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ARE MUNICIPAL ELECTRICITY DISTRIBUTION UTILITIES NATURAL MONOPOLIES?

by

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ABSTRACT:** *The purpose of this study is to analyse the cost structure of the Swiss electricity distribution utilities in order to assess economies of scale and density and the desirability of competition in the distribution of electric power. A translog cost function was estimated using panel data for a sample of 39 municipal utilities over the period 1988–1991. The results indicate the existence of economies of density for most output levels and the existence of economies of scale only for small and medium-sized electric utilities. The empirical evidence suggests that franchised monopolies, rather than side-by-side competition, is the most efficient form of production organization in the electric power distribution industry. Further, the majority of the utilities analysed do not operate at an optimal service territory size. Therefore, the consolidation of small utilities whose service territories are adjacent is likely to reduce costs.*

1 Introduction

The success of deregulation in the transportation and communications sectors, as well as the privatization and competitive

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** *Résumé en fin d'article; Zusammenfassung am Ende des Artikels; resúmen al fin del artículo.*

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restructuring of the electricity supply sector in Norway and in the United Kingdom, have led to a number of recent proposals for the total or partial deregulation of the electric power industry. Therefore, the possibility of deregulating this industry is likely to become a very topical policy issue in the future.[1]

The economic rationale for regulating the electric power industry is a widely held perception regarding the existence of scale economies in the production, transmission and distribution of electric power. Declining average costs in all three stages of electricity provision has been recognized by economists as one condition for markets which may fail to yield an efficient outcome. However, recent empirical research has found evidence to the effects that economies of scale in the production of power may be exhausted, while they continue to exist in the transmission and distribution of electricity.[2]

The purpose of the present study is to make a contribution to this debate through the development and econometric estimation of a translog total cost function of Swiss municipal electric utilities operating at the city level. These publicly-owned companies operate as local franchised monopolies in the retail sale of power in their legally defined service areas. Moreover, the retail rates have to be approved by local regulatory agencies.[3]

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1 See Hogan (1994) and Hunt and Shuttleworth (1996) for a presentation of a competitive electricity market.

2 See Christensen and Greene (1976) and Kamerschen and Thompson (1993) for empirical evidence of exhaustion of economies of scale in power generation. See Weiss (1975), Henderson (1985), Roberts (1986), Nelson and Primaux (1988), Callan (1991), Salvanes and Tjøta (1994), Filippini (1996) and Thompson (1997) for empirical evidence of the existence of scale economies in the transmission and distribution of electricity.

3 In Switzerland, the cantons and the municipalities regulate the activities of regional private and public electricity utilities. The canton and municipal authorities regulate these utilities in different ways and only broad generalizations about their operations can be made. Some cantons regulate all utilities, while others limit jurisdiction to private utilities and leave regulation of local public or private utilities to local government. The regulatory laws on the canton and municipal levels govern entry, quality and condition of service, including the obligation to serve all customers in the assigned service area and not to discriminate. Further, electricity price changes by private electric utilities have to be approved by the federal price-supervisor commission, whereas electricity price changes by canton- and municipal-owned public electric utilities have to be approved by either the canton or the municipal public utility commission.

The results of this study are relevant to several regulatory issues. First they provide information about the validity of the natural monopoly argument in the distribution of electricity. Second, they permit judgment to be made about the legal assignment of service areas. Third, they contribute to an evaluation of the desirability of competition in the distribution of electric power.

This article is organized as follows. Section 2 presents the cost model for the electric distribution utilities. In section 3, the data for 39 Swiss public electricity distributors whose cost structure forms the centre of interest in this study are presented. Parameter estimates of the total cost function and other empirical results are presented in section 4. The policy implications are examined in section 5, and section 6 presents the conclusions.

2 A total cost function for the Swiss electricity distribution utilities

2.1 The empirical Model

A major development in the specification of cost functions for the electric power distribution industry has been the distinction between economies of output and customer density and economies of size, introduced by Roberts in 1986. Because electricity distribution utilities operate different networks, an analysis of their cost structure must take account of the fact that the same quantities of electricity can be distributed on differently shaped networks and that different quantities of electricity can be distributed on the same network. Therefore, following Roberts (1986), Salvanes and Tjøta (1994) and Thompson (1997), in the cost model specification we take into account a number of output characteristics variables, which should capture the heterogeneity dimension of the production process.

