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DIVIDEND POLICY IN REGULATED NETWORK INDUSTRIES: EVIDENCE FROM THE EU

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We study the dividend policy of firms in regulated network industries, focusing on the impact of different regulatory regimes and government control. We link payout and smoothing decisions to different regulatory mechanisms (cost-based vs. incentive regulation) and state versus private ownership. We test our predictions on a panel of listed European electric utilities, accounting for potential endogeneity of the choice of regulatory and ownership patterns. We find that incentive-regulated firms smooth their dividends less than cost-based regulated firms and that they report higher target payout ratios. Consistent with the interest group theory of regulation, we find that incentive regulation schemes are less likely when the state is still an important shareholder in the sector. Additionally, our results show that government control undermines the efficiency-enhancing effects of incentive regulation on dividend policy, for example, lower smoothing is only due to private firms. (*JEL* G35, L51, L32, L9)

I. INTRODUCTION

Dividend policy has always raised a lot of attention both from a theoretical and empirical point of view. Recent anecdotal evidence points out that among the highest dividend paying sectors are network industries. A recent report by J.P. Morgan (2011) shows that telecom and electric utilities have been the highest-paying industries in the United States in the last few years. Dividend payout, that is, the ratio of dividends and net income, is 118% for telecoms and 56% in utilities, while dividend yield, that is, annual dividends per share divided by the share price, is 5.3% for the telecom industry and 4.5% for other utilities, which are the highest values among all sectors. Utilities are even more generous in Europe: as of December 2013, the "STOXX Europe Select Dividend 30 Stocks" included 12 telecom companies and utilities, among which there were seven energy (non-oil) companies. While the average payout ratio for the 30-stock group was 110%, the average for utilities and telecoms was 198% and, for the energy firms, it reached a peak of 317%. Finally, turning to dividend yield, Thomson Reuters Datastream reported that "the MSCI pan-European utilities index—which compares the size of the most recent payout with the share price—has risen to 6.8%, the highest of any sector and nearly twice the market average" (September 25, 2013).

In this paper, we conjecture that a key factor—besides ownership—influencing dividend policy

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ABBREVIATIONS

FE: Fixed Effects
GDP: Gross Domestic Product
GMM: Generalized Method of Moments
OLS: Ordinary Least Squares

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in network industries is regulation.[1] Regulated firms are generally less risky, insulated from product and even capital markets' discipline and regulators may influence, directly or indirectly, how much dividend they can pay.[2] For these reasons, they are usually set apart when studying dividend policy, the common explanation being that their dividend behavior does not reconcile with current textbook explanations.[3]

Among regulated industries, the European electricity industry is an interesting case to study not only because its dividend payments are extremely generous as shown above, but also because, over the last 30 years, it has been the object of sweeping reforms that have changed many aspects of corporate organization and finance, including dividend policy. Such reforms, aimed at liberalizing the market and at privatizing the state-owned monopolies to raise firm efficiency and improve service quality, are still incomplete. While electric generation is now almost fully liberalized, privatized, and deregulated, transmission and distribution services are still subject to regulation and many operators remain partially (or fully) controlled by the state.[4] This heterogeneity of firms operating in transmission and distribution services lends itself to interesting comparisons, which is what we intend to exploit in this study.

A key feature of the electricity industry, which allows us to bring new insight into their dividend policy, is that they are subject to sector-specific regulatory contracts that do not apply to other "regulated" companies like banks or insurance companies, with potential consequences for their efficiency, profitability, and hence dividend behavior. The specific regulatory regimes range from cost-based mechanisms—such as rate of return regulation—to incentive regulation—such as revenue or price cap (see Laffont 1994; Armstrong and Sappington 2006, 2007; Joskow 2007). In practice, most of the regulatory systems reflect both features of cost-based mechanisms and features of incentive regulation, that is, regulators often adopt hybrid forms of these two extremes (see Blank and Mayo 2009).[5] For the purpose of this paper, in the empirical analysis we compare the dividend behavior of firms under pure cost-based regulation to firms subject to schemes incorporating some degree of freedom in price setting and incentives to cost reductions, as an element of incentive regulation. Indeed, notwithstanding its different forms of adoption, hybrid/incentive-based regulation ultimately serves the purpose to raise the efficiency of firms that had so far been regulated—both in the United States and in Europe—through a cost-based regulatory mechanism. Mainly adopted to reduce managerial slack and to shake up utilities' "quiet life," these *modern* regulatory schemes are thought to provide powerful incentives to increase efficiency by leaving larger profits to the regulated operator. At the same time, as compared to a cost-based scheme where the regulator fixes the rate of return that allows the utility to cover all main operating costs, under incentive regulation, earnings become more volatile and firms are perceived as riskier by financial markets.

Starting from the classical Lintner (1956) model, which describes current dividends as partial adjustment of last year's dividends toward a target payout ratio, we modify the standard partial adjustment specification to investigate the effect of a change in regulatory policy on firms' dividend behavior. We argue that, under cost-based regulation, as the regulated price moves with costs, the firm will have more stable cash flows than under incentive regulation, where profits mostly depend on the firm's ability to achieve efficiency gains and firms actually feature as the "residual" claimants. The pressure

1. Regulation affects many different industries in many different ways, and regulatory interventions are largely sector-specific, ranging from the so-called prudential regulation on capital ratios and risk-taking activities in banks and insurance companies, to pricing control for the provision of retail services in telecoms and other public utility services. In this paper, we focus on the electricity industry.

2. For example, Moyer, Chatfield, and Sisneros (1989) find that security analysts' monitoring activities are lower when the firm is a public utility. In general, the finance literature that examined the dividend behavior of regulated firms focused on the role that dividend payouts play in the monitoring process to reduce equity agency costs within capital markets (Miller 1986; Smith 1986; and Hansen, Kumar, and Shome 1994).

3. For example, Fama and French (2001), Allen and Michaely (2003) and Chetty and Saez (2005) exclude companies in utilities and the financial sector "on the grounds that they face additional regulations and hence might have different payout behavior" and that "the historical dividend patterns of utilities and financials are in fact quite different from other companies" (Chetty and Saez 2005, 798).

4. For an overview of the regulatory and privatization reforms in the European electricity sector, see Cambini, Rondi, and Spiegel (2012).

5. Johnson (1994), e.g., says, "… price-cap regulation can best be regarded as a loose form of rate-of-return regulation with a formal time lag" (cited after Blank and Mayo 2009, 237). A recent report by Ernst & Young (2013) also shows that the majority of EU member states (10 out of 15) adopt hybrid/incentive based regulatory models.

to increase efficiency is stronger under incentive than under cost-based regulation, which should drive the behavior of incentive-regulated firms to smooth their dividends less than firms under cost-based regulation. Dividend flows are therefore likely to be more stable for firms under cost-based than under incentive regulation.

Besides regulatory contracts, ownership is another institutional feature likely to influence regulated firms' dividend choices. We argue that the reluctance of the national governments to release control and ownership of energy incumbents may depend, in part, on the reluctance to abandon the large dividend rights. Especially when the budget constraint tightens (as in recent years in all Western economies), the "energy dividend" may become a safe and steady source of financing. The scope of our analysis therefore extends to asking whether firm ownership also affects the dividend policy of electric utilities. The question that arises is whether effective regulation can be expected if the state both owns part of the assets and sets up the regulatory framework or whether a potential conflict of interest emerges (see e.g., Bortolotti, Cambini, and Rondi 2013). We analyze such set-ups, by comparing the dividend policy of firms that are partly owned and controlled by the state and subject to regulation with firms that are fully private and subject to regulation.

We do not only outline a direct effect of state ownership on dividend payout policy as expected by the classical principal–agent problem (as developed by Gugler 2003; Michaely and Roberts 2012) or as postulated by theories of government and political interference (see, e.g., Shleifer and Vishny 1994; Shleifer 1998; Bennedsen 2000). We also analyze the endogeneity of the choice of regulatory regime with respect to state control, that is, state ownership and control affecting dividend payout policy via the policy decision of regulatory regime as suggested by the economic or interest group theory of regulation (see, e.g., Kaserman, Mayo, and Pacey 1993; Beard, Kaserman, and Mayo 2003). The "interest group theory of regulation" (see among others, Stigler 1971; Peltzman 1976; Becker 1983) views regulators as utility-maximizing arbiters between various competing interest groups. Interest groups try to capture regulatory decision-making because it affects firms' and consumers' welfare. Moreover, also politicians may have their own political returns from influencing regulatory decisions (Niskanen 1971). We argue below that more prevalent state control in a country's electricity sector leads to a higher probability that the sector is rate-of-return regulated, since powerful interest groups (such as labor, managers or politicians) can better enforce their interests in this case.

We use a large panel of European electric utilities from 1986 to 2010 to link their dividend behavior to the implementation of new regulatory mechanisms, allowing for potential influences of their ownership status. This paper departs from many previous papers in the literature in that we account for the potential endogeneity of the regulatory policy by relying on firm ownership as well as economic and political variables (see, e.g., Beck et al. 2001; Persson 2002; Potrafke 2010; Macher and Mayo 2012).

Our results show that, consistent with our theoretical reasoning, the dividend behavior of incentive and cost-based regulated utilities differs significantly. Throughout most specifications and econometric methods, utilities under incentive regulation are found to exhibit lower smoothing parameters and higher impact effects.[6] Moreover, higher target payout ratios for firms under incentive regulation are found in all generalized method of moments (GMM) specifications. However, these results are only valid when the firms are privately controlled. In marked contrast, state-controlled firms actually display *larger* smoothing of dividends when incentive regulation is introduced, while impact effects are unaltered, compared to state-controlled firms under cost-based regulation. This leads to a rise in target payout ratios for state-controlled firms under incentive regulation. Moreover, when analyzing the endogeneity of regulatory regime with respect to state control (and other proxies for domestic political institutions), we find support for the "interest group theory of regulation." The more pervasive state control is in a country's electricity sector, the more likely is rate-of-return regulation.

Overall, our results suggest that incentive regulation transfers more risk to regulated

6. "Smoothing parameters" refer to the coefficients on the lagged dependent variables and "impact effects" refer to the coefficients on the contemporaneous profit variables in the Lintner (1956) model of dividends. The former measures the time it takes for a given shock to profits to translate into larger (or lower) dividends, i.e. the "smoothing" of dividends over time. The latter can best be interpreted as the share of profits that is distributed immediately to shareholders, or to put it differently, the share of profits that is not internally reinvested and/or used to smooth dividends in the future. Target payout ratios are defined as smoothing coefficient divided by one minus impact coefficient and measure the optimal long-run payout ratio.

firms, making their managers more sensitive to competition-like efficiency pressures, hence more likely to cut dividends when necessary, especially when also control is privatized. If control remains in the government's hands, however, first, incentive regulation is less likely to be established and, second, the efficiency-enhancing effects of incentive regulation on dividend policy are undermined.

Our analysis is relevant for a number of stakeholders in regulated network industries. First and foremost, shareholders and in general all financial investors might be interested in our results. Our results show that dividends in utilities are highly affected by the kind of regulatory regime and the firm's ownership. Thus, the return from investment in utilities is—at least in Europe—conditioned by regulation and ownership. Since dividends are a large part of the total returns earned in these industries, shareholders should take notice. Second, regulators should be interested in our finding about electric utilities' payout decisions, since sub-optimal dividend policies may limit or deprive the financeability of infrastructure investment. Finally, the government and more generally consumers and taxpayers should take notice of our results. We find distortions of optimal policies if the state remains involved in the control of companies. Not only do we find costly distortions in the dividend policy of state-controlled companies, benefiting short-sighted politicians with additional non-tax resources and other interested groups, but we also show that state control—consistent with the interest group theory of regulation—delays or hinders altogether the adoption of incentive regulation. Both distortions are likely to decrease static and dynamic efficiency in regulated network industries.

