Measuring the degree of economic opening in the German electricity market

by

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ABSTRACT

Barriers to entry can cause differences between "legal" and "economic" degrees of market openness. The German electricity market as a whole is legally 100% open. The industrial segment of the market is also close to being economically 100% open and the general pattern indicates a mature market, despite concerns about data quality. However, the domestic segment of the market is economically only 61% open. Possible explanations of this difference from its legal openness are mismatch of regulation and deliberate market strategies of incumbents. For the total market the economic degree of market openness is summer 2002 89% based on volumes. It is 61% based on customer numbers, reflecting the fact that the vast majority of customers (by number) are domestic.

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1 Introduction

In 1996 the EU Directive 96/92/EG required member states to open up to competition at least some parts of their electricity markets. Article 19 of the Directive defined a measure of market openness to competition based on the demand volume of customers which can change their supplier. This definition can be perceived as a "legal definition of market openness", as it refers to the potential for customers to switch suppliers and does not take into account of the real economic situation.

This paper investigates, for the German electricity supply market, whether an economic definition of market openness would differ from the legal definition commonly used. The analysis was undertaken using empirical data for the German electricity market during the summer of 2002.

2 Economic Degree of Market Openness

The most common measure of market openness (m_L), based on legal considerations, is the share of the entire market demand coming from customers eligible to switch:

$$m_L = \frac{\text{demand of customers eligible to switch}}{\text{total demand}}. \quad (1)$$

Customer numbers instead of demand volumes could also be used to calculate m_L. However with this definition, unless the domestic market is opened, m_L would remain close to 0%.

An economic degree of market openness can differ from the legal degree for two main reasons:

- Tariff and non-tariff barriers preventing customers from switching supplier.

- Tariff and non-tariff barriers preventing suppliers from making an offer.

It is difficult to analyse quantitatively non tariff barriers. Hence, because our objective is to quantitatively assess the economic degree of market openness, we have focused on tariff barriers preventing suppliers from making an offer. Although this makes the problem more tractable, even here there are complications: Some suppliers may make offers despite significant barriers to entry. Those suppliers essentially "pay" to overcome the existing barriers. This means that the existence of suppliers making offers does not mean that there are no barriers to entry.

One approach to estimate tariff barriers to entry can be derived from recent publications by the German competition authorities, the "Bundeskartellamt". Bundeskartellamt (2001) introduced a "subtraction-method" for estimating cross subsidies between the network and the supply business.[1] The approach calculates the part of an electricity price that is open to competition by subtracting network charges and taxes from the overall electricity price, i.e.

	All inclusive ("total") electricity price (p_T)	(2)
-	Taxes (t)	
-	Network charges (p_N)	
=	Remainder (p_R) for energy (p_E) and sales (p_S, retail, billing, supply margin)	

Where the remainder fell under a certain benchmark the Bundeskartellamt believed there was reason to suspect cross subsidies. Brunekreeft (2002) used a similar approach when comparing the components p_T, t, p_N and p_R , both relatively and absolutely, in the UK, the Netherlands and Germany.[2] He concluded that a higher p_R would attract more new entrants.

This suggests a way in which the subtraction method could be used to determine whether or not a market is open economically. Suppose we define p_R* as a benchmark for p_R, which even a very efficient new entrant could not reasonably hope to beat. Then those market segments where a new entrant could not hope to recover at least p_R* could be classed as closed. An economic degree of market openness m_E could then be calculated as:

$$m_E = \frac{\text{demand of customers with } p_R > p_R^*}{\text{total demand}} \tag{3}$$

Sufficient data is available for the German electricity supply industry to make an estimate of m_E.

2.1 Available data for the German electricity supply industry

The components in equations 2 and 3 vary with network area, of which there are about 900 in the German electricity market. The data, and especially the availability of data, also varies significantly between domestic and industrial customers. The following sections discuss, in turn, the data used for the four components p_T, t, p_N, and p_R*.

2.1.1 The electricity price p_T

Several market prices are available in every network area for domestic customers. Firstly, there is the Standard Tariff, which the incumbent supplier has to offer by law. Secondly, there is typically a "best offer" by the incumbent which is trying to attract customers who want lower prices, but do not necessarily want to switch supplier. Thirdly, there are offers from other third party suppliers. In most cases these third party offers are between the "best offer" and the Standard Tariff of the incumbent. Figure 1 gives an overview of Standard Tariffs and "best offers" of the 60 largest network owners, covering about 87% of all customers.

Figure 1: Standard Tariff and Best Offer

The data was obtained from the web pages or other (price) publications of the 60 network areas included in this study. The prices given in figure 1 include all taxes except VAT. The average Standard Tariff is 14.2 c/kWh with a standard deviation of 0.87 c/kWh. The average "best offer" is 13.2 c/kWh (standard deviation 0.67 c/kWh), i.e. 7% below the Standard Tariff.

For the subtraction method one market price for each network is needed. Either the Standard Tariff as the top end of the price range or the best offer as the bottom could be used. In this paper a weighted average is used, based on the percentage of customers still on Standard Tariff r. Currently 70.7% of all customers are still on Standard Tariff.[3]

Network specific changing rates are not available. Hence, for each network area we have assumed that the *domestic* market price is

$$p_T = r \cdot p_{Standard\ Tarif,\ network\ i} + (1-r) \cdot p_{Best\ Offer,network\ i} \,. \tag{4}$$

Almost all domestic customer prices are freely available. However, the data situation is less transparent for industrial end customer prices. Eurostat publishes prices for industrial customers of 9 different demand types for seven towns in Germany.[4] Figure 2 shows the cases for annual demand of 160,000 kWh with a maximum demand of 100 kW, equivalent to 1600 utilisation hours (customer type A) and 1,250,000 kWh with a maximum demand of 500 kW, equivalent to 2500 utilisation hours (customer type B).

