Incentive Compensation in Energy Firms: Does Regulation Matter?[ϒ]

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Research Question/Issue: The impact of regulation on managers' incentive is unclear. While regulation reduces the discretion of CEOs, it is also expected to prompt effort and efficiency. This paper investigates if CEO pay-performance sensitivity differs across different regulatory regimes and industry segments in the European energy industry.

Research Findings/Insights: Using a panel of recently unbundled energy utilities from 12 EU countries tracked from 2000 to 2011, we find that managerial compensation is sensitive to performance only if the firm is subject to incentive regulation, not in the case of cost-based regulation. Results hold when we control for state ownership, market liberalization and shareholder protection, and suggest that the implementation of incentive regulatory schemes like price-cap propels shareholders to change their compensation policies to reduce managerial slack, and align executive behaviors more tightly with the investors' interests.

Theoretical/Academic Implications: This study draws on corporate governance and regulation literatures to develop testable predictions about the relationship between "external" – regulatory mechanism – and "internal" – compensation contract – incentives to align managers and shareholders' interests. We do so by spelling out the features of regulatory regimes that may translate into, substitute or complement performance-based governance mechanism.

Practitioner/Policy Implications: Our findings for a representative sample of large and highly valued European energy companies offer insights to financial investors to pay attention not only to remuneration schemes, but also to regulatory regimes. Indeed, we find that regulatory regimes do matter and that firms subject to high-powered incentive schemes are more similar to unregulated companies. In contrast, the adoption of performance-related contracts for energy utilities under cost-based schemes seems to bring no advantage to firms and only additional costs to shareholders.

JEL classification*:* G3, G38, J33, L51

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1. Introduction

This paper studies the functioning of a hotly debated mechanism of corporate governance – incentive compensation of CEOs – in publicly traded companies operating in the European energy industry. The cross-country heterogeneity allows us to investigate differences in the structure of compensation contracts associated to changes in regulatory regimes, in particular the switch from low-powered (*cost-based*) to high-powered *incentive* schemes.

The European energy industry is interesting because until the early nineties, it consisted of vertically integrated, state-owned companies that were a good approximation of textbook "natural" monopolies and from then on it became subject to a sweeping wave of reforms, which started with the unbundling of operations. On the one hand, the generation segment was deregulated and firms privatized and publicly listed, on the other hand transmission and distribution operators were partially privatized and became regulated by newly setup national regulatory authorities. This process changed much, if not all, of the market structure of the energy industry and, more interestingly for us, of the internal organization of these companies, which are now more oriented to maximize their shareholders' wealth. At the same time, the consideration of investors and financial markets for these firms steadily increased and, in parallel, their interest in any governance tools or mechanisms that might boost their efficiency and market value. The introduction of corporate governance guidelines by the OECD (1999) and the European Commission as well as the growing attention by the media and the public opinion[1] have lighted up the importance of CEO compensations and incentives, but the effects of regulatory schemes and corporate governance have been so far separately analyzed.[2] This paper contributes to study these two topics jointly by investigating whether regulatory and governance mechanisms may work together to ensure a better governance structure. Our results, suggesting a complementarity between these two monitoring and efficiency-enhancing instruments, provide a positive indication not only for European but also for

[1] See for example, from the US and UK press: "Are Utility Ceo Pay Packages Fair Compared to Average Workers", *Forbes*, April 2013, "Bonuses and Executive Pay at Big Six UK Energy Firms Under Fire", *The Guardian*, December, 2011. More generally, in the US, the recent financial crises, where so much blame was put on CEO compensation packages, has produced, in 2010, the Dodd/Frank act which stipulates that, among other things, shareholders must be informed of the relationship between executive compensation actually paid and the company financial performance and that, at least once every three years, they can vote on the compensation of the top five executives.

[2] Becher and Freye (2011) investigate whether regulation may substitute for corporate governance for a wide range of industries, from energy to banking, transportation, telecommunications and sanitary services, and looking at a variety of monitoring measures. Hagendorff et al. (2010) examine, for the banking industry, the effectiveness of different board monitoring mechanisms– independence, CEO-chair duality, and diversity – in preventing underperforming merger strategies under regulatory regimes of varying strictness.

North-American policy-makers, where a large variety of regimes, from cost based to Performance Based/Incentive regulation, are in place.[3]

Among corporate governance mechanisms, CEO compensation and its sensitivity to performance are among the most widely studied topics (Shleifer and Vishny, 1997, Murphy, 1999; Goergen and Renneboog, 2011). Remuneration contracts can be designed as an incentive mechanism that affects the way in which individuals behave, turning into a corporate governance instrument that aligns interests between managers and shareholders, when shareholders do not have complete information about the CEO's activities and the firm's investment opportunities. These contracts link CEO pay to shareholder wealth via performance indicators, pushing the CEO to make decisions that maximize shareholders' value. Compensation contracts may thus be a powerful way of motivating, attracting and retaining managers.

Incentives for managers and, in particular for CEOs, are not only internal to the firm, but also external to the firm. For example, the product market, through its structure and its dynamics, has a strong influence on managers' behavior. In competitive markets, managers have to take decisions that improve firm efficiency and performance in order to make profits and stay in the market. In other words, by leaving managers under constant pressure the product market discipline is expected to provide incentives to mitigate the classical managerial agency problems (Hart, 1983; Holmström and Tirole, 1989; Giroud and Mueller, 2010).

To the contrary, in non-competitive markets, managerial slack and agency problems are pervasive as managers are more likely to maximize their own self-interests rather than those of shareholders. The public utility sector, which provides services of general interests through a network infrastructure, is one of these non-competitive markets where economic regulation plays a strong influencing role by setting a variety of constraints on their behavior and decisions. Regulators, on the one hand, are expected to prompt regulated firms' efficiency and investment, inducing them to operate as if they were in a competitive market (Armstrong and Sappington, 2006). On the other hand, by reducing the complexity of CEOs' tasks and the discretion of their

[3] See Sappington et al. (2001) for an overview of the regulatory regimes - both Performance based/Incentive Regulation and Cost of Service - in place in the US electric utility industry, up to the beginning of the 2000. More recent data (Brattle Group, 2010) shows that only 5 US states employed Performance Based Regulation (such as earning/revenues sharing plans or price cap) in 2010, while the others rely on rate freeze/cost plus mechanism. However, Performance Based Regulation is currently adopted in several states for specific regulatory targets, such as quality of service or environmental sustainability. Similarly, in Canada, PBR is employed in Alberta, British Columbia and Ontario, and cost based regulation in the rest of the country (London Economics International, 2011).

decision-power, or even imposing constraints on the level of the compensation, economic regulation may dampen CEOs' internal incentives, thus making regulated firms less attractive to most talented managers (Joskow, Rose and Shepard, 1993; Palia, 2000; Hadlock, Scott Lee and Parrino, 2002). The overall implications for CEO incentives are thus uncertain, and we draw on the corporate governance and regulation literatures to develop testable predictions about the relationship between "external" (the regulatory mechanism) and "internal" (the compensation contract) incentives aimed at aligning managers and shareholders' interests. To test our hypotheses in a suitable empirical framework, we focus on a panel of European publicly traded firms operating in a single industry – the energy sector – but in different segments, as recent reforms unbundled generation, transmission and distribution activities and implemented different regulatory mechanisms for transmission and distribution utilities, i.e. either incentive or cost-based schemes.

Under cost-based contracts (like the so called rate-of-return regulation typically applied to state-owned monopolies), regulators fix the rate of return the firms can earn on their assets, deciding the price that they have to charge, considering all main operating costs to cover. Evidently, by guarantying the firm's financial integrity, cost-based regimes do not provide any specific incentives to efficiency-seeking managerial practices. Under incentive regulation[4], regulators apply fixed-price contracts, leaving firms to choose a price below or equal to a certain threshold. By pursuing cost savings, managers can then generate higher profits and thus benefit shareholders. In other words, firms under incentive regulation are the "residual" claimants of their performance and this, in theory, reduces managerial slack and provides the appropriate efficiency incentives to managers.

Among regulatory mechanisms, the search for efficiency-enhancing schemes has led many European energy regulators to switch from low-powered to high-powered incentive schemes. Differing regimes provide us with the within sector cross-country heterogeneity that is needed to test whether incentive compensation contracts are an additional, or an alternative, source of efficiency-inducing behavior. To our knowledge, this is the first paper that investigates CEO pay-performance sensitivity in the public utility sector in Europe, by testing the effects of different regulatory regimes. Our results contribute to the existing literature in several ways.

[4] In Europe, incentive regulation is typically implemented through price- or revenue-cap mechanisms or benchmarking analysis, not through earning-sharing plans. See Joskow (2008) surveys incentive regulation schemes as adopted in the energy industry and Armstrong and Sappington (2006), for a comprehensive review of the state-of-art research on regulated sectors.

Firstly, we find that European energy utilities link CEO compensation to firm performance. Using different measures of firm performance, we find a positive and statistically significant CEO pay-for-performance relationship. Specifically, the CEO pay-performance sensitivity in the full sample is 0.09, 0.16 and 0.14 if we consider, respectively ROA - Return on Assets, market capitalization and market to book as performance indicators. In terms of elasticity, these results imply that an increase of 10% in ROA, in market capitalization and in market to book leads respectively to an increase of 0.9%, 1.6% and 1.4% in CEO compensation.

Second, following the unbundling of operations, we test the differences between regulated and unregulated *segments* of the *same* industry. We find that compensations of CEOs in the regulated transmission and distribution segments are somewhat higher than in generation companies, but respond to performance in a similar way, unless we account for industry and country specific characteristics.

Thirdly, in the most novel part of our study, we focus on the sub-sample of regulated energy companies, and test if pay-performance sensitivity differs between firms subject to incentive regulation and firms subject to cost-based regulation. The forces expected to reduce managerial slack in regulated utilities originate from two main sources: the corporate governance and the market mechanisms, provided regulators successfully enforce a regulatory scheme that limits the firm's monopoly power. Price- or revenue-caps or benchmarking, altogether defined "incentive regulation", are the instruments that are expected to do this job (Kwoka, 2006), and we derive our predictions accordingly. We find that pay-performance sensitivity for CEOs operating under incentive regulation is significantly higher than at firm under cost-based. The results survive when we test our models on the subsample of electric utilities, separately. Our findings suggest that whenever residual profits may be obtained by relying on efficient managerial practices, shareholders opt to rely on more effective corporate governance mechanisms that reduce managerial slack and align managers' interests.

Our analysis accounts for the cross-country heterogeneity of privatization and liberalization reforms in the EU. Therefore, we control for the potential influence of partial government ownership of energy utilities, and for cross-country differences in the market structure, such as the different degrees of market openness and liberalization. Finally, we account for varying degrees of shareholder protection and stock market development. We find that executive compensations

increase as the industry becomes more open and liberalized, and decrease when the firms is controlled by the state and when shareholders are better protected.

Overall, our results suggest that, incentive regulation, a scheme that is explicitly designed to transform utilities into the "residual" claimants of their performance (as opposed to cost-based regulation), does complement – i.e. work together with - the internal governance incentives within European energy companies.

The paper is organized as follows. Section 2 describes the literature review. In Section 3 we sketch the institutional background of policy reforms in the EU energy industry. Section 4 provides the empirical modeling and the testable hypotheses. Section 5 describes the data and the variables used in the estimation. Section 6 presents the results of the econometric analysis and Section 7 concludes.