The outline of the paper is the following. In Section II, we present the background literature, in Section III, we extend the Lintner model of dividend-smoothing and payout to account for regulatory regimes and, in Section IV, we present our estimation strategy. Section V describes the changing pattern of the regulatory framework in the European energy market, the sample and the data we use for the estimates. In Section VI, we present the main results. Section VII summarizes and concludes.

II. LITERATURE REVIEW

Dividends have always been quite a puzzle in the theory of the firm. In the neoclassical world of Miller and Modigliani (1961) "dividends do not matter," which is to say that they drop out as a pure residual, once the optimal level of investment has been determined. Dividend-smoothing is even more suspect: if one thought of dividends from the point of view of optimal cash flow management, one might expect them to be highly volatile. When profits are high, firms invest more and pay out large dividends. When profits are low, they cut dividends to maintain working capital. In the long run, average dividend payments would be proportional to average profits, but in the short run they would bounce around. Thus, from the point of view of cash flow management, dividend-smoothing—since costly—is a puzzle.

In his seminal study, Lintner (1956) noticed that managers are particularly concerned with the stability of dividends. More than half a century later, managers still appear to believe strongly that the market puts a premium on firms with a stable dividend policy (Brav et al. 2005). There have been many explanations for this observation, including risk aversion on the part of investors, lack of investment opportunities or signaling theories (Black 1976). Recently, literature evolved explaining dividend-smoothing by agency cost explanations, that is, dividend policy as a consequence of the separation of ownership and control (Easterbrook 1984, and, for comprehensive empirical evidence, Leary and Michaely 2011). Agency theory predicts substantial and stable dividends. Denis and Osobov's (2008) findings that dividend payments concentrate among the largest, most profitable firms are consistent with agency cost-based and lifecycle theories. The higher dividends are, the less free cash flow there is, *ceteris paribus*, in managers' hands to spend on negative net present value projects. The higher dividends are, the greater is also the need to go to the capital market for new outside funds, and the greater the effectiveness of monitoring. If the primary function of dividends is to force firms into the capital market, regular and stable payouts are more valuable. Fudenberg and Tirole (1995) explain income and dividend-smoothing based on incumbency rents. If managers enjoy private benefits from being in control, they, individually and rationally, smooth dividends. In bad times, they pay out too much dividend to lengthen their tenure. In good times, they are less concerned by their short-term prospects and information decay allows them to save for future bad times.

Finally, La Porta et al. (2000) conjecture that minority shareholders press corporate insiders to

pay dividends, since they cannot be sure to get a fair return particularly in countries where shareholder rights are not well developed. Consistent with an agency cost explanation of dividend-smoothing, Gugler (2003) finds that target dividend levels, the smoothing of dividends, and the reluctance to cut dividends depend on the identity of the (ultimately) controlling owner. State-controlled firms engage in dividend-smoothing and have the highest target payout ratios while, in marked contrast, dividend payments of family-controlled firms are not subject to dividend-smoothing. Furthermore, state-controlled firms are most reluctant to cut dividends while family-controlled firms are least reluctant to cut dividends. More recently, Michaely and Roberts (2012), finding that privately owned firms smooth dividends and pay out less than their publicly listed counterparts, suggest that the scrutiny of public capital markets, ownership structure and incentives together play key roles in shaping firm dividend policy.

Drawing on this theoretical framework, in the next section, we match the received wisdom with the peculiarities of regulated network industries in order to derive a set of testable hypotheses. In particular, we investigate the influence of the regulatory system on dividend policy of regulated firms. Moreover, when analyzing the endogeneity of regulatory regime with respect to state control (and other proxies for domestic political institutions), we shed light on the validity of the "interest group theory of regulation" (Beard, Kaserman, and Mayo 2003).

III. A MODEL OF DIVIDEND POLICY FOR REGULATED FIRMS

A. *The Lintner (1956) Model*

We start by assuming that firms set their dividend payout policy according to the partial adjustment model of Lintner (1956). Following the Lintner model, dividends are the result of a partial adjustment of last year's dividends toward a target payout ratio. In more detail, for any year t, the target level of dividends, D_{it}^{*} for firm i, is related to the current earnings, E_{it}, through a desired payout ratio τ_i:

$$D_{it}^{*} = \tau_i E_{it}. \tag{1}$$

In any given year the firm will only partially adjust its dividend policy toward the target dividend level. Hence, it results:

$$D_{it} - D_{it-1} = a_i + \alpha_i \left(D_{it}^{*} - D_{it-1}\right) + u_{it} \tag{2}$$

where $D_{it} - D_{it-1}$ is the actual change in the dividend, a_i is a constant, α_i measures the speed of adjustment and lies between zero and one, and $D_{it}^{*} - D_{it-1}$ is the desired change in the dividend. The closer α_i is to one, the faster the speed of adjustment is. $(1 - \alpha_i)$ is called the *Smoothing* parameter, and τ_i is the *Target Payout Ratio* parameter, which gives the optimal long-run percentage of profits for distribution via dividends. The constant term a_i is generally positive and reflects the greater reluctance to reduce than to raise dividends, a commonly observed phenomenon.[7] Finally, u_{it} represents the discrepancy between the observed and the expected change of dividends. The adjustment process can be rewritten as:

$$D_{it} = a_i + \alpha_i \tau_i E_{it} + \left(1 - \alpha_i\right) D_{it-1} + u_{it} \tag{3}$$

where the coefficient on current earnings, $\alpha_i \tau_i$, is called the "impact effect." The "impact effect" can best be interpreted as the share of profits that is distributed immediately to shareholders, or to put it differently, the share of profits that is not internally re-invested and/or used to smooth dividends in the future. The optimal dividend policy would imply an impact effect equal to the target payout ratio (implying a smoothing parameter of zero), that is, immediate adjustment to the desired long-run payout ratio (see, e.g., Miller and Modigliani 1961; Fudenberg and Tirole 1995). This leads to the following empirically testable equation:

$$D_{it} = a_i + \beta_1 E_{it} + \beta_2 D_{it-1} + u_{it} \tag{4}$$

and to the computation of the three parameters of interest, smoothing, impact effect and target payout ratio, as follows:

$$1 - \alpha_i = \beta_2; \quad \tau_i \alpha_i = \beta_1; \quad \tau_i = \beta_1 / \left(1 - \beta_2\right). \tag{5}$$

B. *The Lintner (1956) Model and Regulation*

On the grounds that earnings volatility is strongly correlated with the kind of regulatory contracts firms are subject to, we augment and modify this model to explain dividend decisions in regulated firms. The different contractual regimes that regulate utilities all over the

7. As Black (1976) writes "The managers of most corporations have a tendency to give out good news quickly, but to give our bad news slowly. […] For one reason or another, managers and directors do not like to cut the dividend." [p. 7]. See also Allen and Michaely (2003), for a review of the literature and Brav et al. (2005) for a thorough survey of company dividend behavior.

world range from cost-based mechanisms—such as rate of return regulation—to incentive-based schemes—including *revenue* or *price cap* (see Laffont 1994; Armstrong and Sappington 2006, 2007), or hybrid forms of these two extremes (see Blank and Mayo 2009).

The most common cost-based regulatory instrument is the rate-of-return mechanism, whereby regulators fix the rate of return the utility can earn on its assets. With this form of contract, regulators set the price the utility can charge in order to cover all main operating and capital costs and to allow it to earn a specified rate of return. The regulated price is adjusted upward (downward) if the firm should make a lower (higher) rate of return. Evidently, such a pricing scheme, guaranteeing the firm's financial integrity, is a low-powered incentive mechanism that, on the one hand, does not spur efficiency gains, but on the other hand, reduces earnings volatility (Armstrong and Sappington 2006; Joskow 2007).

Contrary to the standard cost-based mechanism, the purpose of incentive regulation[8] is to prompt efficiency-seeking managerial practices. By pursuing cost savings, managers can generate higher profits and thus benefit shareholders. However, the incentive-based contract is periodically revised by national regulators in order to prevent the regulated firm from earning supernormal profits. This implies that the firm can obtain high profits only if the management realizes further cost savings and meets and beats the target that the regulator sets over time. Therefore, on the one hand incentive regulation leaves excess profits to the regulated operator, but on the other hand, it shifts the risk of demand or cost fluctuations to the firm, thereby increasing the variability of the company's earnings. Indeed, the existing evidence shows that the adoption of incentive mechanisms leads not only to higher firm productivity and profits (Ai and Sappington 2002), but also to higher volatility in earnings (Parker 1997)[9] and higher systematic risk (Alexander and Irwin 1996; Grout and Zalewska 2006) than the standard low-powered incentive cost-based mechanism.

Thus, under cost-based regulation, because the regulated price moves with ex-post costs, firms will typically have more stable cash flows. In contrast, under incentive regulation or indeed hybrid forms of regulation, profits will more closely depend on the firm's ability to achieve efficiency gains and meet the regulatory constraints (the "caps") over time, and will therefore be less stable. We directly incorporate this reasoning in our setting by modifying the measure of the speed of adjustment in the following way:

$$\overline{\alpha}_i = \alpha_i \left(1 + \sigma_i\right) \tag{6}$$

where α_i is the usual standard measure of the speed of adjustment, and σ_i is a firm-specific measure of the earnings volatility of firm i. This assumes that the speed of adjustment increases as long as earnings volatility rises, and implies that we can rewrite Equation (2) as follows:

$$D_{it} - D_{it-1} = a_i + \overline{\alpha}_i \left(D^*_{it} - D_{it-1}\right) + u_{it} \tag{7}$$

with $D^*_{it} = \tau_i E_{it}$ (see Equation (1)). This leads to the following:

$$D_{it} = a_i + \alpha_i \left(1 + \alpha_i\right) \tau_i E_{it} + \left(1 - \alpha_i \left(1 + \sigma_i\right)\right) D_{it-1} + u_{it} \tag{8}$$

and implies that the "adjusted" smoothing parameter becomes:

$$1 - \alpha_i \left(1 + \sigma_i\right) = \widehat{\beta}_2. \tag{9}$$

Condition Equation (9) shows that higher earnings volatility leads to smaller smoothing parameters. This result is also consistent with recent empirical evidence by Leary and Michaely (2011), who find that dividend-smoothing is highly affected by earnings volatility and company risk and that firms with high earnings and cash flow volatility, and therefore more risk, tend to smooth less. From the above analysis, we derive the following testable hypothesis:

> *H_1 (Dividend-smoothing): Firms under incentive regulation smooth dividends less than firms under cost-based regulation, i.e., smoothing parameters are lower.*

Previous studies (Moyer, Rao, and Tripathy 1992; Hansen, Kumar, and Shome 1994), but also recent anecdotal evidence,[10] show that payout

8. Incentive regulation is usually implemented as *price-* or *revenue-cap* mechanisms or benchmarking (Littlechild 1983), through the application of *fixed-price contracts* (Armstrong and Sappington 2007). Sappington (2002) and Vogelsang (2002) are comprehensive surveys of incentive regulation mechanisms and instruments. Joskow (2008) surveys incentive regulation schemes as adopted in the energy industry.

