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Abstract

Theory and empirics suggest that, by curbing competition, incumbent electricity companies – also referred to as Vertically Integrated Utilities (VIUs) – can increase their profitability through combined ownership of generation and transmission and/or distribution networks. Because curbing competition is generally believed to be welfare-reducing, EU law requires unbundling (separation) of the VIU networks. However, the EU allows its member states the choice between incomplete (legal) and complete (ownership) unbundling. There is tantalizing anecdotal evidence that VIUs have tried to influence this choice through questionable (and quite possibly illegal) means of persuasion. Such means of persuasion should be more readily available in countries with a more corrupted political culture. This paper shows that among the old EU member states (EU-15) countries which are perceived as more corrupt are indeed more likely to apply weaker forms of unbundling. Somewhat surprisingly, we do not obtain a similar finding for the new EU member states (NMS-10). We give a tentative explanation.

1. Introduction

The European electricity market is undergoing major changes. Prompted by EU legislation (most notably DIRECTIVE 2003/54/EC[1] and REGULATION 1228/2003[2]), the EU member states are restructuring their electricity industry to allow for more competition which is widely believed to be welfare-enhancing. A major complication is that, at the outset, the electricity markets were almost completely controlled by large, Vertically Integrated Utilities (VIU) that used to be regulated state monopolies. These VIUs typically still own almost all generators, as well as transmission and/or the distribution networks[3]. Such ownership pattern is believed to be an obstacle for free competition (e.g. European Commission Competition DG, 2006, p.149).

To prevent VIUs from using their influence to reduce competition, the EU has required its member states to unbundle (separate) their generation and network activities. Many members, however, have been slow in implementing these directives and many have chosen the weaker (but permitted) form of unbundling. These developments, and the fact that weaker forms of unbundling are allowed at all, are widely believed (e.g. European Commission Competition DG, 2006, p.144-148), to be welfare-reducing. These developments suggest that the pertinent political, legislative, and regulatory processes have unduly been influenced.

We conjecture (motivated by tantalizing anecdotal evidence and by a well-established literature on legislative and regulatory capture) that a significant part of the timing of the implementation of unbundling regimes and the choice of weaker forms of unbundling regimes, as well as the fact that they are possible at all, can be explained by questionable (and possibly illegal) influence activities by VIUs. We conjecture specifically that such

[1] Directive 2003/54/EC of 26 June 2003 of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 96/92/EC (OJ 2003 L 176/37)
[2] Regulation (EEC) No 1228/2003 of the European Parliament and of the Council on Conditions for Access to the Network for Cross-Border Exchanges in Electricity (OJ 2003 L 176/1).
[3] Generators produce electricity. The transmission network is used for the transport of electricity over long distances, which is done by a Transmission System Operator (TSO). The distribution network is used for the transport of electricity over short distances, mostly to the final consumer, which is done by a Distribution System Operator (DSO).

influence activities are more effective in countries where the policy and regulatory process is more easily influenced.

We will perform ordered logit regressions on a panel data set and perform several additional tests for robustness. The results confirm our hypothesis and additionally present tentative evidence for the use of strategic implementation strategies in the EU accession by the New Member States (NMS-10)

The remainder of this paper is organized as follows. In the next section we first give examples of the welfare-reducing effects of having a fully integrated VIU and then discuss types of unbundling. We also formulate more specifically our conjecture and present a summary of the data that we use. In section 3 we explain the sources of our data and describe our strategy for analyzing the data. In section 4 we report our results. In section 5 we conclude with a discussion.

2. Motivation

The dominance of large Vertically Integrated Utilities (VIU) that used to be (regulated) state monopolies is arguably the major obstacle for creating both a single market in energy and more competition. Especially the fact that VIUs own both generators and (transmission/distribution) networks is problematic, as it allows VIUs to use their network ownership to increase their profits and hinder competition.

For example, VIUs could cross-subsidize their generation activities and recover their generation losses with high transmission fees. Apart from blunt refusal, VIUs have several additional tactics available to hinder access of competing generators to the network, such as imposing discriminating requirements[4] or charging unreasonably high

[4] An inquiry by the European Commission found that many market participants are "highly critical of the efficiency of existing unbundling obligations, believing that discrimination in favour of affiliates continues, and calling for stricter measures." European Commission Competition DG (2006, executive summary, p.4).

access and service fees[5]. Furthermore, VIUs have little incentives to invest in new transmission capacity[6] as more transmission capacity makes it more likely that generators from neighboring countries or distant areas can compete with the VIU-owned generators (European Commission Competition DG, 16.02.2006; Leautier, 2001; Brunekreeft, Neuhoff and Newbery, 2004). In addition, the European Commission Competition DG (16.02.2006, p.147) reported cases of VIUs having been given commercially valuable inside information to their affiliated generators. This puts independent generators at a disadvantage and thereby decreases competition.