2. Related literature

In modern corporations, the separation between ownership and control has created a divergence of interests between shareholders and managers. Specifically, shareholders are interested in that managers take decisions that maximize firm value, while managers are typically more concerned with their own wealth and well-being (Jensen and Meckling, 1976; Demsetz 1983; Fama and Jensen 1983). Compensation policies that tie CEO welfare to shareholder wealth can be a powerful tool to alleviate the typical principal-agent problems and to align shareholders and managers' interests.

Early studies, such as Murphy (1985), Gibbons and Murphy (1990) and Jensen and Murphy (1990) document the relation between CEO pay and corporate performance for US companies. While abundant for the US (for a recent survey see Murphy, 2012), the evidence on executive compensation for European companies is more recent, showing that European CEOs remuneration is less tightly linked to performance, and that American executives hold more wealth in companies' stocks and options than do their European counterparts (Conyon et al., 2011a, 2011b and Goergen and Renneboog, 2011), and that the differences in the level of CEO compensation highly depend on firms' ownership structure (Croci *et al.*, 2012).

Market competition is another key condition for reducing agency costs (Hart, 1983, Hermalin, 1992; Bertrand and Mullainathan, 2003; Beiner et al., 2011). The literature shows that

tough product market competition spurs managers' effort while disciplining managerial slack, thus suggesting that, pushing managers to be efficient, it may even render additional incentives redundant (Schmidt 1997).[5]

More in line with the purpose of this study, the literature on executive compensation in regulated sectors is not abundant and, especially in recent years, has mainly focused on the financial industry (Hubbard and Palia, 1995; Bebchuk and Fried, 2004, 2005; Doucouliagos et al., 2007; Cuñat and Guadalupe, 2009). The typical view is that regulation, by constraining firms' activities, alters the internal incentives resulting from standard market-based mechanism. Comparing regulated and unregulated firms, Yermack (1995) shows that US executives in highly regulated industries (i.e. banking, insurance and utility) receive lower incentives from compensation or equity ownership, because the reduced managerial discretion in these industries diminishes the consequences of good or bad decisions. This evidence suggests that regulation seems to limit standard pay-for-performance schemes. Recent evidence from a wide set of regulated industries hints at a more complex relationship between regulation and corporate governance where governance instruments such as board size, monitoring directors and holdings and equity-based compensation appear to "work together to ensure an effective governance structure" (Becher and Frye, 2011, p. 736). This literature examines regulated activities such as banks, financial companies, gas and electric utilities altogether and compares them to unregulated firms (typically manufacturing firms). It usually does not consider that due to industry-specific conditions and regulatory mechanisms, managers may behave differently and therefore need different forms of incentive.

Focusing on utilities, Carroll and Ciscel (1982) and, more recently, Murphy (1999) document that the variable part of the CEO pay in US utilities is less important than in any other industry. Joskow, Rose and Shepard (1993) and Joskow, Rose and Wolfram, (1996) build up the theoretical framework to analyze the issue of regulation and managerial compensation, providing empirical evidence for US utilities in two seminal papers. Comparing unregulated, manufacturing companies and firms in a broad range of regulated industries[6], Joskow, Rose and Shepard (1993) find that CEOs of US firms subject to economic regulation earn significantly less than CEOs of

[5] In line with this reasoning, Nickell (1996) and Giroud and Mueller (2010) find that industry competition is an effective substitute for other governance mechanisms.
[6] The analysis covers electric utilities, railroads, trucking, airlines, telephone, gas utilities, and natural gas distribution utilities and pipelines.

unregulated firms, that their compensation packages are more weighted toward fixed salary and, more importantly, less responsive to variations in firm financial performance. They argue that this difference may reflect the political constraints on CEO compensation imposed by the regulated environment in which the firms operate as regulators may be reluctant to allow compensation levels that the public might judge to be excessive. In another paper, Joskow, Rose, and Wolfram (1996) explore the effect of political and regulatory constraints for US electric utilities, showing that executive compensation differs with the regulatory climate in which firms operate.[7] They find that firms subject to more consumer-oriented regulation pay their CEOs less than firms under shareholder-oriented regulation.

Finally, focusing on the impact of regulation on CEO labor market in the US, Palia (2000) finds that regulated gas and electric firms attract CEOs with a lower-quality education than do unregulated manufacturing firms, and also that airline firms began to employ CEOs with a higher-quality education post-deregulation. Hadlock et al. (2002) show that, the CEOs of US electric and gas utilities, tend to be older and have less-prestigious educational background than CEOs in unregulated firms. [8]

Overall the evidence from the existing literature suggests that corporate governance mechanisms are less efficient within regulated companies than in unregulated one, but to the best of our knowledge has never explored the effectiveness of these mechanisms *within* the same industry, i.e. by comparing firms subject to different regulatory mechanisms as we investigate in this paper.

3. Regulatory policy and privatization reforms in the European Energy Industry: an institutional background

In this paper we investigate the relationship between managerial compensations and regulated firms' performance in the European Union, where regulatory reforms were introduced only two

[7] In many regulated utilities, particularly if they are state-controlled, directors are either politicians or appointed by politicians who are under public opinion pressure (Boubakri, Cosset and Saffar, 2008). So, in order to avoid public concern about excessive executive compensation, CEO remunerations are expected to be lower and less sensitive to firm performance.

[8] The empirical evidence on CEO pay-performance for European energy utilities is also very scant. Most of this research focuses more on board composition and governance than on CEO pay for performance sensitivity (Bender, 2003), while it does not address the impact of regulatory regimes on CEO compensation as we do in our analysis.

decades ago, the degree of liberalization is heterogeneous across countries and the privatization process is still incomplete (Bortolotti et al., 2011). From a model largely characterized by vertical integration, state monopoly and public ownership, the sector has been gradually liberalized as well as vertically unbundled, evolving into an industrial organization with more degrees of market opening (in the generation and retailing segments), easier access to essential facilities and private investors' involvement in the ownership of assets, as many energy firms were taken public. Substantial progress has been made towards the creation of a single market for energy utilities in Europe, even if market structures of individual countries do not yet converge towards a single, uniform pattern.

The United Kingdom was the laboratory of the first large scale experiment of structural reform in the energy utility sector. The approach taken by the European Commission when liberalizing the energy sector in various European countries took stock of previous experiences, particularly that of the UK, and ultimately led to a strong vertical and horizontal de-integration of the industry combined with solid regulation.

Starting from 1988, the regulatory problem was tackled by enacting a series of measures and directives, setting up a common *de minimis* legal framework among Member States, which were called to transpose them into their national legislation. In the attempt to construct an Internal Energy Market for electricity and gas sectors, the two milestone EU Directives are 96/92 and 98/30 for the electricity and , the gas markets, respectively. Their purpose was to gradually introduce competition in generation/production and to unbundle the various segments in the energy value chain by establishing Network System Operators as entities carrying out specific system functions, by creating a level playing field for the access to transmission and distribution networks, and by forcing the unbundling of vertically integrated operators (the *incumbents*), at least at the accounting level.

The two Directives also established national regulatory authorities (NRA).[9] Initially the new regulatory bodies were simply granted powers to settle disputes among operators and only required to be independent from the parties involved. In time, the EC legislation broadened NRAs' powers to ensure/enforce non-discrimination, effective competition, the unbundling of operations and, ultimately, implementation of incentive regulation regimes in order to boost firm efficiency.[10]

The third energy package, Directive 2009/72/EC, further increased the unbundling requirements. To date, EU member states can choose one of three different unbundling models:

[9] Art. 20 Directive 96/92/EC and art. 21 of Directive 98/30/EC.
[10] Art. 23 Directive 2003/54 and Art. 25 Directive 2003/55.

ownership unbundling, an independent system operator or an independent transmission operator. Although the effects of the different unbundling methods are still under discussion, most countries already switched to ownership unbundling.

As to firm ownership, from the beginning, EC Directives did not provide any recommendation about ownership structure of public utilities in liberalized markets, leaving the privatization decision completely in the hands of national governments. As of 2013, privatization of EU energy firms is far from complete, and central and local governments still hold majority and minority ownership stakes in many regulated utilities, particularly in Austria, France, Finland, Germany and Italy (see Cambini, Rondi and Spiegel, 2012).

From a regulatory perspective, at the end of nineties, most European energy utilities, in particular transmission and distribution operators, were regulated by cost-based mechanisms, typically rate-of-return regulation. The EU Directives did not impose mandatory rules, delegating the task to NRAs . Over time, many NRAs, independently and according to their own agenda, opted for incentive-based regulatory contracts (Vogelsang, 2002), *price* or *revenue* caps to *benchmarking* (yardstick) competition. Within the energy sector, the UK was the first one to adopted incentive mechanisms (at the beginning of the nineties) in both distribution and transmission, while other countries - like Belgium, Italy, Spain and Norway – switched later in time (beginning of 2000s) from rate of return to incentive-based in both transmission and distribution. Austria, Finland and Germany shifted to incentive schemes from the mid of 2000s onwards, while France still rely on cost-based mechanisms. As the pattern of adoption is quite heterogeneous across countries and segments, we report the details in the Appendix Table A1.

4. Empirical model and testable hypotheses

The cross-country heterogeneity described above enables us to investigate differences in the structure of compensation contracts associated to different regulatory regimes, exploiting a quasi-natural experiment, due to the switch from *cost-based* to *incentive* schemes. By looking at CEOs operating in a single (energy) industry, hence with relatively more similar tasks, skills and attributes, we can isolate more precisely the effect of different regulatory contracts on pay-performance (see for example the evidence by Palia, 2000, and Hadlock et al., 2002 reviewed in Section 2). In addition, the unbundling of operations allows us to compare the pay-performance relationships in the deregulated generation segments and in the regulated transmission and

distribution operators. Recent statistics from Eurelectric (2013)[11] show that energy supply (generation and retailing) weigh for as much as 44% of the EU28 average household energy bill (with generation alone covering the 40%), a share that calls for attention for the managerial and governance practices in this segment.

Within the empirical literature, pay- performance sensitivity quantifies managerial incentives by relating changes in CEO pay to firm performance (Frydman and Saks, 2010; Goergen and Renneboog, 2011). The incentive effects of CEO compensation are typically calculated using different metrics and different performance variables. In their seminal paper Jensen and Murphy (1990) define the pay for performance sensitivity as the dollar change in the CEO's wealth associated with a dollar change in the wealth of shareholders. This specification measures the *magnitude* of the CEO sensitivity to the change in the firm performance and denotes the CEO's "share" of value creation. A second metric widely used in the literature is the *elasticity* of the pay-performance. In this case both CEO compensation and firm performance are in the logarithm form. The regression coefficient is interpreted as the percentage change in the CEO's wealth associated with the percentage change in the wealth of shareholders. The third metric is *semi-elasticity* of the pay for performance, where the dependent variable, *CEO compensation*, is in the logarithmic form and the independent variable, *firm performance,* is in the linear form. The regression coefficient is the *semi-elasticity* of CEO compensation with respect to shareholder value (Joskow et al., 1993): it indicates the percentage change in CEO compensation due to a unit change in the variable that measures firm performance.