Figure 2: Industrial prices in Germany (Net of all taxes)

2.1.2 The tax burden *t*

Electricity prices for domestic customers include several taxes (in addition to VAT): An electricity tax, a renewable levy, a CHP levy and a concession fee. These taxes can vary between networks. In our study, the network specific tax burden is used.[5]

In total the tax burden for a domestic household varies between 3.7 c/kWh and 5.3 c/kWh with an average of 4.2 c/kWh (standard deviation of 0.39 c/kWh). It should be noted that VAT (16%) comes on top of all this taxes.

For industrial customers taxes are also imposed, but to a lesser extent. For the analysis undertaken, no further taxes need to be included, as the prices given in figure 2 were already net of all taxes.

2.1.3 Network charges p_N

The self regulation policy of the German electricity industry requires all network owners to publish network charges. These network charges can usually be obtained from the web site of the network owner.[6] They include the charges for their own network and also the charges for all supplying networks up to the highest voltage level. Unlike electricity prices p_T, there is only one network charge for each segment in every network area.

Network charges differ significantly between network areas, as can be seen in figure 3 for domestic customers.

Figure 3: Network charges of the 60 largest networks

The overall picture in figure 3 looks similar to that of figure 1. However, electricity prices p_T and network charges p_N are only weakly correlated. In fact, the correlation coefficient is only 0.34.

Figure 4 shows the network charges for two types of industrial customers. Firstly customer type A, a low voltage connection, and secondly customer type B, a medium voltage connection. In all seven cases the network owner can be clearly identified.[7]

Figure 4: Network charges in seven German towns

Unlike the situation with domestic customers, industrial electricity prices and network charges are much more correlated. The correlation coefficient is 0.90 for customer type A and 0.82 for customer type B.

2.1.4 Benchmark for remainder p_R*

The benchmark for the remainder, p_R*, clearly has a crucial role in equation (2) which we are proposing to use to measure the degree of market openness. All other components in the equation are either clearly available (as in the case for domestic customers) or relevant statistics can be obtained from official sources (as it is the case for industrial customers). However, a considerable degree of judgement is needed to arrive at a benchmark for $p_R{*}=p_E{*}+p_S{*}$.

The Bundeskartellamt (2002A) itself suggested that the real sourcing cost of the electricity supplier in question should be used. Economically it can be argued that sourcing costs only partly reflect the value of electricity. A generator always has the opportunity not to sell to a customer (end customer or another supplier) but to sell to the wholesale market instead. In the same way, a supplier always has the opportunity to buy from the wholesale market instead of buying from a generator or generating with own units. The wholesale price reflects the opportunity costs of electricity, one could therefore use the wholesale price as a basis for the energy component p_E.

Wholesale prices for Germany can be obtained from the EEX.[8] Valuing a domestic load profile with the spot electricity prices of summer 2002 gives an average electricity price of 2.6 c/kWh.[9] The 2.6 c/kWh can be used as sourcing costs for a domestic customer, i.e. could serve as benchmark for p_E*.

To the authors' knowledge a benchmark of p_S* is not publicly available and cannot be directly derived due to a lack of data. However, some implicit calculations can be made. The Bundeskartellamt (2002A) states that in the absence of other cost information wholesale prices could serve as a benchmark. Based on the observable market prices in 2002 as laid out above, the Bundeskartellamt (2002A) concludes a benchmark of 3.0 c/kWh (p_R* in our notation). The average domestic customer in Germany has a demand of 3.000 kWh per year. Hence, what is left in p_R* after deducting energy costs comes to about p_S=0.4 c/kWh (€12 for a 3000 kWh/year customer). This implies that suppliers have €12 per customer and year to cover marketing, retail costs, billing, administration etc. and to capture a margin. This implicit assumption for p_S* seems to be very low. Accordingly, the benchmark has been disputed. The Bundeskartellamt (2003) said that €12 probably should be higher.[10]

In our analysis we have used the 3.0 c/kWh benchmark proposed by the Bundeskartellamt principally because this benchmark is more likely to be too low than too high. This means that the resulting economic degree of market openness is a conservative estimate.

We use this benchmark for domestic and industrial customers. The utilisation hours of the two types of industrial customers of 1600 and 2500 hours are considerably lower than that of a domestic load profile (~4400 hours), so that the wholesale price p_E* should be higher.[11] However, in the absence of more specific demand shapes for industrial customers a detailed evaluation can not be undertaken. This increasing effect of higher utilisation hours is offset by the lower costs for marketing, retail costs, billing, administration etc. on a cent-per-kWh-basis (decreasing average costs with increasing volumes). As will be shown in 3.3, the results for industrial customers vary significantly from those for domestic customers and do not vary with p_R* within reasonable boundaries. Therefore, for simplicity and lack of better data we applied 3.0 c/kWh as p_R* for industrial customers as well.

2.2 Economic degree of market openness in Germany 2002

Using equation 2 and 3 and the data provided the economic degree of market openness for domestic and industrial customers can be evaluated.

For domestic customers, figure 5 compares the remainders p_R for the 60 largest networks to the benchmark p_R*. In 25 network areas the remainder is below the benchmark.

