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Abstract

The EU electricity directive (96/92/EC) established the right of the member states to choose between Regulated and Negotiated Third Party Access (RTPA and NTPA). The interest group theory is able to explain whether the introduction of NTPA in Germany had been an interest group equilibrium under the restriction of EU-directive. Using the NTPA associations of electricity power suppliers, network monopolists and industrial consumers negotiated three agreements. The last one (AA VVII^{+}) in December 2001 introduced a market comparison scheme with three structural features: "East-/West-Germany", "consumption/population density", and "cable rate". These features are variables which are supposed to reflect cost differences between network suppliers. The theoretical analysis will derive the hypothesis that this conception allows to introduce a cost irrelevant factor and therefore to increase prices without harming firms which do not hold this factor. This hypothesis could be tested by analyzing the German low and medium voltage network suppliers in 2002 and 2003. Our estimations show that the use of structural feature "East-/West Germany" and "consumption/population density" could be explained by this hypothesis. But because we have no firm specific information about cost differences other explanations could not be excluded: Monopoly prices differ with marginal costs, and regulation could reflect real cost differences. The third structural feature "cable rate" has no influence in low voltage networks, but has an impact on access charges levied in medium voltage networks. This relationship is only given if we use the borderlines given by AA VVII^{+}. Hence, we are not able to reject the interest group theory: The feature "cable rate" was introduced successfully to increase access charges for medium network suppliers which have high cable rates without having higher costs.

Key words: deregulation, natural monopoly, interest groups

JEL-Classification: D42, L43, L94

Not-competing to the Young Economist Award

I. Introduction

Instead of introducing a strong regulation authority (Regulated third party access; RTPA) as in other EU-countries German network owners and users must negotiate among each other (Negotiated third party access; NTPA). The German energy associations had been appealed for creating a private framework which could be used by private firms. An obligation of using this framework had not been constituted consciously. Since 1998 power energy producers and industrial customers passed three sequent “private laws” (Verbändevereinbarungen; VV; associations´ agreements; AA) which had been created by long lasting negotiations. The AA II^+ is valid currently (Associations´ agreement 2001, passed in December 2001), it contains specific rules for a market comparison scheme which is supposed to be applied for the calculation of network access charges. In addition to the influence of NTPA the German cartel offices (Bundeskartellamt and Landeskartellamt) have the possibility to control network access ex post, especially to secure non-discriminatory access. Consequently, Meran and von Hirschhausen (2004, 1) have described the German way of energy regulation as “cartel type, private contracts negotiated between the main domestic players in the industry, accompanied by weak ex-post control exercised by anti-monopoly agency”.

From the economic view point it is unclear whether RTPA or NTPA should be implemented. RTPA features the crucial problem that the regulation authority needs to be able to enforce adequate access charges. The economic theory gives no definite answer about the adequate price rules (for example (long run) average incremental cost prices, efficient component price rules or Ramsey-prices (Baumol/Sidak 1994; Sidak/Spulber 1997, pp. 403-426), nor can be assumed to have full informed authorities. Further on, following public choice theory the regulated firms will be able to influence the authority; the regulation agency will be captured by the regulated. Analyzing the NTPA-approach the argument could be that the associations are better informed because of being more familiar with the market and cost conditions. In this paper we will argue and empirically test that the interest group of network owners has used the AAs to weak regulation and therefore to improve the possibility of gaining monopoly profits. In detail, they were able to introduce cost irrelevant cost in the market comparison scheme which allow increasing access charges without harming other network owners.

The paper is organized as follows. We will briefly sketch the current association agreement with a closer look to the existing market comparison scheme (chapter 2). Because of the AA argues that cost differences should influence access charges the third chapter shows in which way cost differences between network monopolists will be reflected by price differences. These results depend whether we assume the existence of market power or well-going regulation. The public choice theory which we are discussing in the fourth paragraph suggests that the association of network monopolists had an interest to introduce cost irrelevant factors: Such behaviour presupposes the power of network monopolists during the negotiation process, especially the non-existence of opposition made by industrial customers associations. We will derive empirical testable hypothesis in the fifth chapter. A descriptive comparison of network access charges will show that the mean values of charges are not like the expectations which could be developed out of the current AA (chapter 6). Multivariate estimations will give hints that the AA market comparison scheme allows to introduce cost irrelevant factors in a Pareto-improving manner (chapter 7). Unfortunately, the estimations are often not able to reject that other influences like executing monopoly power or higher costs really exist. Summarized results and some conclusions will be given in the last chapter.

II. NTPA

The EU electricity device (96/92/EC) had allowed the European member states to choose between NTPA and RTPA (Bier 2001, Brunekreeft 2002). Germany was the sole European country which had adopted NTPA, but this way of energy regulation will be disestablished in 2005, not only due to a new European directive. The starting point of NTPA was the amendment of the national energy act (EnWG) at spring time 1998. In combination with Art. 19 IV German Competitive Law (GWB) network users have received the right of non discriminatory access at reasonable prices. As a matter of principle, network users must always negotiate the terms of access with network owners. Facilitating these private negotiations the associations of network owners and industrial customers have bargained access frameworks which are called "Verbändevereinbarungen/VV" (associations` agreements).