To prevent VIUs from using control over their networks to reduce competition, the EU required member states to separate their transmission and distribution networks from generation. The EU distinguishes five main types of such unbundling:

1) Unified ownership requires no unbundling; both network and generation activities continue to be owned and managed by the same company.
2) Accounting unbundling is the least drastic form of separation; separate accounts must be kept for the network activities and generation activities to prevent cross subsidization.
3) Functional unbundling (also called management unbundling) requires, in addition to keeping separate accounts, that the operational activities and management are separated for transmission and generation activities.
4) Legal unbundling requires that transmission and generation be put in separate legal entities.

[5] For example, the Commission of the European Communities (2005, technical annex, p.14) claims that in 2005 in 16 out of 25 EU members the fees for balancing services were set so as to hinder competition. Balancing is the real-time equalization of electricity supply and demand by the TSO; failure of balancing leads to electricity outages. Imbalances are caused by generators who cannot supply the exact amount they contracted for. The TSO has to make up for the shortage or excess in electricity supply and charges out-of-balance generators fees for balancing services. A TSO that is owned by a VIU can curb competition by charging excessive fees for its balancing services. This effect is aggravated by the fact that new and small entrant generators are more likely to cause imbalances than large incumbent generators (Commission of the European Communities, 2005, technical annex, p.13). See Newbery, van Damme, and von der Fehr (2003), p.16, for an example how the balancing system in Belgium (where in 2003 the VIU owned all networks and practically all generation) impedes electricity imports from The Netherlands.

[6] There is a pressing shortage of transmission capacity between countries (European Commission Competition DG, 16.02.2006, p.152). This is especially serious as it obstructs the creation of one single market in electricity (Directive 96/92/EC).

5) Ownership unbundling is the most drastic form of separation. Generation and transmission have to be owned by independent entities. These entities are not allowed to hold shares in both activities.

Interestingly, EU legislation leaves the member states the choice of unbundling regime (legal or ownership) and the time path of implementation (quick or slow[7]) although there seems to be wide agreement that the quick implementation of ownership unbundling would be welfare-enhancing (e.g., OECD, 2001; Pittman, 2003; European Commission Competition DG, 16.02.2006, p.149). Legal unbundling leaves incentives for curbing competition intact[8]. Not surprisingly, in many countries VIUs opposed ownership unbundling in favor of legal unbundling[9]. It is therefore an interesting question (to which our results below provide a suggestive answer) whether VIUs were able to manipulate the legislative and regulatory process in favor of the weaker form of unbundling.

As a result of the available choices there is indeed considerable variation in the unbundling regimes implemented in EU member states. Table 1 documents the state of affairs over the years[10] both for the old (EU-15[11]) and new (NMS-10[12]) member states.

Table 1

EU-15					
Unbundling regime	2001	2002	2003	2004	2005

[7] For transmission, legal or ownership unbundling had to be implemented by July 2004, for distribution, legal or ownership unbundling has to be implemented by July 2007. However, some countries have adopted such a slow pace of implementation that it borders on noncompliance. While 18 EU member countries report to have implemented legal unbundling, in 8 of these it has not been done effectively in that the network activities of the VIU are not overseen by a separate board of directors (Commission of the European Communities, 2005, p.80).

[8] There are several concrete examples of legally unbundled VIUs that curb competition through their combined ownership of generation and transmission or distribution networks, see European Commission Competition DG (6.02.2006, p.144-148).

[9] For example, see Mulder, Shestalova, and Lijesen (2005) for the debate in the Netherlands.

[10] The sources of the data are described in section 3.

[11] EU-15: Austria (A), Belgium (B), Denmark DK, Finland FIN, France (F), Germany (D), Greece (GR), Ireland, (IRL), Italy (I), Luxembourg (L), Netherlands (NL), Portugal (P), Spain (E), Sweden (S).

[12] NMS-10: Cyprus (CY), Czech Republic (CZ), Estonia (EST), Hungary (H), Latvia (LV), Lithuania (LT), Malta (M), Poland (PL), Slovakia (SK), and Slovenia (SLO).