Figure 5: Remainders, Network charges and taxes for domestic customers in different networks

On average, the remainder p_R is 3.14 c/kWh with a standard deviation of 0.74 c/kWh. The 25 networks represent a total number of 13.5m customers. Based on the average customer annual demand this represents a demand of 40.5 TWh. The 60 largest network areas have 34.6m customers with an estimated demand of 103.8 TWh. Hence, the economic degree of market openness according to equation (3) comes to 61%. We should emphasise that this degree of market openness refers to the market segment for domestic customers only.

The table 1 summarises the results and also shows the results for differing assumptions on the market price.

	Base Case	p_T at Best Offer	p_T at Standard Tariff
Number of Networks where p_R<p_R*	25	48	20
Number of customers where p_R<p_R*	13.5m	26.1m	9.9m
Percentage of demand where p_R<p_R*	39%	75%	29%
Economic degree of market openness	61%	25%	71%

Table 1: Results for the domestic market segment

The economic degree of market openness for domestic customers of 61% is significantly different from the legal degree of 100%. Given that we used a cautious benchmark p_R* and did not include non-tariff barriers, this could be regarded as a conservative estimate.

Figure 6 shows the situation for industrial customers.

Figure 6: Remainders and network charges for industrial customers

As can be seen in figure 6 the remainder p_R is always above its benchmark. In this sample average values are 5.13 c/kWh (160,000 kWh/a), and 5.32 c/kWh (1,250,000 kWh/a) respectively. The standard deviations are 0.78 c/kWh (160.000 kWh/a) and 0,77 c/kWh (1,250,000 kWh/a). Assuming that the remainders are normally distributed, then the confidence intervals for the actual average value are 5,13 c/kWh +/- 0,72 (160,000 kWh/a) and 5,32 c/kWh +/- 0,71 (1,250,000 kWh/a) at a confidence level of 95%. Even the lower limits of the intervals at 95% confidence are above the benchmark p_R*.

Thus, the economic degree of market openness is at a 95% confidence level is 100%.

3 Discussion of the findings and conclusions

The difference between the results obtained for the domestic and industrial customer segment is striking.

The results for domestic customers could be triggered by different regulation for Standard Tariffs and network charges. Standard Tariffs are calculated according to the "Bundestarifordnung Electrizität (BTOElt)", a regulation that dates back to monopoly times and has not been removed or updated since liberalisation in 1998. Network charges are calculated according to the "Verbändevereinbarung 2+ (VV2+)", which was agreed by several industry pressure groups and which the German Government accepted to be good industry practice. As Pfaffenberger (2002B) proved, VV2+ leads to higher charges than BTOElt,[12] i.e. the network component in the all-inclusive Standard Tariff according to BTOElt is lower then the actual network charge. This does not change the analysis made above – the network areas identified as economically closed can still not be entered by a new supplier without incurring losses. However, it does question whether the results seen in the domestic market are due to deliberate market strategies of the incumbents. The difference observed could just be caused by inconsistent market regulations. An examination of the results in table 1 shows that it is clear that inconsistent regulation could only explain a part of the difference between the domestic and the industrial segment: The results for p_T at best offers are significantly worse than that for p_T at Standard Tariff. There is no regulation on best offers made by the incumbent, BTOElt only covers Standard Tariffs.

Another point is that the results for the industrial segment do not fit with basic "energy economics". Customers of type B have a higher p_R than customers of type A, although with 2500 instead of 1600 utilisation hours type B customers should have a lower wholesale price. Secondly, even if one assumes a demand profile where type B customers (type A customers) demand their electricity in the 2500 (1600) highest price hours, the average price in the wholesale market of 2002 would come to 3.8 c/kWh (4.3 c/kWh), well below the values for p_R calculated for the industrial segment. Still, the strong correlation between network charges and end customer prices tends to indicate that network charges are a pass-through cost component, something one would expect in a more mature market.[13] Data quality issues could be one explanation, as Eurostat does not lay out what exactly constitutes "net of all taxes".

We conclude that that the degree of market openness in the domestic segment is significantly lower than 100%, which could be explained by the mismatch of regulation and deliberate market strategies of incumbents. This is not true for the industrial segment where the general pattern indicates a more mature market, though there are reservations about data quality.

When using equation (3) to calculate an economic degree of market openness for the total market, the different results for the domestic and the industrial segment level out. As the domestic segment makes only 28% of the market volume, the total degree of market openness is 89%. When considering customer numbers instead of demand volume, the economic degree is (close to) 61%, as the number of industrial customers is relatively small.

1 The Bundeskartellamt introduced the subtraction-method („Subtraktions-/Vergleichsmarktmethode") in Arbeitsgruppe Netznutzung Strom der Kartellbehörden des Bundes und der Länder, 2001, page 25ff. It further commented this approach in Bundeskartellamt, 2002A, page 24f. and used it in praxis in Bundeskartellamt, 2003, page 30ff.

2 See Brunekreeft, Gert, 2002, page 17.

3 See VDEW, 2003A, page 20.

4 See de la Fuente, Luis, 2003. The analysis undertaken in this paper needs network specific price data. During monopoly times, the VIK collected and published network area specific price data from its members. The VIK stopped this price report in 2002. The last report was dated 1. January 2002, but for more than half of the networks the price data was older than one year; some price information had not been updated since liberalisation (see VIK, 2002). The network access regime and the rules for calculation of network charges changed 2000 (coming into effect 2001 / 2002). Also, the tax burden and wholesale prices changed significantly 1999 to 2002. Therefore, we did not use the VIK data but Eurostat data instead. On VIK price reports see also footnote 13.