The current framework VV II^+ was passed in December 2001 (Associations´ Agreement 2001). It contains technical rules, general terms of contracts, principles of the calculation of access charges and the market comparison scheme. Since 2003 VV II^+ has been accepted by law as the general code of practice without constraining the regulatory power of cartel offices. Characteristic consumption cases have been defined in the market comparison scheme. This scheme is supposed to allow the comparison of access charges, differentiated after characteristic consumption cases and low-, medium- and high-voltage-networks. Possible cost differences are supposed to be considered by structural features:

- Structural feature number 1 measures the regional intensity of demand. Regarding the low voltage network the population density (inhabitants per sqkm) is used. Low population density (D) means below 2500 inh./sqkm, medium until 3500 inh./sqkm and high above 3500 inh./sqkm). To avoid contortions, areas without low voltage supply (forests, lakes etc.) are not included. The consumption density (MWh/sqkm) takes the current flows in medium and high voltage networks in relation to the whole area of the network into account. This feature is applied to the whole area as unpopulated territories in these networks cannot be excluded technically. Consumption density in medium/high voltage (D) is classified as low if MWh/sqkm are below 500, medium until 1700 MWh/sqkm, and high above 1700 MWh/sqkm.
- The second structural feature "cable rate" (CR) measures the cable length in comparison to the whole length of the respective network´s conductions. This structural feature is supposed to represent the fact that network operators are frequently obliged (for aesthetical and environmental reasons) to use underground lines. The associations agreed on three classes of CR: Low (CR < 50 %), medium (50 % < CR < 75 %), and high (CR > 75 %).
- The third structural feature includes the fragmentation of network suppliers due to their service areas: East- and West-Germany.

Altogether, the AA includes (3 x 3 x 2) 18 structural categories.

As an essential part of the market comparison scheme the AA provides a process to sue expensive suppliers at an arbitrative board. Firstly, suppliers are defined as expensive if their access charges are higher than the upper 30 % which can be identified per all 18 structural categories. Secondly, at the request of a network user the arbitrative board has the right to proof whether such an expensive supplier takes reasonable access charges. The criteria "reasonable" can be proofed within the AA: As part of VVII^{+} price calculation guidelines were passed which nearly contain the same principles as in the former regulation. Additionally, the supplier should charge only prices comparable to a technical efficient firm ("elektrizitätswirtschaftlich rationelle Betriebsführung"). The network monopolist has the duty to disclose all information as necessary. The board`s decision are not binding for both parties, especially the supplier has no legal obligation to decrease charges. Nevertheless, cartel office interventions are still possible.

III. Cost Differences – The Traditional View

The German electricity market can be split up into the sections generation, transmission networks, distribution networks and retail (cp. Growitsch/Wein 2004). The generation section and retail can be seen as stages in which competition is possible, if non discrimitarory access to both networks stages can be established, no arguments in favour of uncontestable networks are given here. The national grid or transmission networks – in Germany an amalgamation of four combined sub-networks (regional closed loop controls, Regelzonen) - is defined as the network of extra high voltage level (220/380 kV). It is used to transmit electricity from the generation plants to the interconnection sites, which link the national grid to regional distribution networks. Regional and local distribution is based on high, medium and low voltage level networks (100 – 0.4 kV). Transmission and distribution networks are good examples for stages with subadditive cost functions: Density and stochastic scale advantages make it necessary to have only one network supplier (natural monopoly). Because of the existence of enormous sunk costs potential competition can not work; non contestable natural monopolies are given *(*cp. Brunekreeft 2002, Growitsch/Wein 2004).

Uncontestable natural monopolies should be regulated to prevent monopoly prices and to avoid welfare losses. If we are able to assume that NTPA works perfectly (regulatory threat; cp. Brunekreeft 2002), in which way are costs differences decisive for pricing behaviour? Because of having natural monopoly in these networks decreasing average and marginal costs can be supposed for simplification (see figure 3-1). If NTPA only allows charging average costs, the access charge will be P^{LAC}. Assuming different cost structures the LAC-curves can be drawn easily: High costs network suppliers are confronted with LAC^{high}, and suppliers with low costs are characterised by LAC^{low}. Supposed that NTPA is able to recognize these cost differences, different access charges will be allowed: P_{Lac}^{high} for high cost and P_{Lac}^{low} for low cost firms. Hence, NTPA is second best efficient in the sense that cost differences are reflected in different prices. The first best solution (marginal-cost-prices) can not be achieved.

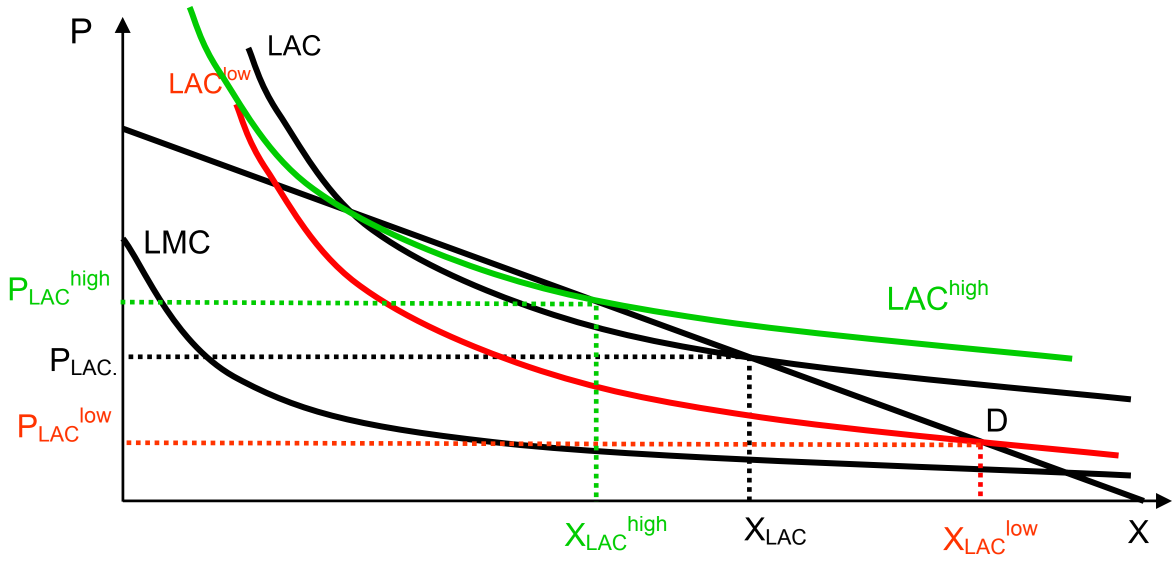

Figure 3-1: NTPA and cost differences.