Following Joskow *et al.* (1993) and many others, we estimate the *pay-performance semi-elasticity*, using *Stock return* to measure firm performance. Stock return indicates the appreciation in the price plus any dividends paid, divided by the original price of the stock, hence the yield realized by shareholders. We then also estimate the *elasticity* between CEO pay and two alternative stock-based variables: market capitalization and market-to-book, both expressed in logarithmic form. As argued by Murphy (1999), the elasticity approach generally leads to a better fit in cross-sectional analyses and has the advantage that it can be better compared across firms of different size (see also Peng and Roell, 2014). Although a substantial body of theoretical and empirical work supports stock market-based variables as the relevant performance indicators for assessing executive action choice,

[11] Eurelectric is the sector association of the electric utility industry at pan-European level, plus its affiliates and associates on several other continents.

they are noisy measures of the executive's performance/success because they are influenced by too many factors beyond the executive's control. Moreover, since public utilities typically provide services of general interest, and may be asked to comply with general purpose and consumer welfare objectives, relying only on stock market-based measures appears somewhat incomplete. As a result, we also consider an accounting, or book, measure of performance, the return on assets, or *ROA* (EBIT to total assets), which is a standard ratio of profitability that measures how efficiently the firm's assets are employed (see also Hadlock et al., 2002). We thus also estimate the *elasticity* of CEO pay to the ROA.

To test managerial incentives within EU energy companies, we take three steps. Initially, we test whether pay for performance sensitivity can be detected at all in the full sample of publicly listed energy utilities. We then exploit the composition of our sample and we derive two testable hypotheses about the differential responsiveness of pay to firm performance, depending on whether the firm operates in a regulated or unregulated segment and, drawing on the properties of different regulatory regimes, whether it is subject to cost-based or incentive regulation.

We thus first test the consequences of the recent reform of the energy industries in European countries, which has unbundled former vertically integrated state monopolies into newly founded companies. Following this, firms in generation and retailing started operating in fully liberalized markets while transmission and distribution operators went subject to ex ante regulation by NRAs, so that, in the end, these companies now operate in fairly distinct business environments. The switch from a protected and regulated setting to a liberalized and unregulated environment should led these firms to introduce compensation packages that are more tightly linked to firm performance than firms in regulated segments. We thus test the following hypothesis:

H1: CEO pay-performance sensitivity in the unregulated generation segment is higher than in regulated transmission and distribution segments.

It has been suggested, however, that the interrelation between regulatory scrutiny and corporate governance may be more complex and that the two disciplining "tools" may even complement each other to ensure an effective governance structure (Becher and Frye, 2011). Focusing on the sub-sample of regulated firms, we investigate the combined effect of regulatory mechanisms designed to

prompt cost-saving, efficiency-seeking managerial decisions and incentive compensation schemes. As shown by Vogelsang (2002) and Armstrong and Sappington (2006), cost-based schemes, by guarantying the firm's rate of return, do not expose managers to great risks and as such are expected to lead to managerial slack. In contrast, incentive regulation, by imposing fixed-price contracts, is more likely to elicit effort and to provide managers with stronger incentives to improve firm efficiency. This leads us to our second testable hypothesis:

H2: CEO pay-performance sensitivity in firms subject to incentive regulation is higher than in firms subject to cost-based regulation.

To test our hypotheses, we estimate specifications where the performance variable is interacted with a dichotomous variable that either accounts for the regulated status (vs. unregulated) of the firm or for the presence of incentive regulation (vs. cost-based regulation).

As mentioned before, pay-performance sensitivity is often measured as the change in the CEO's wealth associated with the change in the wealth of shareholders as in the seminal Jensen and Murphy (1990)'s paper. We thus start by presenting the results from the typical *magnitude* specification on pooled data that eliminates firm-specific fixed effects by estimating a first-difference model on the full sample and for various subsamples. Thereafter, different from Jensen and Murphy (1990), but consistent with many other studies (Gibbons and Murphy, 1990, Yermack, 1995, Palia, 2000), we use fixed effects as estimation method and focus on the interacted variables to single out the differences in pay-performance sensitivity across firms. The *firm-specific* fixed-effect estimator allows us to calculate the effect of the change in the compensation level within a firm and to control for omitted variables and unobservable firm (and country) characteristics that are not included in the usual cross-sectional regressions, but that can be controlled by panel data. In addition, considering that different CEOs may have managed the same firm over the sample period, we also re-estimate our pay-performance models by controlling for CEO-specific omitted variables that vary over CEOs (i.e. using *CEO-specific* fixed-effects regressions), clustering the robust standard errors at CEO level.

Finally, since our purpose is not to establish the magnitude of pay-performance sensitivity itself, but to estimate the *differential* sensitivity across firms subject to different regulatory regimes,

the typical potential endogeneity problem, i.e. managers manipulating information about firms' results to bolster their compensation (Peng and Roell, 2014) should be less severe. Insofar as we focus on the difference in parameters estimated from different subsamples, what really matters is that the managers' propensity to manipulate firm performance does not systematically differ *across subgroups*. Although we cannot exclude that the possibility to manipulate information about firm performance might differ between deregulated and regulated firms subject to regulatory oversight, it is well known that scrutiny by regulators is impaired and obscured by asymmetric information (Baron and Besanko, 1984). On the other hand, it is also unlikely that the latitude to manipulate firm data *and* stock prices should systematically differ across regulated firms, independently of whether they are regulated through an incentive or a cost-plus mechanism. To further help identification, we in fact use several indexes of performance, as book- and stock-based measures also imply different possibility to be manipulated, an important feature of our analysis will thus be to verify that the results survive through different specifications.

The results of the regressions are presented in Section 6.

5. The sample and the data

To test the interplay between regulatory and governance mechanisms, we use 59 publicly traded electricity and gas utilities from 12 European countries (Spain, France, United Kingdom, Germany, Italy, Austria, Switzerland, Norway, Poland, Portugal, Finland and Belgium), over the period 2000-2011. To select these companies, we started from the sample of firms in the "Energy" sector of the Worldscope database (the main source of our accounting data). Then we checked whether these companies are classified as Energy firms in the "Utilities" sector of the stock exchange market in which they are traded. We thus discovered that many so-called "energy" firms are actually listed in the "Industrial" sector of their exchange, because their primary activity is not the provision of public utility services, but the construction of energy plants or equipment, such as solar panels or collectors, wind towers and so forth. For this reason we excluded these firms from the final sample.

In order to be included in the dataset, energy utilities must have their primary operations in the domestic European country[12] and, obviously, report CEO compensation data. The sample may

[12] For example, we dropped a few large energy firms listed in the Spanish stock exchange market in that they operate exclusively in Argentina, Brasil and Chile.

seem not very large, but is highly representative in that it covers, on average, about 90% of total market capitalization of the largest publicly quoted energy operators in Europe that meet the above requirements.[13]

A key variable of this study is CEO compensation. As there is no comprehensive directory of European firms' CEOs and remuneration contracts, data about CEOs' compensations and tenure were hand collected, downloading each annual corporate governance reports of every company. This collecting process makes the uniqueness of this dataset. To estimate the relationship between managerial pay and firm performance, we have compensation data for 101 CEOs, for a total of 436 CEO-years observations. A complete measure of CEO pay should take into account the values of the CEO's stock and option holdings, but these data turned out to be unavailable on a consistent basis.[14] Following Jensen and Murphy's approach, we thus calculate CEO compensation as the sum between salary and bonus awarded by the CEO in the year.

The other key variable is regulation. Regulatory status and regimes vary across countries and across industry's segments. Following the reforming process in the European energy sector, we define a firm as *regulated* or *de(un)regulated* based on its primary activity (transmission and distribution vs. generation and retailing, respectively). Typically, firms classified as generators produce energy from primary or renewable resources. Generation companies are typically very large, publicly traded, and not subject to regulation, while retailers are usually small and unquoted, hence do not qualify to be included in our dataset. Finally, when we inspected each company's business activity, we noticed that a few distributors are also involved in generation, so in this case we classified firms according to their largest activity, based on the information available in the annual reports.

We then collected information about the regulatory schemes, which the national regulators apply in each of the two activities. The primary information derives directly from previous research on the European energy industry (Cambini and Rondi, 2010) and has been updated and extended to 12 EU countries by using recent NRA reports that indicate the regulatory mechanism in place – *incentive*

[13] For each country, we calculated the share of the companies in our database on the total market capitalization of publicly traded energy firms, picking the 2010 as the reference year. We found that, on average, the weight of the sample firms is 93.2%, ranging from 78.9% in Norway to 100% of France, Germany, Italy, Spain and UK.

[14] Specifically, when we tried to collect the data we found that information about the use of stock options as well as the detailed description of individual CEO's stock option plans (i.e. the number of options, the exercise price, the exercise date etc.) are not fully disclosed. In that we could rely only on a partial and approximate picture of the real effect of stock option, we considered that adding this partial information would only lead to misleading results.

(in its different versions, i.e. price cap, revenue cap or firms' benchmarking) or *cost-based* (e.g. rate of return/cost plus) regulation. Of the 59 energy utilities, 43 transmission and distribution operators are subject to regulation (for most of the sample years) while 16 companies operate in the deregulated market of generation. In the Appendix Table A1, we present a breakdown of the sample firms, by country and regulatory status and regime. As expected, France, Germany, Italy and UK, the largest energy markets in Europe, cover the largest share.

Financial and accounting data are sourced from Datastream-Worldscope and Compustat Global database, which provides complete information about income statements and balance sheets of not US-companies. Among stock-based indicators, *Stockret*, the one-year stock return for the firm over its fiscal year. It is calculated as $\{[SharePrice_t * Adjusted\ Factor/SharePrice_{(t-1)}]-1\}$ where $SharePrice_t$ is the share price time *t*, *Adjusted Factor* is the factor to adjust price by splits and dividends in period t; $SharePrice_{(t-1)}$ is the share price at the previous period. We then use two other market-based variables: Market-to-Book, *MTB*, the ratio of the market and the book value of equity, and market capitalization, *MarketCap*, i.e. the product between the share price at the end of the year and the number of outstanding shares in the market. Finally, we calculate the return on asset, *ROA,* as the ratio of EBIT to total assets and we use this as a measure of accounting profitability. In the Appendix Table A2, we report the correlation matrix. We find that the cross-correlation among the four measures of performance is quite low, with the highest correlation, r = 0.35 between *MTB* and *ROA*. However, *stock return* is practically uncorrelated with both *ROA* and *Market Cap*, thus supporting our choice to estimate the pay-performance sensitivity using both accounting and market-based variables. In Table 1, we report the variables' description and definition.

To test the robustness of our results, we take into account further potential sources of influence: firm ownership, the degree of market openness at country/industry-level, and country differences in terms of investor protection and stock market development. We collected information about the ownership status of each firms in the sample from financial reports available on companies' websites. In particular, we define firms as "state-controlled" if the state holds directly or indirectly up to 30% of the firm's control rights, privately-controlled if otherwise. To control for differences in the pace and intensity of liberalization reforms across countries and sectors, we use the OECD annual index from the "Product Market Regulation" (Conway and Nicoletti, 2006), which covers several aspects of liberalization reforms, separately for the electric and gas industries: the presence of entry barriers, the vertical structure of the market, the market share of the dominant player(s) and

the presence of the state as a shareholder. The index is the average of sector-level sub-indicators and ranges from 0 to 6. High values of the index are associated with low degrees of market competition and liberalization. We dropped the state ownership sub-indicator, because we have our own firm specific variable, and recalculated the averages over the remaining OECD sub-indicators.

To capture investor protection we used the time varying "Minority Shareholder index" developed by Martynova and Renneboog (2011, p. 1538) which ranges from 0 to 27 and it is "based on the regulatory provisions aimed at increasing the relative power of the minority shareholders in a context of strong majority shareholders". Finally, to proxy for stock market development, we include the country-specific market capitalization to GDP.

Table 2 reports the summary statistics for the full sample and the Appendix Table A3 - Panels I and II - averages the main variables by country.