5 On overview of the average tax burden on German domestic and industrial customers can be found in VDEW, 2002.

6 Very small networks sometime do not have a webpage. As we dealt with the 60 largest networks in Germany, this has not been a problem.

7 The network owners are SWE Strom und Fernwärme Erfurt GmbH; Stadtwerke Leipzig GmbH; Hamburgische Electricitäts-Werke AG; Mainova Aktiengesellschaft; Stadtwerke Düsseldorf AG; Stadtwerke Hannover AG; SWM-Versorgungs GmbH (in order of the towns given in figure 4).

8 Downloadable from the EEX webpage www.eex.de.

9 The VDEW provides a load profile for a standard German domestic customer (so called „H0" profile). We calculated the demand weighted average electricity price on the basis of the VDEW-H0 profile and EEX hourly auction spot prices for quarter 2 and 3 of 2002.

10 See Bundeskartellamt, 2003, page 32ff.

11 The individual demand of a domestic household has almost certainly utilisation hours significantly below 4400. However, this is not relevant for a new entrant, who supplies according to pre-defined load profile.

12 See Pfaffenberger, Wolfgang, et. al., 2002B.

[13] The approach taken by VIK after abandoning the old price report (see footnote 4) seems to support the sentiment of a more mature market. In 2002 the VIK started a new price index for industrial electricity prices in Germany. The new price index has two components. An energy component is based on the wholesale price for electricity. A network component is based on an average of the network charges of seven large network owners (among which are RWE, EON, EnBW). For the analysis of this paper the new VIK price index cannot be used as it is not network specific. Further, as the price index is build by a "reverse subtraction method", using the subtraction method becomes meaningless.

References

Arbeitsgruppe Netznutzung Strom der Kartellbehörden des Bundes und der Länder, *Bericht der Arbeitsgruppe Netznutzung Strom der Kartellbehörden des Bundes und der Länder über 1) die Reichweite der kartellrechtlichen Eingriffsnormen für die Überprüfung der Höhe der Entgelte für die Nutzung der Stromnetze // 2) die kartellrechtliche Relevanz von den Netzzugang behindernden Verhaltensweisen der Stromnetzbetreiber,* Bonn , 19 April 2001

Brunekreeft, Gert, *Regulation and Third-Party Discrimination in the German Electricity Supply Industry,* European Journal of Law and Economics, Vol. 13, No. 2, 2002.

Bundeskartellamt, *Marktöffnung und Gewährleistung von Wettbewerb in der leitungsgebundenen Energiewirtschaft*, Diskussionspapier für die Sitzung des Arbeitskreises Kartellrecht am 7.10.2002, Bonn, 2002A.

Bundeskartellamt, *Beschluss in dem Verwaltungsverfahren EON / Bergemann, B8-40000-U-149/01*, Bonn, 2002B.

Bundeskartellamt, *Beschluss in dem Verwaltungsverfahren TEAG Thüringer Energie AG*, B11-40100-T-45/01, Bonn, 2003.

de la Fuente, Luis, *Strompreise für den industriellen Verbraucher in der EU am 1.1.2003*, Eurostatis, Thema 8-5/2003, Luxembourg, 2003

European Union, *Zweiter Benchmarkingbericht über die Vollendung des Elektrizitäts- und Erdgasbinnenmarktes*, SEK(2002) 1038, Brüssel, 1.10.2002

Hamburgische Electricitäts-Werke AG, *Bericht über das Geschäftsjahr 2001*, Hamburg, 2002

Pfaffenberger, Wolfgang, et. al., *Anwendung der Vergleichsmarktanalyse auf die Netzentgelte in der Stromwirtschaft*, Bremer Energie Institut, März 2002A.

Pfaffenberger, Wolfgang, et. al., *Vergleich der Arbeitsanleitung nach §12 BTOELT mit dem Kalkulationsleitfaden nach Anlage 3 der Verbändevereinbarung II+*, Bremer Energie Institut, Oktober 2002B.

OXERA et.al., *Electricity Liberalisation Indicators in Europe,* Oxford, 2001.

RWE Aktiengesellschaft, *Geschäftsbericht 2001*, Essen, 2002

VDEW, Verband der Elektrizitätswirtschaft –VDEW- e.V., *Wettbewerb im deutschen Strommarkt*, Argumente, A-01/2002, Frankfurt, 2002.

VDEW, Verband der Elektrizitätswirtschaft –VDEW- e.V., *Strommarkt Deutschland Frühjahr 2003*, Frankfurt, 2003A.

VDEW, Verband der Elektrizitätswirtschaft –VDEW- e.V., *VDEW Marketing und Dienstleistungserhebung*, Frankfurt, 2003B

References to German laws have been made by quoting the name of the law and its official publishing in the „Bundesgesetzblatt" (BGBl.).

