The political economy of electricity market liberalization: a cross-country approach

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More than half of the countries in the world have introduced a reform process in their power sectors and billions of dollars have been spent on liberalizing electricity markets around the world. Ideological considerations, political composition of governments and educational/professional background of leaders have played and will play a crucial role throughout the reform process. Adapting a political economy perspective, this paper attempts to discover the impact of political economy variables on the liberalization process in electricity markets. Empirical models are developed and analysed using panel data from 55 developed and developing countries covering the period 1975–2010. The research findings suggest that there is a significant negative relationship between electricity market liberalization and the size of industry sector, meaning that countries with larger industry sectors tend to liberalize less. Also, we detect a negative correlation between polity score and power sector liberalization, that is; it cannot be argued that liberalization policies are stronger in more democratic countries. On the other hand, our results imply that countries that receive foreign financial aid or assistance are more likely to liberalize their electricity markets. In OECD countries, single-party governments accelerate the reform process by reducing public ownership and vertical integration. Moreover, we detect a negative relationship between the years the chief executive has been in office and the reform progress in OECD countries. Furthermore, we identify a decrease in vertical integration in electricity industry during the terms of parties with "right" or "left" ideologies in OECD countries. Additionally, professional and educational

background of head of executive branch (prime minister, president and so on) seem to have very significant impact on reform process in OECD countries, but this is not the case in non-OECD countries. Leaders with a professional background as entrepreneurs speed up electricity market liberalization process in OECD countries while those with a background as economists slow it down. As for educational background, the reforms seem to progress slower in OECD countries if the head of executive has an educational background in economics or natural science. As a final point, the study suggests that EU or OECD membership, the existence of electricity market reform idea, population density, electricity consumption, income level, educational level, imports of goods and services (as % of GDP) and country specific features have a strong correlation with liberalization process in electricity markets.

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Abstract

More than half of the countries in the world have introduced a reform process in their power sectors and billions of dollars have been spent on liberalizing electricity markets around the world. Ideological considerations, political composition of governments and educational/professional background of leaders have played and will play a crucial role throughout the reform process. Adapting a political economy perspective, this paper attempts to discover the impact of political economy variables on the liberalization process in electricity markets. Empirical models are developed and analysed using panel data from 55 developed and developing countries covering the period 1975–2010. The research findings suggest that there is a significant negative relationship between electricity market liberalization and the size of industry sector, meaning that countries with larger industry sectors tend to liberalize less. Also, we detect a negative correlation between polity score and power sector liberalization, that is; it cannot be argued that liberalization policies are stronger in more democratic countries. On the other hand, our results imply that countries that receive foreign financial aid or assistance are more likely to liberalize their

electricity markets. In OECD countries, single-party governments accelerate the reform process by reducing public ownership and vertical integration. Moreover, we detect a negative relationship between the years the chief executive has been in office and the reform progress in OECD countries. Furthermore, we identify a decrease in vertical integration in electricity industry during the terms of parties with "right" or "left" ideologies in OECD countries. Additionally, professional and educational background of head of executive branch (prime minister, president and so on) seem to have very significant impact on reform process in OECD countries, but this is not the case in non-OECD countries. Leaders with a professional background as entrepreneurs speed up electricity market liberalization process in OECD countries while those with a background as economists slow it down. As for educational background, the reforms seem to progress slower in OECD countries if the head of executive has an educational background in economics or natural science. As a final point, the study suggests that EU or OECD membership, the existence of electricity market reform idea, population density, electricity consumption, income level, educational level, imports of goods and services (as % of GDP) and country specific features have a strong correlation with liberalization process in electricity markets.

Keywords: *Electric utilities, industrial policy, political economy*

JEL Classification: *L94, L52, Q48*

1. Introduction

Since the 1980s, the structure of electricity industry has shifted from a vertically integrated (and usually state-owned) monopoly towards unbundled (and usually privately owned) regulated utilities. This shift has also been strongly encouraged by the World Bank, IMF and other international financial institutions (Williams & Ghanadan, 2006). The power sector reform began in Chile in 1982 for the first time and then spread through various countries in the world especially after the 1990s. Therefore, last three decades have witnessed widespread power market reforms in both developed and developing countries that cost billions of dollars.

Today, reforms are on-going in many countries and reform process in the power sector is regarded as not only possible and necessary, but also inevitable.

In all reforming countries (whether developed or developing), reforms take place in a political economic environment and are directly affected by the developments taking place in it. In most cases, political structure of a country largely determines the extent of the reforms in that country. In the United Kingdom, for example, privatization of state owned electricity utility reinforced the ideology of the Thatcher government and its interest in reducing the costs of domestic coal subsidies. Similar ideological and political explanations can be found from Norway to New Zealand (Hogan, 2002). There is no doubt that without political support the reforms cannot go further in any country. This paper attempts to discover the impact of political economic variables on the liberalization process in electricity markets.

We try to answer following research questions: (i) does the domestic political structure of a country affect the reforms in its electricity market? (ii) does foreign influence resulting from the dependence on foreign financial support have an influence on the electricity market liberalization process? (iii) are government structure (single party or coalition government), political stability, economic policy orientation of the ruling party (left, centre or right ideology), electoral system (presidential or majoritarian) and professional/educational background of the head of executive (prime minister, president and so on) important determinants of the reform progress? If yes, what is the direction of the influences originated from these variables?

The paper proceeds as follows. Next section presents hypotheses tested in this study and conceptual framework. Section 3 provides a literature review regarding the applied empirical studies focusing on the political economy of liberalization processes. Section 4 summarizes the methodological framework. Section 5 describes data. Following section presents empirical analysis and discusses the results. The last section concludes.

2. Hypotheses and conceptual framework

Liberalization of electricity market in a country depends on its political structure and the structure of interest groups, among other factors. Liberalization often means less political influence in the sector and reduction in cross-subsidies in the electricity sector. As politically supported groups and the beneficiaries of cross-subsidization policies differ from one country to another, we cannot know for sure which interest group(s) will benefit or lose as a result of the liberalization process. However, among various interest groups, industrial consumers are the most organized and the largest users of electricity services. Depending on the perceptions of the industrial consumers regarding the benefits/losses from the liberalization process, countries with a larger industrial sector would be more likely to push for or oppose liberalization of the electricity sector. For instance, in some countries, the most important beneficiaries (and therefore potential supporters) of the reform programs may be big industrial consumers because increased efficiency and careful regulation in the sector may transfer huge benefits to them in the form of reduced electricity prices and better service. Therefore, it is reasonable to expect that industry sector in these countries supports the reform initiatives in the power industry; and as its size gets bigger and bigger so does its influence. On the other hand, in some other countries, industrial electricity prices are highly subsidized by the government so industrial consumers may regard liberalization policies as a threat to their self-interest since liberalization usually means removal of such subsidies. Moreover, the pro- or anti-liberalization effect of the industry sector may not materialize in less democratic countries, where industrial consumers have fewer opportunities to influence the incumbent ruling elite. Taking into account all these cause-effect relations, we formulate our first hypothesis as follows.

> **Hypothesis 1:** *The industry sector (i.e. industrial electricity consumers) has a positive or negative impact on the pace of liberalization process in electricity industry. This impact is stronger in more democratic countries.*

Compared with rural consumers, urban consumers are more likely to benefit from reforms that reduce cross-subsidization and increase electricity service offerings in densely populated areas. One indicator of the relative gains of urban consumers is the tariff rebalancing associated with liberalization. In addition to gains from tariff rebalancing, liberalization usually results in an improvement in electricity service (e.g. fewer interruptions), especially in urban areas. Since urban consumers tend to have larger electricity consumption volumes than rural residents, partly due to income effect, they should benefit more from liberalization reforms than rural consumers. If urban consumers are better organized in more democratic and egalitarian societies, they will exercise more influence over policy outcomes. The share of rural population (as % of total population) may be used as a proxy for the relative effectiveness of the urban consumers in influencing policies. Therefore, we expect countries with lower share of rural population to be more likely to liberalize. These conclusions lead us to posit the following hypothesis.

> **Hypothesis 2:** *Holding everything else constant, countries with a lower rural population and lower income inequality are more likely to liberalize their electricity industry.*

In 1992, the World Bank officially changed its lending policy for electricity development from traditional project lending to policy lending (the Washington consensus). That is, any country borrowing from the Bank on power projects would have to agree to move away from a "single national electricity utility as a public monopoly" and adopt ownership, structural and regulatory reforms (Yi-chong, 2006). Other international financial institutions, such as the Asian Development Bank, European Bank for Reconstruction and Development, and the Inter-American Development Bank have followed suit (Williams & Ghanadan, 2006). Today, the liberalization of the infrastructure (including electricity) industries is one of the preconditions of any financial support program. Therefore, our third hypothesis is formulated as below.

> **Hypothesis 3:** *Foreign financial aid and/or assistance make liberalization in electricity industry more likely.*

If we assume that politicians are perfect agents of their constituents and act based entirely on constituent interests, ideology should not affect the policy outcomes. However, in real life, politicians' interests are not perfectly aligned to that of their constituents and their ideologies may affect policy outcomes. Parties with different ideologies may prefer different policies. When right-wing parties dominate the government, privatization and liberalization will be more likely. Besides, countries in which the majority of the constituents prefer privatization and liberalization may elect a right or centre party that intends to implement such policies once they are in power. Furthermore, an unstable political environment often means policy gridlocks, making reforms less feasible. Although subjecting a reform program to the scrutiny of both the ruling and the opposition parties may increase the credibility of the reform program for private investors, implementation of reforms usually requires a stable political environment in the form of single-party governments (rather than coalition governments), presidential regimes (rather than parliamentary ones) and chief executives with longer years in office. These considerations lead us to the following hypothesis.

> **Hypothesis 4:** *Countries with right-wing (or centre) governments are more likely to liberalize their electricity markets. Similarly, politically stable countries are expected to liberalize more.*

The prior knowledge, education and experience of the head of executive branch (prime minister, president and so on) regarding the power market liberalization process may encourage (or discourage) the reform measures. Hence, our final hypothesis is as follows.

> **Hypothesis 5:** *Educational and professional backgrounds of head of executive branch are important determinants of electricity market liberalization.*

In addition to political economic factors, whether and how much a country reforms its electricity industry depend also on other factors such as technology, the state of economic development, and history. Many of these factors are likely to be correlated with the political economic determinants. To improve the accuracy of our estimates, we control for these factors in our empirical analysis. A country on a higher technological ladder is more likely to succeed in attracting private investment to its electricity sector and will therefore be better positioned to push for reforms. Since technologically advanced countries are also developed countries; indicators of economic development, such as being an OECD/EU member, per capita GDP, population density, electricity consumption per capita and number of years of adult (25+) education, can be used as control variables. These indicators have implications for the demand for electricity reforms (Li & Xu, 2002).

3. Literature review

Presenting an extensive literature review on the political economy of economic reform is both outside the scope of this paper and not possible given the limitations on the length of the study. Although there is some preliminary academic work that investigates the impact of political economic variables on electricity market reform outcome; to the best of our knowledge, this study constitutes one of the first empirical applied investigations that focus on the possible implications of political economic environment for electricity market reform process. So, there is a real gap in the empirical literature with regard to the analysis of the possible repercussions of the political economic variables for the power market reforms. This is quite surprising given the economic importance of the sector for both individual countries and the world economy in general, as well as the significant number of reform programs that have already initiated in many power sectors.

In this section, we will mention only applied studies on the relationship between economic reform processes and political economic variables. The studies

presenting an anecdotal discussion of the political economy of the various reform programs without any applied analysis are outside the scope of this section. Within this framework, we will concentrate on three groups of studies: (1) those providing applied evidence from power industry; (2) those on the political economy of reform process in telecommunications industry; (3) studies presenting the results of applied work from non-infrastructure industries. Appendix 1 presents the details of the econometric studies mentioned here including hypotheses tested, dependent variables, explanatory variables, results, data and methodology. Appendix 2 classifies previous econometric studies by their focus.

The first group of studies (those focusing on the political economy of electricity market reforms) include only two papers by Chang & Berdiev (2011) and Cubbin & Stern (2006). Chang & Berdiev (2011) examine the effect of government ideology, political factors and globalization on energy regulation in electricity and gas industries using the bias-corrected least square dummy variable model in a panel of 23 OECD countries over the period 1975-2007. They find that left-wing governments promote regulation in gas and electricity sectors; and less politically fragmented institutions contribute to deregulation of gas and electricity industries. Their results also suggest that long tenures of incumbent government have limited impact on regulation in electricity sector, while it is associated with an increase in regulation of gas sector. Further, they conclude that higher political constraints and more globalization lead to deregulation in electricity and gas sectors; and economic and social integration are the forces that promote deregulation in the gas industry, whereas political integration advances deregulation in the electricity industry. Cubbin & Stern (2006) assess whether a regulatory law and higher quality regulatory governance are associated with superior outcomes in the electricity industry. Their analysis, for 28 developing economies over 1980–2001, draws on theoretical and empirical work on the impact of telecommunications regulators in developing economies. Their study show that, controlling for privatization and competition and allowing for country-specific fixed effects, both regulatory law and higher quality

regulatory governance are positively and significantly associated with higher per capita generation capacity.

The studies providing applied evidence from telecommunications industry are Duso & Seldeslachts (2010), Gasmi et al. (2009), Gasmi & Virto (2010) and Li & Xu (2002). Duso & Seldeslachts (2010) empirically investigate the cross-sectional and temporal variation in entry liberalization in the mobile telecom industries of OECD countries during the 1990s. Their findings indicate that majoritarian electoral systems are important drivers for change, while independent industry regulators slow down such reforms. They conclude that powerful industry incumbents hold up the liberalization process and governing bodies that favour a small welfare state accelerate it. Taking the view that political accountability is a key factor linking political and regulatory structures and processes, Gasmi et al. (2009) empirically investigate its impact on the performance of regulation in telecommunications using a time-series cross-sectional data set for 29 developing and 23 developed countries during 1985–99. They provide empirical evidence on the impact of the quality of political institutions and their modes of functioning on regulatory performance. Their analysis finds that the impact of political accountability on the performance of regulation is stronger in developing countries.

The paper by Gasmi & Virto (2010) has two related objectives. First, it seeks to identify the key determinants of policies that have been at the heart of the reforms of the telecommunications industry in developing countries, namely, liberalization, privatization, and the (re)structuring of regulation. Second, it attempts to estimate the extent to which these policies have translated into actual deployment of telecommunications infrastructure. They conduct this simultaneous investigation by means of an econometric analysis of a 1985-1999 time-series cross-sectional database on 86 developing countries. Their study finds that sectoral as well as institutional and financial factors are important determinants of the actual reforms implemented. They uncover that countries facing increasing institutional risk and financial constraints are more likely to introduce competition in the digital cellular segment and to privatize the fixed-

line incumbent, these policies being economically attractive to both investors and governments. Finally, Li & Xu (2002) examine the political economy of privatization and liberalization in the telecommunications sector in recent decades. They find that countries with stronger pro-reform interest groups, namely the financial services sector and the urban consumers, are more likely to reform in more democratic countries. However, their result suggest that less democratic countries are more likely to maintain the public sector monopoly when the government benefits more from such a governance mode, e.g., when the fiscal deficit is higher.

The final group of studies presents the results of applied investigations from non-infrastructure industries. The examples from this group include Alesina et al. (2006), Boschini (2006), Dreher et al. (2009), Duval (2008), Fredriksson & Wollscheid (2008), Goldberg & Pavcnik (2005), Huang (2009), Ickes & Ofer (2006), Kim & Pirttilä (2006), Olper (2007), Volscho (2007) and Wagner et al. (2009). We will briefly mention them while their details are presented in Appendix 1.