At country level, compensations appear to be highest in Germany and Spain, but then we note that firms in these countries are also very large, thus confirming the typical positive correlation between CEO pay and firm size. Managers seem to be well paid also in Finland, Austria and (to a lesser extent) Italy, where firms are not only quite large but also profitable in terms of *return on assets* (ROA). Interestingly, UK mangers appear to be paid less than the average even though they score the highest accounting profitability and the second highest market-to-book ratio. Table 3 presents the summary statistics by regulatory status and mechanisms and the t-tests of mean differences. Here we find several interesting differences. As compared with deregulated companies, regulated firms are, on average, larger, less profitable (but stock returns are higher), more likely state controlled, but they appear to pay their managers more. Not surprisingly, the average OECD indexes show that state controlled companies generally operate in less liberalized and competitive sectors. When we look at mean differences by regulatory mechanism, we note that managers under incentive regulation are paid significantly less than managers at firms subject to cost-based regulation and, while they operate in a more open and competitive environment, they report higher ROAs, higher market-to-book ratios, but lower stock returns. Incentive regulated firms are significantly smaller than cost-based ones, and are more likely private. Clearly, the descriptive statistics highlight several intriguing differences, but also reveal that too many factors should be accounted for, hence, in the next sections, we turn to regression analysis.

6. Empirical results

6.1 Estimates of the magnitude of the incentives within European energy companies

We begin with the traditional model that estimates the dollar-for-dollar, or better the euro-for-euro, sensitivity of pay to firm value, i.e. market capitalization. In Table 4, we report the estimated coefficients results from the following simple specification proposed by Jensen and Murphy (1990):

$$\Delta (CEOcomp)_t = \alpha + \beta_1 \Delta Market\ Cap_t + \beta_2 \Delta Market\ Cap_{t-1} + \varepsilon_t \qquad (1)$$

where *CEOcomp* is the total (inflation corrected) compensation awarded by the CEO in the year and *Market Cap* is the (inflation corrected) market value of shareholders' equity. All monetary variables are adjusted for inflation using the country specific consumer price indexes, and represent thousands of 2005 constant Euros. The least-squares regression of the total *CEO compensation* on the contemporaneous and lagged *Market Cap* is estimated on variables in first-differences to eliminate the firm-fixed effects. The estimated pay-performance sensitivity is calculated as the sum of the coefficients $b = \beta_1 + \beta_2$ coefficients and the F-statistics testing significance of the sum is reported at the bottom of the table. We estimate this model for the full sample of energy firms (Column 1) and for four subsamples: unregulated generation operators, regulated transmission (TSO) and distribution (DSO) operators and, focusing on the subsample of regulated firms, DSO and TSO subject to incentive regulation and DSO and TSO regulated by cost-based mechanism (Columns (2) to (5), respectively).

In Column (1), we find that estimated coefficient on the contemporaneous term is positive and significant, suggesting a positive relationship between pay and performance. Its size, of 0.0000175, indicates that the typical CEO of an energy company receives an additional 1.75 cents for each 1,000 € increase in shareholder wealth, very similar to the original Jensen and Murphy's results. This amount increases to 2.22 cents if we consider the sum of the contemporaneous and lagged coefficients, *b*, which is also statistically significant (F = 2.43). When we turn to the subsamples, we note interesting differences. First, the sum of estimated coefficients *b,* the measure of pay-performance sensitivity, is highly significant for the CEOs hired by deregulated generation firms (Column (2)) while the coefficients on market capitalization for the group of regulated firms in

Column (3) are always insignificant(though the individual coefficients are larger than those estimated for deregulated generation firms). Second, when we turn to the difference across regulatory regimes, we find that the group of firms subject to incentive regulation (Column (4)) reports statistically and economically significant pay-performance sensitivity whereas the *MarketCap* coefficients for the subsample of firms under cost-based regulation (Column (5)) are statistically insignificant, both individually and jointly.

Overall, these preliminary results are consistent with our predictions: we find that executive compensations are particularly responsive to changes in firm market value in the deregulated generation segments as well as in transmission and distribution energy operators subject to incentive regulation.

In the rest of the paper we turn to the fixed effect estimation model to investigate the differences between subsample of firms, augmenting the model with firm CEO and country variables and, in the sensitivity analysis, including additional industry and country specific controls.

6.2 Panel regression results for the full sample of European energy firms

In this Section, we provide panel regression evidence of the compensation-related corporate governance mechanisms for the full sample of European energy firms by estimating the *semi-elasticity* and the *elasticity* of CEO pay to various measures of performance. The baseline model for our fixed-effect regressions is the following:

$$Log(CEOcomp)_{it} = \alpha + \beta_1 (stockret)_{it} + \beta_2 tenure_{it} + \beta_3 firmsize_{it} + \beta_4 GDP_{it} + \mu_{it} + \varepsilon_{it} \quad (2)$$

where $Log(CEOcomp)_{it}$ is the logarithmic transformation of the total CEO compensation and $Stockret_{it}$ is the one-year stock return of the firm. $Tenure_{it}$ indicates the number of years served as a CEO in the company and accounts for the fact that the CEO's compensation is likely to increase with tenure as well as for CEO turnover, which would bring undesirable breaks in the estimation of sensitivity at the firm level. μ_{it} is the firm specific fixed effect and ε_{it} is the error term. X_{it} represents additional control variables, such as the logarithmic transformation of real total assets, *Log(Total Assets),* to proxy firm size, because past research has clearly established that managerial pay tend to

increase with firm size (Baker and Hall, 2003), or the Gross Domestic Product (*GDP*), to partly control for the cross-country heterogeneity in the size and growth (business cycle) of the national economies. Beside stock returns, we also test the relationship between CEO pay and *ROA*, *Market Capitalization* and *MTB*, the Market-to-Book ratio, all expressed in the logarithmic transformation in order to estimate the elasticity of pay to firm performance. CEO compensations, market capitalization and total assets are in Thousands of 2005 constant Euros.

We report the firm fixed effects estimates in Table 5. The results shows that the semi-elasticity of pay to stock returns is positive though not statistically significant by the conventional two-sided t-tests[15]: an increase of 1 percentage points in the stock return leads to an increase of 0.09% in the managerial compensation. The control variables enter significantly and with the expected sign while CEO pay appears to be increasing with tenure, firm size and domestic GDP.

When we turn to the elasticity of CEO pay to *ROA*, *Market Cap* and *MTB*, we find that the estimated coefficients are positive and significant in all Columns. The results show that a 10% change in ROA leads to an increase in CEO compensation of about 0.9%. The change of CEO compensation is 1.6%, when we consider *Market Cap*, and 1.4% when we consider market-to-book value (*MTB*). Overall, the results show that European energy utilities link CEO compensation to firm performance.

6.3 Within-industry analysis of pay-performance sensitivity: unregulated generation and regulated transmission and distribution

In the second part of the study, we focus on differences across industry-segments by estimating an augmented specification where firm performance, firm size and CEO tenure are all interacted with a dichotomous variable that indicates whether the company is a transmission or distribution operator, hence still subject to regulation (as opposed to a generation firm). The new model is:

[15] Because the standard hypothesis about the relationship between firm performance and CEO pay is typically positive and "one-sided", and there is no belief that larger stock returns would cause lower pay, there is ground to argue that one-sided t-tests could probably be used, in which case the coefficient on stock return in Column (1), with a t = 1.32 would be statistically significant at about 10-11%.

$$Log(CEOcomp)_{it} = \alpha + \beta_1(performance)_{it} + \beta_2(performance)_{it} * REG + \\ + \beta_3 tenure_{it} + \beta_4 tenure_{it} * REG + \beta_5 firmsize_{it} + \beta_6 firmsize_{it} * REG + \\ + \beta_7 GDP_{it} + \mu_{it} + \varepsilon_{it} \quad (3)$$

Results are reported in Table 6. In all columns, we find that performance terms enter with a positive and significant coefficient, suggesting that pay is highly responsive to performance within unregulated generation companies while the interacted terms that capture the differential elasticity within regulated firms is negative, statistically significant only in Column (1), where we use stock returns. In contrast, the negative interactions of Log(*Market Cap), Log(ROA*) and *Log(MTB)* are insignificant at the conventional levels, thus suggesting that the difference in pay-performance sensitivity between regulated operators and generation companies is weak and does not support Hypothesis 1.

If we look at control variables, we find that tenure and firm size enter with positive and significant coefficients, as expected. However, the results show that the interactions with the *REG* dummy are, on the whole, insignificant, indicating that being a regulated TSO or DSO does not influence the direction or the size of the effect. Only in Column (1), the interacted *tenure* term is negatively signed and significant and the negative sign suggests that the relationship between CEO pay and tenure is somehow weaker within regulated firms. In the robustness analysis in Section 6.5, we will account for additional firm, industry and country characteristics.

6.4 Pay-performance sensitivity by regulatory regime: incentive regulation vs. cost-based

Although TSO and DSO are both regulated by national regulators, the institutional context in which they operate is far from homogeneous and the main reason is that they are subject to different regulatory regimes. We now focus on this sample of regulated companies, to investigate whether differences in regulatory schemes may affect the corporate governance decision to link more or less tightly CEO pay to firm performance.[16] By addressing this question, we also aim at understanding

[16] For the impact of regulatory schemes on other dimensions of energy firms' behavior, see Vogelsang (2002), Joskow (2008) and Cambini and Rondi (2010) on investment decisions and Bremberger et al. (2013) on dividend policy.

whether incentive mechanisms provided by either the directors' board or the regulatory agency substitute or complement each other in reducing agency costs and disciplining managerial slack.

To study this, we estimate a specification similar to equation (3), where performance measures and control variables are interacted with a dichotomous variable, *CAP*, that is 1 when the firm is under incentive regulation, 0 otherwise (cost-based regulation).

The results in Table 7 show that, regardless of whether we use accounting or stock market based measures of performance, their interactions with the dummy *CAP* is positive and significant. This indicates that when firms are subject to incentive regulation, executive compensations are tightly related to firm performance. In contrast, we find that the linear term is either insignificant or even negative, a somehow unexpected result. On the one hand, the smaller pay-performance sensitivity in cost-based regulated firms was expected. Indeed, cost-based regulation implies that NRAs guarantee the firms' rates of return. Because the price is controlled by the government agencies, and also affected by other policy considerations, the responsibility of the financial and accounting performance of these firms cannot be solely imputed to the initiative of managers, or to the effectiveness of governance mechanisms. On the other hand, our findings that CEO remunerations in cost-based regulated firms are not only larger than in firms subject to incentive regulation (see Table 3), but also insensitive or even increasing when firm performance deteriorates provide supporting evidence to the phenomenon of the so called "perverse incentives" and "nonperformance pay" described by Bebchuk and Fried (2005) and Murphy (2012).[17]

In order to control that this result is not driven by unspecified differences between the electric and gas utilities in the energy industry, we re-estimated the same model on the subsample of electric firms. The results in Table 8 support and confirm the evidence of significantly tighter elasticity of pay to performance within firms under incentive regulation.[18] Finally, in Figure 1A, we report the time trends of the increasing CEO compensations and shallow or decreasing performance (as measured by ROA and Market Capitalization) of a homogeneous sample of Swiss regulated energy

[17] To quote two recent examples the French government is about to impose a "cap" on the sky-high remuneration of the CEO of state-owned electric utility Electricitè de France (a cost-based regulated firm in our sample), whose stock prices had been decreasing for a period (Bloomberg, May, 2012; see http://www.bloomberg.com/news/2012-05-30/france-to-cap-ceo-pay-at-state-owned-companies-like-edf-areva.html). In 2013, Swiss voters were called to the polls twice to decide on strict new laws to limit bonuses, golden handshakes and salaries of large companies' CEOs.