9. Parker (1997) shows that, after the introduction of incentive regulation in the UK, the profitability of many electric and telecom utilities increased but also started fluctuating widely.

10. For example, the *Wall Street Journal* recently highlighted that "Utility dividends grew at an annual clip of 5% to 8% from 2008 through 2012, making utility stocks a popular pick for income-seeking investors. Last year, 73% of publicly traded electric utilities raised their dividends, compared with 53% in 2011" (July 10, 2013).

ratios of regulated utilities are typically higher than payout ratios of unregulated industrial firms. According to these studies, regulatory oversight insulates managers from the discipline of both the market for corporate control and product market competition and regulated utilities may even use dividend payouts as a strategic instrument to influence the regulator to allow favorable conditions on retail prices (Moyer, Rao, and Tripathy 1992).[11]

Although these considerations help us to explain why larger payout ratios are expected from regulated utilities, they are not sufficient to explain the variation in dividend payouts across firms and, more precisely, across *regulatory schemes*. If incentive regulation generates stronger pressures to enhance efficiency (than cost-based regulation), we argue that firms subject to incentive regulation should also do their best to optimize dividend payout policy. In other words, since dividend-smoothing is costly,[12] optimal dividend payout policy implies that whenever firm profits increase, dividend payouts should also increase; but when profits are low, dividend payouts should also be low. Thus, the optimal dividend policy implies an impact effect equal to the target payout ratio and therefore zero dividend-smoothing. The above reasoning allows us to derive the following prediction on differences in the *impact effect* due to the regulatory contract.

H_2 (Impact effect): Firms under incentive regulation have a stronger pressure to optimize dividend payout policy than firms under cost-based regulation, i.e., impact effect parameters are larger.

C. Dividends, Regulation, and Ownership

In addition to these hypotheses, state ownership might matter for dividend payout policy, both directly and indirectly. The reluctance to privatize, for governments with tight budget constraints and rocketing debt-to-GDP ratios, may also depend on the substantial dividends that these operators distribute. In principle, insofar as firm value is the present value of the stream of future dividends, ownership should not matter, and the decision whether to sell the firm *now* or to cash in the dividends *forever* should only depend on the government's preference for privatization proceeds vis-à-vis an ongoing stream of dividends. Moreover, to the extent that governments and politicians can interfere with regulators (Macher and Mayo 2012; Bortolotti, Cambini, and Rondi 2013) to obtain a more favorable treatment for state-controlled firms, state ownership can be seen as a key determinant of regulation policy. In short, state ownership potentially matters for dividend policy both directly via state control of the company and indirectly via regulatory policy.

Thus, by not relenting state control, governments with a residual stake in many European energy utilities might de-facto counteract the efficiency effects of incentive regulation (Laffont 1996). Elected politicians are indeed held accountable for all of the activities of government, including enterprises that in many countries have yet to be fully privatized (for an overview of the residual state ownership in infrastructure industries in EU-27 countries, see Cambini, Rondi, and Spiegel 2012). For many reasons the government as well as politicians can be expected to have a strong interest in steady flows of dividends from state-controlled firms.[13] First, large payouts may convey to citizens the idea that the state-controlled company is well-performing and ultimately well-run, thus conferring a positive image to the executive. Secondly, a steady stream of dividends reduces the cash flow in the hands of managers that are difficult to monitor (Gugler 2003). Finally and probably more importantly, the "energy dividend" is a safe and steady source of financing, particularly when the budget constraint tightens (as in recent years in all Western economies).[14] Therefore, the reluctance of the national governments to release control and ownership of companies

11. This argument is in line with the strategic use of financial leverage already shown by Daspupta and Nanda (1993), and Bortolotti et al. (2011).

12. Dividend-smoothing is costly, since in an ideal world dividends would simply be the residual profits after all profitable investments have been made. Dividend-smoothing suggests, however, that the amount and stability of dividends are important decision variables affecting the amount of investments made. The argument that dividend-smoothing is a manifestation of agency costs has been made by Fudenberg and Tirole (1995), La Porta et al. (2000), and Gugler (2003), among others.

13. Shleifer and Vishny (1994) claim that "an important determinant of whether politicians want firms to be private or public is their ability to get tangible political benefits out of public ownership" (p. 1022).

14. There are several recent examples of this. Verbund, for example, a large Austrian electricity company, left its dividend stable in 2011 despite a slight drop in profits (see StockExpress.Com, 29 February (2012)). Verbund is 51% state-controlled. The management of Verbund aims at a "target 50% payout ratio."

(Bortolotti and Faccio 2009) can also be related, at least in part, to the reluctance to abandon the large dividend rights that the state receives as the main shareholder.

There is potentially also an indirect effect of state ownership and control of regulated companies on dividends, namely via the choice of regulatory mechanism. The economic or interest group theory of regulation (see, e.g., Kaserman, Mayo, and Pacey 1993; Beard, Kaserman, and Mayo 2003) views regulators as utility-maximizing arbiters between various competing interest groups. The most important interest groups are managers, workers (labor), politicians, and consumers, and their incentives can be described as follows:

1. Managers: From agency theory, managers have an incentive to stick to cost-based regulation, since a steady flow of cash flows can be transformed into a steady flow of dividends, increasing incumbency rents (Fudenberg and Tirole 1995) and/or partly solving the principal/agent conflict (La Porta et al. 2000; Gugler 2003).

2. Labor: The labor forces of regulated utilities also have an incentive that cost-based regulation is implemented, since jobs are safer under this form of regulatory mechanism than under incentive-based regulation due to the lower managerial incentives to cut labor expenditures (Volgelsang 2002; Armstrong and Sappington 2007).

3. Politicians: The executive also has an incentive that firms are regulated by cost-based mechanisms, if it owns a share of the resulting stable dividends. One reason for this may be that obtaining excessive and stable dividends is a more hidden way to enforce political preferences than direct taxation.

4. Consumers: Consumers might lose economically from cost-based regulation but either they may be politically weak (e.g., because dispersed), and/or—as taxpayers—happy with stable dividends, and/or ideologically in favor that the state should own and run public utilities, and/or risk averse and, given the peculiar industry involved (electricity), concerned with "security of supply," favoring cost-based regulation.

The above arguments suggest that a preponderance of relevant interest groups might be of the opinion that it is a good idea that the state is, first, a significant shareholder in public utilities and, second, that a cost-based regulatory mechanism should be applied.[15] Even consumers might have conflicting interests in the electricity sector.[16] From the interest group theory of regulation, therefore, we would expect that utility-maximizing regulators follow the preponderance of interest groups to regulate the electricity utilities in a cost-based manner. Thus, we would expect that electricity sectors in countries with a lot of state-controlled public utilities stick as long as possible to cost-based regulatory mechanisms, since powerful interest groups can better enforce their interests in this case.

Following this reasoning, we adjust the above predictions to account for residual state ownership and test whether the impact of regulatory regimes differs across private and state-controlled firms. In particular, we expect that, despite incentive regulation, state-controlled firms will continue to *smooth* their dividends in order to abide politicians and/or controlling bureaucrats' demand for stable dividends.

With respect to the *impact effect*, we postulate that the need to optimize dividend payout policy is more stringent for private than for state-controlled firms that operate under a somewhat softer budget constraint (Kornai, Maskin, and Roland 2003). If incentive regulation does not imply the same efficiency and/or strategic implications for state-controlled firms as for private firms, we also do not expect Hypothesis 2 to hold for them.

In the following section, we describe the estimation strategy and discuss how we address the potential endogeneity of both the regulatory regime and the ownership status.

IV. ESTIMATION STRATEGY

The theoretical framework developed in the previous section provides the hypotheses to be tested by our econometric analyses. Panel regression techniques have to be used to account for the characteristics of longitudinal data of our unbalanced panel dataset, which comprises different firms as well as varying time spans between 1986

15. Given these arguments, it probably comes as no surprise that incentive-based regulation was introduced (if at all) in most EU countries only after strong political pressure by the EU Commission, which operates reasonably externally to national politics.

16. New entrants might have an incentive for the regulatory mechanism to be incentive-based to reduce the incumbent's rents. However, new entrants might be politically weak and in the regulated parts of the electricity sector new entrants are seldom observed.

and 2010. We concentrate on estimating the pure Lintner model, not accounting for other firm differences (like size or tax differences between countries), which might be correlated with dividend payouts. Insofar as they allow to control for time-invariant omitted variables, therefore, fixed effects (FE) specifications are theoretically more convincing than random effects specifications. In addition, year dummies are included to account for common time varying factors. For further clarification, we performed Hausman specification tests, which also support the fixed-effects model. In particular, the null hypothesis of an efficient random effects estimator is rejected at the 1% significance level for the pure Lintner model (Table 3) and for the Lintner model incorporating the impact of regulation (Table 5).

Estimation of the Lintner partial adjustment model using panel data raises a number of econometric problems that only recently have been explicitly addressed and accounted for (see, e.g., Khan 2006; Andres et al. 2009). First, Net Profits (or Cash Flows) are likely to be correlated across firms with the firm-specific effect and lagged *Dividends* are also most likely correlated with these firm-specific effects. To remove the firm-specific effect, the within-group estimator can be used, but then, because the fixed-effect transformation requires time-demeaning of all variables, the lagged dependent variable would remain correlated with the transformed disturbance term. To obtain consistent estimators, we thus use the first-difference transformation to eliminate the fixed effect and then apply the linear GMM estimator developed by Arellano and Bond (1991) and Arellano and Bover (1995). This estimator is especially designed for panel data models where the lagged dependent variable (in our case, $D_{t\text{-}1}$) is included, some of the regressors are potentially endogenous and, provided there is no serial correlation in the disturbance, lagged values of the dependent variable can be used as instruments. More specifically, we use the dynamic System-GMM estimator (Arellano and Bond 1991; Blundell and Bond 1998), which deals with situations where the lagged dependent variable is persistent (i.e., the autoregressive parameter is large).[17] Standard errors are robust to heteroskedasticity and arbitrary patterns of autocorrelation within firms.

We modify the original Lintner model to allow for a change in dividend behavior due to the regulatory regime, interacting both the lagged dividend and the contemporaneous profits with a binary variable $Inc\ Reg_{\mathrm{it}}$, which is equal to 1 when the firm is regulated by an incentive mechanism, and 0 when a cost-based regime is in place. The estimation equation is therefore:

$$(10)\quad D_{it} = a_0 + a_1 D_{it-1} + a_2 D_{it-1} Inc\ \mathrm{Reg}_{it-1} + a_3 E_{it} + a_4 E_{it} Inc\ \mathrm{Reg}_{it} + \varepsilon_{it} + \eta_i + \lambda_t$$

where the term η_i represents firm-specific effects and λ_t the year dummies that capture common factors that change over time for all electric utilities.

The next econometric issue is that the choice of the regulatory mechanism—involving low- versus high-powered incentive schemes—is potentially endogenous, like any other policy decision or institutional reform. The regulatory contract is in fact chosen by the regulator, who is sensitive to the magnitude of the profits, and consequently to the dividends of the regulated firms in that their size and distribution may convey information about firm efficiency and profitability. Moreover, incentive regulation is also likely to drive firms to higher income levels and, in order to isolate the effect of the regulatory regime on dividend-smoothing, we should control for its effect on net earnings. Ideally, with a static model, we could use a standard 2SLS estimator (as in Bortolotti, Cambini, and Rondi 2013, with a market-to-book regression model), but the presence of the lagged dependent variable, and the need to deal with the dynamic panel bias, rules out this approach.