1) None	0	0	0	0	0
2) account	0	0	1 (L)	0	0
3) Functional	3 (F, D, GR)	2 (F, L)	1 (F)	1 (L)	0
4) Legal	8 (A, B, DK, IRL, I, NL, P, E)	5 (A, B, DK, D, P)	4 (A, B, DK, D)	7 (A, B, DK, D, F, GR, IRL)	7 (A, B, F, D, GR, IRL, L)
5) Ownership	3 (FIN, S, UK)	5 (FIN, NL, E, S, UK)	6 (FIN, NL, P, E, S, UK)	7 (FIN, I, NL, P, E, S, UK)	8 (DK, FIN, I, NL, P, E, S, UK)

NMS-10					
Unbundling regime	2001	2002	2003	2004	2005
1) None	1 (M)	1 (M)	1 (M)	1 (M)	1 (M)
2) Account		1 (H)	2 (EST, H)	1 (LV)	0
3) Functional		2 (CY, EST)	2 (CY, PL)	1 (CY)	1 (CY)
4) Legal		6 (CZ, LV, LT, PL, SK, SLO)	5 (CZ, LV, LT, SK, SLO)	7 (CZ, EST, H, LT, PL, SK, SLO)	4 (EST, LV, P, SK)
5) Ownership		0	0	0	4 (CZ, H, LT, SLO)

Remarkably, but maybe not surprisingly given the available choices, many countries did not choose to implement ownership unbundling. The fact that legal unbundling is the modal choice for the NMS-10 set and the EU-15 set in 2001-2 (and a close contender even in 2003-5) is one indication that VIUs may be able to exert influence over the

transmission company[13]. We therefore conjecture that part of the variation in the choice of unbundling regime, and the speed of implementation, can be explained by influence activities of VIUs. These activities may be legal (e.g., transparent lobbying activities) or may include questionable (and possibly illegal) strategies such as under-the-table payments to allegedly independent lobbyists to effect public opinion and the legislative and regulatory process.

For example, the VIU can try to bribe politicians or "independent" specialists to foment opposition against ownership unbundling. A recent scandal in the Netherlands illustrates such a strategy. In January 2006, it became known that energy companies Nuon, Eneco, Essent, and Delta had secretly promised, contingent on the Netherlands government deciding against ownership unbundling of the distribution network, a "success fee" of EURO 1,7 million to IMSA, an "independent", idealistic, environmentally oriented consultancy company[14]. IMSA had forcefully argued against ownership unbundling of energy networks in Dutch media and in an IMSA consultancy report (Van Dieren, Tuininga, and van Soest, 2006). This example is suggestive of the value of weaker unbundling for energy companies but it begs the question whether the Dutch scandal was an isolated incidence, or one that was unique only in that it had been exposed.

The effect of such questionable influence activities depends on the integrity of legislative and regulatory processes. Direct data that measure the integrity of such processes do not exist. We therefore proxy it with data on the perceived corruption of a country: the Corruption Perception Index (CPI) of Transparency International[15].

[13] Energy Company Essent provides illustrative examples of the rhetoric against ownership unbundling brought up by incumbent VIUs. Essent states that unified ownership of the network provides protection against possible foreign take-over; "We are now being chopped up, ready for swallowing by large foreign groups with headquarters in Munich (*sic!)* or Paris" (http://www.essent-finance.nl/pressroom/release36.jsp).

[14] See http://www.imsa.nl/ for the idealistically flavored mission statements of IMSA. The director of IMSA and benefactor of the success fee, Mr. van Dieren, kept a public appearance as an independent environmental activist. He is a member of the Club of Rome and the founder of a Dutch militant environmental organization called "milieudefensie".

[15] The CPI is a well-established (e.g., Mauro, 1995; Treisman, 2000) assessment instrument that assigns countries a score between 1 (perceived as very corrupt) and 10 (perceived as hardly corrupt at all). The score is based on a number (up to 18) of sources, not all of them just about perception. The CPI of 2005 was based on 16 sources from 10 independent institutions (Lambsdorff, 2005).

Hypothesis: Countries with a higher CPI score (less corrupt) have more complete unbundling regime

Figure 1

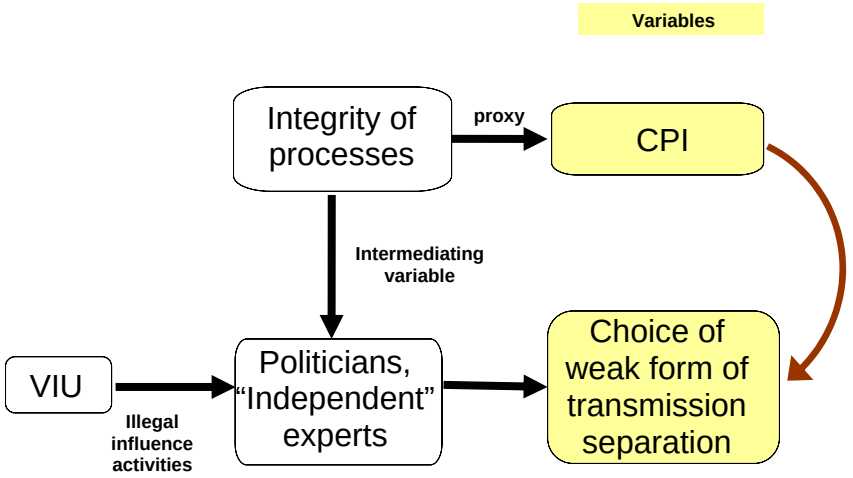

Figure 1 illustrates the relations between concepts and variables

We also use the CPI as a regressor to study how the quality of implementation of the unbundling regime is influenced by the integrity of legislative and regulatory processes. The assessment of the quality of implementation consists of the results of a questionnaire that the European Commission administers and that includes the following four questions:

1. Does the VIU publish its accounts?
2. Does the VIU employ a compliance officer?
3. Do the unbundled activities have a separate corporate identity?
4. Are the unbundled activities located at separate locations?