Alesina et al. (2006) question why countries delay stabilizations of large and increasing budget deficits and inflation and what explains the timing of reforms. They find that stabilizations are more likely to occur during crisis, at the beginning of term of office of a new government, in countries with "strong" governments (i.e. presidential systems and unified governments with a large majority of the party in office), and when the executive faces less constraints. Boschini (2006) analyses how incentives under different sets of political institutions map into policies that promote industrialisation. The results show that a flat wealth distribution and skilled political elite enhance development the most in elitist regimes, while democracies perform as well as elitist regimes in terms of industrialisation. Dreher et al. (2009) analyse whether the educational and professional background of a head of government matters for the implementation of market-liberalizing reforms. Their results show that reforms are more likely during the tenure of former entrepreneurs. Duval (2008) provides an empirical attempt to determine whether macroeconomic policies

determined as a result of political processes influence reform patterns in labour and product markets.

Fredriksson & Wollscheid (2008) seek to explain the implications of corruption and political instability for firm investment in abatement technology. Their results suggest that political instability raises abatement technology investment. Goldberg & Pavcnik (2005) exploit drastic trade liberalizations in Colombia in the 1980s and 1990s to investigate the relationship between protection and industry wage premiums. Huang (2009) focuses on the forces that induce governments to undertake financial sector reform. Ickes & Ofer (2006) examine changes in the industrial structure of employment across Russian regions and assess the importance of legacy factors, political factors, and success factors in explaining this process. They find that initial conditions such as natural resource potential, climate, and industrial specialization explain more of the variation in industrial restructuring than political variables. Using data from transition economies, Kim & Pirttilä (2006) examine linkages between political constraints and economic reforms. Their results suggest that progress in reform is positively associated with public support for reforms, which is affected by income inequality and expected individual performance during future reforms. They also find evidence to support reform sequencing starting with a reform that is both popular and stimulatory to other reforms.

Olper (2007) presents an empirical investigation of how agricultural land ownership inequality and government ideology (right-wing vs. left-wing) affect agricultural protection. Their data show, overall, that protection is decreasing in land inequality and with left-wing government orientation, but not in a linear fashion: left-wing governments tend to support agriculture in more unequal societies. Using data on 160 US metropolitan statistical areas from the 2000 census, Volscho (2007) examines how quintile shares of size-adjusted family income are impacted by union density and federal, state, and local government employment. Finally, Wagner et al. (2009) analyse how institutional factors affect satisfaction with democracy. They find that high-quality institutions like the rule of law, well-functioning regulation, low corruption, and other

institutions that improve resource allocation have a positive effect on average satisfaction with democracy.

4. Methodology

As underlined by Jamasb et al. (2004), there is a lack of generally accepted and measured indicators for monitoring the progress, impacts, and performance of electricity sector reforms. Since the aim of this paper is to propose a framework for analysing the power market reforms from a political economy perspective, we face with the same problem. That is, we need to, first, evaluate possible impact of political economic environment of a country on electricity market reform process in this country; second, decide which indicators to use in our study and; finally, specify methods to measure them. Let me focus on these tasks one by one.

To the best of our knowledge, no applied study has been done so far on the relationship between political economy and power market reform. Therefore, we cannot find empirical evidence in the applied literature concerning the direction of this relationship. To carry out our analysis, we need to decide which indicators to be used in the study. Since we are interested in the impact of political economic variables on power market reform process, we need variables representing political economic environment of a country and those representing the scale and intensity of the reform process. In addition to these variables, we also utilize a set of control variables which are assumed to be endogenous to reform process and explain a portion of the variations in reform progress. Another challenge we face in this study relates to the measurement of the variables. For an indicator to be useful it needs to be based on a clear definition and to be measurable. This is equally important whether it is expressed in physical, monetary or qualitative terms. In fact, most of the economic and industry indicators in our study are measured in some form of monetary or physical unit; and therefore, easy to include into the study. However, the extent and scope of electricity reforms are not quantifiable in physical or monetary units. The main electricity reform measures, such as

privatization, unbundling of functions, wholesale markets and independent regulation, are generally established gradually and have a qualitative dimension. Accounting for these measures with the use of dummy variables, as sometimes done, does not reflect extent or intensity. To overcome this problem, we used electricity market reform indicators constructed by international organizations (namely, OECD and EBRD).

We specify our dependent variables (that is, reform indicators) as a function of (i) political economic variables (comparable cross-country indicators), (ii) a set of controls (being an EU or OECD member, existence of electricity market reform idea, population density, electricity consumption per capita, GDP per capita, average number of years of adult (25+) education, imports of goods and services as % of GDP), (iii) country-specific effects (these are assumed to be exogenous and to exist independently of reform process, but may explain a portion of the variation in reform progress) and (iv) other unobserved variables that influence the reform process. These variables are then used in panel regressions to assess their impact on variables we are interested in. In panel regressions, the exploitation of both cross-country and time-series dimensions of the data allows for control of country-specific effects. Apart from political economic variables; power market reform in a specific country and year may be influenced by being an EU or OECD member, existence of electricity market reform idea, population density, electricity consumption per capita, GDP per capita, average number of years of adult (15+) education and imports of goods and services as % of GDP. In our models, we include all these control variables in order to isolate the effect of political economic variables on the reform process.

In this paper, we formulate regression equations as below.

$$Y_{it} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit} + \sum_{p=1}^{s} \gamma_p Z_{pi} + \delta t + \varepsilon_{it} \qquad (1)$$

In the model, i and t represent unit of observation and time period, respectively. j and p are indices used to differentiate between observed and unobserved

variables. X_{ji} and Z_{pi} represent observed and unobserved variables, respectively. X_{ji} includes both political economic variables and control variables. Y_{it} is dependent variable (that is, electricity market reform indicators). ε_{it} is the disturbance term and t is time trend term. Because the Z_{pi} variables are unobserved, there is no means of obtaining information about the $\sum \gamma_p Z_{pi}$ component of the model. For convenience, we define a term α_i, known as the unobserved effect, representing the joint impact of the Z_{pi} variables on Y_{it}. So, our model may be rewritten as follows:

$$Y_{it} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit} + \alpha_i + \delta t + \varepsilon_{it} \tag{2}$$

Now, the characterization of the α_i component is crucially important in the analysis. If control variables are so comprehensive that they capture all relevant characteristics of the individual, there will be no relevant unobserved characteristics. In that case, the α_i term may be dropped and pooled data regression (OLS) may be used to fit the model, treating all the observations for all time periods as a single sample. However, since we are not sure whether control variables in our models capture all relevant characteristics of the countries, we cannot directly carry out a pooled data regression of Y on X. If we were to do so, it would generate an omitted variable bias. Therefore we prefer to use either a Fixed Effects (FE) or Random Effects (RE) regression. In FE model, the country-specific effects (α_i) are assumed to be the fixed parameters to be estimated. In RE model, the country-specific effects (α_i) are treated as stochastic. The fixed effect model produces consistent estimates, while the estimates obtained from the random effect model will be more efficient. There are more than 90 countries in the world where a reform process has been initiated so far but data are available only for 55 countries. That is, our sample is limited by data availability. Therefore, we cannot be sure whether the observations in our model may be described as being a random sample from a given population; and cannot directly decide which regression specification (FE, RE or OLS) to use. It will be

decided in the course of the analysis based on Hausman test and Breusch and Pagan Lagrangian Multiplier (BPLM) test.

5. Overview of data

Our data set is based on a panel of 55 countries for a period beginning in 1975 and extending through 2010. List of countries in our data set is available in Figure 1 and Figure 2. Years 1975 and 2010 represent, respectively, the earliest and the last year for which data are available at the time the research is conducted. The countries in our sample are determined by data availability, especially by data on electricity market reform indicators. In our study, the total number of maximum observations for each variable is 1,540. Because of missing observations, our panel is unbalanced.

The variables used in the study are entry barriers, public ownership and vertical integration in electricity market; overall electricity market closeness index; industry value added (% of GDP); rural population (% of total population); gini coefficient; polity score (-10,+10); net official development assistance and official aid received (current billion US$); party structure (single-party or coalition); the years the chief executive has been in office; party orientation with respect to economic policy (right, left or centre); electoral system (parliamentary or presidential regime); professional background of head of executive (entrepreneur, scientist (economist), military, politician, scientist (other) or unknown/other); educational background of head of executive (economics, natural science, other university or unknown/other); dummy variables representing EU members, OECD members or the existence of electricity market reform idea; population density (people per square km of land area); electricity consumption (MWh per capita); GDP per capita (PPP, current thousand international $); average number of years of adult (15+) education; imports of goods and services as % of GDP. Table 1 shows descriptive statistics of the variables in our analysis.

Data on overall electricity market closeness index are obtained from Conway and Nicolett (2006) and EBRD[2] (2011). Conway and Nicolett (2006) provide data for 30 OECD countries. They also provide data on sub indicators of reform process; namely entry barriers, public ownership and vertical integration. The index ranges from 0 to 6 where 0 represents the fully open market in which entry barriers, public ownership and vertical integration are minimized and a score of 6 is given to a closed market. EBRD (2011) provides a similar indicator for additional 25 developing countries where it operates. The data from EBRD (2011) are available on a 1-4 scale. To establish uniformity between two data sets, the data from EBRD (2011) are converted into 6-0 scale. Figure 1 and Figure 2 provide the change in electricity market closeness index from 1989 to 2007 for the countries in our dataset.

The data regarding industry value added as % of GDP, rural population as % of total population and net official development assistance and official aid received in current billion US$ are taken from World Bank (2011). Gini coefficient[3] and polity score data come from UNU-WIDER (2011) and Center for Systemic Peace (CSP, 2010) respectively. Figure 3 shows histograms of industry value added, rural population and polity score variables. Figure 4 presents total development assistance and aid received between 1990 and 2007. Countries that did not receive any aid or assistance during this period are excluded from Figure 4. Gini coefficient scores of countries in 1995 and 2005 are shown in Figure 5. Data on political economic variables (party structure, the years the chief executive has been in office, party orientation of head of executive, party orientation with respect to economic policy and electoral system) originate from Keefer (2010). Figure 6 shows the share of electoral systems in our sample countries as of 2007. Professional and educational background of head of executive data are partly collected by the author and partly provided by Dreher et al. (2009). While deciding on which educational and professional backgrounds to include into our analysis, we selected top five most common professional backgrounds

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[2] European Bank for Reconstruction and Development.

[3] The Gini coefficient is a measure of the inequality of a distribution, a value of 0 expressing total equality and a value of 1 maximal inequality.

(entrepreneur, scientist (economist), military, politician and scientist (other)) and top three educational backgrounds (economics, natural science and other university). We also created "unknown/other" category to represent other educational and professional backgrounds.

Dummy variables representing being an EU member, an OECD member and the existence of electricity market reform idea are constructed by the author. The dummy variable for the existence of electricity market reform idea takes the value 1 after 1989 when the electricity market reform was implemented, for the first time, in a full scale in a developed country (i.e. the UK); the years before 1989 take the value 0.

World Bank (2011) provides data on population density (people per sq. km of land area), electricity consumption (MWh per capita), GDP per capita (PPP, current thousand int. $) and imports of goods and services as % of GDP. Average number of years of adult (15+) education is taken from Barro & Lee (2010). The data from Barro & Lee (2010) are available with 5-year intervals; to ensure conformity with other data, we converted them into yearly data by linear interpolation. Figure 7 presents adult education data for 1990 and 2007.

Table 1. Descriptive statistics of the variables

Variables (units)	Mean	Std. Dev.	Min	Max	# of Obser.	# of Ctrys
Dependent Variables						
Entry barriers in electricity market (0-6)	4.59	2.26	0	6	990	30
Public ownership in electricity market (0-6)	4.56	1.80	0	6	990	30
Vertical integration in electricity market (0-6)	4.65	2.03	0	6	990	30
Overall electricity market closeness index (0-6)	4.46	1.61	0	6	1,540	55
Explanatory Variables						
Industry value added (% of GDP)	32.39	7.43	10.29	69.92	1,415	55
Rural population (% of total population)	33.95	14.47	2.66	73.60	1,514	55
Gini coefficient (0-100)	30.43	6.75	16.63	57.40	760	54
Polity score (-10,+10)	6.31	6.13	-10	10	1,357	53
Net official development assistance and official	0.11	0.28	-0.46	3.79	1,408	55

Variables (units)	Mean	Std. Dev.	Min	Max	# of Obser.	# of Ctrys
aid received (current billion US$)						
Party Structure (1: single-party, 0: coalition)	0.46	0.50	0	1	1,493	53
The years the chief executive has been in office	4.35	3.84	1	35	1,437	54
Party orientation with respect to economic policy						
- Right	0.40	0.49	0	1	1,218	51
- Left	0.44	0.50	0	1	1,218	51
- Center	0.15	0.36	0	1	1,218	51
Electoral system (parliamentary regimes)	0.68	0.47	0	1	1,475	55
Professional background of head of executive						
- Entrepreneur	0.06	0.24	0	1	1,429	54
- Scientist (Economist)	0.04	0.21	0	1	1,429	54
- Military	0.07	0.25	0	1	1,429	54
- Politician	0.63	0.48	0	1	1,429	54
- Scientist (Other)	0.27	0.45	0	1	1,429	54
- Unknown/other	0.37	0.48	0	1	1,429	54
Educational background of head of executive						
- Economics	0.25	0.43	0	1	1,429	54
- Natural science	0.18	0.38	0	1	1,429	54
- Other university	0.47	0.50	0	1	1,429	54
- Unknown/other	0.14	0.35	0	1	1,429	54
Control Variables						
EU member (0-1)	0.30	0.46	0	1	1,540	55
OECD member (0-1)	0.56	0.50	0	1	1,540	55
Existence of electricity market reform idea (0-1)	0.73	0.45	0	1	1,540	55
Population density (people per sq. km of land area)	101.26	104.35	1.40	499.96	1,428	55
Log of population density	4.00	1.34	0.33	6.21	1,428	55
Electricity consumption (MWh per capita)	5.90	4.99	0.34	36.85	1,450	54
Log of electricity consumption	1.47	0.80	-1.07	3.61	1,450	54
GDP per capita (PPP, current thousand int. $)	14.34	10.83	0.73	84.41	1,307	55
Log of GDP per capita	2.32	0.92	-0.32	4.44	1,307	55
Average number of years of education received by people ages 15 and older	9.27	1.68	2.92	12.75	1,364	47
Imports of goods and services (% of GDP)	41.33	21.00	5.88	143.72	1,427	55
Log of imports of goods and services	3.59	0.53	1.77	4.97	1,427	55

Figure 1. Electricity market closeness index in OECD countries (1989, 2007)

■ Electricity market closeness index in 2007

■ Electricity market closeness index in 1989
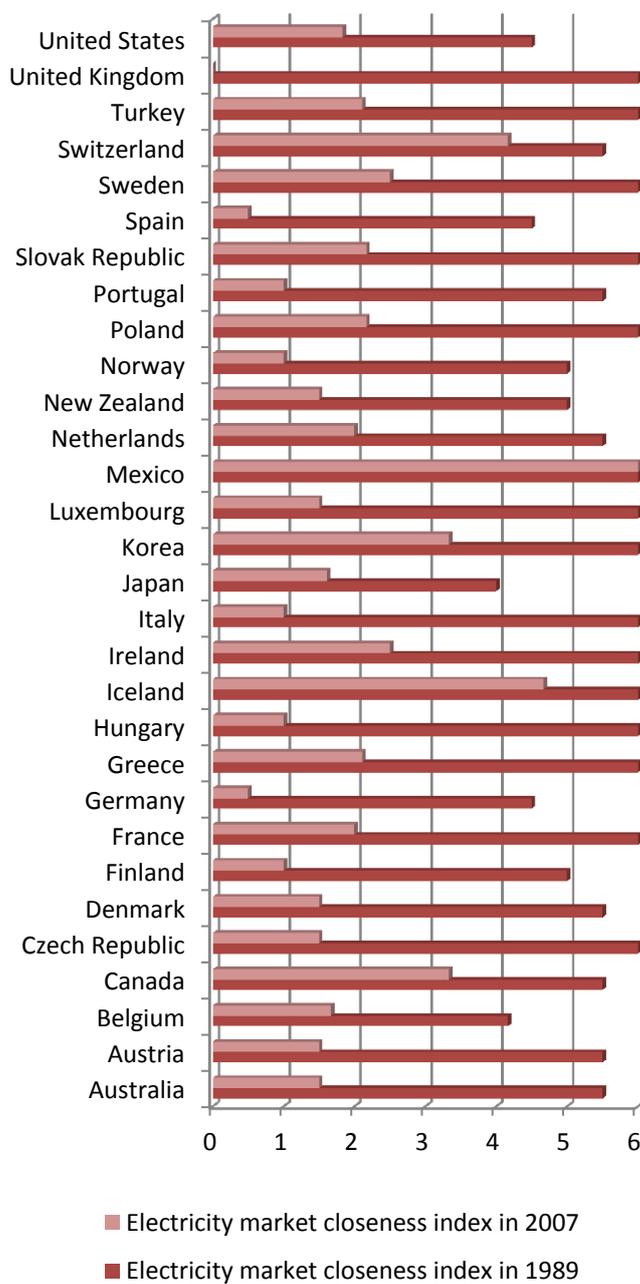
Figure 2. Electricity market closeness index in countries where EBRD operates (1989, 2007)