[18] The results are qualitatively similar for gas utilities, though the group of gas utilities is smaller than the subsample of electric firms. We do not report the results for reason of space, but they are available on request.

utilities subject to cost-based regulation from 2007 to 2011.[19] For comparison, we report in Figure 1B the evolution of average CEO pay, ROA and market capitalization for a homogeneous and time consistent subsample of six Italian and Spanish regulated operators subject to incentive regulation, which shows the positive co-relation between CEO compensation and firm performance.

Overall, the evidence in Table 7 and 8 is consistent with Hypothesis 2. The tighter pay-performance sensitivity for companies under incentive regulation can be the result of optimal contracting in the market for managerial talents. Jensen and Murphy (1990) argue that high compensations will attract high-skilled people to self-select into a company. Fernandes *et al.* (2013) claim that firms attempting to attract global managerial talent need to offer to CEOs contracts more sensitive to firm performance. By implementing regulatory contracts like price-, revenue-cap or benchmarking, regulators aim at enhancing the incentives to mimic market functioning, thus leaving residual profits to accrue to the firm. Hence, not surprisingly, shareholders look for more talented CEOs who are, in turn, keener to sign compensation contracts that link their remunerations to firm performance.

Our results show that under incentive regulation the governance mechanisms disciplining managers are strengthened, suggesting the CEO "internal" incentives may be a complement to the tighter scrutiny by the regulator. In other words, regulation and traditional instruments of shareholders monitoring (i.e. CEO monetary incentives) work together to ensure effective efficiency- and value-enhancing incentives.

6.5 Sensitivity Analysis: the impact of firm ownership, market liberalization and financial institutions

As recalled in Section 3, the energy industry has been subject to important liberalization and privatization reforms. Different degrees of market liberalization and residual state ownership may thus be influencing factors of the propensity to rely on incentive compensation contracts to align shareholders and managers' interests. For example, Hart et al. (1997) show that managers in state controlled firms are less incentivized and receive lower remunerations and Joskow et al. (1996)

[19] To obtain a reliable and time consistent average trend, we had to select companies that had the same manager for a reasonable number of years and were not subject to a regulatory regime switch (unlike, for example, Germany which switched to incentive regulation in 2010, or Austria, in 2006, or Finland in 2006).

argue that state control implies a sort of politically motivated "cap" on managerial compensation. State ownership, moreover, may also capture the influence of political connections since political interference appears to be stronger when the firm is under (partial) state control (Bortolotti, Cambini and Rondi, 2013).

In this section, we account for these factors by including two additional control variables. *State Ownership* is a firm-level dichotomous variable that is equal to 1 when the state has at least 30% of the ultimate control rights and the country-level *OECD Index of Liberalization* which varies from 0 to 6, with high values are associated to weaker market competition and liberalization (see Section 4 for a detailed description). Moreover, to account for cross-country differences in financial markets and institutions, we also include the index of *Minority Shareholder Protection* (Martinova and Renneboog, 2011) and the *Stock Market Capitalization to GDP* ratio. All variables are time-varying to capture changes over time. Table 9 reports the results for the differences between regulated transmission and distribution operators and unregulated generation firms while Table 10 tests the robustness of the differential pay-performance sensitivity of incentive and cost-plus regulated firms. We do not include in the specification the full set of interacted terms, as they did not add anything informative to the analysis. Robust standard errors are clustered by firms as usual, but we also estimated the panel regressions by clustering at the country level.[20]

In Table 9, we find that differently from Table 6, the negative interaction with the REG dummy is now significant not only with stock returns, but also when we use ROA and Market Capitalization as performance variables. When we account for additional industry and country characteristics, a difference in the pay-performance sensitivity seems to surface, testifying that the two groups of firms operate in distinct business environments, where weaker competition in regulated segments allows managers to "enjoy the quiet life" (Bertrand and Mullainathan, 2003). These results are consistent with Joskow et al. (1996), who explain that the lower sensitivity may also reflect the political constraints on CEO compensations imposed, directly or indirectly, by the regulated environment, which provides a kind of substitute for the corporate governance mechanism, reducing the scope of adopting costly incentive compensation contracts. Notably, one of the consequences of the politically motivated "moral suasion" is that CEO pay in state-owned companies should also be

[20] The results on the clustering by country are very similar and even stronger, so we do not report them, but they are available on request.

lower, as suggested by Hart et al. (1997), a prediction that is supported by the negative coefficient on the state ownership dummy in both Table 9 and Table 10.

We now turn to the sample of regulated firms. Comfortingly, the robustness analysis in Table 10 show that the key finding in Table 7 holds, as pay-performance elasticity in incentive regulated energy utilities is found to be significantly tighter than in firms under cost-based regulation with all four performance variables.

In both tables, the control variables, contribute interesting information *per se*. On the one hand, the *OECD Index of Liberalization*, negative and statistically significant in most columns, indicates that in more competitive and liberalized markets, CEOs obtain larger managerial compensations. On the other hand, the negative coefficients on *State Ownership* again suggest that managerial compensations tend to be lower in state-controlled firms. This evidence is consistent through all specifications, samples and performance measures. *Market capitalization to GDP* is never significant, but *Shareholder Protection* enters with a negative coefficient (significant in Column (2)), suggesting that the stronger the protection provided to shareholders by the law, the lower the executive compensation (statistical significance increases when we cluster standard errors by country).

Finally, as a further control, we also checked whether the presence of foreign operations (hence a more complex corporate organization and a more sophisticated market for managers) might affect the structure of CEO compensations. We collected information about each firm's geographical diversification and constructed a dummy variable, which we added to the usual specifications. The estimated coefficient on *Multinationality* was never significant, while the key results on pay-performance sensitivity across regulatory status and regimes remained unchanged.[21] This finding could suggest that the worldwide market for managers in utilities is relatively thin: since regulated firms are supervised by national regulators, managers of public utilities are more likely to be selected locally to deal with "local" regulators according to their "local" connections with firms, institutions and, last but not least, politicians (Faccio, 2006; Boubakri et al., 2008).

[21] We do not report the results for reasons of space, but they are available from the authors upon request.

6.6 Incentive regulation versus cost-based regulation: Analysis at the CEO level

So far, we have used fixed effect models that control for firm-specific omitted variables that vary over firms, clustering the robust standard errors by firm (and by country). This way we did not consider that different CEOs might have managed the firm over the sample period, and the calculated mean differences in compensation does not allow for the differences between the old and new CEOs (Hubbard and Palia, 1995). Accordingly, as a further robustness check of the key result on the differential sensitivity between incentive and cost-based regulation, we perform a panel analysis with *CEO* fixed-effect regressions, i.e. by controlling for *CEO-specific* omitted variables that vary over CEOs and clustering the standard errors at CEO level. Among these omitted variables is, for example, education, a piece of information that we tried to collect but only found for a very small number of CEOs, insufficient to perform a sensible regression analysis. Another CEO-specific characteristic is expertise, and in want of a better variable, we found CEO age for a limited number of CEOs, large enough to run a robustness check.

We present the results in Panels A and B of Table 11. To provide a consistent comparison with the previous regression analysis with firm specific effects, in Panel A, we re-estimate the specification where all the variables are interacted with the CAP dummy (as per Table 7) while in Panel B we re-estimate the specification with the complete set of firm, industry and country control variables (as per Table 10). Comfortingly, in both panels, we find, similar to all previous results, that executive compensations are more tightly related to firm performance when CEOs operate under incentive regulation. The estimated coefficients on performance interacted with *CAP* remain positive and statistically significant, also when we also control for omitted CEO-specific effects, regardless of the specification and of the set of control variables. Finally, using the smaller sample of CEOs for which we had found the information about age, we re-estimated the usual specifications including *Age* and found that the main results survive (also if we include *Age*, but drop *Tenure* as the two variables are obviously highly correlated).[22] Again, we note that the pay-performance relationship for CEOs under cost-based regulation appears to be negative, which suggests that the two regimes imply very different, indeed opposite, incentives for managers.

Overall, also when we control for CEO-specific effects, the key result survives, suggesting that CEO compensations are more responsive to stock-based and accounting measures when they are

[22] For brevity sake, we do not report the results, but they are available from the authors on request.

subject to regulatory contracts based on high-powered incentive schemes aimed at enhancing efficiency. This evidence is robust across measures of performance and estimation methods[23], and suggests that incentive compensation contracts and incentive regulation schemes are complementary mechanisms that improve corporate governance as well as regulatory outcomes.

7. Conclusions

In contemporary corporations, the separation between ownership and control has created a divergence of interests between managers and shareholders. Specifically, shareholders want managers to take decisions that increase the firm's equity value, whereas managers are interested in maximizing their own wealth and well-being. Principal-agent problems become even more complicated in the public utility sector where services of general interest should be supplied efficiently and in line with consumers' interests and companies often operate in non-competitive and regulated markets. Regulation is typically implemented in industries with characteristics typical of natural monopolies to mimic competitive pressures and to prompt firms to increase efficiency, thus reducing the shareholders/managers-related agency costs.

This paper studies the effects of incentive mechanisms provided by economic regulation and by corporate governance in European energy firms in the period 2000-2011. Our results show, for the full sample of energy utilities, positive and statistically significant relationships between CEO pay and accounting and market-based performance measures. An increase of 10% in ROA, leads to an increase of 0.9%, in CEO compensation while a change of 10% in market to book and market capitalization leads, respectively, to an increase of 1.4% and 1.6% in CEO compensation.

Notwithstanding many reforms, European energy markets still differ across countries in terms of competition, liberalization, regulatory regimes and firm ownership structure. This heterogeneity is precisely what makes this industry an interesting case to study.

When we compare unbundled industry segments where firms operate in distinct business environments, we find that the pay-performance sensitivity of unregulated generation firms is not

[23] To parallel the CEO-level analysis, we conducted another robustness check on the *firm-level* fixed effects model (Tables 6-10), dropping the only CEO specific variable, *Tenure*, and re-estimating the pay-performance regressions. The results (available on request) did not change and all the previous evidence is confirmed.

significantly higher than in regulated transmission and distribution operators, unless we account for industry and country specific characteristics.

Next, in the most novel part of our analysis, we postulate that alternative regulatory regimes– namely, cost- vs. incentive-based schemes – might influence not only the behavior and strategy of firms and CEO, but also the propensity of shareholders to adopt different corporate governance mechanisms to align managers' interests with their own. Thus, eventually, both external - i.e. regulation - and internal – i.e. corporate governance - incentives are expected to jointly affect CEO's behavior.

The comparative analysis by regulatory mechanisms shows statistically significant differences in the pay-performance sensitivities between energy utilities subject to incentive and to cost-based regulation. We find that pay-performance sensitivity for CEOs operating under incentive regulation - that leaves excess profits to the firms, making shareholders more dependent on CEO's efforts and more eager to link their pay to performance - is significantly higher than for their counterparts under cost-based regulation. Results do not change if we control for state ownership, for different degrees of market openness in the industry and of investor protection in the country, for CEO-specific effects, and also if we focus on the subsample of electric companies.