But which results could we expect if NTPA does not work and cost differences are given? Figure 3-2 shows the case of natural monopoly with decreasing average and marginal costs. Assuming no NTPA regulation is in force, profit maximizing monopolists equate marginal costs with marginal revenues; Cournot quantities as X^M and Cournot prices P^M can be observed. Having higher average costs like LAC^{new} does not lead to any price reaction. Only differences on the marginal cost level are important for prices: LMC^{low} is an argument to decrease prices to P^{low}, whereas LMC^{high} allows price markups (P^{high}). The graphical exposition shows that marginal cost differences must be given to influence Cournot monopoly prices, costs differences which are only important for average costs would be ignored in the price setting behaviour.

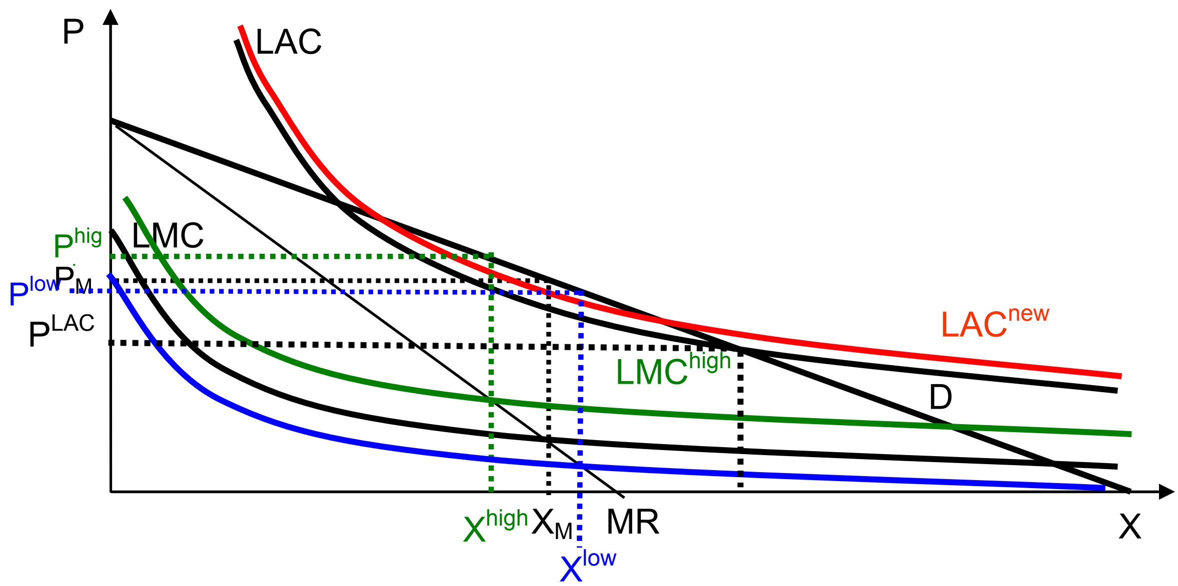

Figure 3-2: No regulation and cost differences

Answering the question about the connection between costs differences and price traditionally the results are dependent on the effectiveness of regulation: Average cost difference are relevant for prices in case of a workable NTPA, and if price regulation does not work, marginal cost difference will only be relevant for the price setting behavior.

4. Cost Differences and Interest Groups

Because of the AAs have been bargained between several interest groups, the result must be explained by the interest group theory. Interest group theories can be divided into three directions. Firstly, following capture theory, regulated firms and their interest groups are interested to be regulated because of being protected from competition. If regulation has been established the firms are able to influence politicians and bureaucrats. As longer as regulation exists bureaucrats and regulated firms agree more and more to prevent competition (cp. Stigler 1971). Secondly, Peltzman (1977) modeled in detail how politicians use regulation to favor regulated industries and transfer the burden to consumers which do not recognize disadvantages individually. Thirdly, Becker (1983) showed that regulation can be imposed in a competing process between different interest groups.

Bonde (2002) has explained the deregulation of German electricity market, especially the dismissal of the Energy act, with Becker`s model:

- The Federal government favored deregulation because of ideological reasons (supply side economic policy).
- The energy using industry, represented by VIK[1] and BDI[2] also supported deregulation.
- ARE[3], which had been founded by local power producers and network monopolists, opposed deregulation.
- The owners of transmission networks and big energy producers (VDN/VdEW[4] and VKU[5]) defied deregulation.

Bonde has argued that the German deregulation was the equilibrium of these antagonistic interest groups under the restriction of the EU directive.