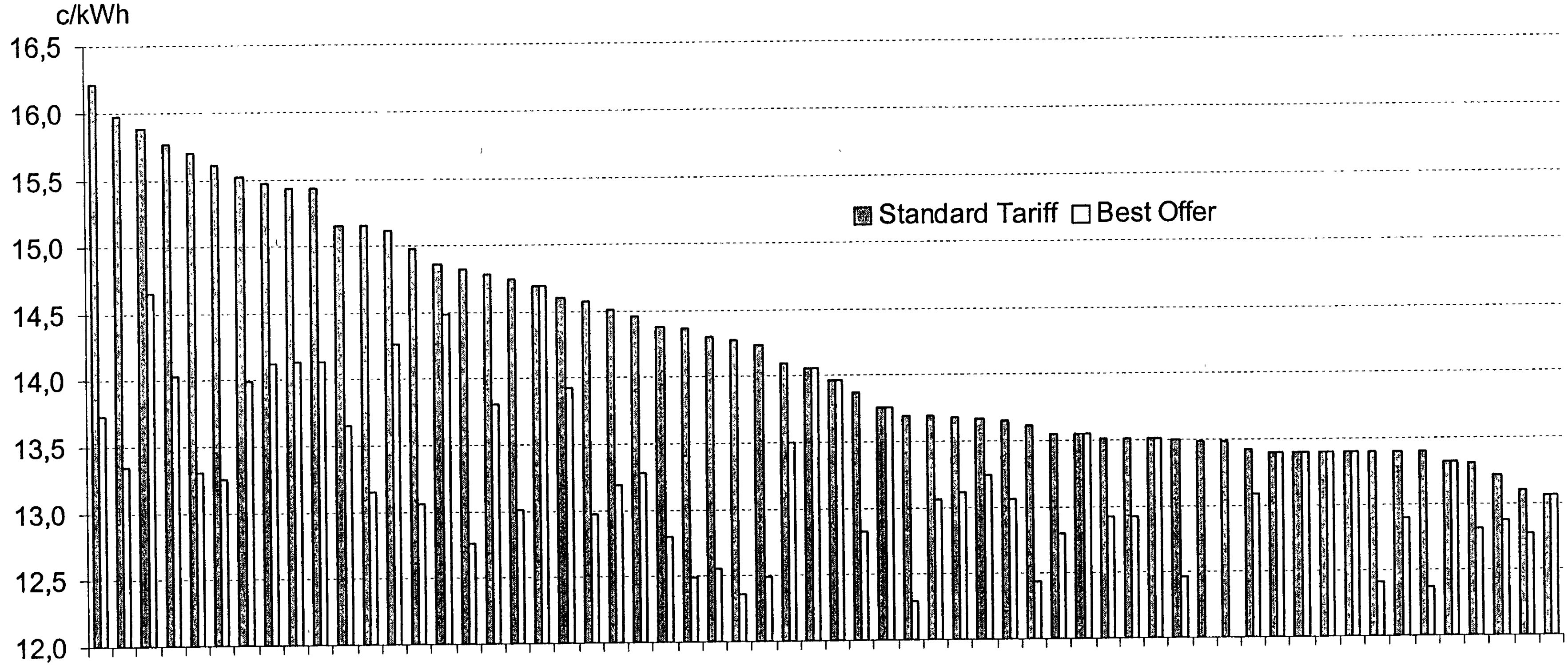

Figure 1: Standard Tariff and Best Offer

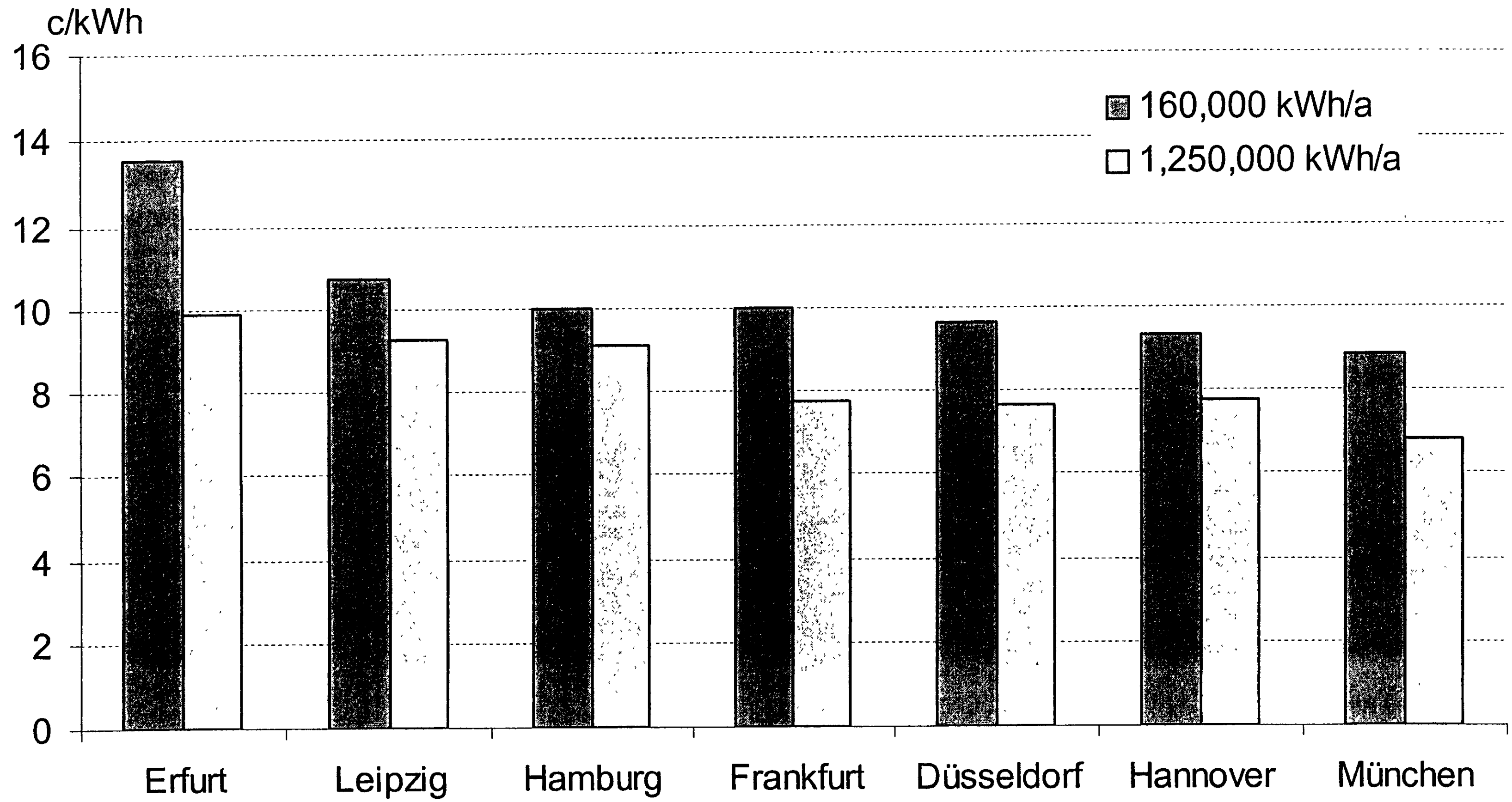

Figure 2: Industrial prices in Germany (net of all taxes)

