks from IRA
    - Tests on sub-samples: Energy, Electricity, TLC
  - Privatization effects: Privatized vs. Non-privatized; Golden Share
  - Exogenous changes in equity markets: Stock market indexes and Investor protection indexes
- Significant long-run effects are found when we estimate a dynamic model

Results/H2– Leverage and Prices: Granger Tests

Utility Prices	*(1) Full sample*	*(4) Private firms*	*(6) State controlled*
α_1 Utility Price$_{t-1}$	0.759***	0.787***	0.821***
	(0.083)	*(0.074)*	*(0.134)*
α_2 Utility Price$_{t-2}$	0.183*	0.161*	0.025
	(0.103)	*(0.092)*	*(0.118)*
β_1 Leverage$_{t-1}$	-0.052	-0.019	0.040
	(0.053)	*(0.038)*	*(0.065)*
β_2 Leverage$_{t-2}$	0.154***	0.154***	0.001
	(0.057)	*(0.055)*	*(0.045)*
P-value test on H_0: $\beta_1 = \beta_2 = 0$	*0.025*	*0.024*	*0.604*
P-value test on H_0: $\beta_1 + \beta_2 = 0$	*0.048*	*0.023*	*0.327*
Arellano-Bond test for AR(1) *(p-value)*	*0.000*	*0.000*	*0.031*
Arellano-Bond test for AR(2) *(p-value)*	*0.898*	*0.475*	*0.764*
Sargan-Hansen test *(p-value)*	*0.191*	*0.264*	*0.964*
N. Firms [N. Obs.]	74 [482]	57 [362]	30 [120]
Instruments	t-3; t-4; Δt-2	t-3; t-4; Δt-2	t-2; Δt-1

Results H2 – Leverage and prices

- Leverage Granger-causes Regulated Prices
  - The full sample
  - When the IRA is in place
  - Firms in industries regulated by an IRA
  - Privately-controlled firms (under 50% and restricted def.)
  - Firms that were and remained private (never privatized)
- Regulated Prices *do not* Granger-cause Leverage in all above cases

- Leverage does not Granger-cause regulated prices for the sub-sample of State-controlled firms

Results /H3 – Leverage and Market Value

Market to Book	*Full sample*	*IRA is not in place*	*IRA is in place*
Book Leverage$_{t-1}$	-0.607*	-0.085	-0.984*
	(0.314)	*(0.200)*	*(0.529)*
Private Control $_{t-1}$	-0.434	0.073	-1.030
	(0.286)	*(0.092)*	*(0.763)*
Leverage $_{t-1}$*Private Control $_{t-1}$	0.762**	0.193	1.088*
	(0.366)	*(0.229)*	*(0.649)*
GDP Growth	0.046	0.102**	0.057
	(0.036)	*(0.042)*	*(0.053)*
EBIT-to-Total Assets ratio	0.884	0.341	0.881
	(0.548)	*(0.330)*	*(0.598)*
Log of real total assets	-0.327***	-0.108	-0.377**
	(0.102)	*(0.099)*	*(0.145)*
Investor Protection	0.094*	0.111**	0.062
	(0.044)	*(0.048)*	*(0.098)*
R squared	0.156	0.250	0.200
Wald-test χ^2 (p value)	(0.00)	(0.00)	(0.00)
N. Firms [N. Obs.]	92 [705]	43 [270]	62 [435]

Results H3 and robustness

- An increase in leverage has a significant positive effect on regulated firms' market-to-book ratios, provided they are privately controlled
- The positive effect is stronger when the IRA is in place
- Results robust to alternative measures of leverage: Book leverage and Debt-to-Assets

Summary and conclusions

- We constructed a comprehensive panel of the main relevant 92 publicly traded regulated utilities in the EU15
- We studied the strategic interaction between capital structure, regulation, and market values, and examined how this interaction is affected by ownership
- Our findings are broadly consistent with the idea that regulated firms use leverage strategically to mitigate regulatory opportunism
- But ownership does matter: the theory holds only for privately-controlled firms

The theoretical framework: a sketch/1

- Three stage game:
  - 1. the firm chooses its investment level, *k*, and its debt level, *D*, and eventually equity
  - 2. the market value debt (and possibly equity) is determined in a competitive capital market.
  - 3. given *k* and *D*, the regulated price is set by the regulator.

The theoretical framework: a sketch/2

- The firm's cost are subject to random cost shocks and are given by $C = c(1-z)$, where z is a random variable distributed uniformly over the unit interval, and $c < V(0)$.
- Let D denote the face value of the firm's debt
- The operating income of the regulated firm can be written as

$$p - c(1-z).$$

- let $z^*(p, D)$ denote the critical state of nature above which the regulated firm can pay D in full:

$$z^*(p,D) = \begin{cases} 0 & D \le p - c, \\ \dfrac{D + c - p}{c} & p - c < D \le p, \\ 1 & D > p. \end{cases}$$

The theoretical framework: a sketch/3

- Let *T* be the (fixed) cost of financial distress which occurs when the firm fails to meet its debt obligation. The objective function of a regulated firm is:

$$\pi(p, D, \delta) = p - \left[\int_0^1 c(1-z)dz + Tz^*(p, D) \right]$$

$$= p - \left[\frac{c}{2} + Tz^*(p, D) \right].$$

The theoretical framework: a sketch/4

- Consumers surplus is given by:

$$CS(k, p) = V(p, k) - p,$$

where k is a measure of the "quality" of the firm's product or the range of its services and *Q*(.) is the total quantity

- The regulator maximizes (Spulber, 1989; Besanko and Spulber, 1992):

$$Arg\max_{p} = CS(k, p)^{\gamma}\, \pi(p, D)^{1-\gamma}.$$

where parameter γ captures the regulatory climate

Testable predictions

- The (standard) strategic role of leverage implies:
  - *Leverage* $\uparrow \Rightarrow$ *regulated retail price* $\uparrow$ $(\partial p/\partial D > 0)$
  - *Leverage* $\uparrow \Rightarrow$ *fixed capital investment* $\uparrow$ $(\partial k/\partial D > 0)$