The Associations agreements which have been passed after the new Energy Act from 1999 to 2001 were negotiated by the same interest groups, but without the Federal government. Hence, it is probably true that the current AA "VV II^{+}" can also be seen as an

[1] Verband der Industriellen Energie- und Kraftwirtschaft, Association of the Industrial Energy and Power Industry.
[2] Bundesverband der deutschen Industrie, Federal Association of German Industry.
[3] Arbeitsgemeinschaft regionaler Energieversorgungs-Unternehmen, Federation of Regional Energy Utilities.
[4] Verband der Elektrizitätswirtschaft (Association of the Electricity Industry)/Verband der Netzbetreiber beim VdEW (Association of System Operators at VDEW).
[5] Verband kommunaler Unternehmen (Association of Municipal Utilities).

interest group equilibrium. Network suppliers certainly had an interest to levy high access charges, circumventing deregulation. They also had the possibility to do this because of information advantages about cost structures. Considering this two questions have to be answered:

- Did the association of network suppliers have an incentive to introduce cost irrelevant factors?
- If yes, were the suppliers able to implement this solution against the other interest groups, especially against the associations of (industrial) consumers?

The first question will be answered in this paragraph intensively. The second question can be answered empirically: If the network suppliers were strong enough the prices should reflect incorrect structural features.

To argue the first question we introduce table 4-1. We suppose to have eight firms (A to H) which have different average costs C. They are charging different access charges as mentioned in column 3. Therefore, firm B-D and F-H have prices which are not reasonable. Assuming that the structural feature л is able to indicate the cost difference correctly, л is a relevant feature. For simplicity, we assume that the critical value for starting an arbitration process in the market comparison scheme should be 50 %. Therefore, the critical values are the mean values 4.5 (with $\pi = 0$) and 8.5 (with $\pi = 1$). Using such kind of NTPA firms B and F are not discovered, the detecting probability is 2/3.

Table 4-1: Relevant cost feature

	C	P	Relevant π	
A	3	3	0	Ø=4,5
B	3	4	0	undiscovered: B
C	3	5	0	proceeding: C,D
D	3	6	0	Detecting prob.: ⅔
E	7	7	1	Ø=8,5
F	7	8	1	Undiscovered: F
G	7	9	1	proceeding: G, H
H	7	10	1	Detecting prob.: ⅔

If we suppose introducing an irrelevant factor named σ, we will get table 4-2. The feature σ should be allocated randomly.

Table 4-2: Randomly distributed cost irrelevant factor				
	C	P	Relevant π	Irrelevant σ
A	3	3	0	0
B	3	4	0	1
C	3	5	0	0
D	3	6	0	1
E	7	7	1	0
F	7	8	1	1
G	7	9	1	0
H	7	10	1	1

Table 4-3 shows resulting structural features with critical mean values and names of the firms which will have proceedings.

Table 4-3: Randomly distributed irrelevant cost factor – summary			
		Π	
		=1	=0
σ	=1	F, H Ø=9 proceeding: H	B, D Ø=5 proceeding: D
	=0	E, G Ø=8 proceeding: G	A, C Ø=4 proceeding: C

If we compare our results in case of using one relevant structural feature with the case of introducing an additional irrelevant feature (table 4-4), we can see that no differences exist: The same firms will have proceeding or will not be discovered. Hence, the additional use of σ does not change the progression of the market comparison scheme.

Table 4-4: Comparing results I				
	C	P	Only: π	π and σ
A	3	3	right	right
B	3	4	undiscovered	undiscovered
C	3	5	proceeding	proceeding
D	3	6	proceeding	proceeding
E	7	7	right	right
F	7	8	undiscovered	undiscovered
G	7	9	proceeding	proceeding
H	7	10	proceeding	proceeding

Assuming that high prices of C/D on the one hand and G/H on the other hand are good arguments during the negotiation of a new AA to introduce σ as a new structural feature, table 4-5 is given. The firms which have high prices without higher average costs are characterized by σ=1,. The feature σ is allocated strategically.

Table 4-5: Strategic irrelevant cost feature				
	C	P	Relevant π	Irrelevant σ
A	3	3	0	0
B	3	4	0	0
C	3	5	0	1
D	3	6	0	1
E	7	7	1	0
F	7	8	1	0
G	7	9	1	1
H	7	10	1	1

Table 4-6 shows the results of the market comparison scheme if table 4-5 is used. The results have been changed compared to the case of randomly distributed σ.

Table 4-6: Strategic irrelevant cost feature/Summary			
		Π	
		=1	=0
σ	=1	G, H Ø=9,5 Proceeding: H	E, F Ø=7,5 proceeding: F
	=0	C, D Ø=5 Proceeding: D	A, B Ø=3,5 proceeding: B

The strategic use of σ leads to a dramatic result (table 4-7): Firms B and F are not discovered as high price suppliers, but C and G are faced with proceedings. The detecting probability remains unaffected.

Table 4-7: Comparing results II				
	C	P	Only: π	π an σ
A	3	3	Right	Right
B	3	4	Undiscovered	Proceeding
C	3	5	Proceeding	Undiscovered
D	3	6	Proceeding	Proceeding
E	7	7	Right	Right
F	7	8	Undiscovered	Proceeding
G	7	9	Proceeding	Undiscovered
H	7	10	Proceeding	Proceeding

Another question is whether the same probability of conviction is given? The prices of the impeached firms B and F are lower than unburdened suppliers, C and G. Further on, the price calculation guidelines which are part of the market comparison scheme are nearly independent from structural features. Are B and F able to argue that their costs are so important that their lower prices are justified? Hence, we can get a possible outcome which is a „pareto improvement“ (table 4-8): C and G are not faced with proceeding, and B and F will not be sentenced to decrease prices.