The significant difference of pay-performance elasticity across regulatory schemes points out that incentive regulation is an efficiency enhancing mechanism that prompts shareholders to adopt disciplining devices such as incentive compensation contracts so that, eventually, regulation and corporate governance work together to ensure effective governance structures, in line with shareholder wealth maximization. These results also confirm that the corporate governance of firms under incentive regulation is somehow more similar to that of unregulated firms, as reported by the existing literature. In contrast, we find null or even negative sensitivity for firms under cost-based regulatory regimes, which implies that remunerations may increase (or do not decrease) even when the performance deteriorates. This suggests that the adoption of incentive compensation contracts for energy utilities under this scheme brings no advantages to the firm and only additional costs to the shareholders.

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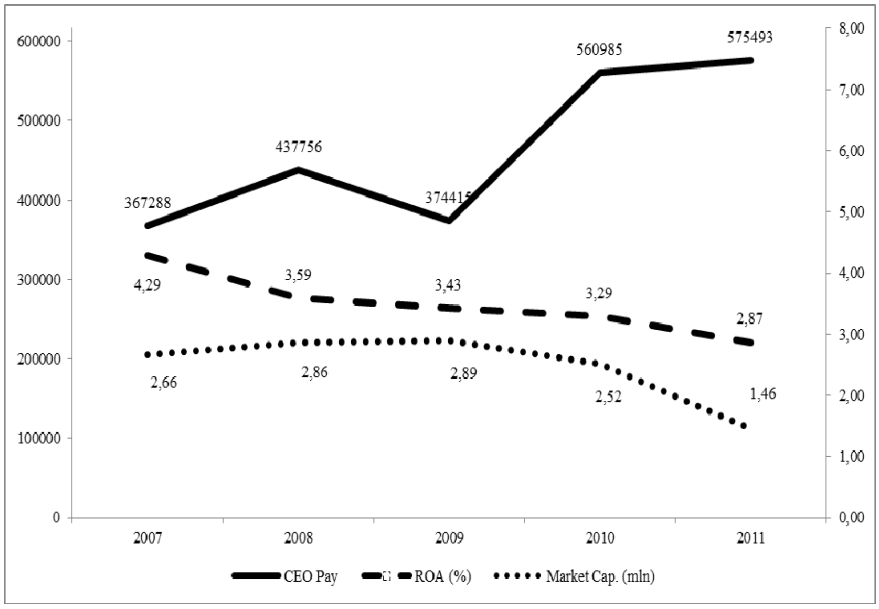
Figure 1

Average CEO pay, ROA and market capitalization in energy companies

A. Firms under cost-based regulation



B. Firms under incentive regulation

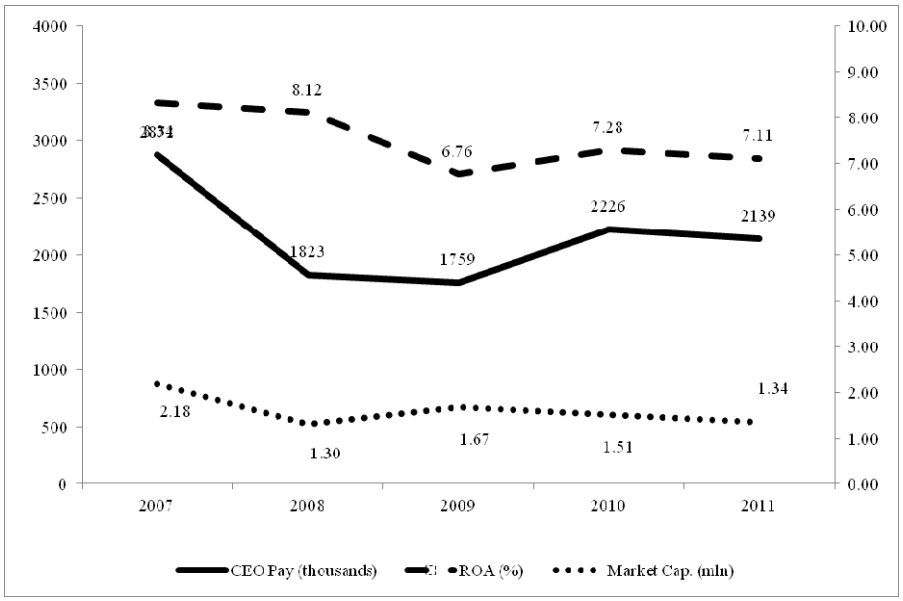


Table 1 – Variables description

Variable name	Label	Description
CEO comp	CEO compensation	It is computed as the sum between salary and bonus awarded by CEOs at the end of the year. (Thousands of Euros)
Stock Return	*Stock Return*	It is calculated using prices from end-of-period to end-of-period (fiscal year). r(t)={[p(t)f(t)/p (t')]–1}where p(t) is the sale price or closing bid at time t, f(t) is the factor to adjust price by splits and dividends in period t; p(t') is the sale price or closing bid at the previous period
ROA	Return on Assets	It is calculated as: (Net Income before Preferred Dividends + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / Average of Last Year's and Current Year's Total Assets * 100
MTB	Market-to-book	It is the ratio of the market value of equity and the book value of equity.
Market Cap	Market capitalization	It is Market Price-Fiscal Period End * Common Shares Outstanding
Tenure	CEO tenure	It indicates the number of years served as CEO.
REG	Regulation	It is a dummy that assumes 1 if the firm is under regulation.
CAP	Incentive regulation	It is a dummy that assumes 1 if the firm is under incentive regulation.
State Ownership	Government control rights	It is a dummy that assumes 1 if the government holds at least 30% of the ultimate control rights
OECD Index of Liberalization	Index of market competition	It ranges from 0 to 6. A high value is associated with a low degree of market competition and liberalization.
Shareholder Protection	Index of minority shareholder protection	It ranges from 0 to 27. A high value is associated with a stronger level of shareholder protection
Market Cap/GDP	Total stock market capitalization over GDP	It is the ratio of the total market capitalization and GDP in a country in a given year

Table 2 – Descriptive statistics (Full sample)

Variable	Obs	Mean	Std. Dev.	Min	Max
CEO compensation	418	1262.67	1491.03	114.04	11640.74
Stock return	492	0.08	0.38	-1	1.89
ROA	535	6.90	7.03	-42.09	79.09
Market-to-book	482	1.40	0.55	0.01	4.17
Market capitalization	485	$1.36*10^7$	$2.27*10^7$	4503.35	$2.10*10^8$
Log (Total Asset)	580	15.47	2.23	4.66	19.23
Tenure	520	3.71	2.39	1	12
State Ownership	674	0.55	0.50	0	1
OECD Index of Liberalization	674	1.46	1.63	0	6
Shareholder Protection	651	19.61	4.62	11	26
Market Cap/GDP	656	89.65	60.08	12.79	309.45

Notes: CEO compensations, Market capitalization and Total Assets are in Thousands of 2005 constant Euros

Table 3 – Descriptive statistics

	Regulated segments (TSO, DSO)			Deregulated segment (Generation)			Diff.
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	*t*
CEO compensation	321	1333.37	1638.36	97	1028.67	798.44	*
Stock return	396	0.09	0.35	96	0.05	0.48	-
ROA	431	6.83	4.61	104	7.21	12.95	-
Market-to-book	383	1.36	0.46	99	1.59	0.78	***
Market capitalization	386	$1.35*10^7$	$2.28*10^7$	99	$1.42*10^7$	$2.24*10^7$	-
Log (Total Asset)	450	15.85	1.69	128	14.16	3.19	***
Tenure	401	3.73	2.40	118	3.66	2.36	-
State Ownership	490	0.66	0.47	161	0.23	0.42	***
OECD Index of Liberalization	490	1.58	1.74	161	0.98	1.11	***
Shareholder Protection	488	19.41	4.43	161	20.23	5.16	*
Market Cap/GDP	490	85.12	65.44	161	104.32	37.14	***

	Regulated segments (TSO, DSO)						
	Incentive Regulation			Cost-based Regulation			
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	
CEO compensation	238	1201.25	1583.79	83	1712.25	1740.45	**
Stock return	248	0.04	0.32	148	0.16	0.39	***
ROA	285	7.65	5.22	146	5.23	2.41	***
Market-to-book	248	1.38	0.52	135	1.31	0.31	-
Market capitalization	251	$1.04*10^7$	$1.36*10^7$	135	$1.93*10^7$	$3.30*10^7$	***
Log (Total Asset)	292	15.58	1.60	158	16.35	1.76	***
Tenure	282	3.84	2.41	119	3.48	2.37	-
State Ownership	318	0.57	0.49	172	0.81	0.39	***
OECD Index of Liberalization	318	0.93	1.15	172	2.77	1.99	***
Shareholder Protection	316	21.55	3.82	172	15.49	2.25	***
Market Cap/GDP	318	67.88	41.32	172	116.99	86.63	***

Notes: CEO compensations, Market capitalization and Total Assets are in Thousands of 2005 constant Euros. *, ** and *** denotes significance at 10%, 5% and 1% respectively

Table 4 – Change in CEO pay for changes in firm performance

(First-differences estimates)

Δ CEO compensation	***Full Sample***	***Deregulated firms***	***Regulated firms***	***Firms under incentive regulation***	***Firms under Cost-based regulation***
	(1)	(2)	(3)	(4)	(5)
Δ Market value of equity$_t$	0.0000175*	0.0000072	0.0000197	0.0000808***	0.0000046
	(1.72)	*(0.93)*	*(1.52)*	*(2.93)*	*(1.19)*
Δ Market Value of equity$_{t-1}$	0.0000047	0.0000060*	0.0000048	0.0000013	0.0000057
	(1.04)	*(1.87)*	*(0.88)*	*(0.04)*	*(1.50)*
Estimated pay-performance sensitivity, *b*	0.0000222	0.0000132	0.0000254	0.0000821	0.0000103
F-statistic for *b*	2.43*	6.08***	1.80	6.52***	1.14
R-squared	0.031	0.049	0.033	0.117	0.055
N. Obs	*235*	*55*	*180*	*134*	*46*

Robust standard errors are clustered by CEO. T-statistics are reported in brackets. *, ** and *** denotes significance at 10%, 5% and 1% respectively. Variables are adjusted by inflation.

Table 5 – CEO pay for performance sensitivity

(Panel regressions with firm-specific fixed effects)

	Log (CEO compensation)			
	(1)	(2)	(3)	(4)
Stock Return	*0.09*			
	(1.32)			
Log(ROA)		*0.09***		
		(2.16)		
Log (MarketCap)			*0.16***	
			(2.02)	
Log (Market-to-book)				*0.14**
				(1.75)
Tenure	*0.06****	*0.04***	*0.05****	*0.05****
	(3.74)	*(2.36)*	*(3.07)*	*(3.09)*
Log (TotalAsset)	*0.13**	*0.35****	*0.25****	*0.32****
	(1.75)	*(4.34)*	*(3.09)*	*(4.12)*
GDP	$1.12e^{-06}$***	$5.09e^{-06}$	$5.67e^{-07}$	$7.75e^{-07}$**
	(3.76)	*(1.41)*	*(1.61)*	*(2.46)*
R-squared	*0.30*	*0.28*	*0.30*	*0.30*
N. Obs.	*355*	*362*	*347*	*345*
N. Firms	*54*	*53*	*55*	*54*

Robust standard errors are clustered by firm. T-statistics are reported in brackets. *, ** and *** denotes significance at 10%, 5% and 1% respectively. Variables are adjusted by inflation. *CEO compensation*, *Stock Return, ROA*, *Market Capitalization, Market-to-book, Tenure* and *Log (Total Asset)* are defined as in Table 1. GDP is the Gross Domestic Product.