■ Electricity market closeness index in 2007
■ Electricity market closeness index in 1989
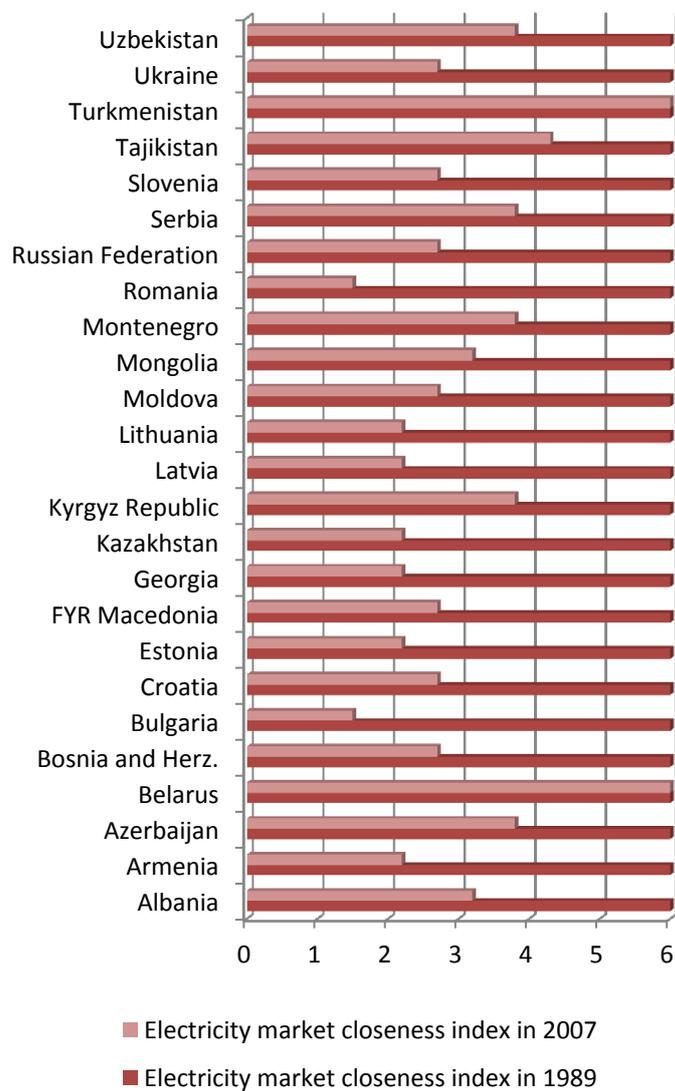
Figure 3. Histograms of industry value added, rural population and polity score variables
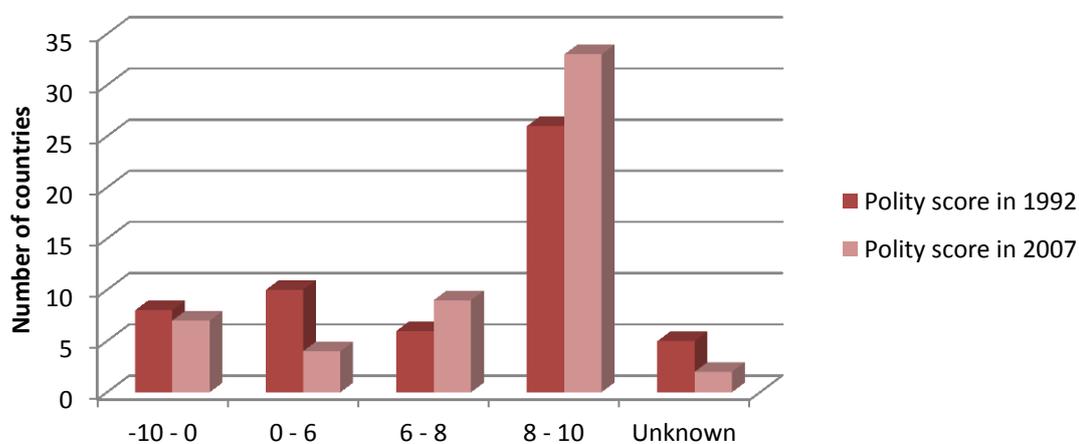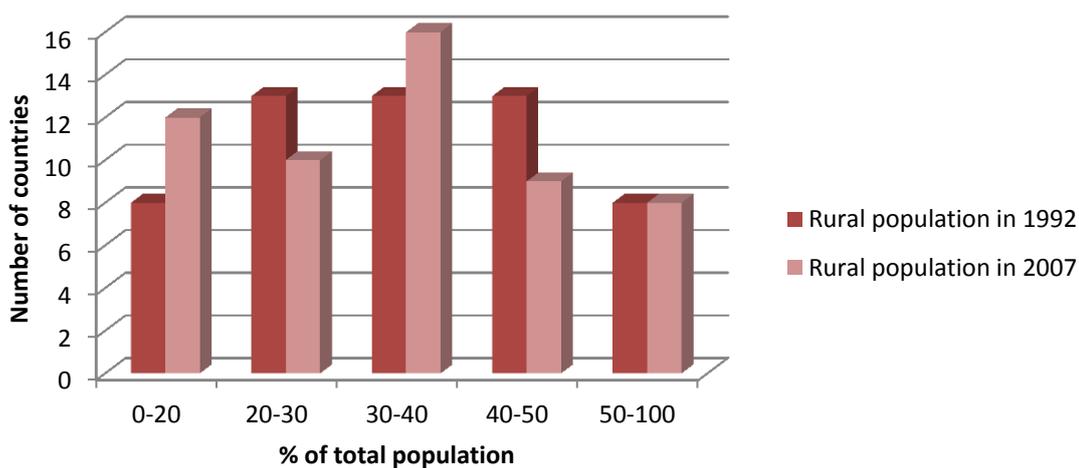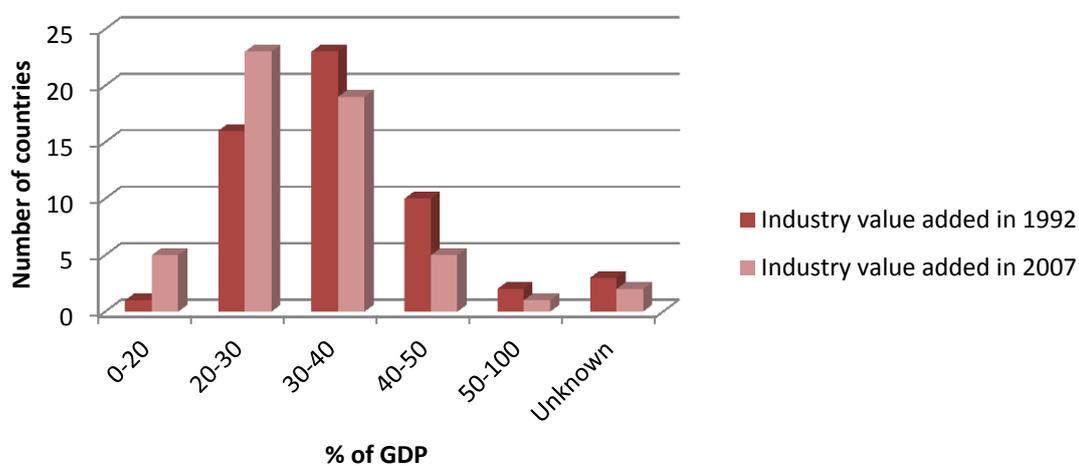
Figure 4. Total development assistance and aid received, 1990-2007
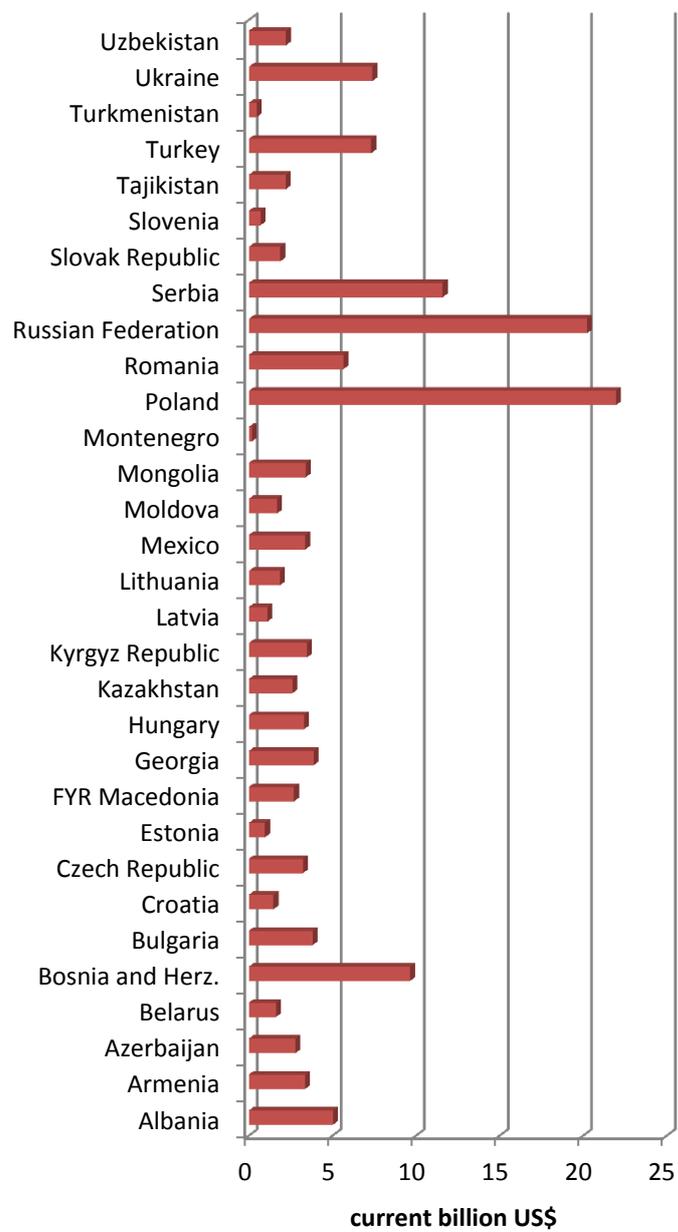
Figure 5. Gini coefficients (1995, 2005)

■ Gini coefficient in 1995   ■ Gini coefficient in 2005
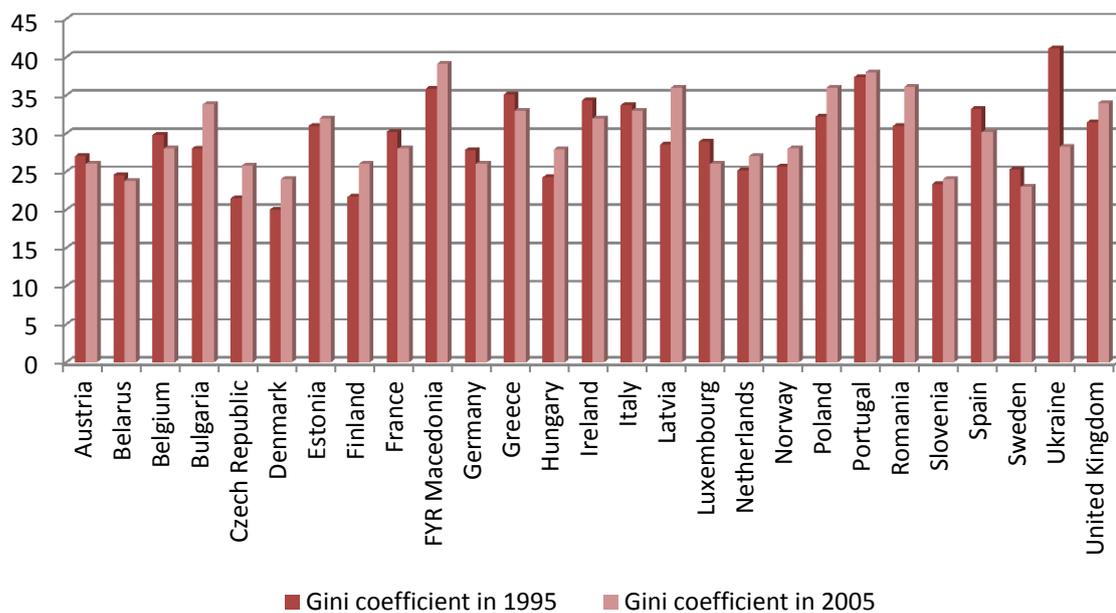
Figure 6. Electoral systems in 2007

Presidential or
semi-presidential
regimes
31%

Parliamentary
regimes
69%
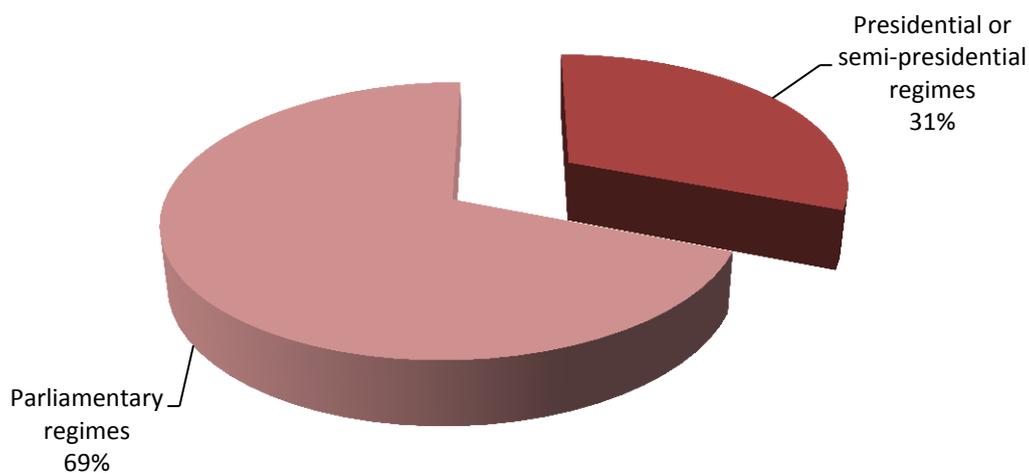
Figure 7. Adult education (1990, 2007)