Table 4-8: Pareto-improvement				
	C	P	Only: π	π an σ
A	3	3	right	right
B	3	4	undiscovered	no conviction
C	3	5	proceeding	undiscovered
D	3	6	proceeding	proceeding
E	7	7	right	right
F	7	8	undiscovered	no conviction
G	7	9	proceeding	undiscovered
H	7	10	proceeding	proceeding

5. Hypotheses

Until now we have only analyzed cost differences theoretically without defining which variables are able to measure cost differences. Standard microeconomic theory would assume that labor and capital factor prices, economies of scale and scope, topographic reasons etc. are decisive. It can be supposed that no crucial regional differences for factor prices are given, hence, they could be neglected. The AA “VV II^{+}” has introduced (Katzfey 2002):

- regional density of demand (D) as first structural feature, measured by population density in low voltage networks and consumption density in medium/high voltage networks. To receive values that are comparable to other explaining variables we have divided the density values by 1 000. The negotiation partners have argued that these variables are adequate indicators for economies of scale. In detail, increasing density of demand should cause diminishing average costs; to control for non-linearity we use quadratic terms of D.
- cable rate (CR) as second structural feature, measured as cable length in comparison to the whole length of the respective network´s conductions. To create comparable values, we have divided the cable rate by 100. The “cable rate” represents the fact that network operators are frequently obliged (for aesthetical and environmental reasons) to use underground lines which lead to higher installation and maintenance costs. The

hypothesis is that overhead lines would be less cost intensive and would have been established by the operators in case of the absence of these obligations. Hence, an increasing cable rate would be an argument for higher marginal/average costs. Non-linearity will be checked by the quadratic term of CR.

- East Germany as third structural feature. This variable represents the consideration that oversized networks have been established in East Germany after 1989. The over-sizing effects are the result of not forecasting the diminishing peak load quantity (by 70 %) after the reunification (stranded costs). Further arguments for higher and also lower network costs in East Germany are reported: Poor network conditions, duties to connect new enterprise areas, lower personnel costs. Because of the assumption that the over sizing effects were decisive, higher marginal and average costs are expected in East Germany. Further on, we have defined the third structural feature as dummy-variable "East" (Yes =1, else = 0).

The AA VVII+ includes further cost-relevant factors, but without any hypotheses: Number of network access ports, annual consumption quantity, annual decentralized power quantity per year, spare capacity (provided by preliminary networks), cable length of overhead lines, cable length of underground lines, and number of nodal points. No firm specific data are published about these factors, therefore we can not test these variables.

As dependant variable we use access charges because we expect a connection between cost variables and access charges. Several firm specific access charges have been published by AA since 2002 (VDN 2003): Access charges at the low voltage networks have been differentiated between with and without power metering, and at medium and high voltage with power metering. All charges have been differed in terms of characteristic consumption classes, for example for low voltage networks without power metering between 1 700, 3 500 and 30 000 kWh/a, and for medium voltage between 1 600, 2 500 and 5 000 utilization h/a (cp. Katzfey et al. 2002). Furthermore, the German association of the electricity network operators has calculated the arithmetic mean values of the firm-specific charges, separated for the low and medium voltage networks.

To constrain the extent of estimation we only consider the mean values. The Ordinary-Least-Square-(OLS-)-method is used for all multivariate estimations (cp. Gujarati 1995 or Hill/Griffiths/Judge 1997). Furthermore, we conduct normality tests after Jarque-Bera and homoscedasticity-tests after White to check for important assumptions of the OLS-Method (cp. Greene 1997, Gujarati 1995, and Kawakatsu 1998). The used statistical software package is EViews 4.0.

The expected signs for the independent variables are shown in table 5-1. The last column assumes that NTPA does not work and therefore network suppliers are able to charge

Table 5-1: Hypothesis

		mean value of access charges/exp. Sign		
		interest group	public interest	monopoly
D (population/consumption density)				
	Linear		-	-
	Non-linear		decreasing	decreasing
	Low	+		
	Medium	+		
Cable rate				
	Linear		+	+
	Non-linear		increasing	increasing
	Low	-		
	Medium	-		
East Germany		+	+	+

monopoly prices. The column "public interest" recapitulates the influence of real cost differences on access charges. Assumed the introduction of cost irrelevant factors by interest groups the second column needs be examined.

We would expect the following signs:

- The last row variable "East Germany" leads to the same expectation independent off the explaining theories: East-German firms will charge higher prices than West-German suppliers.
- The density variable must be checked according to the used theories. Testing public-interest- or monopoly-theory the original values of density have to be used. If density increases, monopolist or strongly regulated suppliers will decrease prices because of realizing economies of scale. If there is a linear connection we would expect a negative sign; in the case of non-linear relationships we will predict to be on a decreasing intercept. Because in the AA VVII$^+$ the density variable has been implemented by structural categories, we have to estimate the interest group hypothesis by adopting these categories: Firms which belongs to the low or medium density feature would charge higher prices as suppliers in the high density feature.
- If an increasing cable rate is be accompanied by higher marginal costs, monopoly prices will increase. Regulated firms will raise charges to compensate for additional average

costs. Positive linear or increasing quadratic relationship are possible in both cases. If the interest group hypothesis can not be rejected the structural features will have the following correlation: Suppliers which fulfill the conditions of the low or medium cable rate feature demand lower charges than suppliers in the high cable rates feature.

6. Descriptive Analysis

Tables 6-1 and 6-2 show the mean values of access charges in autumn 2003, separated between East- and West-Germany. Given the structural feature of consumption density we would expect increasing access charges if the cable rate increases. Regarding East-Germany and low voltage network the values in the feature "CR high" contradicts this expectation (table 6-1). Moving to West-Germany/low voltage network suppliers access charges will not increase with higher CR-feature if medium or high density is given. Keeping the structural feature "cable rate" in East Germany constant the mean access charge for high consumption/ medium cable rate only is contradictory to our hypothesis, the same contradictorily result is given for West-Germany/low cable rate/medium density (table 6-1).