Table 6 – Regulated vs. Deregulated segments

(Panel regressions with firm-specific fixed effects)

	Log (CEO compensation)			
	Stock Return	*Log(Market Cap)*	*Log(ROA)*	*Log(MTB)*
	(1)	(2)	(3)	(4)
Performance	0.302**	0.302**	0.174**	0.216**
	(2.61)	*(2.17)*	*(2.46)*	*(2.22)*
Performance*REG	-0.305**	-0.208	-0.105	-0.111
	(-2.31)	*(-1.46)*	*(-1.22)*	*(-0.90)*
Tenure	0.106***	0.086***	0.061***	0.096***
	(4.04)	*(4.21)*	*(3.42)*	*(3.30)*
Tenure*REG	-0.057*	-0.044	-0.020	-0.053
	(-1.75)	*(-1.55)*	*(-0.72)*	*(-1.50)*
Log (TotalAsset)	0.033	0.199	0.320***	0.311**
	(0.36)	*(1.43)*	*(2.77)*	*(2.59)*
Log (TotalAsset)*REG	0.117	0.066	0.024	-0.006
	(0.85)	*(0.38)*	*(0.17)*	*(-0.04)*
GDP	$1.02e^{-06}$***	$4.83e^{-07}$	$4.60e^{-07}$	$6.63e^{-07}$**
	(3.74)	*(1.34)*	*(1.26)*	*(2.03)*
R-squared	*0.329*	*0.323*	*0.286*	*0.309*
N. Obs	*352*	*344*	*359*	*342*
N. Firms	*53*	*54*	*52*	*53*

Robust standard errors are clustered by firm. T-statistics are reported in brackets. *, ** and *** denotes significance at 10%, 5% and 1% respectively. Variables are adjusted by inflation. *CEO compensation*, *Stock Return, ROA*, *Market Capitalization, Market-to-book, Tenure* and *Log (Total Asset)* are defined as in Table 1. *REG* is a dummy equal to 1 when the firm is regulated. GDP is the Gross Domestic Product.

Table 7 – Incentive vs. Cost-Based Regulation

(Panel regressions with firm-specific fixed effects)

	Log (CEO compensation)			
	Stock Return	*Log(Market Cap)*	*Log(ROA)*	*Log(MTB)*
	(1)	(2)	(3)	(4)
Performance	-0.183**	0.065	-0.056	-0.210*
	(-2.18)	*(1.03)*	*(-0.85)*	*(-1.81)*
Performance*CAP	0.264**	0.035***	0.181**	0.334***
	(2.30)	*(4.15)*	*(2.51)*	*(2.70)*
Tenure	0.039*	0.032	0.030	0.030
	(1.76)	*(1.23)*	*(1.19)*	*(1.15)*
Tenure*CAP	0.014	0.012	0.015	0.015
	(0.50)	*(0.37)*	*(0.46)*	*(0.46)*
Log (TotalAsset)	0.139	0.272***	0.370***	0.288***
	(1.34)	*(2.78)*	*(3.81)*	*(2.96)*
Log (TotalAsset)*CAP	0.004	-0.023*	-0.017	0.002
	(0.41)	*(-1.69)*	*(-1.51)*	*(0.24)*
GDP	$8.68e^{-07}$***	$3.34e^{-07}$	$3.13e^{-07}$	$5.26e^{-07}$
	(2.92)	*(0.91)*	*(0.78)*	*(1.55)*
R-squared	*0.292*	*0.752*	*0.733*	*0.650*
N. Obs	*273*	*268*	*294*	*266*
N. Firms	*40*	*41*	*42*	*40*

Robust standard errors are clustered by firm. T-statistics are reported in brackets. *, ** and *** denotes significance at 10%, 5% and 1% respectively. Variables are adjusted by inflation. *CEO compensation*, *Stock Return, ROA*, *Market Capitalization, Market-to-book, Tenure* and *Log (Total Asset)* are defined as in Table 1. *CAP* is a dummy equal to 1 when the firm is subject to incentive regulation. GDP is the Gross Domestic Product.

Table 8 –Electric Firms

Incentive vs. Cost-Based Regulation

(Panel regressions with firm-specific fixed effects)

	Log (CEO compensation)			
	Stock Return	*Log(MarketCap)*	*Log(ROA)*	*Log(MTB)*
	(1)	(2)	(3)	(4)
Performance	-0.120	0.110	-0.067	-0.207
	(-1.69)	*(1.58)*	*(-0.97)*	*(-1.67)*
Performance*CAP	0.228*	0.039***	0.209***	0.370***
	(1.95)	*(3.96)*	*(2.90)*	*(2.83)*
Tenure	0.034	0.026	0.027	0.025
	(1.41)	*(0.90)*	*(1.00)*	*(0.85)*
Tenure*CAP	0.016	0.014	0.014	0.017
	(0.53)	*(0.40)*	*(0.38)*	*(0.46)*
Log (TotalAsset)	0.177	0.308***	0.423***	0.343***
	(1.58)	*(2.72)*	*(3.89)*	*(3.11)*
Log (TotalAsset)*CAP	0.0002	-0.034**	-0.026**	-0.005
	(0.02)	*(-2.35)*	*(-2.61)*	*(-0.47)*
GDP	$8.72e^{-07}$**	$8.59e^{-08}$	$1.77e^{-07}$	$3.62e^{-07}$
	(2.51)	*(0.22)*	*(0.38)*	*(0.98)*
R-squared	*0.250*	*0.247*	*0.235*	*0.243*
N. Obs	*233*	*228*	*251*	*226*
N. Firms	*34*	*35*	*36*	*34*

Robust standard errors are clustered by firm. T-statistics are reported in brackets. *, ** and *** denotes significance at 10%, 5% and 1% respectively. Variables are adjusted by inflation. *CEO compensation*, *Stock Return, ROA*, *Market Capitalization, Market-to-book, Tenure* and *Log (Total Asset)* are defined as in Table 1. *CAP* is a dummy equal to 1 when the firm is subject to incentive regulation. GDP is the Gross Domestic Product.

Table 9 – Controlling for Firm Ownership, Market Liberalization and Financial Institutions

Regulated vs. Deregulated Segments

(Panel regressions with firm-specific fixed effects)

	Log (CEO compensation)			
	(1)	(2)	(3)	(4)
	Stock Return	*Log(MarketCap)*	*Log(ROA)*	*Log(MTB)*
Performance	0.31**	0.36**	0.23***	0.26*
	(2.14)	*(2.61)*	*(2.89)*	*(1.94)*
Performance*REG	-0.34**	-0.29*	-0.18*	-0.14
	(-2.19)	*(-1.97)*	*(-1.97)*	*(-0.87)*
Tenure	0.06***	0.05***	0.04**	0.05***
	(3.24)	*(2.86)*	*(2.11)*	*(2.95)*
Log (TotalAsset)	0.13	0.20**	0.29***	0.29***
	(1.59)	*(2.60)*	*(3.39)*	*(3.86)*
State Ownership	-0.31*	-0.31	-0.31	-0.32*
	(-1.65)	*(-1.64)*	*(-1.49)*	*(-1.66)*
OECD Index of Liberalization	-0.12	-0.19***	-0.15*	-0.21***
	(-1.40)	*(-3.45)*	*(-1.70)*	*(-4.01)*
Shareholder Protection	-0.01	-0.02*	-0.01	-0.02*
	(-0.52)	*(-1.65)*	*(-0.98)*	*(-1.78)*
Market Cap/GDP	-0.0002	-0.0002	-0.0005	0.0000
	(-0.23)	*(-0.59)*	*(-0.65)*	*(0.03)*
R-squared	*0.30*	*0.35*	*0.32*	*0.33*
N. Obs	*353*	*346*	*360*	*344*
N. Firms	*54*	*55*	*53*	*54*

Robust standard errors are clustered by firm. T-statistics are reported in brackets. *, ** and *** denotes significance at 10%, 5% and 1% respectively. Variables are adjusted by inflation. *CEO compensation*, *Stock Return, ROA*, *Market Capitalization, Market-to-book, Tenure* and *Log (Total Asset)* are defined as in Table 1. *REG* is a dummy equal to 1 when the firm is regulated. *State Ownership* is a dummy variable that is 1 when the state has at least 30% the control rights. *OECD Index of Liberalization* indicates the degree of market competition: a high value of this index is associated with a low degree of market competition and liberalization. *Shareholder Protection* measures shareholder and creditors' protection, as well as the quality of the law enforcement: a high value is associated with a larger protection of investors and control over CEO performance. *Market Cap/GDP* is the ratio between total stock market capitalization and the Gross Domestic Product.

Table 10 – Controlling for Firm Ownership, Market Liberalization and Financial Institutions
Incentive vs. Cost-Based Regulation

(Panel regressions with firm-specific fixed effects)

	Log (CEO Compensation)			
	(1) *Stock Return*	(2) *Log(MarketCap)*	(3) *Log(ROA)*	(4) *Log(MTB)*
Performance	-0.28**	0.05	-0.002	-0.27**
	(-2.40)	*(0.81)*	*(-0.05)*	*(-2.07)*
Performance*CAP	0.33**	0.01**	0.08**	0.39***
	(2.42)	*(2.28)*	*(2.10)*	*(3.50)*
Tenure	0.05**	0.04**	0.04*	0.05**
	(2.34)	*(2.12)*	*(1.71)*	*(2.19)*
Log (TotalAsset)	0.14	0.19*	0.30***	0.21**
	(1.31)	*(1.84)*	*(2.69)*	*(2.13)*
State Ownership	-0.30**	-0.29*	-0.30	-0.36*
	(-2.00)	*(-1.86)*	*(-1.56)*	*(-1.89)*
OECD Index of Liberalization	-0.14	-0.21***	-0.13	-0.22***
	(-1.49)	*(-3.67)*	*(-1.25)*	*(-3.91)*
Shareholder Protection	-0.02	-0.03*	-0.02	-0.03
	(-0.83)	*(-1.65)*	*(-1.09)*	*(-1.56)*
Market Cap/GDP	0.0003	-0.0005	-0.0005	-0.0002
	(0.30)	*(-0.51)*	*(-0.44)*	*(-0.26)*
R-squared	*0.26*	*0.27*	*0.25*	*0.27*
N. Obs	*271*	*267*	*292*	*265*
N. Firms	*40*	*41*	*42*	*40*

Robust standard errors are clustered by firm. T-statistics are reported in brackets. *, ** and *** denotes significance at 10%, 5% and 1% respectively. Variables are adjusted by inflation. *CEO compensation*, *Stock Return, ROA*, *Market Capitalization, Market-to-book, Tenure* and *Log (Total Asset)* are defined as in Table 1. *CAP* is a dummy equal to 1 when the firm is subject to incentive regulation. *State Ownership* is a dummy variable that is 1 when the state has at least 30% the control rights. *OECD Index of Liberalization* indicates the degree of market competition: a high value of this index is associated with a low degree of market competition and liberalization *Shareholder Protection* measures shareholder and creditors' protection, as well as the quality of the law enforcement: a high value is associated with a larger protection of investors and control over CEO performance. *Market Cap/GDP* is the ratio between total stock market capitalization and the Gross Domestic Product.