Within the GMM framework, we rely on two ways to deal with the need to endogenize the regulatory regime. On the one hand, we GMM-instrument not only the linear *Inc Reg* term but

17. This model estimates a system of first-differenced and level equations and uses lags of variables in levels as instruments for equations in first-differences, and lags of first-differenced variables as instruments for equations in levels for which the instruments used must be orthogonal to the firm-specific effects. For the validity of the GMM estimates, it is crucial that the instruments are exogenous. We check that they are and report the appropriate tests: the Arellano and Bond (1991) autocorrelation tests to control for first-order and second-order correlation in the residuals, the two-step Sargan-Hansen statistic to test the joint validity of the instruments and the Difference-in-Hansen test of exogeneity of individual instruments to test the overidentifying restrictions for the external instruments. The Sargan-Hansen test is robust, but may be weakened if there are too many instruments with respect to the number of observations (see Roodman 2006). Therefore, we follow a conservative strategy using no more than two lags of the instrumenting variables, in order to assure that the number of instruments is no greater than the number of firms.

also its interactions with dividends and profits, on the grounds that the "contract type" is fundamentally a choice variable that arises through a process of bargaining between the regulator, the firms and eventually the government[18] and that this bargaining process is influenced by the past performance (dividends and profits) of the firm (as in Wintoki, Linck, and Netter 2012). On the other hand, we turn to "external" variables to instrument *Inc Reg*. With this alternative approach, not only do we perform a robustness check to address criticisms that "internal" instruments (in our case the lags of the linear and interacted *Inc Reg* terms) sometimes raise about their strength (weak identification), but we also directly introduce the political economy aspects behind the regulatory and privatization reforms. As developed above, from the interest group theory of regulation, we would expect that utility-maximizing regulators follow the preponderance of interest groups and, in case of state ownership and control, this implies regulating the electricity utilities in a cost-based manner. Thus, we would expect electricity sectors in countries with a lot of state-controlled public utilities to stick as long as possible to cost-based regulatory mechanisms, since powerful interest groups can enforce their interests in this case.

We account for firm ownership, in the form of a dummy, *State Control*, which is equal to 1 when the government directly and/or indirectly holds at least 25% of the firm, and therefore has ultimate control. This variable has been manually constructed, as further detailed in the data section below. Initially, therefore, we include *State Control* in the set of external instruments for *Inc Reg*, but in the second part of our analysis, to account for the two-sided influence of firm ownership and the regulatory framework on dividends, the *State Control* becomes a direct determinant of dividend payout policy and is itself endogenized.

Additionally, to find suitable instruments, we rely on a set of variables that account for specific features of domestic institutions that typically influence the quality and the enforcement of policy reforms, as recently advanced by the political economy literature (see, e.g., Persson 2002; for recent applications to regulated network industries see Macher, Mayo, and Schiffer 2011; Macher and Mayo 2012; Bortolotti, Cambini, and Rondi 2013). One has to recall that the regime switch from cost-based to incentive regulation marks the shift from a typically "relaxing" scheme in place at the time of vertically integrated state monopolies to a tougher mechanism that puts the firms under an efficiency-seeking, cost-saving regulatory contract. Hence, our instruments are meant to proxy for the credibility of the institutions and of the political environment in which this regime switch was decided. We use country-specific, time-varying variables sourced from the World Bank database on Political Institutions (see Beck et al. 2001, for a detailed description of the variables) and extensively used in the applied political economy literature (Gilardi 2005; Duso and Seldeslachts 2010; Potrafke 2010; Dinc and Gupta 2011). *Herfindahl Gov*, the Herfindahl Index of government parties—the sum of the squared seat shares of all parties in the government—is expected to control for the internal cohesion of the executive, hence the ability to make and enforce policy decisions. *Political Orientation* is a time-varying variable, which accounts for the political orientation of the executive in charge; it is equal to 1 when the executive is right wing, 2 when it is center, and 3 when it is left wing. Government *Stability* is a survey-based measure that captures the extent of turnover of a government's key decision makers in any year and ranges from 0 (high stability) to 1 (low stability). *Checks* is an index for checks and balances incorporated into a political system that ranges from 1 (minimal checks) to 10 (maximal checks). We also add the ratio of *Public Debt to GDP* as a further external instrument. Bortolotti and Faccio (2009) include this ratio to control for a given country's fiscal conditions and public finance constraints that affect the executive's decision to keep control over a company or privatize it.

To summarize our empirical strategy, we start with simple pooled-ordinary least squares (OLS) regressions (with time dummies) and fixed-effect estimates, and then we turn to the GMM-IV estimator to account for the dynamic panel bias. In order to deal with the endogeneity of the choice of the regulatory regime, we present two sets of results. In the first set, we use the standard GMM internal instruments (i.e., lags of all the

18. See the development of the arguments of the interest group theory above. This view is also consistent with the theoretical analysis by, for example, Besanko and Spulber (1992) and with anecdotal evidence. In particular, according to the U.S. Supreme Court, the decision to adopt a specific regulatory contract "involves a balancing of the investors' and the consumers' interests" that should result in rates "within a range of reasonableness" (see *Federal Power Comm. v. Hope Natural Gas Co*., 320 U.S. 591, 603 (1944)).

endogenous firm-level variables as well as their interactions with *Inc Reg*); in the second set, we use the standard GMM internal instruments for the firm-level variables and only use external instruments, that is, variables drawn from the recent political economy literature, to instrument the policy variables (regulatory regime and firm ownership). Next, we introduce firm ownership and investigate whether state control also has a direct effect on dividend payout policy, allowing for its potential endogeneity. In both cases, we also present results from the sub-sample of firms that switched from cost-based to incentive regulation.

For robustness, we repeat the empirical strategy using C*ash Flows* instead of *Net Profits* as suggested by Fama and Babiak (1968) and recently adopted by Andres et al. (2009). Our panel includes firms from several countries with different and time-varying tax laws with respect to fixed-asset depreciation (equipment write-offs and allowances for accelerated depreciation which may be relevant for capital-intensive electric utilities) as well as to legal reserves. With this alternative approach, we try to allow for dividend decisions that are not based on published earnings only. Since results are very similar and robust, we do not report the *Cash Flow* results though they can be obtained upon request.

Share repurchases might also affect our results as they are an important substitute to dividend payments in initiating cash payouts to shareholders (see, e.g., Grullon and Michaely 2002, for the United States). However, in many European countries, share repurchases were liberalized only at the end of the 1990s or allowed under special circumstances. Moreover, Denis and Osobov (2008) do not find any link between the propensity to pay dividends and share repurchases in selected EU countries (see also, Andres et al. 2009, for the case of German firms). Also within our sample, share repurchases play a minor role. The average value of share repurchase is equal to US$ 18 million, which corresponds to only 8% of the average value of distributed dividends (equal to US$ 230 million, see Table 2). In any case, as a robustness check, in a set of unreported regressions, we added share repurchases to dividend payments and used this aggregate variable in the regressions. We found that the results remain quantitatively and qualitatively similar.[19]

19. For reasons of space, we do not report this further set of results, but they are available upon request.

V. INSTITUTIONAL CONTEXT, DATA, AND SUMMARY STATISTICS

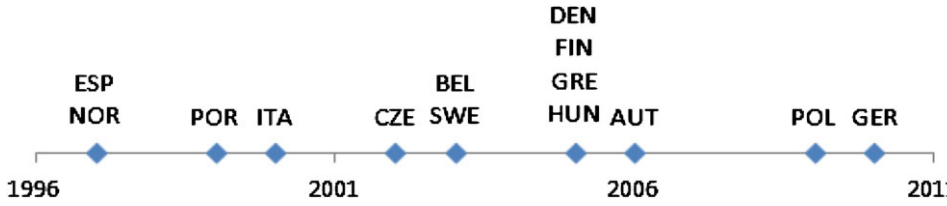
A. *Institutional Context*

Starting from the early 1990s, the European Commission has been issuing directives in order to prompt national reforms of the legal and regulatory framework of public utility sectors. In those years, the electricity industry in European countries was still characterized by vertical integration, state monopoly, and public ownership, except in the United Kingdom where privatization and liberalization reforms were introduced in the 1980s. The purpose of these reforms was to raise efficiency, improve service quality, and spur infrastructure investment through the introduction of liberalization, privatization, and new regulatory interventions.

Directive 96/92/EC built the basis for this significant reform, which was meant to open national markets and to prepare an integrated European electricity market. The directive issued common rules for electricity generation, transmission, and distribution, introducing a separation between monopolistic (transmission and distribution) and potentially competitive (generation and retail) segments. Directive 2003/54/EC required complete liberalization of national retail markets by July 1, 2007. Moreover, for the first time, the European Commission requested the legal unbundling of monopolistic and competitive operations and the inception of independent (i.e., non-governmental) national regulatory authorities. The third energy package, Directive 2009/72/EC, further increased the unbundling requirements.

At the time the regulatory authorities were created, most European electric utilities, in particular transmission and distribution operators, were regulated by cost-based regulatory contracts. The only exception was the United Kingdom, which implemented incentive regulation regimes back in 1990. The EU Directives did not impose any mandatory rule on the implementation of regulation, delegating the choice of the most appropriate regime to each national regulatory agency. In time, many regulatory authorities, independently and according to their own agenda, opted for a switch to some kind of incentive scheme (Volgelsang 2002; Cambini and Rondi 2010). For this reason, the regulatory mechanisms differ across countries and across market segments. They range from the typical cost-based (mainly, rate of return) to incentive-based schemes, either in the form of

FIGURE 1
Timeline of the Introduction of Incentive Regulation



price or revenue caps or through benchmarking (yardstick) competition. Within the electricity sector, the United Kingdom adopted incentive mechanisms at the beginning of the 1990s in both distribution and transmission, while other countries—like Belgium, Hungary, Italy, Spain, and Norway—switched later in time from rate of return to incentive-based pricing in both segments. Austria, Denmark, Finland, and Sweden shifted to incentive schemes only in distribution, Greece and France still rely only on cost-based mechanisms, while Germany switched to incentive regulation in 2010.

Figure 1 presents a timeline indicating the first introduction of incentive regulation in the electricity market (for distribution, transmission or both) of several European countries.

B. Data and Summary Statistics

The starting point of our sample creation was all firms listed in Worldscope with a primary or secondary SIC code equal to 4911 "Electric services."[20] We reviewed the selected sample by checking all included firms by hand and eliminating those which mainly operate in different fields, like conglomerates or investment trusts. Subsequently, we created a dummy indicating whether the firms operate in distribution, transmission, or generation of electricity. We dropped all firms that exclusively operate in electricity generation, because these firms are not subject to regulation. Note that our sample does not only include transmission grid firms, which are mostly ownership unbundled in Europe today, but mainly distribution grid firms, which are mostly only legally unbundled (only in the Netherlands distribution grid ownership unbundling is mandatory, but we have no Dutch firms in the sample). Thus, all of our firms still operate a grid at the end of the sample period, and are therefore subject to regulation.