3. Data and analysis

The data on unbundling regimes and the quality of implementation were collected from reports of the EU Commission (2002, 2003, 2004, 05.01.2005, 15.11.2005 and

12.01.2006) that monitor the implementation of DIRECTIVE 2003/54/EC and REGULATION 1228/2003. For consistency we use these official data for our main analysis[16].

However, one typically does not find an assessment of the unbundling regimes in Malta or Cyprus in the DG Tren reports. Therefore, we draw on information from the Malta Resources Authority (2005), the Ministry for Resources and Infrastructure of Malta (2006), and the Cyprus Energy Regulatory Authority (2005). Furthermore, Malta is such a small country that it makes do without a transmission network; electricity is transported through the distribution network. In our analysis of transmission network unbundling, we use the status of the Maltese distribution network.

Also, the categorization of the transmission unbundling regime in Latvia in the report of the Latvian regulator (The (Latvian) Public Utilities Regulation Commission, 2005) is in conflict with the categorization in the DG Tren reports. While we stick to the official EU data (the DG Tren reports) for consistency, we use the report of the Latvian regulator to perform a robustness test.

The DG Tren reports and the reports from Malta and Cyprus do not indicate when exactly a particular unbundling regime was in place. We therefore used the following decision rule: If the report said that the data were, say, collected in 2001, then we report them in the column "2001" even if the report itself was published in 2002. Likewise, it does not matter whether a legislative or regulatory change was enacted in January or December. We can not think of any reason why our (strong) results reported below should be significantly affected by these caveats.

The data on the CPI were obtained from Transparency International[17]. The data on per capita GDP (corrected for PPP), GDP (corrected for PPP), electricity prices, wages, and net electricity import relative to total available production were obtained from Eurostat[18].

[16] The sources used to determine the transmission unbundling regime are summarized in Table 2.
[17] Available on http://www.transparency.org/

To test our hypothesis, we ran ordered logit regressions with transmission unbundling regime and quality of implementation, respectively, as dependent variable, and *CPI* and various controlling variables as regressors.

$$\Pr(t\_unbund = \text{ i}) = \Pr(\kappa_{i-1} < \alpha + \beta_1 \cdot CPI + \beta_2 \cdot t + \beta_3 \cdot GDP\_pc + \beta_4 \cdot GDP + \beta_5 \cdot NetElecIMP + \beta_6 \cdot EU\_NMS + \beta_7 \cdot SmallIsolated + u_j < \kappa_i)$$

where the relevant group of variables is defined as follows:

- *t_unbund* stands for the transmission unbundling regime implemented and can take the categorical values $i \in$ {Unified ownership, Accounting unbundling, Functional unbundling, Legal unbundling, Ownership unbundling}.
- *CPI* stands for the Corruption Perception Index.
- *t* stands for time trend.
- *GDP_pc* stands for the per capita Gross Domestic Product (corrected for purchasing power parity).
- *GDP* stands for Gross Domestic Product (corrected for purchasing power parity)
- *NetElecIMP* stands for the net import of electricity relative to the total net generation of electricity[19]. Included to control for the possible influence a net position as a buyer could have on the unbundling policy.
- *EU_NMS* is a dummy variable that equals 1 if the country is a New Member State (NMS) of the EU.
- *SmallIsolated* is a dummy variable that equals 1 if the country has an electricity system that is small and isolated from the other EU countries; this is the case for Malta and Cyprus[20].

[18] Eurostat website for energy.
[19] Net imports (100600) divided by total net electricity generation (107100) on the Eurostat website for energy.
[20] The Ministry for Resources and Infrastructure of Malta (2006, p.42) argues that countries that operate a small isolated system (Cyprus and Malta) have little to gain from unbundling as the low demand for electricity and the absence of interconnectors leave no room for effective competition. In Malta the total installed capacity is 550 MW and in Cyprus the total installed capacity is 988 MW (Cyprus Energy Regulatory Authority, 2005, p. 17). The European Commission has indeed granted Malta and Cyprus a derogation on the unbundling requirements; both countries are exempted from the obligation to implement

The Shapiro-Wilk test for normality indicates that all variables – apart from the dummy variables - are normally distributed. We assume that they are clustered by country, but otherwise independent. We therefore use the robust Huber/White/sandwich estimator clustered by country for the variance.