Years of adult education in 1990

Years of adult education in 2007
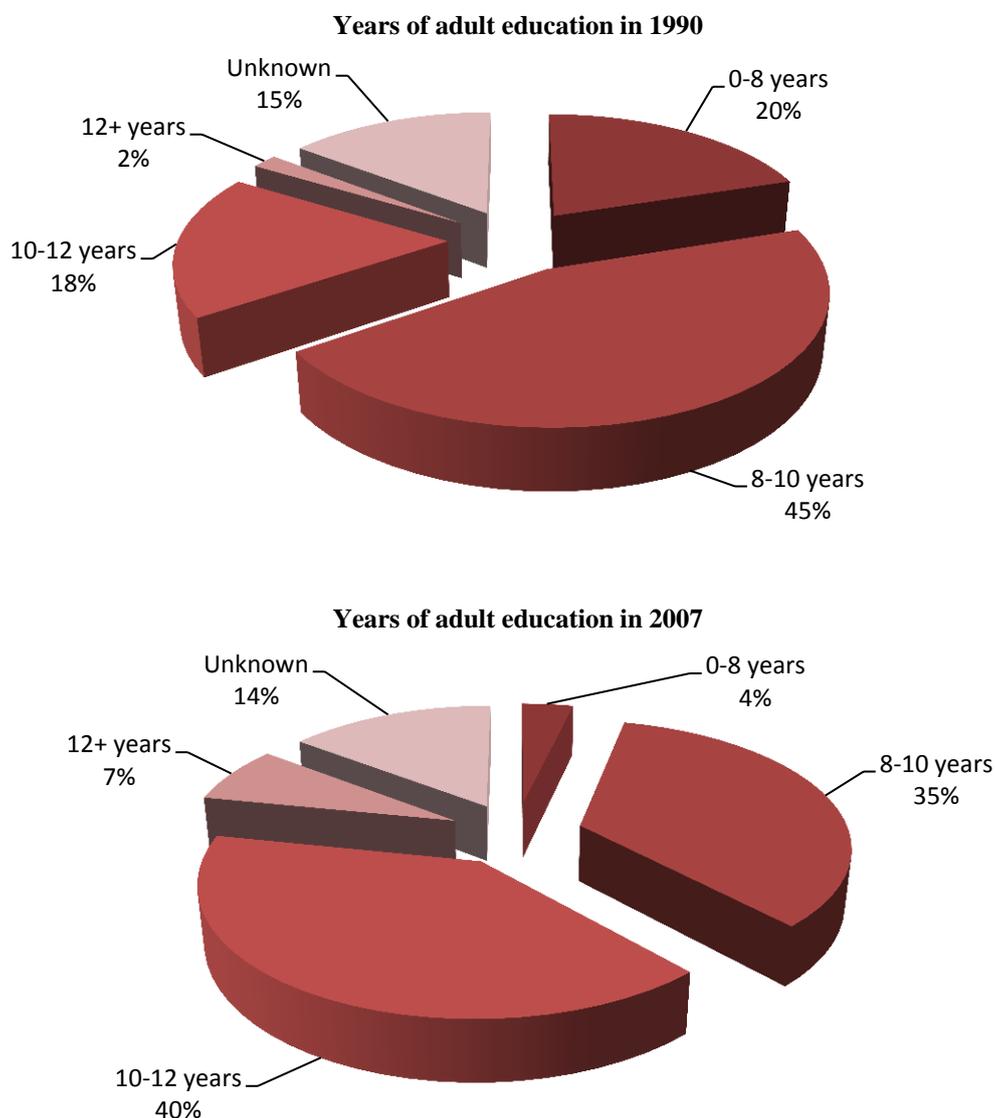
6. Empirical analysis and discussion of the results

Our analysis is composed of estimation of three main groups of models to test our hypotheses. Each main group includes two sub-groups of models: one for sub-indicators (entry barriers, public ownership and vertical integration in OECD countries) and another for overall indicator (OECD countries, non-OECD countries, all countries). In total, we estimate 18 models. Since using logarithms of variables enables us to interpret coefficients easily and is an effective way of shrinking the distance between values, we transform population density,

electricity consumption per capita, GDP per capita and imports of goods and services as % of GDP variables into logarithmic form and use these transformed variables in our models.

We start our analysis by applying Hausman test for fixed versus random effects in each model[4]. As usual, we prefer 5% significance level so any p-value less than 0.05 from Hausman test implies that we should reject the null hypothesis of there being no systematic difference in the coefficients. In other words, Hausman test with a p-value up to 0.05 indicates significant differences in the coefficients. Therefore, in our analysis, if we get a p-value less than 0.05, we choose fixed effects model. However, if p-value from Hausman test is above 0.05, we cannot reject the null hypothesis of there being no systematic difference in the coefficients at 5% level. In such a case, we apply Breusch and Pagan Lagrangian Multiplier (BPLM) test for random effects in order to decide on using either pooled OLS or random effects in our analysis. This test is developed to detect the presence of random effects. In this test, the null hypothesis is that variances of groups are zero; that is, there is no unobserved heterogeneity, all groups are similar. If the null is not rejected, the pooled regression model is appropriate. That is, if the p-value of BPLM test is below 0.05, we reject the null, meaning that random effects specification is the preferred one. If it is above 0.05, we prefer pooled OLS specification to carry out our regression. Tables below show a summary of estimation results that present statistically significant coefficients and their standard errors. Full details of estimation results are provided in Appendix 3 including the full estimation output, the number of observations and the countries included in each model, results of Hausman and BPLM tests and preferred specifications based on these tests.

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[4] Throughout the paper, model estimations are carried out and cross-checked by Stata 11.2 and Eviews 7.1.

Table 2. Estimation results for the models testing Hypotheses 1 and 2 (sub-indicators)

Dependent Variables →	Entry barriers (0-6)	Public Ownership (0-6)	Vertical integration (0-6)
Explanatory Variables ↓	*(OECD countries)*	*(OECD countries)*	*(OECD countries)*
Industry value added (% of GDP)	0.129*** (0.027)	0.076*** (0.015)	0.128*** (0.025)
Rural population (% of total population)	*NS*	*NS*	*NS*
Gini coefficient (0-100)	*NS*	*NS*	*NS*
Polity score (-10,+10)	0.178*** (0.046)	*NS*	0.109*** (0.042)
EU member (0-1)	-1.61*** (0.319)	*NS*	-1.407*** (0.294)
OECD member (0-1)	1.717*** (0.419)	*NS*	0.907** (0.386)
Existence of electricity market reform idea (0-1)	1.078*** (0.274)	*NS*	0.521** (0.252)
Log of population density	*NS*	9.221*** (1.357)	*NS*
Log of electricity consumption per capita (MWh)	2.566*** (0.796)	-1.188*** (0.423)	*NS*
Log of GDP per capita (PPP, cur. thousand int. $)	-5.201*** (0.536)	-1.157*** (0.285)	-3.679*** (0.494)
Average number of years of adult (25+) education	*NS*	*NS*	*NS*
Log of imports of goods and services (% of GDP)	-2.415*** (0.582)	-0.936*** (0.31)	-1.444*** (0.536)
Constant	*NS*	-25.833*** (5.876)	17.055* (10.177)

Standard errors are shown in parentheses () with coefficients.
"NS": The coefficient is not significant even at 10% level.
Coefficient that is significant at ***1% level, **5% level, *10% level.

Table 3. Estimation results for the models testing Hypotheses 1 and 2 (overall indicator)

Dependent Variables →	Overall indicator (0-6)	Overall indicator (0-6)	Overall indicator (0-6)
Explanatory Variables ↓	*(OECD countries)*	*(Non-OECD countries)*	*(All countries)*
Industry value added (% of GDP)	0.111*** (0.018)	0.057*** (0.012)	0.087*** (0.012)
Rural population (% of total population)	*NS*	-0.157* (0.082)	*NS*
Gini coefficient (0-100)	*NS*	*NS*	*NS*
Polity score (-10,+10)	0.091*** (0.03)	*NS*	0.063*** (0.023)
EU member (0-1)	-0.927*** (0.21)	0.463* (0.25)	-0.517*** (0.176)
OECD member (0-1)	0.889*** (0.275)	(omitted)	0.551** (0.242)
Existence of electricity market reform idea (0-1)	0.569*** (0.18)	(omitted)	0.314* (0.164)
Log of population density	3.153* (1.675)	*NS*	*NS*
Log of electricity consumption per capita (MWh)	*NS*	4.001*** (0.568)	1.655*** (0.43)
Log of GDP per capita (PPP, cur. thousand int. $)	-3.345*** (0.352)	-3.009*** (0.351)	-2.963*** (0.252)
Average number of years of adult (25+) education	*NS*	*NS*	-0.336*** (0.108)
Log of imports of goods and services (% of GDP)	-1.598*** (0.382)	*NS*	-1.209*** (0.298)
Constant	*NS*	*NS*	14.773*** (5.705)

Standard errors are shown in parentheses () with coefficients.
"NS": The coefficient is not significant even at 10% level.
Coefficient that is significant at ***1% level, **5% level, *10% level.

Table 4. Estimation results for the models testing Hypothesis 3 (sub-indicators)

Dependent Variables →	Entry barriers (0-6)	Public Ownership (0-6)	Vertical integration (0-6)
Explanatory Variables ↓	*(OECD countries)*	*(OECD countries)*	*(OECD countries)*
Net official assistance and aid received	-0.628** (0.311)	*NS*	*NS*
EU member (0-1)	-1.06*** (0.234)	0.227* (0.119)	-1.171*** (0.214)
OECD member (0-1)	2.136*** (0.287)	-0.371** (0.147)	1.125*** (0.262)
Existence of electricity market reform idea (0-1)	1.125*** (0.178)	*NS*	0.626*** (0.162)
Log of population density	*NS*	7.314*** (0.73)	2.843** (1.307)
Log of electricity consumption per capita (MWh)	2.984*** (0.408)	-0.354* (0.208)	1.297*** (0.373)
Log of GDP per capita (PPP, cur. thousand int. $)	-5.987*** (0.347)	-1.273*** (0.177)	-4.536*** (0.316)
Average number of years of adult (25+) education	-0.226** (0.103)	-0.226*** (0.052)	*NS*
Log of imports of goods and services (% of GDP)	-2.491*** (0.399)	-0.621*** (0.203)	-2.002*** (0.364)
Constant	23.5*** (5.198)	-16.994*** (2.651)	7.825* (4.747)

Standard errors are shown in parentheses () with coefficients.
"NS": The coefficient is not significant even at 10% level.
Coefficient that is significant at ***1% level, **5% level, *10% level.

Table 5. Estimation results for the models testing Hypothesis 3 (overall indicator)

Dependent Variables →	Overall indicator (0-6)	Overall indicator (0-6)	Overall indicator (0-6)
Explanatory Variables ↓	*(OECD countries)*	*(Non-OECD countries)*	*(All countries)*
Net official assistance and aid received	-0.334* (0.202)	-0.557** (0.252)	*NS*
EU member (0-1)	-0.668*** (0.152)	*NS*	-0.778*** (0.14)
OECD member (0-1)	0.964*** (0.187)	(omitted)	0.671*** (0.18)
Existence of electricity market reform idea (0-1)	0.576*** (0.116)	(omitted)	0.342*** (0.108)
Log of population density	3.429*** (0.933)	*NS*	1.314* (0.698)
Log of electricity consumption per capita (MWh)	1.309*** (0.266)	2.208*** (0.309)	1.571*** (0.213)
Log of GDP per capita (PPP, cur. thousand int. $)	-3.932*** (0.226)	-1.898*** (0.219)	-3.139*** (0.154)
Average number of years of adult (25+) education	-0.115* (0.067)	-1.353*** (0.209)	-0.338*** (0.063)
Log of imports of goods and services (% of GDP)	-1.705*** (0.26)	*NS*	-1.099*** (0.168)
Constant	*NS*	11.222* (6)	10.84*** (2.601)

Standard errors are shown in parentheses () with coefficients.
"NS": The coefficient is not significant even at 10% level.
Coefficient that is significant at ***1% level, **5% level, *10% level.

Table 6. Estimation results for the models testing Hypotheses 4 and 5 (sub-indicators)

Dependent Variables →	Entry barriers (0-6)	Public Ownership (0-6)	Vertical integration (0-6)
Explanatory Variables ↓	*(OECD countries)*	*(OECD countries)*	*(OECD countries)*
Single-party government (0-1)	*NS*	-0.144* (0.085)	-0.229* (0.139)
The years the chief executive has been in office	0.042** (0.018)	0.033*** (0.009)	0.044*** (0.015)
Economic policy orientation of ruling party: Right	*NS*	*NS*	-0.526** (0.211)
Economic policy orientation of ruling party: Left	-0.423* (0.246)	*NS*	-0.38* (0.214)
Economic policy orientation of ruling party: Center	(omitted)	(omitted)	(omitted)
Parliamentary regimes (0-1)	*NS*	-0.407* (0.231)	*NS*

Professional background of head of executive			
- Entrepreneur	*NS*	-0.457*** (0.161)	-0.591** (0.264)
- Scientist, Economics	1.333*** (0.389)	*NS*	1.982*** (0.335)
- Military	*NS*	*NS*	*NS*
- Politician	0.482** (0.213)	-0.201* (0.117)	0.443** (0.191)
- Scientist, Other	0.446* (0.243)	-0.484*** (0.132)	*NS*
- Unknown/other	0.516** (0.227)	-0.302** (0.124)	0.725*** (0.202)
Educational background of head of executive			
- Economics	*NS*	*NS*	0.814* (0.468)
- Natural science	*NS*	1.123*** (0.33)	1.75*** (0.541)
- Other university	*NS*	*NS*	*NS*
- Unknown/other	*NS*	*NS*	*NS*
EU member (0-1)	-0.829*** (0.233)	*NS*	-1.282*** (0.206)
OECD member (0-1)	1.697*** (0.327)	-0.474*** (0.181)	0.966*** (0.293)
Existence of electricity market reform idea (0-1)	0.749*** (0.181)	*NS*	0.384** (0.158)
Log of population density	0.606*** (0.14)	*NS*	0.47** (0.218)
Log of electricity consumption per capita (MWh)	2.886*** (0.318)	*NS*	1.778*** (0.349)
Log of GDP per capita (PPP, cur. thousand int. $)	-5.73*** (0.321)	-0.638*** (0.187)	-4.266*** (0.299)
Average number of years of adult (25+) education	-0.24*** (0.085)	-0.333*** (0.055)	*NS*
Log of imports of goods and services (% of GDP)	-1.202*** (0.272)	*NS*	-1.484*** (0.296)
Constant	16.661*** (1.214)	9.582*** (0.972)	14.172*** (1.352)

Standard errors are shown in parentheses () with coefficients.
"NS": The coefficient is not significant even at 10% level.
Coefficient that is significant at ***1% level, **5% level, *10% level.

Table 7. Estimation results for the models testing Hypotheses 4 and 5 (overall indicator)

Dependent Variables →	Overall indicator (0-6)	Overall indicator (0-6)	Overall indicator (0-6)
Explanatory Variables ↓	*(OECD countries)*	*(Non-OECD countries)*	*(All countries)*
Single-party government (0-1)	*NS*	*NS*	*NS*
The years the chief executive has been in office	0.038*** (0.011)	*NS*	0.031*** (0.01)
Economic policy orientation of ruling party: Right	*NS*	(omitted)	*NS*
Economic policy orientation of ruling party: Left	-0.268* (0.159)	*NS*	-0.273** (0.137)
Economic policy orientation of ruling party: Center	(omitted)	*NS*	(omitted)
Parliamentary regimes (0-1)	*NS*	*NS*	*NS*
Professional background of head of executive			
- Entrepreneur	-0.431** (0.196)	*NS*	-0.412** (0.177)
- Scientist, Economics	1.195*** (0.248)	*NS*	0.642*** (0.202)
- Military	*NS*	*NS*	*NS*
- Politician	0.262* (0.141)	*NS*	*NS*
- Scientist, Other	*NS*	*NS*	*NS*
- Unknown/other	0.342** (0.149)	*NS*	*NS*

Educational background of head of executive			
- Economics	*NS*	*NS*	*NS*
- Natural science	0.948** (0.402)	*NS*	*NS*
- Other university	*NS*	*NS*	*NS*
- Unknown/other	*NS*	*NS*	*NS*
EU member (0-1)	-0.752*** (0.152)	*NS*	-0.583*** (0.15)
OECD member (0-1)	0.791*** (0.215)	(omitted)	0.831*** (0.217)
Existence of electricity market reform idea (0-1)	0.465*** (0.117)	(omitted)	0.27** (0.116)
Log of population density	0.272* (0.141)	*NS*	*NS*
Log of electricity consumption per capita (MWh)	1.696*** (0.249)	2.266*** (0.43)	1.779*** (0.254)
Log of GDP per capita (PPP, cur. thousand int. $)	-3.628*** (0.218)	-1.245*** (0.37)	-3.14*** (0.192)
Average number of years of adult (25+) education	-0.169*** (0.063)	-1.613*** (0.292)	-0.321*** (0.068)
Log of imports of goods and services (% of GDP)	-0.954*** (0.212)	*NS*	-1.127*** (0.186)
Constant	13.918*** (0.94)	*NS*	12.551*** (3.054)

Standard errors are shown in parentheses () with coefficients.
"NS": The coefficient is not significant even at 10% level.
Coefficient that is significant at ***1% level, **5% level, *10% level.