Finally, we obtain an unbalanced panel sample consisting of 106 firms operating in the European[21] electricity market in the period from 1986 to 2010. We use total common and preferred dividends paid to shareholders as the dividend variable *Dividends*. For current earnings, we use two different proxies: net income after preferred dividends for *Net Profits* of the firms and net profits plus depreciation, depletion, and amortization for *Cash Flows* of the firm. All variables are in US$, see Table 1 for definitions of all variables used.

To describe the regulatory regime, we constructed a dummy for incentive regulation (*Inc Reg*), which takes the value of one if either a transmission or distribution company operates under incentive regulation, and zero otherwise.[22] Following Volgelsang (2002), incentive regulation is an umbrella term covering different regulatory methods which introduce more price flexibility and lead firms to reap profit increases from cost reductions; consequently we oppose pure cost-based regulation (with a dummy value of zero) to hybrid/incentive based regulatory regimes incorporating at least elements of incentive regulation (with a dummy value of 1). As far as firm ownership is concerned, we constructed a dummy (*State Control*), indicating at least

20. If a sales breakdown for segments is available, SIC Code 1 represents the business segment providing most revenue, and SIC Code 2 the second most. If a sales breakdown is not available, the SIC Code is assigned according to the best judgment of Worldscope (Worldscope Database—Datatype Definitions Guide).

21. Countries included: Austria, Belgium, Czech Republic, Denmark, Finland, Italy, Luxembourg, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and United Kingdom.

22. The data on the adoption of a regulatory scheme are drawn from Cambini and Rondi (2010) and were updated using recent documents released by national regulatory agencies, indicating whether the activity is under incentive regulation (in its different forms, i.e., price cap, revenues cap, or firms' benchmarking) or cost-based (e.g., rate of return) scheme.

TABLE 1
Variable Definitions and Sources

Variable Name	Source	Definition
Dividends	Worldscope	Total common and preferred dividends paid to shareholders of the company (1,000 US$).
Net Profits	Worldscope	Net income after preferred dividends that the company uses to calculate its basic earnings per share (1,000 US$).
Dividend Payout Ratio		Actual dividend payout ratio, computed as dpr = Dividends/Net Profits.
Cash Flows	Worldscope	Net Profit plus depreciation, depletion, and amortization (1,000 US$).
Total Assets	Worldscope	Total assets of the company (1,000 US$).
Total Liabilities	Worldscope	All short and long term obligations (1,000 US$).
Ebitda	Worldscope	Earnings before interest, taxes, and depreciation (1,000 US$).
Market Capitalisation	Worldscope	Total market value of the company based on year end price and number of shares outstanding (1,000 US$).
Tobin's Q		Computed with variables from Worldscope as Tobin's Q = (Market Capitalisation + Total Liabilities)/Total Assets.
Leverage		Computed with variables from Worldscope as Leverage = Total Liabilities/Total Assets.
Price Volatility	Worldscope	A measure of a stock's average annual price movement to a high and low from a mean price for each year.
Inc Reg	Regulatory Authorities	Self-constructed dummy, indicating whether the firm is operating under incentive regulation (1) or not (0).
State Control	Annual Reports	Self-constructed dummy, indicating at least 25% state ownership (direct and ultimate).
Mean_State Control		Computed as the yearly mean of the State Control dummy by nation.
Political Orientation	DPI2009	A time-varying variable which accounts for the political orientation of the executive in charge: (1) for right wing, (2) for center, and (3) for left-wing.
Herfindahl Gov.	DPI2009	Herfindahl Index Government: The sum of the squared seat shares of all parties in the government.
Stability	DPI2009	A survey-based measure that captures the extent of turnover of a government's key decision makers in any year and ranges from (0) high stability to (1) low stability.
Checks	DPI2009	An index for checks and balances incorporated into a political system that ranges from (1) minimal checks to (10) maximal checks.
Public Debt to GDP	OECD–STAN Database	Ratio between public debt and GDP

Note: DPI2009 stands for Database of Political Institutions, World Bank.

25% state ownership. We chose this threshold because 25% of shares establish a blocking minority in most European countries, which enables the owner to control important, strategic decisions of the enterprise.[23] In creating the dummy, we took the following procedure: If the state (governments at federal, state, and local level) holds 25% or more of the shares of a firm, the dummy contains a one, and zero otherwise. If a state-controlled firm holds the majority of shares of another firm, this second firm is also marked as state-controlled. Thus, both direct and ultimate state ownership are considered. The necessary information was mainly collected from the homepages and annual reports of the firms.

Table 2 summarizes descriptive statistics of all variables included in the regression analysis for the full sample (Panel A), highlights the yearly development of *Inc Reg* and *State Control* (Panel B), and presents means and mean difference tests in the variables between the different regulatory regimes (Panel C). For the panel structure, see Table A1 in the Appendix; for dividend payout ratios across countries, see Table A2 in the Appendix.

As reported in Panel A, firms pay on average around US$ 230 m in *Dividends* out of *Net Profits* of US$ 384 m (and *Cash Flows* of around US$ 900 m). Around 33% of firm-years operate under incentive-based regulatory schemes, while 67% operate under cost-based regimes. Over time, 74 out of the 106 firms faced a regulatory regime switch from cost-based to incentive regulation. The average country in the sample locates around the center of the political spectrum (mean *Political Orientation* of 2.05), enjoys broad internal cohesion in government (mean *Herfindahl Gov*. of 0.66), with a *Checks* average of around 4.19 (out of a maximum of 10), and faces political stability (mean *Stability* of 0.14). More than half of

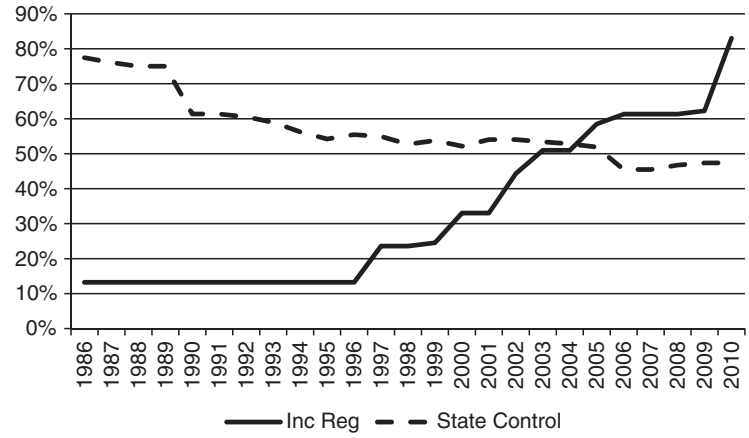
23. Our main findings also hold for the 50% threshold.

TABLE 2
Descriptive Statistics (106 Electric Utilities, Period 1986–2010)

Panel A: Full Sample[a]

	Mean	*SD*	Min	Max	Obs.
Political Institutions					
Orientation	2.048	0.932	1.00	3.00	356
Herfindahl Gov.	0.658	0.274	0.18	1.00	384
Stability	0.138	0.272	0.00	1.00	383
Checks	4.185	1.399	1.00	10.00	384
Public Debt to GDP	65.249	28.744	11.270	149.620	371
Firm Characteristics					
Inc Reg	0.327	0.469	0.00	1.00	2,650
State Control	0.565	0.496	0.00	1.00	2,027
Log_ Total Assets	14.613	2.026	6.75	19.65	1,580
Tobin's Q	1.300	0.563	0.35	5.99	1,425
Leverage	0.573	0.186	0.00	1.15	1,580
Profitability					
Net Profits (abs.)	384,352	1,042,573	−2,723,519	12,028,613	1,579
Cash Flows (abs.)	905,845	2,011,819	−2,162,773	17,316,560	1,572
Net Profits/Total Assets	0.041	0.047	−0.55	0.35	1,578
Cash Flows/Total Assets	0.087	0.051	−0.54	0.38	1,571
Net Profits/Equity	0.114	0.110	−0.83	0.91	1,566
Ebitda/Total Assets	0.120	0.059	−0.53	0.52	1,567
Dividends					
Dividends (abs.)	229,029	677,985	0.00	8,945,529	1,537
Dividends/Total Assets	0.022	0.028	0.00	0.41	1,537
Dividends/Net Profits	0.549	0.434	0.00	3.76	1,480
Dividends/Cash Flows	0.238	0.207	0.00	1.30	1,501
Price Volatility	18.270	6.516	0.00	43.43	914
N.Firms [N. Obs.]	106 [2,650]				

Panel B: Time Structure of Inc Reg and State Control[b]



Panel C: Firms under Incentive vs. Cost-Based Regulation[c]

	Incentive	Mean Comparison	Cost
Political Institutions			
Orientation	1.905	~	2.052
Herfindahl Gov.	0.716	> ***	0.625
Stability	0.158	~	0.139
Checks	4.071	~	4.246
Public Debt to GDP	61.647	< *	67.146
Firm Characteristics			
Inc Reg	1.000	.	0.000
State Control	0.348	< ***	0.687
Log_ Total Assets	15.158	> ***	14.373
Tobin's Q	1.305	~	1.297
Leverage	0.561	< *	0.579

TABLE 2
Continued

Panel C: Firms under Incentive vs. Cost-Based Regulation[c]			
	Incentive	**Mean Comparison**	**Cost**
Profitability			
Net Profits (abs.)	602,547	> ***	288,481
Cash Flows (abs.)	1,108,116	> ***	816,667
Net Profits/Total Assets	0.055	> ***	0.034
Cash Flows/Total Assets	0.095	> ***	0.083
Net Profits/Equity	0.142	> ***	0.101
Ebitda/Total Assets	0.131	> ***	0.115
Dividends			
Dividends (abs.)	391,809	> ***	157,546
Dividends/Total Assets	0.031	> ***	0.018
Dividends/Net Profits	0.537	~	0.554
Dividends/Cash Flows	0.287	> ***	0.217
Volatility: Profitability			
sd_Net Profits/Total Assets	0.032	> *	0.024
sd_Cash Flows/Total Assets	0.033	~	0.026
sd_Net Profits/Equity	0.074	~	0.061
sd_Ebitda/Total Assets	0.039	~	0.032
Price Volatility	21.196	> ***	16.545
Volatility: Dividends			
sd_Dividends/Total Assets	0.022	> ***	0.010
sd_Dividends/et Profits	0.352	> *	0.284
sd_Dividends/Cash Flows	0.164	> ***	0.106
N.Firms [N. Obs.]	88 [866]		92 [1,784]

[a]The section Political Institutions refers to a nation-year basis.
[b]Percentages refer to firms under incentive regulation (solid line) and state control (dashed line) over the total of included firms respectively.
[c]The prefix sd in Volatility refers to the standard deviation of the single variables computed as firm averages; mean difference tests in the section Political Institutions were computed on a nation-year basis.
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

the firm-years (56.5%) are under state control, and over time 28 of the 106 firms face a switch in *State Control*.

A comparison of incentive versus cost-based regulated firms is particularly revealing (see panel C). Interestingly, if cost-based regulation is in place, the percentage of companies still ultimately controlled by the state is much higher (68.7%) than if incentive regulation is in place (34.8%). Moreover, over time, incentive regulation gains, and cost-based regulation loses in importance, while the state gradually withdraws from control over time (see Panel B). This is a first indication that regulation as well as ownership and control are related.