Table 11 – CEO level analysis: Incentive vs. Cost-based Regulation

Panel regressions with CEO-specific fixed effects

Panel A

	Log (CEO compensation)			
	Stock Return	*Log(MarketCap)*	*Log(ROA)*	*Log(MTB)*
	(1)	(2)	(3)	(4)
Performance	-0.12	0.01	-0.09	-0.27
	(-1.49)	*(0.17)*	*(-1.11)*	*(-1.57)*
Performance*CAP	0.17*	0.04***	0.15*	0.38**
	(1.75)	*(5.33)*	*(1.77)*	*(2.38)*
Tenure	0.06**	0.07**	0.07**	0.07**
	(2.06)	*(2.34)*	*(2.08)*	*(2.14)*
Tenure*CAP	-0.03	-0.03	-0.02	-0.02
	(-0.90)	*(-0.89)*	*(-0.61)*	*(-0.62)*
Log (TotalAsset)	0.16	0.17	0.18	0.17
	(1.46)	*(1.32)*	*(1.20)*	*(1.28)*
Log (TotalAsset)*CAP	0.02**	-0.02**	-0.00	0.01
	(2.61)	*(-2.14)*	*(-0.53)*	*(0.76)*
GDP	$2.44e^{-07}$	$2.44e^{-07}$	$4.38e^{-07}$	$-1.69e^{-07}$
	(-0.68)	*(-0.61)*	*(-0.98)*	*(-0.44)*
R-squared	*0.23*	*0.21*	*0.21*	*0.21*
N. Obs	*273*	*268*	*294*	*266*
N. CEO	*72*	*77*	*78*	*76*

Robust standard errors are clustered by CEO. T-statistics are reported in brackets. *, ** and *** denotes significance at 10%, 5% and 1% respectively. Variables are adjusted by inflation. *CEO compensation*, *Stock Return, ROA*, *Market Capitalization, Market-to-book, Tenure* and *Log (Total Asset)* are defined as in Table 1. *CAP* is a dummy equal to 1 when the firm is subject to incentive regulation.

Panel B: Controlling for Firm Ownership, Market Liberalization, Financial Institutions

Panel regressions with CEO-specific fixed effects

	Log (CEO compensation) Incentive regulation vs RoR			
	(1)	(2)	(3)	(4)
	Stock Return	*Log(MarketCap)*	*Log(ROA)*	*Log(MTB)*
Performance	*-0.20***	*-0.03*	*-0.04*	*-0.32****
	(-2.04)	*(-0.42)*	*(-0.70)*	*(-2.61)*
Performance*CAP	*0.24***	*0.02****	*0.09***	*0.40****
	(2.32)	*(3.16)*	*(2.46)*	*(3.54)*
Tenure	*0.04***	*0.03**	*0.06***	*0.04**
	(2.42)	*(1.77)*	*(2.28)*	*(1.95)*
Log (TotalAsset)	*0.12*	*0.17*	*0.19*	*0.16*
	(1.22)	*(1.58)*	*(1.31)*	*(1.45)*
State Ownership	*0.04*	*-0.14*	*-0.03*	*-0.13**
	(0.85)	*(-1.62)*	*(-0.36)*	*(-1.76)*
OECD Index of Liberalization	*-0.05*	*-0.24****	*-0.05*	*-0.23****
	(-0.89)	*(-4.63)*	*(-0.80)*	*(-4.51)*
Shareholder Protection	*0.01*	*-0.05*	*-0.04*	*-0.04*
	(0.34)	*(-1.56)*	*(-1.16)*	*(-1.43)*
Market Cap/GDP	*0.0005*	*-0.0002*	*0.0002*	*-0.0001*
	(0.50)	*(-0.20)*	*(0.18)*	*(-0.14)*
CEO-Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*
R-squared	*0.22*	*0.23*	*0.22*	*0.24*
N. Obs	*271*	*267*	*292*	*265*
N. CEO	*72*	*77*	*78*	*76*

Robust standard errors are clustered by CEO. T-statistics are reported in brackets. *, ** and *** denotes significance at 10%, 5% and 1% respectively. Variables are adjusted by inflation. *CEO compensation*, *Stock Return, ROA*, *Market Capitalization, Market-to-book, Tenure* and *Log (Total Asset)* are defined as in Table 1. *CAP* is a dummy equal to 1 when the firm is subject to incentive regulation. *State Ownership* is a dummy variable that is 1 when the state has the 70% of the control rights. *OECD Index of Liberalization* indicates the degree of market competition: a high value of this index is associated with a low degree of market competition and liberalization. *Shareholder Protection* measures shareholder and creditors' protection, as well as the quality of the law enforcement: a high value is associated with a larger protection of investors and control over CEO performance. *Market Cap/GDP* is the ratio between total stock market capitalization and the Gross Domestic Product.

APPENDIX – TABLE A1

Energy firms by Country and Regulatory Regimes

Country	***Company name***	***Deregulated***	***Regulatory Regime***
Austria	Verbund		Cost-based (up 2005)/Incentive (from 2006)
Belgium	Elia System Operator		Incentive
Finland	Fortum		Cost-based (up 2004)/Incentive (from 2005)
France	Areva	X	
	Electricité de France		Cost-based
	EDF Energies Nouvelles	X	
	Electricité de Strasburg		Cost-based
	Sechilienne-Sidec	X	
	Theolia	X	
	Veolia	X	
	Gaz de France		Cost-based
	GDF Suez		Cost-based
Germany	E.On		Cost-based (up 2009)/Incentive (from 2010)
	En.BW		Cost-based (up 2009)/Incentive (from 2010)
	MVV Energie		Cost-based (up 2009)/Incentive (from 2010)
	RWE		Cost-based (up 2009)/Incentive (from 2010)
	Vattenfall	X	
	Mainova		Cost-based (up 2009)/Incentive (from 2010)
Italy	Edison		Incentive
	A2A		Incentive
	Hera		Incentive
	Enel		Incentive
	ENI	X	
	Terna		Incentive
	Acea		Incentive
	Iride		Incentive
	Acegas-Aps		Incentive
	ACSM		Incentive
	Ascopiave		Incentive
	Enia		Incentive
	Snam		Incentive
Norway	Hafslund ASA		Incentive
Poland	PGE Polska Group Energetyczna		Incentive
	ENEA		Incentive
Portugal	Energias de Portugal		Incentive
Spain	Endesa		Incentive
	Gas Natural		Incentive
	Iberdola		Incentive
	Red Electrica Corporacion		Incentive
	Enagas		Incentive
Switzerland	Società Elettrica Sopracenerina		Cost-based
	BKW FMV		Cost-based
	Romande Energie Holding		Cost-based
	Alpiq Holding		Cost-based
	Repower		Cost-based
			Cost-based
UK	Viridian		Incentive
	British Energy		Incentive
	BG Group	X	
	Drax Group	X	
	Helius Energy	X	
	International Power	X	

	Jersey Electricity		Incentive
	Novera Energy	X	
	Renewable Energy Generation Ltd	X	
	Renewable Energy Holding	X	
	SSE	X	
	Centrica		Incentive
	Igas Energy	X	
	National Grid	X	
			Incentive

APPENDIX – TABLE A2

Performance measures: correlation matrix

	Stock Return	*ROA*	*Market-to-Book*	*Market Cap*
Stock Return	1			
ROA	0.080	1		
Market-to-Book	0.239	0.349	1	
Market Cap	0.006	0.151	0.158	1

APPENDIX – TABLE A3 – Panel I

Descriptive statistics by country

Country	CEO compensation		Log (Assets)		Tenure		Market Capitalization		Stock Return		ROA		Market-to-book	
	Mean	*Std. Dev.*	Mean	*Std. Dev.*	Mean	*Std. Dev.*	Mean	*Std. Dev.*	Mean	*Std. Dev.*	Mean	*Std. Dev.*	Mean	*Std. Dev*
Austria	933.55	*351.89*	15.85	*0.18*	2.3	*1.41*	$9.5*10^6$	*6082596*	0.21	*0.43*	9.50	*3.35*	2.04	*0.82*
Belgium	480.08	*21.70*	15.20	*00.11*	4	*2.16*	$1.8*10^6$	*188589*	0.04	*0.10*	6.00	*1.36*	1.11	*0.05*
Finland	986.10	*129.30*	16.61	*0.12*	4.25	*2.73*	$1.6*10^7$	*$1.07*10^7$*	0.32	*0.40*	9.79	*1.95*	1.56	*0.61*
France	855.96	*838.07*	15.67	*2.88*	3.56	*2.6*	$2.1*10^7$	*$3.77*10^7$*	0.05	*0.51*	4.2	*3.37*	1.55	*0.61*
Germany	2607.06	*2302.13*	16.66	*1.63*	3.2	*1.78*	$2.2*10^7$	*$2.75*10^7$*	0.11	*0.26*	5.67	*2.36*	1.33	*0.29*
Italy	897.16	*1154.64*	15.63	*1.66*	3.58	*2.2*	$1.4*10^7$	*$2.30*10^7$*	-0.02	*0.29*	7.11	*4.62*	1.22	*0.25*
Norway	378.35	*45.10*	14.87	*0.36*	3.5	*2.19*	$1.0*10^6$	*474621.1*	0.21	*0.57*	5.74	*3.01*	0.96	*0.19*
Poland	174.29	*53.65*	11.96	*0.76*	2.5	*1.05*	102096	*3929.42*	0.75	-	6.69	*3.13*	-	-
Portugal	733.81	*209.32*	17.04	*00.28*	3.33	*2.18*	$1.2*10^6$	*5123469*	0.06	*0.32*	6.06	*1.07*	1.22	*1.90*
Spain	1863.82	*2845.78*	16.46	*1.22*	4.78	*2.93*	$1.7*10^6$	*$1.59*10^7$*	0.54	*0.29*	8.11	*2.11*	1.46	*0.31*
Switzerland	378.00	*179.26*	15.17	*1.16*	4.38	*2.87*	$2.5*10^6$	*2865605*	0.30	*0.47*	3.97	*2.03*	1.15	*0.16*
UK	654.11	*620.16*	14.00	*2.71*	3.72	*2.30*	$8.7*10^6$	*$1.02*10^7$*	0.04	*0.34*	9.69	*13.77*	1.64	*0.85*

Notes: CEO compensations, Market capitalization and Total Assets are in Thousands of 2005 constant Euros

APPENDIX – TABLE A3 – Panel II

Descriptive statistics by country

	State Ownership		Market Liberalization		Shareholder Protection		Market Capitalization/GDP	
Country	Mean	*Std. Dev.*	Mean	*Std. Dev.*	Mean	*Std. Dev.*	Mean	*Std. Dev.*
Austria	1.00	*0.00*	0.56	*1.07*	14.00	*0.00*	31,25	*18,12*
Belgium	1.00	*0.00*	1.97	*0.46*	18.00	*0.00*	64,31	*23,21*
Finland	1.00	*0.00*	0.43	*0.38*	18.17	*1.03*	106,81	*56,99*
France	0.65	*0.48*	1.86	*1.42*	13.84	*2.49*	80,19	*18,20*
Germany	0.75	*0.44*	1.28	*0.54*	17.17	*0.99*	46,27	*11,57*
Italy	0.92	*0.27*	1.51	*1.33*	24.36	*1.97*	37,62	*15,98*
Norway	1.00	*0.00*	0.44	*0.39*	16	*0.00*	53,23	*19,01*
Poland	1.00	*0.00*	1.00	*0.00*	15	*0.00*	30,63	*8,26*
Portugal	1.00	*0.00*	0.65	*0.70*	18.75	*1.54*	38,77	*10,24*
Spain	0.08	*0.27*	0.88	*1.20*	17.33	*1.99*	85,53	*17,24*
Switzerland	0.60	*0.49*	5.04	*0.91*	15.33	*1.99*	217,42	*48,23*
UK	0.00	*0.00*	0.34	*0.71*	24.00	*0.00*	126,62	*23,69*