When we look at the results from the first group of models (Table 2 and Table 3), at first sight, we notice that there is a significant negative relationship between electricity market liberalization and the size of industry sector in OECD countries, meaning that countries with larger industry sectors tend to liberalize less. Urbanization and income equality seem to have almost no significant impact on regulatory reform in electricity markets. Besides, although there seems to be no relation between public ownership and polity score, overall we detect a negative correlation between polity score and power sector liberalization in OECD countries; that is; we cannot argue that liberalization policies are stronger in more democratic countries. These results are also valid for overall indicators for both OECD and non-OECD countries. There are two exceptions to this trend. First of all, the market liberalization process seems to speed up in non-OECD countries as the share of rural population in total population increases. Second, polity score does not have an impact on reform process in non-OECD countries.

As for the second group of models (Table 4 and Table 5), apparently, the countries that receive foreign financial aid or assistance are likely to liberalize their electricity markets and especially tend to reduce entry barriers to their power sector. In the last group of models (Table 6 and Table 7), we see that government structure (coalition or single-party) has an impact on the reform

process in OECD countries but does not seem to affect liberalization process in non-OECD countries. In OECD countries, single-party governments accelerate the reform process by reducing public ownership and vertical integration. Moreover, we detect a negative relationship between the years the chief executive has been in office and the reform process in OECD countries. The same relationship is not observed in non-OECD countries. Furthermore, we identify a decrease in vertical integration in electricity industry during the terms of parties with "right" or "left" ideologies in OECD countries. The ruling parties with "left" ideology seem to reduce entry barriers in OECD countries. Economic policy orientation of the ruling party does not affect the reform process in non-OECD countries. Similarly, electoral system (majoritarian or presidential) does not seem to influence liberalization process much while entry barriers seem to be lower in countries with parliamentary systems. In addition, professional and educational backgrounds of head of executive branch (prime minister, president and so on) have very significant impact on reform process in OECD countries. Background of head of executive branch is not important in non-OECD countries. Leaders with a professional background as entrepreneurs speed up electricity market liberalization process in OECD countries while those with a background as economists slow it down. Non-economist scientists decrease public ownership but increase entry barriers. We could not detect a statistically significant relationship between a military background and reform process. Head of executives with a background as politicians decrease public ownership but increase entry barriers and vertical integration. As for educational background, the reforms seem to progress slower in OECD countries if the head of executive has an educational background in economics or natural science. Especially, those with a background in economics increase vertical integration while those with a background in natural science increase both vertical integration and public ownership. The interpretation of the results in detail is as follows:

Results from the first group of models testing Hypotheses 1 and 2:

(1) In the first group of models, our empirical findings suggest that there is an inverse relationship between the size of the industry sector and electricity

market liberalization process. As industry value added (as % of GDP) increases in a country, power market structure of that country becomes less liberal. For example, if industry value added of an OECD country increases from 40% to 50% of GDP; entry barriers, public ownership and vertical integration scores (on 0-6 scales) of that country increase by 1.29, 0.76 and 1.28 points, respectively.

(2)   Urbanization and income equality seem to have almost no impact on reform process. The only statistically significant impact is that an increase in rural population in non-OECD countries (as % of total population) seems to speed up liberalization process in electricity industry; however this impact is quite limited. For instance, if rural population in a non-OECD country increases from 20% to 30% of total population, overall indicator (on a 0-6 scale) of that country decreases by 1.57 points.

(3)   One of the most surprising results is that in most cases there is a negative relationship between polity score and electricity market liberalization process in OECD countries, meaning that politically more liberal OECD countries prefer to liberalize their electricity markets less. Democracy does not seem to be an important factor explaining the reform process in non-OECD countries. For example, if polity score (on a -10 to +10 scale) of an OECD country increases from 3 to 8, entry barriers and vertical integration scores (on 0-6 scales) of that country increases by 0.89 and 0.55 points, respectively.

Results from the second group of models testing Hypothesis 3:

(4)   Our analysis reveals that countries that receive foreign financial assistance or aid tend to liberalize their electricity market more than a country that does not receive any assistance or aid. This finding holds true for both OECD and non-OECD countries. However, the tendency of liberalization in OECD countries is towards reducing entry barriers to their electricity markets. We could not detect any statistically significant impact of assistance or aid on public ownership or vertical integration. Our results imply that if an OECD country receives foreign financial

assistance or aid, its entry barriers score (on a 0-6 scale) reduces by 0.6 point.

Results from the third group of models testing Hypotheses 4 and 5:

(5)   We could not detect any statistically significant result for the impact of government structure (single party or coalition) on overall electricity market liberalization process. The only exception is that single-party governments seem to reduce public ownership and vertical integration in OECD countries. The same holds true for the electoral system (majoritarian or presidential) with the only exception that public ownership score (on a 0-6 scale) of a country with a parliamentary system tends to be 0.4 point less than one with a presidential system.

(6)   As for economic policy orientation of ruling party, our results imply that right wing governments do not have a statistically significant overall effect on reform process. However, we see that they reduce vertical integration in OECD countries. On the other hand, left wing governments seem to speed up the reform process in OECD countries. Left wing governments in OECD countries reduce entry barriers and vertical integration scores (on 0-6 scales) by 0.42 and 0.38 points, respectively.

(7)   Our findings suggest that as the number of years the chief executive has been in office increases, the reform progress slows down in OECD countries. We could not detect a statistically significant relationship between political stability and reform process for non-OECD countries.

(8)   Our results clearly show that the professional and educational backgrounds of head of executives (prime ministers, presidents and so on) are significant for the reform process in OECD countries. For non-OECD countries, we could not identify a statistically significant relationship. In OECD countries, leaders' background in economics or natural sciences influences the reform process. We could not detect such an effect for other university degrees. The same influence holds true for leaders with a professional background as businessman, scientist

(economist and others), or politician. Our results do not indicate significant results for military officers.

(9)   We observe a negative relationship between an educational background in economics or natural sciences and the vertical integration score in OECD countries. This relationship is much stronger with an educational background in natural sciences. Our findings suggest that if the head of executive of a country has an educational background in economics or natural sciences, vertical integration score (on a 0-6 scale) of that country increases by 0.81 and 1.75 points, respectively. As for entry barriers and public ownership, we could not detect a meaningful relationship for an educational background in economics but leaders with a background in natural sciences seem to increase public ownership by 1.1 points.

(10)   As for professional backgrounds, our study finds that businessmen speed up the regulatory reform in OECD countries while scientists (economists) and politicians slow the liberalization process down. If head of executive of a country has a professional background as entrepreneur, then public ownership and vertical integration scores (on 0-6 scales) of that country reduce by 0.45 and 0.59 points, respectively. On the other hand, if s/he has a professional background as scientist (economist), entry barriers and vertical integration scores increase by 1.33 and 1.98 points, correspondingly.

(11)   In OECD countries, heads of executive with a professional background as politicians decrease public ownership but increase entry barriers and vertical integration. On the other hand, those with a background as scientists (other than economists) have a tendency to increase entry barriers but to reduce public ownership.

Results from control variables:

(12)   Out of 18 models we estimate, 12 models suggest that being an EU member country considerably contributes to efforts for electricity market liberalization. In most cases, this effect is large and statistically significant even at 1% level. The reverse holds true for being an OECD country. The

results from 12 models imply that being an OECD country slows down electricity market liberalization process. The relative magnitude of these effects changes from one model to another. Therefore, being a member of both EU and OECD does not have a uniform effect on the reform process.

(13) Surprisingly, the existence of electricity market reform idea limits the reform progress, which implies that the early reformers had an advantage than the late comers in terms of reform implementation. This result may be explained by reform failures in some countries (e.g. California disaster).

(14) Population density and electricity consumption per capita seem to have a negative correlation with liberalization process in power industry, meaning that densely populated countries with higher per capita electricity consumption tend to liberalize their electricity markets less.

(15) On the other hand, per capita income, education level and imports of goods and services (% of GDP) tend to have a positive correlation with liberalization process. Countries with higher per capita income and education level that import a higher portion of goods and services from abroad introduce more reform elements in their electricity markets.

(16) Finally, we see that country specific features tend to have a high power in explaining regulatory reform in electricity industries.

To illustrate our results, we provide an example for each of our hypotheses that presents the quantitative impact of political economic variables on the reform progress using data from our dataset. The example for Hypothesis 1 is as follows. Overall electricity market closeness indexes (on a 0-6 scale) of Turkey and Portugal for 2007 are 2.1 and 1.0; and industry value added (as % of GDP) in these countries was 28.3 and 24.9 in the same year, respectively. Our results suggest that if industry value added (as % of GDP) increases by one unit, electricity market closeness index is expected to rise by 0.087 point (see Table 3). Therefore, holding all other variables constant and assuming that two countries are the same apart from their industry value added figures and electricity market closeness indexes, our results suggest that Portugal's electricity market closeness index might be 1.3 [1+ 0.087* (28.3-24.9)] if

Portugal's industry value added figure were to be equal to that of Turkey (i.e. 28.3). So, our findings imply that 0.3 of 1.1 points difference between the electricity market closeness indexes of two countries may be explained by the difference between their industry value added figures.

The second quantitative example relates to the impact of the size of rural population on reform progress. Our results point out that if rural population (as % of total population) in a non-OECD country increases by 1%, overall electricity market closeness indexes (on a 0-6 scale) of that country decreases by 0.157 point (see Table 3). For 2009, overall electricity market closeness indexes (on a 0-6 scale) of Turkmenistan and Uzbekistan are 6.0 and 3.8; and rural population (as % of total population) in these countries was 50.94 and 63.14, respectively. Hence, holding all other variables constant and assuming that two countries are the same apart from the sizes of their rural population and electricity market closeness indexes, our results suggest that Turkmenistan's electricity market closeness index might be 4.08 [6-0.157*(63.14-50.94)] if Turkmenistan's rural population figure were to be equal to that of Uzbekistan (i.e. 63.14). So, our findings imply that 1.92 of 2.2 points difference between the electricity market closeness indexes of two countries may be explained by the difference between the sizes of their rural population.

The third example is about foreign financial aid and/or assistance. Our results show that if foreign financial aid and/or assistance in a non-OECD country increase by $1 billion, overall electricity market closeness index (on a 0-6 scale) of that country decreases by 0.557 point (see Table 5). For 2009, overall electricity market closeness indexes (on a 0-6 scale) of Azerbaijan and Armenia are 3.8 and 2.2; and foreign financial aid and/or assistance in these countries was $0.23 and $0.53 billion, respectively. Hence, holding all other variables constant and assuming that two countries are the same apart from the amount of foreign financial aid and/or assistance and electricity market closeness indexes, our results suggest that Azerbaijan's electricity market closeness index might be 3.64 [3.8-0.557*(0.53-0.23)] if Azerbaijan's foreign financial aid and/or assistance were to be equal to that of Armenia (i.e. 0.53). So, our findings imply

that 0.16 of 1.6 points difference between the electricity market closeness indexes of two countries may be explained by the difference between the amount of foreign financial aid and/or assistance received by each country.

The following example illustrates the impact of political stability (measured by the years the chief executive has been in office) on reform progress. In 2007, New Zealand and Spain had an electricity market closeness index of 1.5 and 0.5, respectively. At that year, the chief executive had been in office for the last 9 years in New Zealand and for 3 years in Spain. Our findings suggest that if the years the chief executive has been in office increases by 1 year, overall electricity market closeness index (on a 0-6 scale) is expected to increase by 0.031 point (see Table 7). So, holding all other variables constant and assuming that two countries are the same apart from the years the chief executives have been in office in two countries and electricity market closeness indexes, our results suggest that Spain's electricity market closeness index might be 0.69 [0.5+0.031*(9-3)] if the years the chief executive has been in office in Spain were to be equal to that of New Zealand (i.e. 9). So, our findings imply that 0.19 of 1 point difference between the electricity market closeness indexes of two countries may be explained by the difference between the years the chief executives have been in office in two countries.

The final example is concerned with the relationship between the background of head of executive and the extent of electricity market reforms. Our findings suggest that if the head of executive has a professional background as entrepreneur, electricity market closeness index decreases by 0.412 point; and if s/he has a background as economist (scientist), the index increases by 0.642 point (see Table 7). In 2007, the professional backgrounds of head of executives were entrepreneur and economist in Hungary and Bosnia & Herzegovina, respectively. Electricity market closeness indexes were 1 for Hungary and 2.7 for Bosnia & Herzegovina for the same year. Holding all other variables constant and assuming that two countries are the same apart from the professional backgrounds of head of executives and electricity market closeness indexes, our results suggest that Bosnia & Herzegovina's electricity market closeness index

might be 1.6 [2.7-0.642-0.412] if the professional background of Bosnia & Herzegovina's head of executive were to be the same as that of Hungary (i.e. entrepreneur). So, our findings imply that 1.1 of 1.7 points difference between the electricity market closeness indexes of two countries may be explained by the difference between the professional backgrounds of head of executives in two countries.

To sum up, based on our results, we reject Hypothesis 2 and partially reject Hypothesis 4; but clearly fail to reject Hypotheses 1, 3 and 5.

7. Conclusion

This paper examined the political economy of liberalization in the electricity industries in the last decades. We empirically analysed the political economy of reform in the electricity industries of 55 countries during the period 1975–2010 with the aim of shedding light on the differing paces of reform in different countries. The use of a unique data set obtained by merging different data sources on political, government and reform structures as well as private interests and government ideologies allowed us to explore time-series and cross-sectional variation in the political process of economic liberalization. Our findings are consistent with the rationale that the structure of political economic system has a strong effect on reform outcomes, and that the relative strength of economic and political variables matters for the implementation of the reforms. That is, consistent with a generalized interest group theory, our results suggest that a portion of the differences in the reform experiences of reforming countries in the past three decades can be explained by differences in the political structure, in the ideology of the government and in the professional and educational backgrounds of the political leaders.

In the course of the study, we discover that democracy negatively affects the pace of reforms, maybe, by magnifying the voices of anti-reform interest groups. We also notice that countries with a strong presence of industry sector are less likely to liberalize their power industry. This may be an indication that industrial

consumers prefer guaranteed subsidized prices in a closed market to the possibility of future reduced prices in a liberal market. Besides, our results imply that countries receiving foreign financial support are more likely to liberalize their electricity markets, which underlines the point that reforms may not be always voluntary. We also discover that government structure (coalition or single-party) has an impact on the reform process in OECD countries but does not seem to affect liberalization process in non-OECD countries. In OECD countries, single-party governments accelerate the reform process. Moreover, we see a negative relationship between the years the chief executive has been in office and the reform progress in OECD countries, which falsifies the assumed linkage between political stability and reform progress. Furthermore, our study identifies a decrease in vertical integration in electricity industry during the terms of parties with "right" or "left" ideologies in OECD countries. The ruling parties with "left" ideology seem also to reduce entry barriers in OECD countries.