C. Profitability, Dividends, and Volatility across Regulatory Regimes

Our theoretical framework highlights the impact of earnings (profitability) variability and firm risk on dividend-smoothing, while hinting at the potential differences of return volatility for utilities operating under cost-based or incentive regulation. Thus, before turning to the estimation of the modified Lintner dividend model, we present evidence of firm heterogeneity of the level and variability of profitability and dividend payout across regulatory regimes (for a similar approach see, e.g., Leary and Michaely 2011; Michaely and Roberts 2012; specifically on regulated electric utilities, Hansen, Kumar, and Shome 1994). We use *Net Profits/Total Assets*, *Cash Flows/Total Assets*, *EBITDA/Total Assets* (*Return on Assets or ROA*) and *Net Profits/Equity* (*Return on Equity or ROE*) as profitability measures and, to gauge dividend policy, we use both *Dividend/Net Profits* and *Dividend/Cash Flows* as measures of payout and *Dividend/Total Assets* as an alternative normalization for dividends. In the lower part of Table 2, Panel C, we use the standard deviations of these variables to measure their volatility. Finally, to further document the differences in return variability (and firm risk), we include a comparison for *Price Volatility*, which is a measure of a stock's average annual

FIGURE 2
Return on Assets (Ebitda/Total Assets)

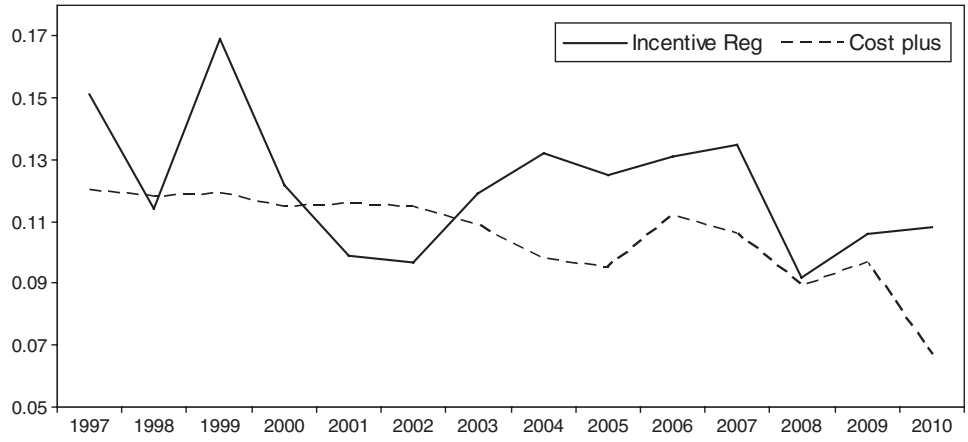
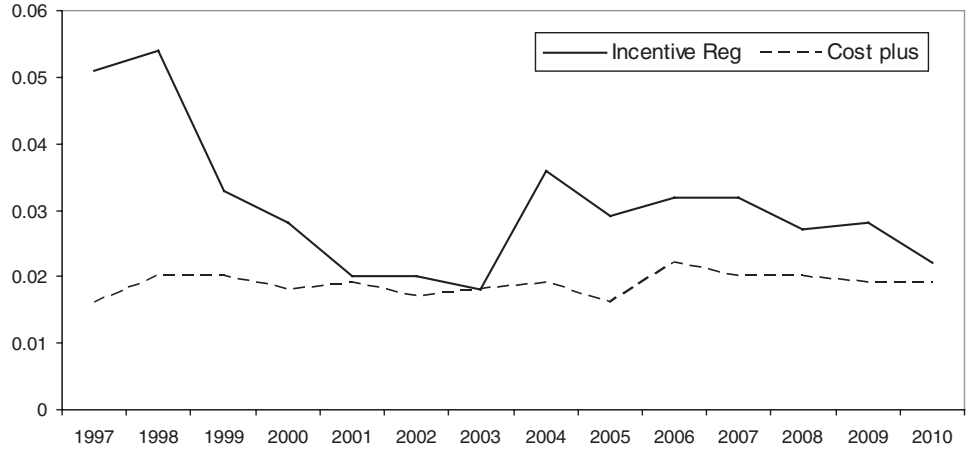


FIGURE 3
Dividends/Total Assets

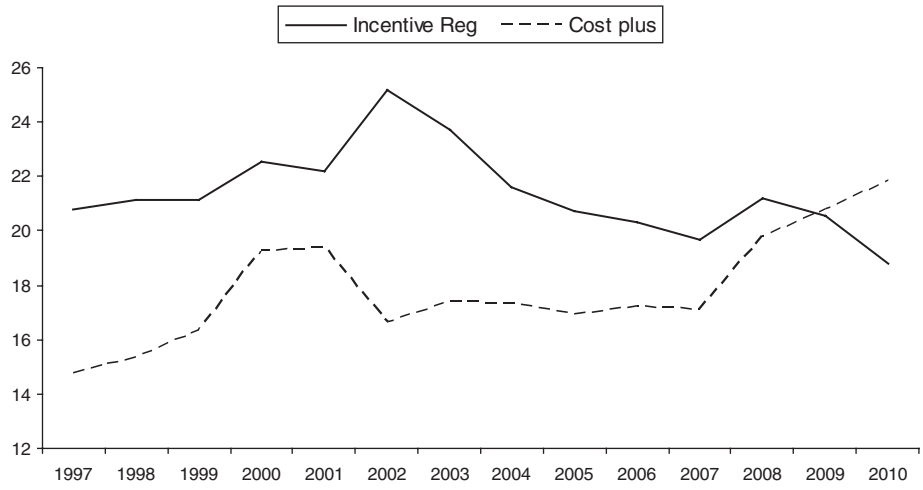


price movement to a high and low from a mean price for each year. Figures 2–4 visually track the evolution over time of selected variables by regulatory regime.

Table 2, Panel C highlights the following differences between the sub-samples of incentive versus cost-based regulation. First, as already mentioned, the state is much more important as a controlling shareholder for cost-based regulated firms than for incentive-regulated firms. Second, whether we measure profitability using *Net Profits*, *Cash Flows*, or *Ebitda*, we find that firms under incentive regulation exhibit significantly higher profitability ratios than firms under cost-based regulation. This is consistent with the efficiency-enhancing pressures of incentive regulation we hypothesized in Section III. Third, the picture is slightly more nuanced with respect to dividend payout ratios. While *Dividends* as a share of *Net Profits* are (insignificantly) lower for incentive-regulated firms (53.7%) than for cost-based regulated firms (55.4%),[24] firms under incentive regulation pay out significantly

24. Of course, the absolute amounts of dividends are higher under incentive regulation, since profits are generally larger.

FIGURE 4
Price Volatility



larger shares as a percentage of *Total Assets* and *Cash Flows*. Thus, again consistent with our theoretical assumptions, the effects of incentive regulation on the dividend payout ratio are not clear-cut, since both lower smoothing and higher impact effects may be present at the same time. Finally, all comparisons of standard deviations of our profitability and dividend measures indicate that the volatility of profitability and dividends is larger under incentive regulation. We also find that stock price volatility, a market-based proxy for firm risk, is also (significantly) higher for incentive-regulated firms. The graphical evidence is in line with the mean differences tests. Figure 2 shows that profitability of incentive-regulated firms as measured by *Return on Assets* tends to be both higher and more volatile. This pattern is confirmed by Figure 3, which maps *Dividends* to *Total Assets*, and by Figure 4 where we graph *Price Volatility*. Moreover, when we calculate the standard deviations of our profitability measures in Table 2, Panel C, we also unambiguously find that the variability of profits goes up. For example, in the entire sample, the standard deviation of *Net Profits/Total Assets* is 2.4% under rate-of-return regulation and 3.2% with incentive regulation. Restricting the sample to countries that actually switch to incentive regulation within our sample period, this difference even increases: the standard deviation of *Net Profits/Total Assets* is 3.5% during rate-of-return regulation and goes up to 5.4% once countries switch to incentive-based regulation. This is another indication that the regulatory regime is responsible for this greater variability.

Summarizing, both the level and variability of profitability are larger under incentive regulation. This is consistent with efficiency-enhancing pressures and firm riskiness going up due to becoming a "residual claimant" under incentive regulation. While this translates into a dividend policy that is significantly more volatile whenever the firm is under incentive regulation, the dividend payout *ratio* does not necessarily go up. Thus, to ultimately judge the effects of incentive regulation one needs to look at the time profile of dividend payout policy, which we do below by estimating the Lintner model.

VI. RESULTS

A. The Lintner Dividend Model for Regulated Firms

In this section, we present the results from estimating the Lintner dividend model extended to allow for regulatory regimes and residual state ownership. We focus on the system GMM estimates and report pooled-OLS and FE estimates for comparison.

Table 3 reports the baseline results for Equation (4), while Table 5 allows for the differential impact of incentive versus cost-based regulatory regimes by estimating the unrestricted

TABLE 3
Main Results—Full Sample

	OLS	FE	GMM
Dep. Var.: $Dividends_t$			
$Dividends_{t-1}$	0.454***	0.379***	0.475***
	(0.129)	(0.125)	(0.119)
$Net\ Profits_t$	0.306***	0.289***	0.172***
	(0.0565)	(0.0516)	(0.0403)
N.Firms [N.Obs.]	106 [1,417]	106 [1,417]	106 [1,417]
R^2	0.736	0.604	
adj. R^2	0.732	0.596	
sarganp			0.000
hansenp			0.117
AR(1) p			0.0107
AR(2) p			0.313
(a) Smoothing (S), Impact (I), and Target Payout Ratio (Tpr)			
S	0.454***	0.379***	0.475***
I	0.306***	0.289***	0.172***
Tpr	0.560***	0.465***	0.327***

Robust standard errors in parentheses; hansenp represents the *p* value of the Hansen test of overid. restrictions; sarganp represents the *p* value of the Sargan test of overid. restrictions; AR(1) p and AR(2) p represent the *p* values of the autocorrelation tests of order 1 and 2 respectively; Note that year dummies were included in all specifications.

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

TABLE 4
First-Stage Regressions–Dependent Variable: Inc Reg

	FE	Logit	Logit Sub-Sample That Switches From Cost to Inc
$Mean\_State\ Control_{t-1}$	−0.235***	−3.521***	−2.415***
	(0.081)	(0.426)	(0.569)
$Herfindahl\ Gov_{t-1}$	0.074	3.285***	4.221***
	(0.119)	(0.835)	(0.970)
$Checks_{t-1}$	0.036**	−0.114	−0.149
	(0.018)	(0.121)	(0.209)
$Political\ Orientation_{t-1}$	−0.050***	−0.155	−0.504*
	(0.019)	(0.199)	(0.274)
$Stability_{t-1}$	−0.038	−0.231	−0.712
	(0.060)	(0.609)	(0.851)
Year dummies	Yes	Yes	Yes
Country dummies	Yes	No	No
N	380	380	163
R^2/*Pseudo* R^2	0.658	0.449	0.403

Notes: In this table firm-year observations are averaged by country in order to match the country-level structure of the political and institutional variables. Robust standard errors in parentheses. *Mean_State Control, Herfindhal Gov., Checks, Political Orientation* and *Stability* are defined in Table 1 and in Section III.B.

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

model in Equation (10). Table 4 reports the results of our quasi first-stage analysis, that is, a regression analysis of the determinants of the choice of the regulatory mechanism on a country-year level. For all tables we quantify and report the corresponding model parameters: the coefficients of dividend-smoothing (S), the impact effects (I), and the estimated target payout ratios (Tpr).