Table 6-1: Mean values of access charges – low voltage 09/2003

		East			West		
		D „consumption density					
		low	medium	high	Low	medium	high
CR „cable rate“	High	6.23	6.09	5.89	5.53	5.25	5.15
	medium	6.84	5.97	6.12	5.51	5.35	5.20
	low	n=1	n=1	5.71	5.53	5.68	5.21

Source: VDN 2003

Table 6-2 represents the mean values of medium voltage networks with population density as the first structural feature. Keeping constant D we have any expected sign in East Germany, and for West Germany unexpected values in high cable rate/low density and in medium cable density/medium density are calculated. Assuming a given cable rate we only get an "anomaly" in West-Germany/low CR and medium D.

Table 6-2: Mean values of access charges – medium voltage 09/2003

		East			West		
		D „population density“					
		Low	medium	high	low	medium	high
CR „cable rate“	High	3.13	3.21	3.08	2.81	2.71	2.58
	medium	3.39	3.35	n=1	2.96	2.60	2.50
	low	3.43	n=1	n=1	2.67	2.74	n=1

Source: VDN 2003

The descriptive values show that the variable cable rate can not be confirmed many times. But the density variables also have unexpected signs.

7. Multivariate Estimations

Because we possess firm specific data we are able to estimate multivariate equations to check the influence of structural features simultaneously. We estimate with the access charges in 9/2002, in 5/2003, and in 9/2003, which are available for low and medium networks. In all points of time and for all networks two models are used: The first model applies the framework of AA VVII$^+$, and the second model uses data according to the monopoly- or public interest approach.

Table 7-1 shows the results of access charges in September 2002 which have been charged by 388 low voltage suppliers. Both models confirm that East-German network owners charged higher access charges, approximately 8 %; these variables are highly significant. Hence, this can be the result of monopoly pricing, adequate public interest regulation or successful interest group activity done by the network suppliers. The density variable which

Table 7-1: Average network access charges September 2002 – low voltage

		Model 1	**Model 2**
East-Germany (Yes=1)		0.830*** (16.418)	0.838*** (14.646)
Population density (Inhabitants/ 1 000 sqkm)		-	-0.144*** (-2.997)
Population density^2		-	0.004 (0.731)
Population density?	low (Yes=1)	0.417*** (6.436)	-
	medium(Yes=1)	0.164*** (3.353)	-
Cable rate (1=100)		-	-0.330* (-1.960)
Cable rate^2		-	0.037** (2.074)
Cable rate?	low (Yes=1)	0.237 (1.570)	-
	medium(Yes=1)	0.128* (1.938)	-
Constant		5.094*** (153.965)	5.974*** (37.978)
R^2 (adjusted)		0.419	0.415
F-Test (p-value)		56.867*** (0.000)	55.832*** (0.000)
N		388	388

Test of normality after Jarque/Bera[2]	H_0^a*** (0.000)	H_0^a*** (0.000)
Test of homoscedasticity after White[2]	H_0^a* (0.066)	H_0^{na} (0.174)
Estimation method	OLS[3]	OLS

*[1] Significant on 10 %-, 5 %-, and 1 %-level: *, **, and ***; t-values in parentheses. [2] H_0^a: null hypothesis could be rejected; H_0^{na}: null hypothesis could not be rejected; p-values in parentheses. [3] Heteroscedastie-consistent-OLS-Estimation after White.*
Source: Data set "Deregulated German electricity market"; estimated with "EViews 4.0.

should be measured by population density shows that with a linear increasing of density the access charges decrease: 1000 inhabitants per sqkm indicate a price reduction by 14 % (significant on the 1 percent level). An evidence of a non-linear influence is not given. This price setting behaviour may be the result of using monopoly power if regulation does not work or an adequate regulatory rule implemented by AA VVII$^+$. Model 1 also allows the interpretation that network suppliers with low/medium density imposed higher prices without having higher costs (interest group hypothesis). If we look on the estimations for the structural feature "cable rate" we find other results: The linear and the quadratic term are significant (model 2), but the functional form shows that we will be on the decreasing intercept if the upper and lower boundaries of existing cable rates are included. In opposition to this result public interest and monopoly pricing behaviour forecast an increasing intercept! Hence, we can reject both explanations. If we are testing the interest group approach, model 1 should be used: The dummy variable "low" is not significant, and the "medium" exhibits the wrong sign. Hence, model 1 contradicts the hypotheses that the structural category "cable rate" has been used to increase prices without having higher costs. In other words: We have no indication that the variable "cable rate" must be classified as an irrelevant structural feature introduced by the network suppliers. It is possible that the association of the network suppliers had enforced this structural category strategically, the firms did not recognize this possibility to earn more profits indeed. Perhaps the firms would have changed their behaviour in the following periods.

Both models which are reported in table 7-1 are highly significant and are able to explain more than 40 % of the variance. The assumption of normal distributed error terms must be rejected in both models, but we can assume an asymptotic normal distribution with nearly 400 numbers of firms. Homoscedasticity tests after White indicate that model 1 should be done with a heteroscedastie-consistent-OLS-Estimation-method.