The study also questions whether politicians' education and profession matter for the electricity market reforms. Overall, our results show that they do. According to our results, reforms are more likely to occur if the head of government has been an entrepreneur before entering into politics. Personal capabilities required to manage a company thus seem to be advantageous in promoting economic reform. Moreover, during the tenure of former professional economists, reforms are less likely. This result may also be plausible if we take into account the fact that many economists educated before the 1990s are taught that electricity industry is a natural monopoly and, therefore, an unbundled power sector may result in inefficiency in the provision of electricity service. We also provide evidence that the reforms seem to progress slower in OECD countries if the head of executive has an educational background in economics or natural science. Especially, those with a background in economics increase vertical integration while those with a background in natural science increase both vertical integration and public ownership in the sector. In summary, our analysis confirms that the personal background of political leaders may be important. Clearly, other characteristics of politicians also matter for successful policy, and profession and education alone do not guarantee success. Besides, the

focus of our analysis is restricted to economic reforms. Arguably, other policy dimensions are as equally important as the economic policy. Whether and to what extent those types of education and profession identified here as being supportive for market-oriented liberal reforms are also successful in other areas remain for future research. Moreover, as a result of our analysis, we reached certain surprising conclusions; all of which are, however, perfectly explicable and robust thanks to our extensive dataset.

The most important single policy implication that can be derived from these findings for the electricity industry and, to some extent, for other infrastructure industry reform is that future liberalization programs should give due attention to the political economic environment of the countries.

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Appendices

Appendix 1: Summary of previous applied econometric studies adopting a political economy approach

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
Alesina et al. (2006)	**H:** It is easier to stabilize an economy more decisively in times of crisis than in times of more "moderate" economic problems	- Deficit/GDP ratio - Inflation rate	- Number of executive constraints - Election year - Political orientation of the ruling government - Assembly or parliamentary system - Executive control of absolute majority - Number of years left in the current term for the executive - Total government deficit as a share of GDP and inflation - The real per capita GDP - The ratio of exports and imports to GDP - The dummy taking value 1	- Stabilizations are more likely to occur during crisis, at the beginning of term of office of a new government, in countries with "strong" governments (i.e. presidential systems and unified governments with a large majority of the party in office), and when the executive faces less constraints - The role of external inducements like IMF programs has at best a weak effect	**Data:** - Yearly data on a large sample of developed and developing countries covering from 1960 to 2003 - Source(s): Polity IV project, World Bank's Database of Political Institutions, IMF's International Financial Statistics (IFS) database, Penn World Table **Methodology:** - OLS

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
			if the country is currently in crisis - Participation to IMF programs		
Boschini (2006)	**H-1:** The skills of the political elite and political institutions play a crucial role for industrialisation to occur **H-2:** The government (controlled by elite or through a pivotal voter) must have the ability as well as the incentives to promote the industrialisation process	- Industrialisation index - GDP growth 1820-1913	- Political regime - Enrolment in primary education - Index of the favourableness of attitudes toward entrepreneurship - Index of concentration in landholdings	- A flat wealth distribution and skilled political elite enhance development the most in elitist regimes, while democracies perform as well as elitist regimes in terms of industrialisation	**Data:** - 23 countries from 1820 to 1913 - Source(s): Comparative Patterns of Economic Development 1850–1914, John Hopkins University **Methodology:** - Partial sums of squares
Chang & Berdiev (2011)	**H:** Government ideology, political factors and globalization are crucial for energy regulation in electricity and gas industries	- The growth rate of regulation indicator in energy industry	- Government ideology - Herfindahl index to proxy for government fragmentation - Number of years that the incumbent government has been in office	- Left-wing governments promote regulation in gas and electricity sectors - Less politically fragmented institutions contribute to deregulation of gas and electricity industries	**Data:** - 23 OECD countries over the period 1975-2007 - Source(s): Conway and Nicoletti (2006), Potrafke (2009), Beck

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
			- Index of political constraints - Globalization index - Energy demand - Real GDP per capita (constant in 2000)	- Long tenures of incumbent government have limited impact on regulation in electricity sector, while it is associated with an increase in regulation of gas sector - Higher political constraints and more globalization lead to deregulation in electricity and gas sectors - Economic and social integration are the forces that promote deregulation in the gas industry, whereas political integration advances deregulation in the electricity industry	et al. (2001), Henisz (2000), World Bank, BP **Methodology:** - The bias-corrected least square dummy variable model
Cubbin & Stern (2006)	**H:** A regulatory law and higher quality regulatory governance are associated with superior outcomes in the electricity industry	- Per capita generation capacity	- Electricity (or energy) regulatory law - Autonomous or ministry regulator - License fee or government budget regulatory funding	- Controlling for privatization and competition and allowing for country-specific fixed effects, both regulatory law and higher quality	**Data:** - 28 developing economies over 1980-2001 - Source(s): U.S. Energy Information

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
			- Free or mandatory civil service pay scales for regulatory staff - Real GDP per capita - Debt payments as a proportion of national income - Industry value added as proportion of GDP	regulatory governance are positively and significantly associated with higher per capita generation capacity	Agency, World Bank **Methodology:** - Panel data modelling, error correction models
Dreher et al. (2009)	**H:** The educational and professional background of a head of government matters for the implementation of market-liberalizing reforms	- Composite index of economic freedom - Size of government index - Legal structure and security of property rights index - Access to sound money index - Exchange with foreigners index - Regulation of credit, labour and business index	- Profession of heads of governments - Education of heads of governments - Economic freedom - Economic growth - Civil liberties - Aid - Linguistic fractionalization - Currency crises - Government fractionalization - Coalition government	- Reforms are more likely during the tenure of former entrepreneurs - Entrepreneurs belonging to a left-wing party are more successful in inducing reforms than a member of a right-wing party with the same previous profession - Former professional scientists also promote reforms, the more so, the longer they stay in office - The impact of politicians'	**Data:** - Panel data over the period 1970–2002 - Profession and education of more than 500 political leaders from 72 countries - Source(s): Gwartney and Lawson (2004), World Bank, Alesina et al. (2003), Freedom House, Beck et al. (2001), Dreher (2006)

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
				education is not robust and depends on the method of estimation	**Methodology:** - Pooled time-series cross-section (panel data) regressions - Feasible generalized least squares
Duso & Seldeslachts (2010)	**H:** Differences in political, government and regulatory environments explain the differing speed of reforms in the mobile telecom industries at the beginning of the 1990s	- Degree of liberalization in the digital mobile industry	- Share of incumbent operator in long-distance telecom - Annual revenues in the mobile telecommunications industry - Dummy variables for regulatory independence - Number of parties in the opposition - Percentage seats in the legislature held by government parties - Government's programmatic position: Pro market regulations - Government's	- Majoritarian electoral systems are important drivers for change, while independent industry regulators slow down the reforms - Powerful industry incumbents hold up the liberalization process and governing bodies that favour a small welfare state accelerate it	**Data:** - 24 OECD countries - Source(s): OECD regulation database, Persson and Tabellini (1999), Woldendorp et al. (1998), Budge et al. (2001), Lijphart (1999) **Methodology:** - Ordered probit model with country random-effects

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
			programmatic position: Pro welfare state limitation - Population - Share of active population aged between 15 and 64 years - Annual income per capita		
Duval (2008)	**H:** Macroeconomic policies and ideology influence reform patterns in labour and product markets	- Policy index	- Unemployment - Output gap - Crisis years - Small country - Ideology - Fractionalisation - Degree of sustainability of public debt - Fiscal expansion	- Sound public finances and fiscal expansions help foster reforms - The effect of fiscal expansion may also be greater for countries that pursue fixed exchange-rate regimes	**Data:** - 21 OECD countries over the period 1985–2003 - Source(s): OECD **Methodology:** - Multivariate probit and linear econometric models
Fredriksson & Wollscheid (2008)	**H:** Corruption and political instability are important determinants of firm investment in pollution control technology	- Level of investment in clean technology in the steel industry	- The respect that institutions and citizens use to govern their interactions - The degree to which business transactions involve corruption - The perception of the	- Greater corruptibility increases the level of abatement technology investment because the strategic incentive to underinvest in pollution control technology declines	**Data:** - Steel-sector panel data from 41 countries for the years 1992–1998 - Source(s): International Iron and

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
			quality of public service provision - Political instability - Social and Institutional Capacity index - The size of the steel market - Per capita steel production - Total steel exported as a percentage of total steel produced - Total trade as a share of GDP - Gastil index - Government commitment - Per capita gross domestic product	when policymakers become more corruptible - Political instability raises abatement technology investment	Steel Institute, Kaufman et al. (1999), Banks (1995), CIESIN of Columbia University, Freedom House, World Bank **Methodology:** - Panel data estimation (fixed and random effects models)
Gasmi et al. (2009)	**H:** There is a strong relationship between the quality of political institutions and the performance of regulation in telecommunications sector	- Mainline coverage - Cellular subscription - Mainlines per employee - Price of monthly subscript to fixed-line service	- Regulatory governance index - Corruption - Bureaucracy - Law and order - Expropriation - Currency risk	- The impact of political accountability on the performance of regulation is stronger in developing countries - Future reforms in these countries should give due	**Data:** - Panel data for 29 developing countries and 23 developed countries during 1985–99 - Source(s): Gasmi,

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
		- Price of cellular service	- Institutional environment index - Checks and balances - Privatization - Competition in fixed and cellular line services - Rural population - Population density	attention to the development of politically accountable systems	Noumba, and Recuero Virto (2006) **Methodology:** - Differenced generalized method-of-moments estimation
Gasmi & Virto (2010)	**H:** Sectoral, institutional and financial factors are important determinants of the reforms implemented in telecommunication industry	- Fixed-line deployment - Cellular competition (analogue) - Counter (analogue) - Cellular competition (digital) - Counter (digital) - Fixed-line competition (local) - Separate regulator - Privatization	- Corruption - Institutional index - Democracy index - Risk index - Total debt service - Net taxes on products - Aid per capita - Population density - Rural population - Imports - Telecommunications staff - Checks and balances - English legal origin - French legal origin - Share of protestant (1980)	- Sectoral as well as institutional and financial factors are found to be important determinants of the actual reforms implemented - There is a positive relationship between the decision to introduce competition in the digital cellular segment and the growth of the fixed line segment - Countries facing increasing institutional risk and	**Data:** - 1985-1999 panel data on 86 developing countries - Source(s): Available from the authors upon request **Methodology:** - Duration methodology - System Generalized Method of Moments (SYS-GMM)

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
			- Latitude - Average schooling years (1980) - Ethno linguistic fractionalization - Africa - Crop and forest land - Political constraints - Free press - Ethnic tensions - Law and order	financial constraints are more likely to introduce competition in the digital cellular segment and to privatize the fixed-line incumbent - Competition in the analogue cellular segment and the creation of a separate regulator seem to be relatively less attractive policies	
Goldberg & Pavcnik (2005)	**H:** Worker industry affiliation plays a crucial role in how trade policy affects wages in many trade models	- Wage differentials	- Worker characteristics - Occupation indicators - Job type indicators - Place of work characteristics	- Without industry fixed effects, workers in protected sectors earn less than workers with similar observable characteristics in unprotected sectors - Allowing for industry fixed effects reverses the result: trade protection increases relative wages - Because tariff reductions	**Data:** - Data on 21 industries of Colombia - Source(s): Colombian National Planning Department **Methodology:** - 2SLS - OLS

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
				were proportionately larger in sectors employing a high fraction of less-skilled workers, the decrease in the wage premiums in these sectors affected such workers disproportionately	
Huang (2009)	**H-1:** Political structure of a country has a substantial influence on policy change in financial sector **H-2:** Policy change in a country is positively correlated with the initial level of liberalization	- Level of financial liberalization	- Balance of payments crisis - Banking crisis - Recession - High inflation - Drastic political change - Political orientation of ruling party - IMF program - Democracy	- Policy change in a country is negatively rather than positively associated with the initial extent of liberalization level, and the distance behind the regional leader - Countries with highly repressed financial sectors have more potential to embark on reform, while countries with a highly liberalized financial sector have greater status quo bias - Economic and political structure and ideology can	**Data:** - 35 countries for the period 1973–1996 - Source(s): IMF, World Bank, Polity IV project **Methodology:** - Common correlated effect pooled (CCEP) modelling

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
				have a substantial influence on policy change, and the extent of democracy has a significantly negative effect on policy reform	
Ickes & Ofer (2006)	**H:** Changes in the industrial structure of employment across Russian regions are mainly determined by legacy factors, political factors, and success factors	- Structural change in industry	- The natural resource potential - The initial employment share - The rate of urbanization - The specialization of industry - Average January (1997) temperature - Change in population - Change in the number of employed - Change in the number of small enterprises - Change in gross regional product per capita - FDI per 1000 employed - Change in the crime rate	- Initial conditions such as natural resource potential, climate, and industrial specialization explain more of the variation in industrial restructuring than political variables	**Data:** - Data on various industrial sectors of Russia during 1990s - Source(s): CEFIR database, RSS, Russian Statistical Office, World Bank **Methodology:** - OLS

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
			- Democracy index - Legislative quality - Political environment - Social environment		
Kim & Pirttilä (2006)	**H:** Both ex post and ex ante political constraints are instrumental in determining the extent of progress in welfare-enhancing reforms	- Liberalization index	- Support for reforms - Inflation rate - Unemployment rate - GDP growth - Gini coefficient - Government's budget balance - Capital formation - Future loss - Index of political freedom	- Progress in reform is positively associated with public support for reforms, which is affected by income inequality and expected individual performance during future reforms - Reform sequencing should start with a reform that is both popular and stimulatory to other reforms	**Data:** - 14 transition countries for 1990-97 period - Source(s): EBRD, United Nations University, World Institute for Development Economics Research **Methodology:** - Generalized Method of Moments (GMM) - 2SLS - Static fixed effects - Dynamic fixed effects

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
Li & Xu (2002)	**H-1:** Countries with a larger financial sector, a higher urban population, and a lower income inequality are more likely to privatize and liberalize **H-2:** A higher government budget deficit makes privatization and liberalization less likely, while a larger government debt has the opposite implications **H-3:** Countries with a right-of-centre government and countries that receive World Bank assistance in the telecommunications sector are more likely to privatize and liberalize	- Non-state ownership of telecommunications sector	- Urban/total population - Gini coefficient - Financial depth - Deficit/GDP - Profitability - Ideology - World Bank project - Democracy - Party polarization - Number of veto players - The number of main lines per 100 inhabitants - Real GDP per capita - Illiteracy rate - The ratio of manufacturing value added over GDP - The share of population in the largest city - The share of government debt in GDP	- Countries with stronger pro-reform interest groups, namely the financial services sector and the urban consumers, are more likely to reform in more democratic countries - Less democratic countries are more likely to maintain the public sector monopoly when the government benefits more from such a governance mode - Democracy affects the pace of reforms by magnifying the voices of interest groups in more democratic countries and by moderating politicians' discretion in less democratic countries	**Data:** - 50 countries over the period from 1990 to 1998 - Source(s): World Bank, Gurr (1999) **Methodology:** - Fixed/random effects models - OLS

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
Olper (2007)	**H-1:** Agricultural protection is influenced directly by land inequality and ideology **H-2:** The effect of land inequality is conditional to the ideological orientation of the government	- Aggregated producer subsidy equivalent	- Land inequality (land gini) - Ideological orientation of the government - Amount of agricultural land per capita - Share of agricultural export to total export - Agricultural share in employment and in GDP - Gastil index of political rights - Index of quality of institutions	- Protection is decreasing in land inequality and with left-wing government orientation, but not in a linear fashion: left-wing governments tend to support agriculture in more unequal societies - The relationship holds better in democracies than in dictatorships	**Data:** - 40 countries for 1982-2000 period - Source(s): IFAD, Keefer and Knack (1995), FAO, Database on Political Institutions, OECD, USDA, World Bank, Freedom House, International Country Risk Guide **Methodology:** - OLS
Volscho (2007)	**H:** Quintile shares of size-adjusted family income are impacted by union density and federal, state, and local government employment	- Family income	- Union density - Federal government employment - State government employment - Local government employment - Mean establishment size - Manufacturing employment	- Union density has a progressive effect that benefits middle and upper-middle income families - Federal government employment has a strong progressive effect on the entire income distribution - State government	**Data:** - Data on 160 US metropolitan statistical areas from the 2000 census - Source(s): USA 2000 Census Data **Methodology:** - Seemingly unrelated