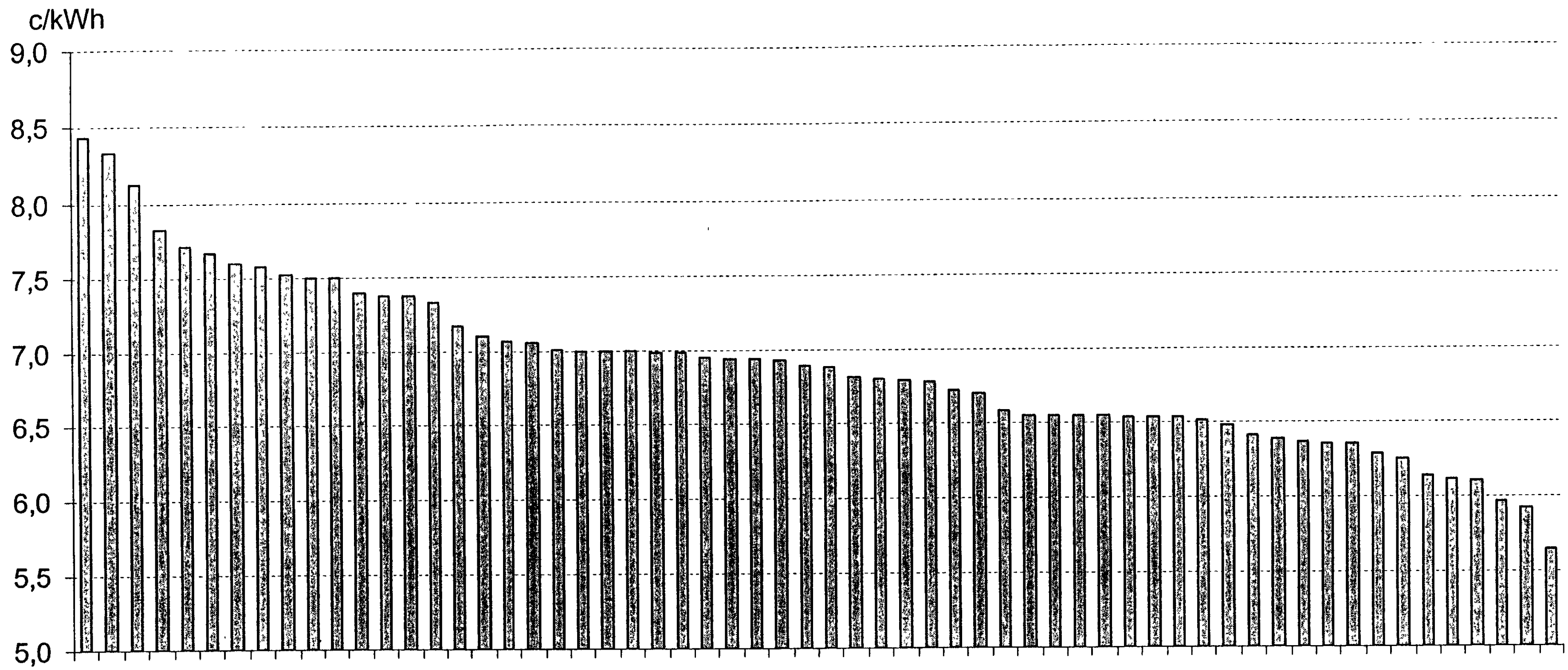

Figure 3: Network charges of the 60 largest networks

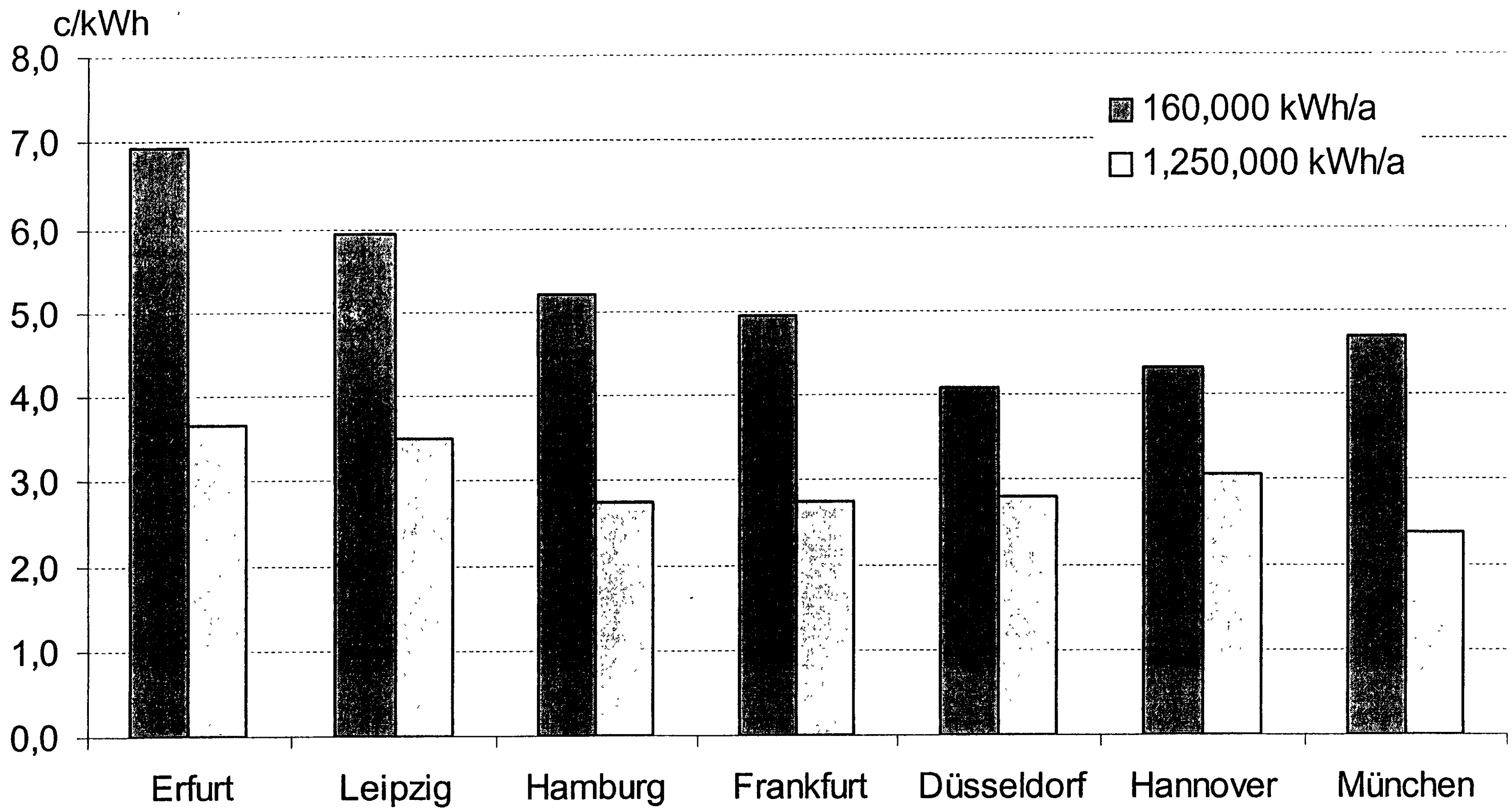