Table 7-2 summarizes the results of model 1 and 2 and shows the results for the other points of time concerning low voltage networks: May and September 2003; detailed estimation results are presented in the appendix (tables A-2 and A-4). The non-colored, significant

Table 7-2 Average network access charges – low voltage

		9/2002		5/2003		9/2003	
population density							
	Linear		-***		-***		-***
	non-linear		+		+		+
Structural feature	Low	+***		+***		+***	
	Medium	+***		+***		+	
cable rate							
	Linear	9	-*	9	-*	89	-*
	non-linear		+**		+*		-*
structural feature	Low	+		+*		+	
	Medium	+*		+***		+**	
East		+***	+***	+***	+***	+***	+***

signs show the expected signs and can be interpreted like the estimation for 2002: Population density and East-Germany influence access charges as predicted by all three theories. Red marked variables show significant impact from the cable rates to access charges, but with an opposite direction as predicted. The blue variable means that we have an decreasing or increasing functional form depending on the range of existing cable rates. Hence, our results shows that the average network charges which are imposed by low voltage network suppliers can not be explained by any of our three theories. Our expectation that network suppliers with higher cable rates and no higher costs would learn to use their mark up possibilities has to be rejected.

Table 7-3 gives an overview about the estimation results for medium voltage networks (see tables A-1, A-3, and A-5 in the appendix). The findings to East-Germany coincide with the results of table 7-2. Consumption density in 2002 and May 2003 also leads to the same results, but in autumn 2003 the significant, non-linear relationship indicates increasing and decreasing values. Regarding cable rate we can see that public-interest- and monopoly-pricing-hypothesis have to be rejected. Interest-group-explanation can not be upholded in 2002, but in 2003 firms with high cable rates charged higher prices than suppliers with medium cable rates as predicted by the interest-group-approach. Hence, it is possible that network suppliers with a high cable rate have learned to take higher prices without having higher costs.

Table 7-3 Average network access charges – medium voltage

		9/2002		5/2003		9/2003	
consumption density							
	Linear	9	-***	9	-***	89	-**
	non-linear		+***		+***		+**
	Low	+***		+***		+***	
	Medium	+***		+***		+	
cable rate							
	Linear		-		-		-
	non-linear		+		-		-
	Low	+		-		-	
	Medium	-		-**		-**	
East		+***	+***	+***	+***	+***	+***

VIII. Conclusions

The traditional interest group theory can be used to explain the current German energy act with NTPA. It would be surprising that interest group theory could not be used for the bargaining process of the AAs which had to be implemented as a consequence of NTPA. Theoretically, it can be shown that the strategic use of an irrelevant structural feature benefits the "holders" of this feature without harming the non-holders. Therefore, the introduction of such an irrelevant structural feature could be a Pareto-improving action. Structural features which represent real cost differences would lead to higher prices, independent of assuming an adequate regulation or monopolistic behaviour. In the monopoly case price distinctions can only be expected if marginal costs have changed.

The structural feature "East Germany" is highly significant and shows the expected sign. This can be the result of public interest regulation, monopoly pricing behaviour or working interest groups. In the last case, the provision of energy in East Germany can be used as an argument to increase prices without having higher costs.

The structural feature "Population density in low voltage networks" has a significant influence with the expected sign: Increasing density leads to lower charges. Regarding medium voltage in 9/2002 and 5/2003 the same evidence is given; the values for 9/2003 can not be interpreted. This confirmative evidence can be explained by public interest regulation, monopoly pricing behaviour, or working interest groups. If the interest group approach is valid suppliers with lower density would increase prices without be burdened with higher costs.

The structural feature "cable rate" can be characterised twofold. The access charges at the low voltage networks can not be explained by this variable. Hence, we must reject all three theories, including the hypothesis: "cable rate is a cost irrelevant factor". Our estimations about the medium voltage show that suppliers which are faced with high cable rates charged higher prices; but these results are not true if we use the public-interest-approach or assume monopoly pricing behaviour. Therefore, we have a weak hint that the interest group of network suppliers has used the AA VVII^{+} to promote their members: The introduction of the variable cable rates has been in the interest of the firms with high cable rate without encumbering the others.

Finally, we should mention that our estimation approach is handicapped because (firm specific) information about costs is not available. Hence, our estimations only work indirectly by using different assumptions about the effectiveness of regulation.

Appendix

Table A.1: Average network access charges September 2002 – medium voltage

		Model 3	Model 4
East-Germany (Yes=1)		*0.522**** *(12.042)*	*0.497**** *(11.373)*
Consumption density (Inhabitants/ 1 000 sqkm)		-	*-0.052**** *(-5.330)*
Consumption density^2		-	*0.002**** *(4.781)*
Population density?	low (Yes=1)	*0.270**** *(4.544)*	-
	medium(Yes=1)	*0.190**** *(4.482)*	-
Cable rate (1=100)		-	*-1.084* *(-1.604)*
Cable rate^2		-	*0.777* *(1.634)*
Cable rate?	low (Yes=1)	*0.003* *(0.045)*	-
	medium (Yes=1)	*-0.078* *(-1.501)*	-
Constant		*2.560**** *(98.799)*	*3.103**** *(13.671)*
R2 (adjusted)		*0.312*	*0.309*
F-test (p-value)		*35.627**** *(0.000)*	*34.613**** *(0.000)*
N		*382*	*377*
Test of normality after Jarque/Bera[2]		H_0^{a}*** *(0.000)*	H_0^{a}*** *(0.000)*
Test of homoscedasticity after White[2]		H_0^{a} *(0.850)*	H_0^{na} *(0.983)*
Estimation method		*OLS*	*OLS*

*[1] Significant on 10 %-, 5 %-, and 1 %-level: *, **, and ***; t-values in parentheses. [2] H_0^{a}: null hypothesis could be rejected; H_0^{na}: null hypothesis could not be rejected; p-values in parentheses*
Source: Data set "Deregulated German electricity market"; estimated with "EViews 4.0.