Study	Hypothesis (H)	Dependent Variable(s)	Explanatory Variable(s)	Result(s)	Data & Methodology
			- Unemployment rate - Female labour force participation - Female-headed families - Dispersion in education - Dispersion in age	employment has a progressive effect on middle and upper-middle income families - Local government employment mainly impacts families in the bottom forty percent of the income distribution	regression estimation (SURE)
Wagner et al. (2009)	**H:** Institutional factors affect satisfaction with democracy	- Average yearly satisfaction with democracy	- Inflation - GDP per capita - Growth in GDP - Unemployment rate - BERI composite index - Quality of monetary policy - Regulatory quality - Rule of law - Control of corruption - Size of the shadow economy - Checks and balances - Left/right placement - Inequality	- High-quality institutions like the rule of law, well-functioning regulation, low corruption, and other institutions that improve resource allocation have a positive effect on average satisfaction with democracy	**Data:** - A panel of observations from Eurobarometer in the time span 1990–2000 - Source(s): Business Environment Risk Intelligence (BERI), Database of political institutions (DPI), Eurobarometer **Methodology:** - Random effects panel regressions

Appendix 2: Summary of previous econometric studies based on political economy by their focus

Focus of the study	Major Variable(s)	Primary Data Sources	Examples
Political economy of liberalization in electricity industry	- Regulation indicator in power industry - Government ideology - Government fragmentation - Number of years that the incumbent government has been in office - Index of political constraints - Globalization index - Energy demand - Real GDP per capita - Per capita generation capacity - Debt payments as a proportion of national income - Industry value added as proportion of GDP	- World Bank - US Energy Information Agency - BP	Chang & Berdiev (2011), Cubbin & Stern (2006)
Political economy of liberalization in telecommunications industry	- Degree of liberalization - Share of incumbent operator - Regulatory independence - Government's programmatic position - Share of population aged between 15-64 years - Mainline coverage & cellular subscription - Mainlines per employee	- OECD regulation database - World Bank	Duso & Seldeslachts (2010), Gasmi et al. (2009), Gasmi & Virto (2010), Li & Xu (2002)

Focus of the study	Major Variable(s)	Primary Data Sources	Examples
	- Price of fixed-line, cellular services		
	- Regulatory governance index		
	- Corruption		
	- Bureaucracy		
	- Law and order		
	- Expropriation		
	- Currency risk		
	- Institutional environment index		
	- Checks and balances		
	- Privatization		
	- Competition in fixed and cellular		
	- Democracy index		
	- Total debt service		
	- Aid per capita		
	- Ethno linguistic fractionalization		
	- Free press		
	- Ownership of telecommunications sector		
	- Urban/total population		
	- Gini coefficient		
	- Financial depth		
	- Deficit/GDP		
	- World Bank project		
	- Real GDP per capita		

Focus of the study	Major Variable(s)	Primary Data Sources	Examples
Political economy of economic reforms in non-infrastructure industries and other areas	- Deficit/GDP ratio - Inflation rate - Number of executive constraints - Election year - Political orientation of the ruling government - Assembly or parliamentary system - Executive control of absolute majority - Number of years left in the current term - Total government deficit as a share of GDP and inflation - The real per capita GDP - The ratio of exports and imports to GDP - Crisis years - Countries' participation to IMF programs - Industrialisation index - Index of the favourableness of attitudes toward entrepreneurship - Index of concentration in landholdings - Size of government index - Legal structure and property rights index - Regulation of credit, labour and business index - Profession of heads of governments	- Polity IV project - World Bank's Database of Political Institutions - IMF's International Financial Statistics (IFS) database - Penn World Table - Freedom House - OECD - National Statistical Offices - EBRD - United Nations University - World Institute for Development Economics Research - International Country Risk Guide - Business Environment Risk Intelligence (BERI) - Eurobarometer	Alesina et al. (2006), Boschini (2006), Dreher et al. (2009), Duval (2008), Fredriksson & Wollscheid (2008), Goldberg & Pavcnik (2005), Huang (2009), Ickes & Ofer (2006), Kim & Pirttilä (2006), Olper (2007), Volscho (2007), Wagner et al. (2009)

Focus of the study	Major Variable(s)	Primary Data Sources	Examples
	- Education of heads of governments		
	- Aid		
	- Degree of sustainability of public debt		
	- The degree to which business transactions involve corruption		
	- The perception of the quality of public service		
	- Political instability		
	- Level of financial liberalization		
	- The rate of urbanization		
	- Support for reforms		
	- Gini coefficient		
	- Satisfaction with democracy		

Appendix 3: Estimation results

Models	Dependent variable	Explanatory variables	Coef.	Std. Err.	t-stat.	p value	# of countries	# of observations	Hausman Test		BPLM Test		Preferred Specification
									Statistic	p-value	Statistic	p-value	
1.1.1	Entry barriers (0-6) *(OECD countries)*	Industry value added (% of GDP)	0.129	0.027	4.720	0.00	28	456	499.40	0.0000	-	-	Fixed Effects
		Rural population (% of total population)	0.091	0.058	1.580	0.12							
		Gini coefficient (0-100)	-0.022	0.023	-0.930	0.35							
		Polity score (-10,+10)	0.178	0.046	3.910	0.00							
		EU member (0-1)	-1.610	0.319	-5.040	0.00							
		OECD member (0-1)	1.717	0.419	4.100	0.00							
		Existence of electricity market reform idea (0-1)	1.078	0.274	3.930	0.00							
		Log of population density	0.427	2.552	0.170	0.87							
		Log of electricity consumption per capita (MWh)	2.566	0.796	3.220	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-5.201	0.536	-9.700	0.00							
		Average number of years of adult (25+) education	-0.282	0.182	-1.550	0.12							
		Log of imports of goods and services (% of GDP)	-2.415	0.582	-4.150	0.00							
		Constant	14.124	11.049	1.280	0.20							
1.1.2	Public Ownership (0-6) *(OECD countries)*	Industry value added (% of GDP)	0.076	0.015	5.200	0.00	28	456	72.18	0.0000	-	-	Fixed Effects
		Rural population (% of total population)	-0.015	0.031	-0.500	0.62							
		Gini coefficient (0-100)	-0.012	0.012	-0.980	0.33							
		Polity score (-10,+10)	-0.013	0.024	-0.550	0.58							
		EU member (0-1)	0.235	0.170	1.380	0.17							
		OECD member (0-1)	0.043	0.223	0.190	0.85							
		Existence of electricity market reform idea (0-1)	0.107	0.146	0.730	0.46							
		Log of population density	9.221	1.357	6.790	0.00							
		Log of electricity consumption per capita (MWh)	-1.188	0.423	-2.810	0.01							
		Log of GDP per capita (PPP, cur. thousand int. $)	-1.157	0.285	-4.060	0.00							
		Average number of years of adult (25+) education	-0.120	0.097	-1.240	0.22							
		Log of imports of goods and services (% of GDP)	-0.936	0.310	-3.020	0.00							
		Constant	-25.833	5.876	-4.400	0.00							

Models	Dependent variable	Explanatory variables	Coef.	Std. Err.	t-stat.	p value	# of countries	# of observations	Hausman Test		BPLM Test		Preferred Specification
									Statistic	p-value	Statistic	p-value	
1.1.3	Vertical integration (0-6) *(OECD countries)*	Industry value added (% of GDP)	0.128	0.025	5.080	0.00	28	456	60.18	0.0000	-	-	Fixed Effects
		Rural population (% of total population)	-0.084	0.053	-1.570	0.12							
		Gini coefficient (0-100)	0.005	0.021	0.210	0.83							
		Polity score (-10,+10)	0.109	0.042	2.590	0.01							
		EU member (0-1)	-1.407	0.294	-4.780	0.00							
		OECD member (0-1)	0.907	0.386	2.350	0.02							
		Existence of electricity market reform idea (0-1)	0.521	0.252	2.060	0.04							
		Log of population density	-0.187	2.351	-0.080	0.94							
		Log of electricity consumption per capita (MWh)	0.266	0.733	0.360	0.72							
		Log of GDP per capita (PPP, cur. thousand int. $)	-3.679	0.494	-7.450	0.00							
		Average number of years of adult (25+) education	-0.076	0.168	-0.450	0.65							
		Log of imports of goods and services (% of GDP)	-1.444	0.536	-2.690	0.01							
		Constant	17.055	10.177	1.680	0.10							
1.2.1	Overall indicator (0-6) *(OECD countries)*	Industry value added (% of GDP)	0.111	0.018	6.180	0.00	28	456	74.78	0.0000	-	-	Fixed Effects
		Rural population (% of total population)	-0.003	0.038	-0.070	0.94							
		Gini coefficient (0-100)	-0.010	0.015	-0.640	0.52							
		Polity score (-10,+10)	0.091	0.030	3.050	0.00							
		EU member (0-1)	-0.927	0.210	-4.430	0.00							
		OECD member (0-1)	0.889	0.275	3.240	0.00							
		Existence of electricity market reform idea (0-1)	0.569	0.180	3.160	0.00							
		Log of population density	3.153	1.675	1.880	0.06							
		Log of electricity consumption per capita (MWh)	0.548	0.522	1.050	0.30							
		Log of GDP per capita (PPP, cur. thousand int. $)	-3.345	0.352	-9.510	0.00							
		Average number of years of adult (25+) education	-0.160	0.120	-1.330	0.18							
		Log of imports of goods and services (% of GDP)	-1.598	0.382	-4.180	0.00							
		Constant	1.782	7.251	0.250	0.81							
1.2.2	Overall indicator (0-6) *(Non-OECD countries)*	Industry value added (% of GDP)	0.057	0.012	4.550	0.00	17	150	80.09	0.0000	-	-	Fixed Effects
		Rural population (% of total population)	-0.157	0.082	-1.910	0.06							
		Gini coefficient (0-100)	-0.023	0.015	-1.470	0.14							
		Polity score (-10,+10)	-0.033	0.025	-1.300	0.20							
		EU member (0-1)	0.463	0.250	1.850	0.07							
		OECD member (0-1)	(omitted)										
		Existence of electricity market reform idea (0-1)	(omitted)										

Models	Dependent variable	Explanatory variables	Coef.	Std. Err.	t-stat.	p value	# of countries	# of observations	Hausman Test		BPLM Test		Preferred Specification
									Statistic	p-value	Statistic	p-value	
		Log of population density	2.136	2.667	0.800	0.43							
		Log of electricity consumption per capita (MWh)	4.001	0.568	7.050	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-3.009	0.351	-8.580	0.00							
		Average number of years of adult (25+) education	-0.246	0.296	-0.830	0.41							
		Log of imports of goods and services (% of GDP)	0.038	0.329	0.110	0.91							
		Constant	3.938	11.972	0.330	0.74							
1.2.3	Overall indicator (0-6) *(All countries)*	Industry value added (% of GDP)	0.087	0.012	7.070	0.00	45	606	87.72	0.0000	-	-	Fixed Effects
		Rural population (% of total population)	0.005	0.032	0.160	0.88							
		Gini coefficient (0-100)	-0.014	0.013	-1.080	0.28							
		Polity score (-10,+10)	0.063	0.023	2.780	0.01							
		EU member (0-1)	-0.517	0.176	-2.930	0.00							
		OECD member (0-1)	0.551	0.242	2.280	0.02							
		Existence of electricity market reform idea (0-1)	0.314	0.164	1.920	0.06							
		Log of population density	-0.451	1.314	-0.340	0.73							
		Log of electricity consumption per capita (MWh)	1.655	0.430	3.850	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-2.963	0.252	-11.740	0.00							
		Average number of years of adult (25+) education	-0.336	0.108	-3.120	0.00							
		Log of imports of goods and services (% of GDP)	-1.209	0.298	-4.060	0.00							
		Constant	14.773	5.705	2.590	0.01							
2.1.1	Entry barriers (0-6) *(OECD countries)*	Net official assistance and aid received	-0.628	0.311	-2.020	0.04	30	764	83.97	0.0000	-	-	Fixed Effects
		EU member (0-1)	-1.060	0.234	-4.530	0.00							
		OECD member (0-1)	2.136	0.287	7.430	0.00							
		Existence of electricity market reform idea (0-1)	1.125	0.178	6.340	0.00							
		Log of population density	0.131	1.431	0.090	0.93							
		Log of electricity consumption per capita (MWh)	2.984	0.408	7.310	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-5.987	0.347	-17.280	0.00							
		Average number of years of adult (25+) education	-0.226	0.103	-2.200	0.03							
		Log of imports of goods and services (% of GDP)	-2.491	0.399	-6.250	0.00							
		Constant	23.500	5.198	4.520	0.00							
2.1.2	Public Ownership (0-6) *(OECD countries)*	Net official assistance and aid received	-0.120	0.159	-0.760	0.45	30	764	123.73	0.0000	-	-	Fixed Effects
		EU member (0-1)	0.227	0.119	1.910	0.06							
		OECD member (0-1)	-0.371	0.147	-2.530	0.01							
		Existence of electricity market reform idea (0-1)	-0.024	0.091	-0.270	0.79							

Models	Dependent variable	Explanatory variables	Coef.	Std. Err.	t-stat.	p value	# of countries	# of observations	Hausman Test		BPLM Test		Preferred Specification
									Statistic	p-value	Statistic	p-value	
		Log of population density	7.314	0.730	10.020	0.00							
		Log of electricity consumption per capita (MWh)	-0.354	0.208	-1.700	0.09							
		Log of GDP per capita (PPP, cur. thousand int. $)	-1.273	0.177	-7.200	0.00							
		Average number of years of adult (25+) education	-0.226	0.052	-4.310	0.00							
		Log of imports of goods and services (% of GDP)	-0.621	0.203	-3.050	0.00							
		Constant	-16.994	2.651	-6.410	0.00							
2.1.3	Vertical integration (0-6) *(OECD countries)*	Net official assistance and aid received	-0.252	0.284	-0.890	0.37	30	764	19.84	0.0189	-	-	Fixed Effects
		EU member (0-1)	-1.171	0.214	-5.480	0.00							
		OECD member (0-1)	1.125	0.262	4.290	0.00							
		Existence of electricity market reform idea (0-1)	0.626	0.162	3.860	0.00							
		Log of population density	2.843	1.307	2.180	0.03							
		Log of electricity consumption per capita (MWh)	1.297	0.373	3.480	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-4.536	0.316	-14.330	0.00							
		Average number of years of adult (25+) education	0.108	0.094	1.160	0.25							
		Log of imports of goods and services (% of GDP)	-2.002	0.364	-5.500	0.00							
		Constant	7.825	4.747	1.650	0.10							
2.2.1	Overall indicator (0-6) *(OECD countries)*	Net official assistance and aid received	-0.334	0.202	-1.650	0.10	30	764	855.87	0.0000	-	-	Fixed Effects
		EU member (0-1)	-0.668	0.152	-4.380	0.00							
		OECD member (0-1)	0.964	0.187	5.140	0.00							
		Existence of electricity market reform idea (0-1)	0.576	0.116	4.980	0.00							
		Log of population density	3.429	0.933	3.680	0.00							
		Log of electricity consumption per capita (MWh)	1.309	0.266	4.920	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-3.932	0.226	-17.410	0.00							
		Average number of years of adult (25+) education	-0.115	0.067	-1.710	0.09							
		Log of imports of goods and services (% of GDP)	-1.705	0.260	-6.560	0.00							
		Constant	4.777	3.387	1.410	0.16							
2.2.2	Overall indicator (0-6) *(Non-OECD countries)*	Net official assistance and aid received	-0.557	0.252	-2.210	0.03	17	271	140.97	0.0000	-	-	Fixed Effects
		EU member (0-1)	0.480	0.398	1.200	0.23							
		OECD member (0-1)	(omitted)										
		Existence of electricity market reform idea (0-1)	(omitted)										
		Log of population density	1.823	1.354	1.350	0.18							
		Log of electricity consumption per capita (MWh)	2.208	0.309	7.150	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-1.898	0.219	-8.650	0.00							