4. Results

Table 3 shows the results for several model specifications[21]. Model 1 includes all observations and all controlling variables.

Table 3: Regression models.

	Model 1 EU-25	Model 2a EU-15	Model 2b EU-15	Model 3 NMS-10
CPI	.78**	1.48***	.92**	-.83***
	(.36)	(.53)	(.44)	(.28)
T	.61***	.63***		1.23**
	(.13)	(.17)		(.58)
GDP_pc	-.04***	-.11***	-.05***	.08**
	(.01)	(.04)	(.01)	(.04)
GDP	-2.6 x10^{-7}	0.78 x10^{-7}		-43 x10^{-7}***
	(8.6 x10^{-7})	(10.3 x10^{-7})		(19.2 x10^{-7})
EU_NMS	-1.92*			
	(1.14)			
NetImportElec	.44	8.47*		-1.80
	(1.44)	(5.02)		(1.37)
Pseudo R2	*0.21*	*.35*		*.23*
N	100	68		32

*** Significant at the 1% confidence level
** Significant at the 5% confidence level
* Significant at the 10% confidence level

transmission unbundling before July 2004. We decided that these facts are substantial enough to have an individual effect on the choice of unbundling regime and therefore included a dummy variable.

[21] We obtained basically the same results using survival analysis, an alternative method of data analysis. In the survival analysis, we categorized a country as being "alive" as long as it has not implemented ownership unbundling, a country "fails" at the moment it implements ownership unbundling.

Model 1 shows that for the EU-25 the effect of the *CPI* is significant and positive[22]. This supports our hypothesis: less corrupt EU-25 countries (a high *CPI* score) tend to implement more rigorous transmission unbundling. Further it shows that richer EU-25 countries (as measured by the per capita GDP) are less likely to implement rigorous transmission unbundling. The dummies for EU membership indicate that being a recent member of the EU has a negative influence on the unbundling regime; it makes it less likely to have implemented rigorous unbundling. Not surprisingly given the fact that the EU directives require legal unbundling by 2004**,** the time trend variable shows that in later years it is more likely for any country to have more unbundling. The significant effect of the *CPI* is robust to varying our treatment of problematic observations[23].

As mentioned in section 3, our observations are most likely correlated by countries; this reduces the degrees of freedom below the number of observations. Our use of six explanatory variables further decreases the degrees of freedom. To avoid a possible overfitting of the model, we performed ordered logit regressions of the transmission unbundling regime on the *CPI* alone and on the *CPI* and one more variable, which results in six regressions. Of these six regressions, three were significant on the .01 level, two on the .05 level and one, on the *CPI* and on the *EU_NMS*, was insignificant. The insignificant result is remarkable, and indicates the existence of a negative interaction effect between the variables *CPI* and *EU_NMS*.

Differences in EU-15 and NMS-10

To assess whether there are indeed differences in the effect of the CPI for old and new EU member states, we perform separate regressions for old EU member states (EU-15; model 2a and 2b) and for new EU member states (NMS-10; model 3). In model 2a the effect of *CPI* becomes more strongly significant, even though the number of observations

[22] It takes time to decide on, and implement, an unbundling regime. It can therefore be argued that the unbundling regime should be regressed on the lagged *CPI*. However, the *CPI* is a moving average over the past three years; the *CPI* of a certain year is based on numerous indexes and reports over a time period including the two previous years (Lambsdorf, 2005). For example, the *CPI* of 2005 is based on information over the period 2003-2005. Performing a regression on the *CPI* lagged by one year gives coefficients and significance levels that are virtually identical to the ones in model 1.

[23] See appendix.

falls by one third. Model 2b shows that using fewer explanatory variables does not affect the significance of the *CPI* much[24]. Model 2a and 2b therefore support our hypothesis.

The effect of *NetImportElec* (P<.1) is now weakly significant; net importers of electricity are more likely to implement rigorous transmission unbundling, or in other words; net exporters of electricity are less likely to implement rigorous transmission unbundling. A possible explanation is that when a country exports electricity the ownership of the transmission is seen as a strategic asset to be able to capitalize on the profits of selling electricity, hence a lower likelihood of the implementation of rigorous unbundling. A linear regression of *NetImportElec* on the transmission regime (P < .05) and other explanatory variables indicates that the causation could also work in the opposite direction: a VIU that is less unbundled has more chances to use its ownership of the transmission strategically to maintain a position as a net exporter by facilitating exports, but not imports.