Table A.2: Average network access charges May 2003 – low voltage

		Model 5	Model 6
East-Germany (Yes=1)		*0.811**** *(15.998)*	*0.818**** *(16.155)*
Population density (Inhabitants/ 1 000 sqkm)		-	*-0.166**** *(-4.066)*
Population density^2		-	*0.007* *(1.385)*
Population density?	low (Yes=1)	*0.410**** (7.970)	-
	Medium(Yes=1)	*0.122*** *(2.545)*	-
Cable rate (1=100)		-	*-0.254** *(-1.783)*
Cable rate^2		-	*0.029** *(1.893)*

Cable rate?	low (Yes=1)	*0.176** *(1.814)*	-
	medium (Yes=1)	*0.136**** *(2.631)*	-
Constant		*5.146**** *(156.919)*	*5.980**** *(46.938)*
R^2 (adjusted)		*0.399*	*0.404*
F-test (n-value)		*65.952**** *(0.000)*	*67.040**** *(0.000)*
N		*490*	*489*
Test of normality after Jarque/Bera[2]		H_0^a*** *(0.000)*	H_0^a*** *(0.000)*
Test of homoscedasticity after White[2]		H_0^{na} *(0.182)*	H_0^{na} *(0.723)*
Estimation method		*OLS*	*OLS*

Legend see A-1

Table A.3: Average network access charges May 2003 – medium voltage

		Model 7	**Model 8**
East-Germany (Yes=1)		*0.510**** *(14.557)*	*0.501**** *(14.108)*
Consumption density (MWh/ 1 000 sqkm)		-	*-0.045**** (-5.816)
Consumption density[2]		-	*0.001**** (5.139)
Consumption density?	Low (Yes=1)	*0.252**** *(5.605)*	-
	medium(Yes=1)	*0.158**** *(4.570)*	-
Cable rate (1=100)		-	*-0.531* *(-1.175)*
Cable rate[2]		-	*-0.430* *(-1.306)*
Cable rate?	low (Yes=1)	*-0.059* *(-1.066)*	-
	medium (Yes=1)	*-0.089*** *(-2.070)*	-
Constant		*2.589**** *(125.106)*	*2.881**** *(19.581)*
R^2 (adjusted)		*0.346*	*0.346*
F-test (p-value)		*51.715**** *(0.000)*	*50.162**** *(0.000)*
N		*480*	*465*
Test of normality after Jarque/Bera[2]		H_0^a*** *(0.000)*	H_0^a*** *(0.000)*
Test of homoscedasticity after White[2]		H_0^{na} *(0.309)*	H_0^{na} *(0.568)*
Estimation method		*OLS*	*OLS*

Legend see A-1

Table A.4: Average network access charges September 2003 – low voltage

		Model 9	**Model 10**
East-Germany (Yes=1)		*0.797**** *(20.294)*	*0.823**** *(19.585)*
Population density (Inhabitants/ 1 000 sqkm)		-	*-0.131**** *(-2.660)*
Population density^2		-	*-0.004* *(-0.567)*
Population density?	low (Yes=1)	*0.382**** *(8.054)*	-
	medium(Yes=1)	*0.115* *(3.118)*	-
Cable rate (1=100)		-	*-1.929** *(-1.858)*
Cable rate^2		-	*1.257** *(1.880)*
Cable rate?	low (Yes=1)	*0.071* *(0.507)*	-
	medium (Yes=1)	*0.108*** *(2.171)*	-
Constant		*5.146**** *(195.937)*	*6.388**** *(15.721)*
R^2 (adjusted)		*0.363*	*0.371*
F-test (p-value)		*73.519**** *(0.000)*	*75.994**** *(0.000)*
N		*637*	*637*
Test of normality after Jarque/Bera[2]		H_0^a*** *(0.000)*	H_0^a*** *(0.000)*
Test of homoscedasticity after White[2]		H_0^a*** *(0.000)*	H_0^a*** *(0.000)*
Estimation method		*OLS*[3]	*OLS*[3]

Legend see A-1

Table A.5: Average network access charges September 2003 – medium voltage

		Model 11	Model 12
East-Germany (Yes=1)		*0.517**** *(18.185)*	*0.508**** *(17.631)*
Consumption density (MWh/ 1 000 skim)		-	*-0.010*** *(-2.286)*
Consumption density^2		-	*0.001*** *(5.509)*
Consumption density?	low (Yes=1)	*0.277**** *(6.098)*	-
	medium(Yes=1)	*0.150* *(6.098)*	-
Cable rate (1=100)		-	*-0.573* *(-0.851)*
Cable rate^2		-	*0.384* *(0.870)*
Cable rate?	low (Yes=1)	*-0.053* *(-1.226)*	-
	medium (Yes=1)	*-0.136** *(-1.950)*	-
Constant		*2.564**** *(153.595)*	*2.931**** *(11.817)*
R^2 (adjusted)		*0.345*	*0.346*
F-test (p-value)		*64.333**** *(0.000)*	*64.282**** *(0.000)*
N		*601*	*598*
Test of normality after Jarque/Bera[2]		H_0^a*** *(0.000)*	H_0^a*** *(0.000)*
Test of homoscedasticity after White[2]		H_0^a*** *(0.002)*	H_0^a* *(0.063)*
Estimation method		*OLS*[3]	*OLS*[3]

Legend see A-1

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