Models	Dependent variable	Explanatory variables	Coef.	Std. Err.	t-stat.	p value	# of countries	# of observations	Hausman Test		BPLM Test		Preferred Specification
									Statistic	p-value	Statistic	p-value	
		Average number of years of adult (25+) education	-1.353	0.209	-6.480	0.00							
		Log of imports of goods and services (% of GDP)	-0.104	0.204	-0.510	0.61							
		Constant	11.222	6.000	1.870	0.06							
2.2.3	Overall indicator (0-6) *(All countries)*	Net official assistance and aid received	-0.191	0.165	-1.160	0.25	47	1,035	56.45	0.0000	-	-	Fixed Effects
		EU member (0-1)	-0.778	0.140	-5.540	0.00							
		OECD member (0-1)	0.671	0.180	3.730	0.00							
		Existence of electricity market reform idea (0-1)	0.342	0.108	3.180	0.00							
		Log of population density	1.314	0.698	1.880	0.06							
		Log of electricity consumption per capita (MWh)	1.571	0.213	7.390	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-3.139	0.154	-20.360	0.00							
		Average number of years of adult (25+) education	-0.338	0.063	-5.390	0.00							
		Log of imports of goods and services (% of GDP)	-1.099	0.168	-6.560	0.00							
		Constant	10.840	2.601	4.170	0.00							
3.1.1	Entry barriers (0-6) *(OECD countries)*	Single-party government (0-1)	0.053	0.162	0.330	0.74	29	710	3.40	1.0000	326.16	0.0000	Random Effects
		The years the chief executive has been in office	0.042	0.018	2.360	0.02							
		Economic policy orientation of ruling party: Right	-0.306	0.242	-1.270	0.21							
		Economic policy orientation of ruling party: Left	-0.423	0.246	-1.720	0.09							
		Economic policy orientation of ruling party: Centre	(omitted)										
		Parliamentary regimes (0-1)	0.538	0.361	1.490	0.14							
		Prof. bgr. of head of executive: Entrepreneur	-0.326	0.309	-1.060	0.29							
		Prof. bgr. of head of executive: Scientist, Economics	1.333	0.389	3.430	0.00							
		Prof. bgr. of head of executive: Military	0.344	0.415	0.830	0.41							
		Prof. bgr. of head of executive: Politician	0.482	0.213	2.260	0.02							
		Prof. bgr. of head of executive: Scientist, Other	0.446	0.243	1.840	0.07							
		Prof. bgr. of head of executive: Unknown/other	0.516	0.227	2.270	0.02							
		Educ. bgr. of head of executive: Economics	-0.085	0.556	-0.150	0.88							
		Educ. bgr. of head of executive: Natural science	-0.235	0.640	-0.370	0.71							
		Educ. bgr. of head of executive: Other university	-0.519	0.579	-0.900	0.37							
		Educ. bgr. of head of executive: Unknown/other	-0.042	0.605	-0.070	0.94							
		EU member (0-1)	-0.829	0.233	-3.560	0.00							
		OECD member (0-1)	1.697	0.327	5.190	0.00							
		Existence of electricity market reform idea (0-1)	0.749	0.181	4.140	0.00							
		Log of population density	0.606	0.140	4.340	0.00							

Models	Dependent variable	Explanatory variables	Coef.	Std. Err.	t-stat.	p value	# of countries	# of observations	Hausman Test		BPLM Test		Preferred Specification
									Statistic	p-value	Statistic	p-value	
		Log of electricity consumption per capita (MWh)	2.886	0.318	9.070	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-5.730	0.321	-17.860	0.00							
		Average number of years of adult (25+) education	-0.240	0.085	-2.830	0.01							
		Log of imports of goods and services (% of GDP)	-1.202	0.272	-4.420	0.00							
		Constant	16.661	1.214	13.730	0.00							
3.1.2	Public Ownership (0-6) *(OECD countries)*	Single-party government (0-1)	-0.144	0.085	-1.690	0.09	29	710	14.85	0.8687	2929.78	0.0000	Random Effects
		The years the chief executive has been in office	0.033	0.009	3.660.	0.00							
		Economic policy orientation of ruling party: Right	0.074	0.129	0.570	0.57							
		Economic policy orientation of ruling party: Left	-0.203	0.131	-1.550	0.12							
		Economic policy orientation of ruling party: Centre	(omitted)										
		Parliamentary regimes (0-1)	-0.407	0.231	-1.760	0.08							
		Prof. bgr. of head of executive: Entrepreneur	-0.457	0.161	-2.840	0.00							
		Prof. bgr. of head of executive: Scientist, Economics	0.056	0.204	0.270	0.79							
		Prof. bgr. of head of executive: Military	0.103	0.230	0.450	0.65							
		Prof. bgr. of head of executive: Politician	-0.201	0.117	-1.720	0.09							
		Prof. bgr. of head of executive: Scientist, Other	-0.484	0.132	-3.670	0.00							
		Prof. bgr. of head of executive: Unknown/other	-0.302	0.124	-2.430	0.02							
		Educ. bgr. of head of executive: Economics	0.163	0.285	0.570	0.57							
		Educ. bgr. of head of executive: Natural science	1.123	0.330	3.410	0.00							
		Educ. bgr. of head of executive: Other university	0.126	0.295	0.430	0.67							
		Educ. bgr. of head of executive: Unknown/other	0.120	0.313	0.380	0.70							
		EU member (0-1)	-0.016	0.127	-0.130	0.90							
		OECD member (0-1)	-0.474	0.181	-2.610	0.01							
		Existence of electricity market reform idea (0-1)	0.114	0.097	1.180	0.24							
		Log of population density	-0.118	0.181	-0.650	0.51							
		Log of electricity consumption per capita (MWh)	0.232	0.228	1.020	0.31							
		Log of GDP per capita (PPP, cur. thousand int. $)	-0.638	0.187	-3.410	0.00							
		Average number of years of adult (25+) education	-0.333	0.055	-6.050	0.00							
		Log of imports of goods and services (% of GDP)	0.196	0.191	1.030	0.31							
		Constant	9.582	0.972	9.860	0.00							
3.1.3	Vertical integration (0-6) *(OECD countries)*	Single-party government (0-1)	-0.229	0.139	-1.650	0.10	29	710	16.93	0.7153	1075.26	0.0000	Random Effects
		The years the chief executive has been in office	0.044	0.015	2.970	0.00							
		Economic policy orientation of ruling party: Right	-0.526	0.211	-2.500	0.01							

Models	Dependent variable	Explanatory variables	Coef.	Std. Err.	t-stat.	p value	# of countries	# of observations	Hausman Test		BPLM Test		Preferred Specification
									Statistic	p-value	Statistic	p-value	
		Economic policy orientation of ruling party: Left	-0.380	0.214	-1.770	0.08							
		Economic policy orientation of ruling party: Centre	(omitted)										
		Parliamentary regimes (0-1)	0.078	0.365	0.210	0.83							
		Prof. bgr. of head of executive: Entrepreneur	-0.591	0.264	-2.240	0.03							
		Prof. bgr. of head of executive: Scientist, Economics	1.982	0.335	5.920	0.00							
		Prof. bgr. of head of executive: Military	-0.173	0.373	-0.460	0.64							
		Prof. bgr. of head of executive: Politician	0.443	0.191	2.330	0.02							
		Prof. bgr. of head of executive: Scientist, Other	-0.043	0.215	-0.200	0.84							
		Prof. bgr. of head of executive: Unknown/other	0.725	0.202	3.590	0.00							
		Educ. bgr. of head of executive: Economics	0.814	0.468	1.740	0.08							
		Educ. bgr. of head of executive: Natural science	1.750	0.541	3.230	0.00							
		Educ. bgr. of head of executive: Other university	0.659	0.486	1.360	0.18							
		Educ. bgr. of head of executive: Unknown/other	0.507	0.513	0.990	0.32							
		EU member (0-1)	-1.282	0.206	-6.220	0.00							
		OECD member (0-1)	0.966	0.293	3.300	0.00							
		Existence of electricity market reform idea (0-1)	0.384	0.158	2.430	0.02							
		Log of population density	0.470	0.218	2.150	0.03							
		Log of electricity consumption per capita (MWh)	1.778	0.349	5.090	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-4.266	0.299	-14.280	0.00							
		Average number of years of adult (25+) education	0.047	0.087	0.540	0.59							
		Log of imports of goods and services (% of GDP)	-1.484	0.296	-5.010	0.00							
		Constant	14.172	1.352	10.480	0.00							
3.2.1	Overall indicator (0-6) *(OECD countries)*	Single-party government (0-1)	-0.113	0.103	-1.090	0.28	29	710	14.82	0.8698	988.55	0.0000	Random Effects
		The years the chief executive has been in office	0.038	0.011	3.400	0.00							
		Economic policy orientation of ruling party: Right	-0.191	0.156	-1.230	0.22							
		Economic policy orientation of ruling party: Left	-0.268	0.159	-1.690	0.09							
		Economic policy orientation of ruling party: Centre	(omitted)										
		Parliamentary regimes (0-1)	0.118	0.265	0.450	0.66							
		Prof. bgr. of head of executive: Entrepreneur	-0.431	0.196	-2.200	0.03							
		Prof. bgr. of head of executive: Scientist, Economics	1.195	0.248	4.810	0.00							
		Prof. bgr. of head of executive: Military	0.111	0.275	0.400	0.69							
		Prof. bgr. of head of executive: Politician	0.262	0.141	1.860	0.06							
		Prof. bgr. of head of executive: Scientist, Other	0.021	0.159	0.130	0.90							

Models	Dependent variable	Explanatory variables	Coef.	Std. Err.	t-stat.	p value	# of countries	# of observations	Hausman Test Statistic	Hausman Test p-value	BPLM Test Statistic	BPLM Test p-value	Preferred Specification
		Prof. bgr. of head of executive: Unknown/other	0.342	0.149	2.290	0.02							
		Educ. bgr. of head of executive: Economics	0.328	0.348	0.940	0.35							
		Educ. bgr. of head of executive: Natural science	0.948	0.402	2.360	0.02							
		Educ. bgr. of head of executive: Other university	0.130	0.362	0.360	0.72							
		Educ. bgr. of head of executive: Unknown/other	0.268	0.381	0.700	0.48							
		EU member (0-1)	-0.752	0.152	-4.940	0.00							
		OECD member (0-1)	0.791	0.215	3.670	0.00							
		Existence of electricity market reform idea (0-1)	0.465	0.117	3.980	0.00							
		Log of population density	0.272	0.141	1.920	0.05							
		Log of electricity consumption per capita (MWh)	1.696	0.249	6.830	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-3.628	0.218	-16.610	0.00							
		Average number of years of adult (25+) education	-0.169	0.063	-2.700	0.01							
		Log of imports of goods and services (% of GDP)	-0.954	0.212	-4.510	0.00							
		Constant	13.918	0.940	14.810	0.00							
3.2.2	Overall indicator (0-6) *(Non-OECD countries)*	Single-party government (0-1)	0.137	0.156	0.880	0.38	14	194	142.00	0.0000	-	-	Fixed Effects
		The years the chief executive has been in office	-0.002	0.023	-0.100	0.92							
		Economic policy orientation of ruling party: Right	(omitted)										
		Economic policy orientation of ruling party: Left	-0.041	0.213	-0.190	0.85							
		Economic policy orientation of ruling party: Centre	0.002	0.267	0.010	1.00							
		Parliamentary regimes (0-1)	-0.504	0.567	-0.890	0.38							
		Prof. bgr. of head of executive: Entrepreneur	0.276	0.363	0.760	0.45							
		Prof. bgr. of head of executive: Scientist, Economics	-0.418	0.336	-1.240	0.22							
		Prof. bgr. of head of executive: Military	0.080	0.414	0.190	0.85							
		Prof. bgr. of head of executive: Politician	-0.341	0.369	-0.920	0.36							
		Prof. bgr. of head of executive: Scientist, Other	0.139	0.343	0.400	0.69							
		Prof. bgr. of head of executive: Unknown/other	-0.028	0.238	-0.120	0.91							
		Educ. bgr. of head of executive: Economics	-0.234	0.540	-0.430	0.67							
		Educ. bgr. of head of executive: Natural science	-0.273	0.479	-0.570	0.57							
		Educ. bgr. of head of executive: Other university	-0.357	0.505	-0.710	0.48							
		Educ. bgr. of head of executive: Unknown/other	-0.174	0.792	-0.220	0.83							
		EU member (0-1)	0.515	0.393	1.310	0.19							
		OECD member (0-1)	(omitted)										
		Existence of electricity market reform idea (0-1)	(omitted)										

Models	Dependent variable	Explanatory variables	Coef.	Std. Err.	t-stat.	p value	# of countries	# of observations	Hausman Test		BPLM Test		Preferred Specification
									Statistic	p-value	Statistic	p-value	
		Log of population density	1.379	2.110	0.650	0.51							
		Log of electricity consumption per capita (MWh)	2.266	0.430	5.280	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-1.245	0.370	-3.370	0.00							
		Average number of years of adult (25+) education	-1.613	0.292	-5.530	0.00							
		Log of imports of goods and services (% of GDP)	-0.098	0.228	-0.430	0.67							
		Constant	14.494	10.103	1.430	0.15							
3.2.3	Overall indicator (0-6) *(All countries)*	Single-party government (0-1)	0.105	0.091	1.150	0.25	43	904	142.75	0.0000	-	-	Fixed Effects
		The years the chief executive has been in office	0.031	0.010	3.120	0.00							
		Economic policy orientation of ruling party: Right	-0.122	0.134	-0.910	0.36							
		Economic policy orientation of ruling party: Left	-0.273	0.137	-1.990	0.05							
		Economic policy orientation of ruling party: Centre	(omitted)										
		Parliamentary regimes (0-1)	0.058	0.241	0.240	0.81							
		Prof. bgr. of head of executive: Entrepreneur	-0.412	0.177	-2.330	0.02							
		Prof. bgr. of head of executive: Scientist, Economics	0.642	0.202	3.180	0.00							
		Prof. bgr. of head of executive: Military	0.030	0.218	0.140	0.89							
		Prof. bgr. of head of executive: Politician	0.091	0.130	0.700	0.49							
		Prof. bgr. of head of executive: Scientist, Other	-0.134	0.142	-0.940	0.35							
		Prof. bgr. of head of executive: Unknown/other	0.168	0.127	1.320	0.19							
		Educ. bgr. of head of executive: Economics	-0.127	0.289	-0.440	0.66							
		Educ. bgr. of head of executive: Natural science	0.212	0.319	0.660	0.51							
		Educ. bgr. of head of executive: Other university	-0.401	0.296	-1.350	0.18							
		Educ. bgr. of head of executive: Unknown/other	-0.257	0.321	-0.800	0.43							
		EU member (0-1)	-0.583	0.150	-3.890	0.00							
		OECD member (0-1)	0.831	0.217	3.820	0.00							
		Existence of electricity market reform idea (0-1)	0.270	0.116	2.340	0.02							
		Log of population density	0.800	0.813	0.980	0.33							
		Log of electricity consumption per capita (MWh)	1.779	0.254	7.010	0.00							
		Log of GDP per capita (PPP, cur. thousand int. $)	-3.140	0.192	-16.380	0.00							
		Average number of years of adult (25+) education	-0.321	0.068	-4.720	0.00							
		Log of imports of goods and services (% of GDP)	-1.127	0.186	-6.050	0.00							
		Constant	12.551	3.054	4.110	0.00							