In model 3 however the effect of the *CPI* in NMS-10 countries is opposite to what we found before; more corrupt NMS-10 countries tend to implement *more* rigorous transmission unbundling. Also the effect of wealth is reversed; richer NMS-10 countries (as measured by *GDP_pc*, the per capita GDP) are *more* likely to implement rigorous transmission unbundling. Further has the economic size of the country (as measured by *GDP*) has a strongly significant effect; economically larger countries are less likely to implements rigorous transmission unbundling.

A possible explanation is that the reverse *CPI* effect is spurious; indeed we have reasons to suspect that the transmission unbundling regime has not always been reported accurately for NMS-10 countries. In the case of Latvia our robustness check (see appendix) indicates that misreporting could have caused a spurious relationship; running the ordered logit regression for NMS-10 countries using the data provided by the Latvian

[24] Ordered logit regressions of the transmission regime on the CPI and one or more other explanatory variables are all significant at the .05 level as long as the variable *GDPpc*, the per capita GDP, is included. The variable *GDPpc* has a positive correlation of .67 with the CPI while its effect (negative) is opposite to the effect of the CPI (positive). Therefore exclusion of the variable GDPpc would partially mask the positive effect of the CPI.

regulator instead of those provided by the European Commission renders the coefficient on the *CPI* (P<.34) and on the economic size of the country (P<.60) insignificant[25].

However, it seems likely that the occurrence of misreporting is related to the level of corruption in the NMS-10 countries. After all, in the pre-accession stage the European Commission has exerted strong pressure on the NMS-countries to show clear signs of reform to be eligible for EU membership. Compliance with the unbundling requirements is a step towards creating a liberal market-economy and a way for an accession country to signal its commitment for reform to the EU[26]. Especially for very corrupt countries such formal compliance is a cheap means relative to curbing anticompetitive practices and governmental corruption. This might explain why more corrupt counties choose (at least formally) more rigorous unbundling. Furthermore, this pressure was most likely more intense for economically smaller countries, as they had less bargaining power vis-à-vis to the EU. This would explain that economically large countries (as measured by the GDP) are less likely to implement rigorous transmission unbundling.

Marginal effects for EU-15 and NMS-10

To explore the size of the effect of the *CPI* on the transmission unbundling regime[27], we calculate the marginal effect of the *CPI* on the probability of choosing an unbundling regime.

Table 4: Marginal effects (in percentages) for EU-15

Absolute	Account	Functional	Legal	Ownership

[25] Likewise, using the data from the Latvian regulator in a survival analysis for the NMS-10 countries renders the coefficient on the *CPI* (P<.58) insignificant.

[26] Prior to the accession of a selected group of candidate countries in 2004, these candidate countries were evaluated by the European Commission, see for example the European Economy Enlargement Papers. As can be seen in the European Economy Enlargement Papers, one of the criteria on which the candidate countries were evaluated was the state of liberalization and regulation of the energy sector. The European Economy Enlargement Papers are available at http://ec.europa.eu/economy_finance/publications/enlargementpapers_en.htm

[27] We expected that the same effect could be found for the unbundling regime for distribution. Running an ordered logit regression of the distribution unbundling regime on the *CPI* and controlling variables results in a positive (0.27) but insignificant (P<0.52) coefficient. A possible explanation is that distribution unbundling was scheduled to be implemented later (July 2007) than transmission unbundling (July 2004), and that the effect of the *CPI* will show up significantly once data over 2005-2007 are available.

CPI	- .2% (.002)	-3.7%* (.021)	-29%** (.12)	33%*** (.11)
TimeTrend	-.09% (.001)	-1.6% (.011)	-13%*** (.04)	14%*** (.05)
GDP_cp	0.01% (.0002)	0.3%* (.001)	2.2%** (.009)	-2.5%*** (.008)
NetImportElec	1.2% (.010)	21% (.13)	-167% (1.02)	189% (1.07)

*** Significant at the 1% confidence level
** Significant at the 5% confidence level
* Significant at the 10% confidence level

Table 4 shows that an increase in the *CPI* with one point (the country is *less* corrupt) increases the likelihood for the average EU-15 country to chose ownership unbundling for transmission with 33%. Likewise, an increase in the *CPI* (the country is *more* corrupt) decreases the probability to have legal, functional or accounting unbundling.

Table 5: Marginal effects for NMS-10

Absolute	Account	Functional	Legal	Ownership
CPI	3.9% (.030)	2.5% (.021)	-2.2% (.031)	-4.2%** (.021)
TimeTrend	-6.9% (.042)	-3.8% (.024)	3.3% (.04)	6.3%* (.033)
GDP_cp	-0.38% (.002)	-0.2% (.002)	0.2% (.003)	0.4%** (.002)
GDP_pps (in millions)	20.6% (.136)	13.2% (.069)	-11.7% (.118)	-22.1%* (.133)
NetImportElec	8.6% (.068)	5.5% (.042)	-4.9% (.050)	-9.2% (.077)

*** Significant at the 1% confidence level
** Significant at the 5% confidence level
* Significant at the 10% confidence level

Table 5 shows that an increase in the *CPI* with one point (the country is l*ess* corrupt) lowers the likelihood for the average NMS-10 country to chose ownership unbundling for transmission with 4.2%. It lowers the likelihood to choose legal unbundling for transmission with 2.2%. Likewise, an increase in the *CPI* (the country is *more* corrupt) increases the probability to have functional or accounting unbundling.