Table 3 shows that the coefficient on lagged dividends, $(1\text{-}\alpha_i)$, that is, dividend-smoothing, varies from 0.379 (FE) to 0.475 (GMM), and thus the speed of adjustment (α_i) ranges between 0.525 and 0.621. Impact effects are estimated to range between 0.172 (GMM) and 0.306 (OLS), and thus target payout ratios range between 0.327 (GMM) and 0.560 (OLS) (Table 3a). All estimated coefficients are significant at the 1% level of significance. The autocorrelation tests for second-order correlation in the residuals and the two-step Sargan-Hansen statistic testing the joint validity of the instruments all suggest that our estimates are valid.

Before turning to the results from the unrestricted model that tests for the differences across regulatory regimes, Table 4 reports the results of regressions of *Inc Reg* on the set of external instruments used in the GMM regression of Table 5 (a "quasi" first stage). As explained in Section IV, the chosen instruments account for features of the domestic political institutions and for the importance of the state as a shareholder in the industry, both of which may influence the choice of the regulatory regime. Because all institution variables vary only at the country-year level, we estimate these regressions at the country-year level, and accordingly the number of observations goes down from the previous table. To deal with state control (which is a firm-specific, time-varying variable), we average *State Control* over all the electric utilities of each country and year, and thus *Mean_State Control* measures the percentage of companies under state control in each year in a given country in the electricity industry. In Table 4, we present the regression results for a within-group (fixed-effects) model and for one Logit regression on the full sample. In Column (3), we estimate a fixed-effects Logit model for the sub-sample of countries that report a switch in the regulatory regime from cost-based to incentive regulation.

The first-stage analysis confirms our prior assumptions that ownership/control of the state and domestic political institutions play a significant role in affecting the choice of regulatory regime. Incentive regulation schemes are less likely when state control of electric utilities is more pervasive. This is consistent with our interpretation of the interest group theory of regulation, according to which utility-maximizing regulators arbiter between various competing interest groups. In our case this implies that the larger the share of state-controlled companies in

TABLE 5
The Impact of Incentive Regulation

Dep. Var.: Dividends $_t$	OLS	FE	GMM	GMM (extern)	GMM Sub-Sample of Firms That Switch Their Regulatory Regimes
Dividends$_{t-1}$	0.543***	0.506***	0.663***	0.661***	0.478**
	(0.0815)	(0.084)	(0.188)	(0.185)	(0.204)
Dividends$_{t-1}$*Inc Reg$_{t-1}$	−0.171	−0.232	−0.497*	−0.508*	−0.391*
	(0.201)	(0.193)	(0.263)	(0.276)	(0.224)
Net Profits$_t$	0.266***	0.247***	0.144	0.130	0.102
	(0.0395)	(0.044)	(0.0891)	(0.0897)	(0.200)
Net Profits *Inc Reg$_t$	0.083	0.069	0.312***	0.333***	0.531***
	(0.072)	(0.066)	(0.117)	(0.128)	(0.159)
N.Firms [N.Obs.]	106 [1,417]	106 [1,417]	106 [1,323]	96 [1,103]	74 [809]
R^2	0.740	0.613			
adj. R^2	0.735	0.605			
sarganp			0.000	0.000	0.000
hansenp			0.151	0.316	0.340
AR(1) p			0.0124	0.0117	0.013
AR(2) p			0.390	0.371	0.206

(a) Smoothing (S), Impact (I), and Target Payout Ratio (Tpr)

	OLS		FE		GMM		GMM (extern)	
	Inc	*Cost*	*Inc*	*Cost*	*Inc*	*Cost*	*Inc*	*Cost*
S	0.372*	0.543***	0.273	0.506***	0.166	0.663***	0.152	0.661***
I	0.349***	0.266***	0.316***	0.247***	0.456***	0.144	0.464***	0.130
Tpr	0.555***	0.581***	0.435***	0.499***	0.547***	0.428***	0.547***	0.384***

Robust standard errors in parentheses; hansenp represents the p value of the Hansen test of overid. restrictions; sarganp represents the p value of the Sargan test of overid. restrictions; AR(1) p and AR(2) p represent the p values of the autocorrelation tests of order 1 and 2 respectively; GMM refers to the "system GMM" and "extern" indicates the use of external instruments. "Inc Reg" is a dummy that takes a value equal to 1 when the firm-year observation is subject to incentive regulation. Note that year dummies were included in all specifications.

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

the electricity sector, the larger the pressure of interest groups (managers, workers, and politicians) to stick to a form of cost-based regulatory mechanism. Consistently, incentive regulation schemes are less likely when the government executive in charge is more left-wing. Moreover, incentive regulation appears to be more likely when the parties in government are more unified and concentrated. Government *Stability* is statistically insignificant, but always negative, suggesting that the regime switch to incentive regulation is more likely where the executive is more stable. No clear-cut results are obtained with institutional *Checks* and balances as we find switching signs across specifications.

We now turn to the results from the dividend model with the interacted terms, which tests our prediction on different dividend policies due to different regulatory regimes. To recall, both the lagged *Dividends* and the *Net Profits* are interacted with *Inc Reg*, which is 1 when the firm is under incentive regulation or a hybrid regulatory mechanism, and 0 when under cost-based regulation. In Table 5, the results show that the interacted *Dividends* terms (*Dividends*Inc Reg)* are always negative, and significant in Columns (3) and (4), where the appropriate GMM estimator is used (in the OLS and FE estimates of Columns (1) and (2) the coefficients on the lagged *Dividends* terms are downward-biased). The coefficients are similar whether or not we include the external instruments. Thus, we find clear evidence that the past level of dividends has a higher impact on this year's dividends for cost-based regulated utilities than for incentive-regulated firms. Moreover, in the GMM regressions, the coefficients on the *Net Profits* (*Net Profits*Inc Reg*) interaction terms enter significantly with positive signs. As predicted by our theoretical framework, therefore, dividend-smoothing is less prevalent and impact effects are higher among firms that are subject to regulatory schemes that prompt efficiency gains. The differences between firms subject to incentive and cost-based regulation survive, and the results are quite similar in the regression that uses

TABLE 6
Profitability and Dividend Behavior Across Regulation and Control

	Cost			Incentive		
	State		***Private***	***State***		***Private***
Profitability						
Net Profits/Total Assets	0.035	∼	0.034	0.043	< ***	0.064
	(0.037)		(0.046)	(0.059)		(0.058)
Cash Flows/Total Assets	0.086	> ***	0.078	0.085	< ***	0.102
	(0.042)		(0.050)	(0.062)		(0.060)
Net Profits/Equity	0.101	∼	0.101	0.105	< ***	0.170
	(0.089)		(0.097)	(0.084)		(0.157)
Ebitda/Total Assets	0.116	∼	0.113	0.116	< ***	0.142
	(0.054)		(0.055)	(0.064)		(0.071)
Dividends						
Dividends/Total Assets	0.017	< ***	0.022	0.028	∼	0.033
	(0.020)		(0.022)	(0.032)		(0.043)
Dividends/Net Profits	0.526	< ***	0.618	0.619	> ***	0.481
	(0.397)		(0.401)	(0.528)		(0.489)
Dividends/Cash Flows	0.199	< ***	0.263	0.301	∼	0.278
	(0.193)		(0.188)	(0.226)		(0.238)
Price Volatility	17.219	> *	16.145	21.951	> **	20.529
	(6.329)		(6.996)	(5.570)		(4.791)

Significance is reported according to mean difference tests on firm-year observations, standard deviation in parentheses.
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

the sub-sample of firms that switch across regulatory regimes, in Column (5). Table 5a shows that for the GMM regressions the resulting target payout ratios are higher for incentive-regulated firms than for cost-based regulated utilities, and thus the increase in the impact effects outweighs the drop in dividend-smoothing. Corresponding tests confirm a significant difference in the target payout ratios in the GMM specifications.

Summarizing, our results—a higher speed of adjustment and larger impact effects within electric utilities subject to incentive regulation—suggest that these firms are less reluctant to cut dividends when necessary and that incentive-based schemes make the dividend policy more responsive to earnings variability, consistent with efficiency-enhancing pressures. In addition, we find that, particularly in the columns reporting the consistent GMM estimates, target payout ratios for firms subject to incentive regulation tend to be higher than those of cost-based regulated firms.

B. Dividend Policy of Regulated Firms: Does Ownership Matter?

The first-stage analysis in Table 4 has drawn our attention to the role that state control may play in the choice of regulatory regime. In this section, we consider whether ultimate ownership or control by the government may also directly influence the dividend policy of the regulated firms (see, e.g., Gugler 2003) and make it differ across different regulatory regimes.

As discussed in Section IV, the reluctance of national governments to release the ownership of energy incumbents may be in part related to the reluctance to abandon a large dividend payout. In particular, one may postulate that politicians could make use of their influence by demanding high and stable dividends, even when the firm is subject to incentive regulation, to obtain funds for their purposes without the need to directly tax their electorate.

In Table 6, we report a set of statistics and mean difference t-tests similar to Table 2, but differentiating by state control as well as by regulatory regime. We note that private firms tend to be more profitable when they are under incentive regulation, but that the same cannot be said for state-controlled firms, corroborating our prior assumption that incentive regulation does not exert the same efficiency pressures on firms when they remain under state control as when they are privatized. The picture from dividend payout ratios is less straightforward. Private firms tend to pay *lower* dividends under incentive regulation than under cost-based regulation when we look at *Dividends/Net Profits*, but *higher* dividends when we use *Dividends/Cash Flows* or *Dividends/Total Assets*. In contrast, state-controlled firms unambiguously display larger dividend payout ratios if

TABLE 7
First-Stage Regressions–Dependent Variable: State Control

	FE	Logit	Logit with Country Effects	Logit Sub-Sample That Switches Across Regulatory Regimes
Herfindahl Gov_{t-1}	0.229***	−1.096	1.795**	1.512**
	(0.082)	(0.890)	(0.731)	(0.649)
Political $Orientation_{t-1}$	−0.004	0.326***	−0.019	0.165*
	(0.015)	(0.085)	(0.128)	(0.099)
$Stability_{t-1}$	−0.046***	0.217	−0.358***	−0.196
	(0.013)	(0.228)	(0.113)	(0.313)
Public $Debt/GDP_{t-1}$	0.003*	0.021**	0.062***	0.045***
	(0.002)	(0.010)	(0.017)	(0.009)
Year dummies	Yes	Yes	Yes	Yes
Firm dummies	Yes	No	No	No
Country dummies	No	No	Yes	Yes
N	1,758	1,758	1,586	1,099
R^2 or *Pseudo* R^2	0.163	0.082	0.380	0.229
Joint significance of country dummies (χ^2)			70.34 [10]***	

Robust standard errors in parentheses, *Herfindhal Gov.*, *Political Orientation*, *Stability* and *Public Debt/GDP* are defined in Table 1 and in Section III.B.
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

subject to incentive regulation than if under cost-based regulation.