Figure 4: Network charges in seven German towns

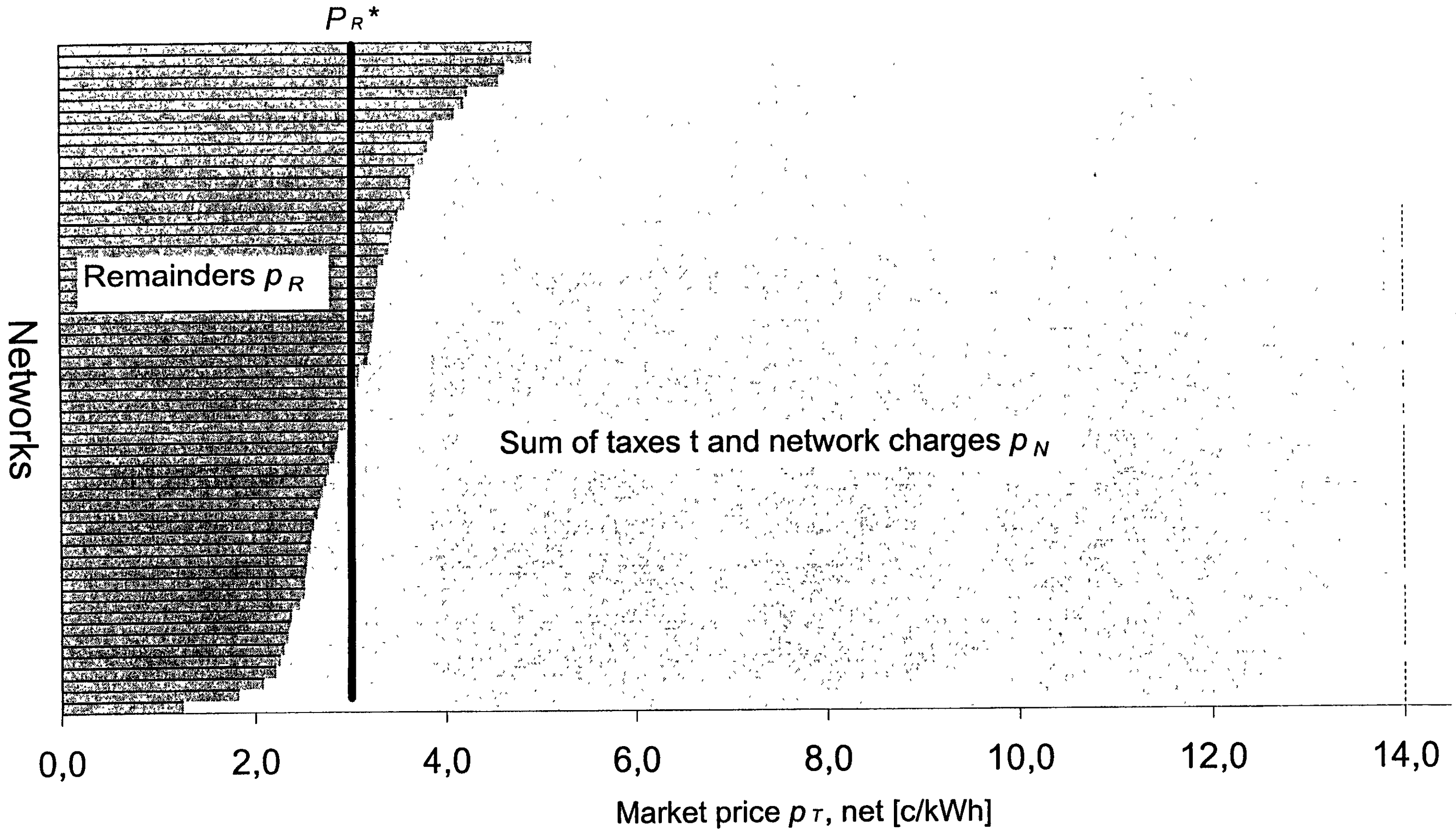

Figure 5: Remainders, Network charges and taxes for domestic