Additional tests

To further illustrate the importance of the CPI, we used our regressions to predict for our observations the binary choice between ownership unbundling and less binding unbundling regimes (legal, functional, account and none)[28]. Inclusion of the CPI generally adds around 9% till 11% to the percentage of correct predictions. The same result follows when we only focus on the data for EU-15. Focusing on the data for NMS-10, we used our regressions to predict for our observations the binary choice between ownership or legal unbundling and less binding unbundling regimes (functional, account and none). Inclusion of the CPI then adds around 6% till 8% to the percentage of correct predictions.

The *CPI* also has, as assessed through a questionnaire that the European Commission administers, a significant effect on the quality of implementation. Performing a binary logit regression on the *CPI* and controlling variables resulted in significant coefficients for the first two questions (see Table 6).

Table 6

Questions	Coefficient	N
Published Accounts?	*CPI* > 4.3 predicts data perfectly	44
Compliance officer?	.60** (.25)	46
Separate corporate identity?	-.01 (.82)	60
Separate locations?	.66 (.45)	60

Mapping the answers to these questions into affirmative (=1) or negative (=0) and pretending that the answer to each question has the same weight, an ordered logit

[28] See appendix. We thank Jan Hanousek for this suggestion.

regression of the total score on the *CPI* and the controlling variables displayed in Table 2 gives a highly significant result (P<0.000).

A final question is whether we can see an increase in rents from less unbundling[29]. Here we consider the industrial electricity price relative to the domestic electricity price. We expect this indicator to be higher for countries with less rigorously unbundled transmission networks. Industrial consumers have more bargaining power than domestic consumers and therefore profit more from rigorous unbundling.[30] A higher indicator value therefore reflects the captivity of industrial consumers and can be used as a proxy for rents captured by the VIU. Indeed the regression of the indicator on the unbundling system (and controlling variables) shows a positive (0.1) and significant effect (p<0.05).

5. Discussion

For the EU member states we found a significant and robust effect of corruption on the realized unbundling regime; countries that are more corrupt are more likely to have chosen weak unbundling regimes.

The fact that more corrupt or less accountable politicians allow less unbundling is an indication that less unbundling is a way to grant VIUs higher rents. Obviously this idea has not been generally recognized; EU laws treat legal and ownership unbundling as equivalently suitable. Our results therefore also contribute to the claim that weaker unbundling enables VIUs to capture higher rents.

This effect is even stronger when we focus only on the old EU member states (EU-15). Our result adds empirical evidence to a literature that casts doubt on the wisdom of allowing a weak unbundling regime which facilitates the continuing existence of large utilities that are effectively still integrated. Our results suggests specifically that the questionable practices of persuasion that were uncovered in the Netherlands (and that we

[29] We thank Libor Dusek for his suggestion.
[30] Steiner (2001) states that industrial consumers are larger – they have the scale to contract their own generator or access spot markets – and they have more elastic demand.

discussed in section 2) may be systemic; VIUs in countries that are more corrupt might use, apart from legal lobbying channels, also illegal means to further their interests.

The analysis focused on only the NMS-10 shows a weaker but statistically effect in the opposite direction. In our framework, this suggests that NMS-10 countries reported early adoption of formal EU requirements as a cheap means to increase their chances to be judged eligible for accession into the EU. This strategy should be especially attractive for corrupt countries; countries that find it costly to implement other EU requirements as curbing anticompetitive practices and governmental corruption.

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[31] At the time of writing the authors, most likely because of the turmoil caused by their compromised independence, did not allow the final version of the report to be downloaded anymore. However, the concept version of the disputed report was still available at http://www.imsa.nl/uploads/ManifestCONCEPT.pdf.

Appendix

In this section we report a variety tests we performed to verify our results. We performed robustness tests for the observations that report a mixed transmission unbundling regime and for contradictory data on Latvia. We also used our regressions to perform predictions on our data set and show the effect of the inclusion of the CPI on the percentage of correct predictions. All these tests support our results.