In Table 7, we present the "quasi" first-stage analysis of the potentially endogenous ownership variable, while in Table 8 we report the regression results introducing the four-way interactions into the Lintner model—*Inc State*, *Inc Private*, and *Cost Private* with *Cost State* as the base category. Differently from Table 4, we conduct the "first-stage" analysis on firm-year observations, as the state ownership dummy varies across firms and over time. Hence, in order to control that the effect of the institutional variables does not simply reflect cross-country differences, we also estimate a Logit model where we add country dummies (Column (3)). The set of variables is also slightly different, since we now add the *Public Debt to GDP* ratio, to account for a potential covariate of state ownership and we drop *Checks*, which turned out to be always insignificant. The estimated coefficients suggest that state control tends to be more prevalent when the executive is more concentrated, at least when we control for firm or country effects. Moreover, politically more left-wing countries appear to increase the prevalence of state control, since the two significant coefficients are positive. The preponderance of negative coefficients for our stability measure points to the conclusion that more stable environments make state control more likely (remember from the definition of *Stability* that a larger number implies lower stability). A larger debt-to-GDP ratio unambiguously leads to more state-controlled companies. The results furthermore indicate that country dummies to control for unobserved time-invariant national characteristics are important determinants of the decision to privatize an electric utility or not.

We now turn to the dividend model results in Table 8. Although we can rely on a large enough sample, the precision of the estimates from this four-way distinction goes down. Since the instrument count soars (see Roodman 2006, for a warning about the problem of too many instruments) due to the many lagged dividend interactions, in Column (4) we do not GMM-instrument interacted terms and only rely on the external instruments. In Column (5), we focus on the sub-sample of firms that switch regulatory regimes, as in Table 5. Comfortingly, we find that, regardless of the instrumenting strategy and of the estimation sample, the results do not change and the coefficients are quite similar across columns.

To help interpretation of the four-way interactions, it is worth noting that the coefficients can be interpreted as marginal effects and the interaction terms represent the differences in these marginal effects to the basis "cost-based regulation in state controlled firms" case. Table 8a then uses the regression coefficients to calculate the parameters of interest of our dividend model. Thus, for example, to obtain the smoothing coefficient for "state-controlled firms under incentive regulation," one just needs to add the coefficient on $Div_{t-1}{*}Inc_{t-1}{*}State_{t-1}$ to the coefficient on $Dividends_{t-1}$, that is, for the GMM results

TABLE 8
The Impact of Regulation and Control

Dep. Var.: Dividends $_t$	OLS	FE	GMM	GMM (extern)	GMM Sub-Sample That Switches Across Regulatory Regimes
$Dividends_{t-1}$	0.585^{***}	0.557^{***}	0.388^{***}	0.397^{***}	0.527^{***}
	(0.0455)	(0.121)	(0.0766)	(0.146)	(0.163)
Div_{t-1}*Inc_{t-1} * $State_{t-1}$	0.163^{**}	0.126	0.253^{**}	0.313^{*}	0.193
	(0.0659)	(0.145)	(0.118)	(0.162)	(0.148)
Div_{t-1}*Inc_{t-1} * $Priv_{t-1}$	-0.453^{***}	-0.498^{***}	-0.336^{***}	-0.405^{***}	-0.567^{***}
	(0.0585)	(0.140)	(0.130)	(0.157)	(0.104)
Div_{t-1}*$Cost_{t-1}$*$Priv_{t-1}$	−0.0598	−0.103	0.0667	0.028	−0.160
	(0.0628)	(0.201)	(0.166)	(0.234)	(0.211)
Net $Profits_t$	0.241^{***}	0.215^{***}	0.304^{***}	0.442^{***}	0.275^{**}
	(0.0268)	(0.0459)	(0.0441)	(0.106)	(0.135)
NP *Inc * $State_t$	−0.0503	−0.0597	−0.0424	−0.147	0.055
	(0.0449)	(0.0621)	(0.0658)	(0.156)	(0.184)
NP *Inc * $Priv_t$	0.153^{***}	0.120	0.121	−0.022	0.132
	(0.0349)	(0.0950)	(0.0932)	(0.184)	(0.114)
NP* Cost* $Priv_t$	−0.0158	−0.0319	−0.0576	-0.223^{**}	0.056
	(0.0343)	(0.0724)	(0.0790)	(0.108)	(0.134)
N.Firms [N.Obs.]	106 [1,358]	106 [1,358]	106 [1,263]	95 [1,057]	73[737]
R^2	0.760	0.597			
adj. R^2	0.754	0.588			
Sarganp			0.000	0.000	0.000
Hansenp			0.999	0.638	0.212
AR(1) p			0.0435	0.045	0.061
AR(2) p			0.226	0.143	0.068

(a) Smoothing (S), Impact (I), and Target Payout Ratio (Tpr)

	GMM				GMM (extern)			
	State		Private		State		Private	
	Inc	*Cost*	*Inc*	*Cost*	*Inc*	*Cost*	*Inc*	*Cost*
S	0.641***	0.388***	0.0524	0.455***	0.710***	0.396***	−0.008	0.425***
I	0.261***	0.304***	0.425***	0.246***	0.295***	0.442***	0.420***	0.219***
Tpr	0.729***	0.496***	0.448***	0.452***	1.017***	0.732***	0.416***	0.381***

Robust standard errors in parentheses; hansenp represents the p value of the Hansen test of overid. restrictions; sarganp represents the p value of the Sargan test of overid. restrictions; AR(1) p and AR(2) p represent the p values of the autocorrelation tests of order 1 and 2 respectively; GMM refers to the "system GMM," "extern" indicates the use of external instruments. "Inc" indicates that the firm-year observation is subject to incentive regulation. "Cost" indicates that the firm-year observation is subject to cost-based regulation. "State" indicates that the firm-year observation is under state control. "Priv" indicates that the firm-year observation is under private control. Note that year dummies were included in all specifications.

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

$0.388 + 0.253$, and get the marginal effect of dividends lagged on current dividends of 0.641.

The regression results in Table 8 suggest that the dividend policy, and particularly the smoothing behavior, is significantly different between state and private utilities, even when they are subject to the same regulatory regime. The strongest result is undoubtedly the evidence that the lower smoothing parameters characterizing utilities under incentive regulation appear to be entirely due to private firms. Conversely, state firms continue to smooth dividends regardless of the regulatory regime. Table 8a points out that smoothing parameters for private firms under incentive regulation are very low and insignificant in all specifications, suggesting that they even stop targeting dividends at all and exclusively link dividend policy to current earnings. Together with the results on impact effects, which are not significantly different from each other, we obtain consistent evidence for the conjecture that state firms are seen as a source of stable dividends by the government, irrespective of the regulatory regime.

Overall, the results suggest that the response to incentive regulation in terms of dividend payout policy is dampened when the firm is

partially owned by the state. Thus, the government appears to find ways to influence the dividend payout policy of electric utilities not only indirectly, by determining regulatory policy, but also through state control of the utility.

VII. CONCLUSION

Regulated industries not only provide a rich testing ground for theories of regulation (like the interest group theory of regulation) but also for theories of the firm, such as the interactions between regulation and ownership, and their effects on key corporate finance decisions like the dividend payout decision. The aim of this paper is to shed light on these issues via estimating the Lintner model of dividends for an unbalanced panel of 106 publicly listed firms from 17 European countries operating in the regulated segments of the electricity market (distribution and transmission). The observed time span ranges from 1986 to 2010, which covers a period of deep market reforms for the European energy sector. We unearth important differences in the dividend payout policy, that is, the smoothing of dividends, impact effects and target payout ratios, of companies subject to different regulatory (cost- vs. incentive-based) and corporate governance (state vs. private control) regimes.

We extend the partial adjustment "behavioral" model by Lintner (1956) to take into account the potential effects of a regulatory regime change on firms' earnings and their variability. We then test our predictions with our original dataset, allowing for dynamic panel data bias as well as for the potential endogeneity of the regulatory mechanism and of firm ownership. Our results show that dividend-smoothing, impact effects, and therefore target payout ratios are sensitive to the regulatory regime companies face. We find that electric utilities subject to incentive regulation smooth their dividends less and respond more readily to profit changes than those subject to cost-based regulation. This implies that incentive regulation leads dividend policy to be more responsive to earnings variability and more consistent with efficiency-enhancing pressures. These results are confirmed when we account for the potential endogeneity of the regulatory mechanism, when we use cash flows instead of net profits and when we perform robustness sub-sample analyses.

The endogeneity of regulatory mechanism deserves special mention. We find that the larger the share of state-controlled companies in the electricity sector, the more likely the regulator will stick to a form of cost-based regulation. Consistently, incentive regulation schemes are less likely when the government executive in charge is more left-wing. We interpret these findings as being consistent with the interest group theory of regulation, according to which utility-maximizing regulators arbiter between various competing interest groups. State control allows important interest groups (managers, workers, and politicians) to exert pressure by, first, sticking to a form of cost-based regulatory mechanism and, second, undermining the efficiency-enhancing effects of incentive regulation on dividend policy, that is, the lower smoothing of dividends under incentive regulation is entirely due to private firms. We even find some evidence that private firms operating under incentive regulation stop targeting dividends completely and exclusively link current dividends to current earnings. In contrast to that, state-controlled firms (i.e., electric utilities that are still partially state-owned) continue to smooth their dividends and to pay larger dividends, despite moving from cost-based to incentive regulation. One reason for this may be that obtaining excessive and stable dividends is a more hidden way to enforce political preferences than direct taxation.

Overall, our analysis contributes empirical evidence that is important for a number of stakeholders in regulated network industries. First financial investors, since dividend policies are heavily affected by the kind of regulatory and ownership regimes in electric utilities; second, regulators as well as consumers, since sub-optimal dividend policies might constrain infrastructure investment; finally, the state and the taxpayers, as we find costly distortions in the dividend policy of state-controlled companies.

APPENDIX

TABLE A1
Panel Structure

Available Observations	Number of Firms	%	Cumm. %
6	4	3.77	3.77
7	12	11.32	15.09
8	6	5.66	20.75
9	7	6.60	27.36
10	5	4.72	32.08
11	12	11.32	43.40
12	3	2.83	46.23
13	4	3.77	50.00
14	3	2.83	52.83
15	11	10.38	63.21
16	4	3.77	66.98
17	2	1.89	68.87

TABLE A1
Continued

Available Observations	Number of Firms	%	Cumm. %
18	2	1.89	70.75
19	2	1.89	72.64
20	5	4.72	77.36
21	3	2.83	80.19
22	2	1.89	82.08
23	5	4.72	86.79
24	3	2.83	89.62
25	11	10.38	100.00
N	106		

TABLE A2
Dividend Payout Ratios (Descriptive Statistics for Nations)

Nation	Firms	Observations	Mean	Median	*SD*
Austria	4	79	54.72%	38.95%	39.47%
Belgium	4	56	67.82%	74.68%	32.45%
Czech Republic	12	107	34.05%	24.68%	42.97%
Denmark	2	25	38.52%	34.26%	28.70%
Finland	3	50	58.62%	40.22%	55.10%
France	5	100	33.05%	30.65%	35.34%
Germany	22	305	67.10%	63.96%	37.13%
Greece	1	10	44.60%	29.22%	47.80%
Hungary	3	28	61.58%	80.08%	61.47%
Italy	9	112	63.51%	57.28%	60.73%
Luxembourg	1	20	62.02%	67.51%	15.39%
Norway	3	49	33.61%	24.12%	39.00%
Portugal	2	22	70.00%	67.58%	25.99%
Spain	8	137	59.92%	56.64%	31.91%
Sweden	3	35	55.51%	43.85%	32.05%
Switzerland	10	188	58.96%	52.33%	38.56%
UK	14	159	43.79%	32.62%	50.28%
Total	106	1,482	54.86%	49.63%	43.35%

Note: Presented data refer to the variable *Dividend Payout Ratio*.

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