customers in different networks

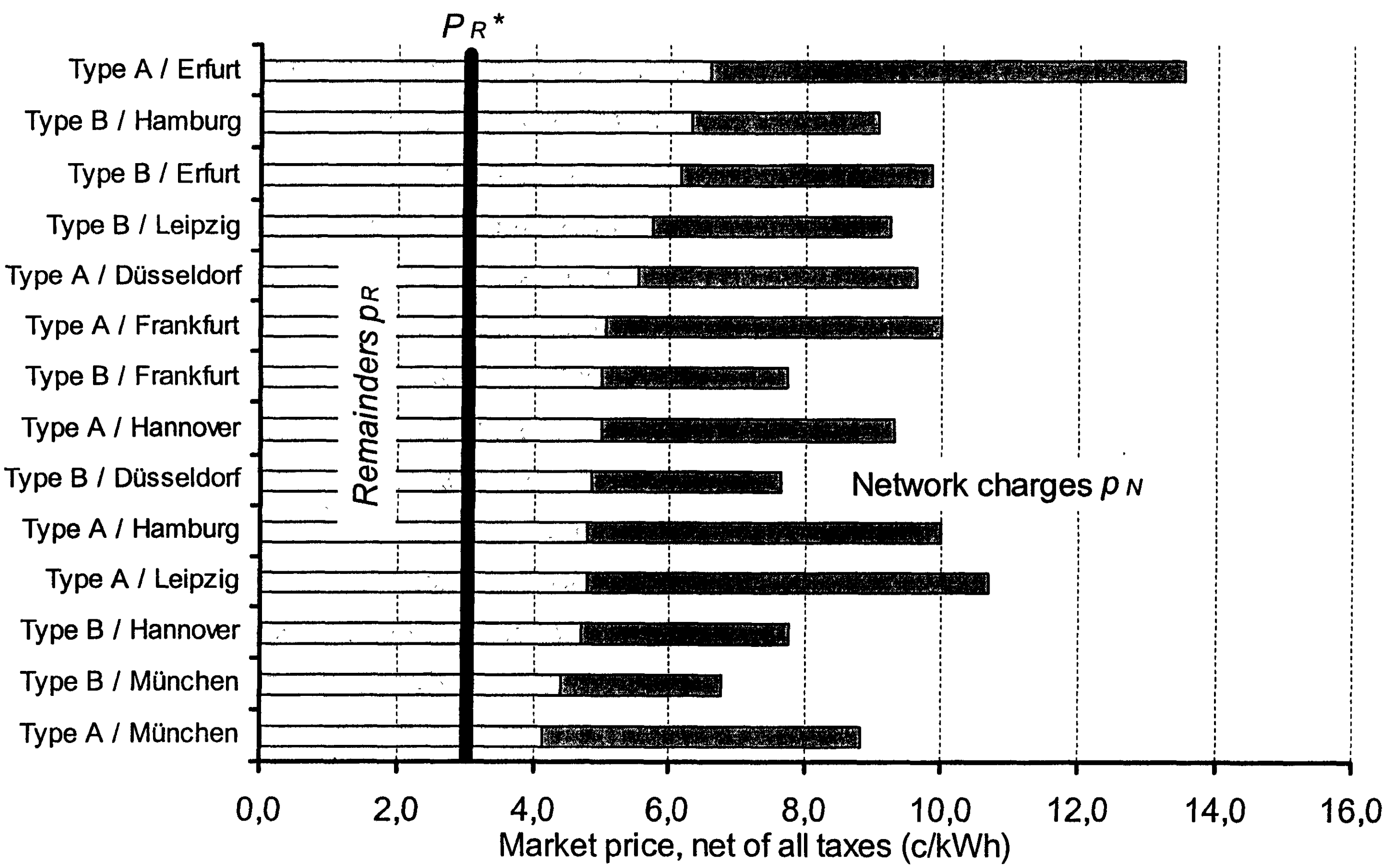

Figure 6: Remainders and network charges for industrial customers