1. Mixed transmission unbundling regime

To assess whether the removal of observations that report a mixed transmission unbundling regime - Legal/Management (L/M) for Ireland and Greece and Ownership/Legal (O/L) for Italy – affects the results, we did three robustness tests. In the first test, we included the mixed regimes as ordered categories; e.g. L/M is more unbundled than Management unbundling, but less than Legal unbundling. The significance of the coefficient of the *CPI* falls slightly for model 1 and 2 (to 0.033 and 0.32 respectively), but is unaffected for model 3 and 4 ($P<0,01$). The second test assigns the lower unbundling regime to each combination e.g. L/M becomes Management unbundling. The significance of the coefficient of the *CPI* is unaffected in all models. The third test assigns the higher unbundling regime to each combination e.g. L/M becomes Legal unbundling. In model 1, the significance of the coefficient of the *CPI* falls to 0.076, the significance in model 3 falls to 0.014, the significance in model 4 is unaffected.

2. Contradictory data on Latvia

In the DG Tren reports the unbundling regime of Latvia is classified as accounting unbundling in 2003, and as legal unbundling before (2002) and after (2004 and 2005) (Commission of the European Communities, 2002, 2003, 2004, 2005). The (Latvian) Public Utilities Regulation Commission (2005) indicates that Latvia implemented legal unbundling only in 2005, and had accounting unbundling up to 2004. For consistency, we use the classification officially reported by the Commission of the European Communities. However, we ran a robustness check with the data from the (Latvian)

Public Utilities Regulation Commission (2005). The correction in the data lowers the significance of the coefficient on the *CPI* in model 1 (p<.1), and leaves the significance in model 3 (for the EU-15) unaffected. The coefficient on the *CPI* in model 4 becomes insignificant (P<.34).

3. The effect of the CPI on the percentage of correct predictions.

To further illustrate the importance of the CPI, we used our regressions to predict for our observations the binary choice between ownership unbundling and any unbundling regime less than ownership unbundling (legal, functional, account and none). We created a new variable, *Ownership*. The variable receives the value 1 if ownership unbundling regime has been implemented; it receives the value 0 otherwise. The variable *Ownership* has 110 observations, 33 of which are ones (ownership unbundling has been implemented) and 77 of which are zeros (an unbundling regime lower than ownership has been implemented).

We use our regressions to predict for our observations the binary choice between ownership unbundling and any unbundling regime less than ownership unbundling (legal, functional, account and none).

EU-25: correct classification for binary choice

	Excluding cpi	N	Including cpi	N	Increase in correct classification due to cpi variable
All variables	73%	100	82%	100	9%
t, GDP_pc, EU_NMS	68%	108	79%	105	9%
GDP_pc, EU_NMS	79%	105	68%	108	11%
T	59%		59%		0%

Inclusion of the CPI generally adds around 9% till 11% to the percentage of correct predictions. The same result follows when we only focus on the data for EU-15.

EU-15: correct classification for binary choice

	Excluding cpi	N	Including cpi	N	Increase in correct classification due to cpi variable
t, GDP_pc	65%	68	74%	68	9%
GDP_pc	59%	68	75%	68	11%

Focusing on the data for NMS-10, we used our regressions to predict for our observations the binary choice between ownership or legal unbundling and any unbundling regime less (functional, account and none) In this case, inclusion of the CPI generally adds around 6% till 8% to the percentage of correct predictions

NMS-10: correct classification for binary choice

t, GDP_pc, GDP_pps	68%	40	76%	37	8%
t, GDP_pps	67%	42	76%	37	9%
t, GDP_pc	68%	40	76%	37	8%
GDP_pps	62%	42	68%	37	6%

For reference only

Overview of the sources used to determine the transmission unbundling regime

Official EU Sources		Remarks
2001	First DG Tren report (Commission of the European Communities, 2001)	• The observation on Luxemburg is missing. • Does not contain data on NMS-10.
2002	Second DG Tren report (Commission of the European Communities, 2002),	• For the EU-15 member states, two observations are categorized as a mix of functional and legal unbundling and one

		observation as a mix of legal and ownership unbundling; these observations are omitted from Table 1. We did, however, do various robustness tests including these data; they are reported in section 4.
2003	In the Third DG Tren report (Commission of the European Communities, 2004)	• For the EU-15 member states, two observations are categorized as a mix of functional and legal unbundling and one observation as a mix of legal and ownership unbundling; these observations are omitted from Table 1. We did, however, do various robustness tests including these data; they will be reported in section 4.
2004	Report on Progress in Creating the Internal Gas and Electricity Market, Technical Annex (Commission of the European Communities, 05.01.2005).	
2005	Report on progress in creating the Internal Gas and Electricity Market (Commission of the European Communities, 05.11.2005).	
Additional sources		Remarks
	Malta Resources Authority (2005), p.3.	•Observations on Malta for 2001-2005
	Cyprus Energy Regulatory Authority (2005), p.15.	•Observations on Cyprus for 2002-2005.
	The (Latvian) Public Utilities Regulation Commission (2005)	•Used for a robustness check of a possible mistake in the official EU data