Output is measured by the total number of kWh delivered. Inputs to the electricity distribution process consist primarily of labour, capital and purchased power. The firm's total cost of distributing electricity can then be represented by the cost function

$$C = C(y, w_c, w_p, w_l, LF, CU, ST, T) \tag{1}$$

where C represents total cost and y is the output represented by the total number of kWh delivered,[4] and w_c, w_p and w_l are the prices of capital, kWh input and labour, respectively. LF is the load factor, ST the size of the service territory of the distribution utility measured in squares kilometers and CU the number of customers. These variables are introduced in the model as output characteristics. The load factor should capture the impact on cost of the intensity of use of the plant.[5] T is a time variable which captures the shift in technology representing change in technical efficiency.

The properties of the cost function (1) are that it is concave and linearly homogeneous in input prices and non-decreasing in input prices and output.[6]

Estimation of cost function (1) requires the specification of a functional form. The translog cost function offers an appropriate functional form for answering questions about economies of scale.[7] Most important for our purposes, it imposes no *a priori* restrictions on the nature of technology, allowing the values for economies of size and density to vary with output. The translog approximation to (1) is

$$\begin{aligned}\ln\left(\frac{C}{w_p}\right) &= \alpha_0 + \eta_y \ln y + \sum_j \beta_j \ln\left(\frac{w_j}{w_p}\right) + \phi_{LF}\ln LF + \frac{1}{2}\eta_{yy}(\ln y)^2 \\ &+ \frac{1}{2}\gamma_{LFLF}(\ln LF)^2 + \frac{1}{2}\sum_j\sum_i \mu_{ji}\ln\left(\frac{w_j}{w_p}\right)\ln\left(\frac{w_i}{w_p}\right) + \sum_j \omega_{yj}\ln y \ln\left(\frac{w_j}{w_p}\right) \\ &+ \sum_j \theta_{jLF}\ln\left(\frac{w_j}{w_p}\right)\ln LF + \rho_{yLF}\ln y \ln LF + \sum_f \kappa_f FD_f + \tau_T T\end{aligned} \tag{2}$$

where $j = c, l.T$, the time trend, is included in a way to capture the effects of neutral technical change. Note that by normalizing total

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[4] See Filippini (1996, 1997) for the estimation of a variable cost function for the Swiss electricity distribution utilities. However, the model specification by Filippini (1996, 1997) does not include the area size and the number of customers as explanatory variables.

[5] See Foreman-Peck and Waterson (1985) for a discussion of the introduction of load factor in cost models.

[6] See Cornes (1992), p.106.

[7] A translog function requires the approximation of the underlying cost function to be made at a local point, which in our case is taken at the median point of all variables. Thus, all independent variables are normalized at their median point.

cost and input prices by one of the input prices, we impose the theoretical condition that the cost function is linearly homogeneous in input prices.

In order to improve the efficiency of the estimation of least squares parameter estimates for the cost function, a cost system is estimated. This system consists of the translog cost function (2) and the factor share equations. By applying Shephard's lemma, the resulting share equations take the familiar form:

$$S_j = \alpha_j + \sum_j \alpha_{ji} \ln\left(\frac{w_i}{w_p}\right) + \alpha_{yj} \ln y + \alpha_{jLF} \ln LF + \alpha_{jCU} \ln CU + \alpha_{jST} \ln ST \tag{3}$$

where S_j is the share of input j in total costs. The price by which we normalize is that of the input whose share equation we dropped from the estimating system.

2.1 Economies of scale and density

The inclusion in the cost function of the number of customers and the size of the service territory allows for the distinction of economies of output density, economies of customer density and economies of scale. Following Roberts (1986) we define economies of output density (EOD) as the proportional increase in total costs brought about by a proportional increase in output, holding all input prices, the load factor, the number of customers and the size of the service territory fixed. This is equivalent to the inverse of the elasticities of total cost with respect to output,

$$EOD = \frac{1}{\dfrac{\partial \ln TC}{\partial \ln y}} \tag{4}$$

We will talk of economies of output density if EOD is greater than 1, and accordingly, identifies diseconomies of output density if EOD is below 1. In the case of $EOD = 1$ no economies or diseconomies of output density exist. Economies of output density exist if the average costs of a electricity distribution utility decrease as the volume of electricity sold to a fixed number of customers in a service territory of a given size increases. This measure is relevant to decide whether side-by-side competition or local monopoly are the most efficient form in the electricity distribution industry.

Economies of customer density (*ECD*) are defined as the proportional increase in total costs brought about by a proportional increase in output and the number of customers, holding all input prices, the load factor and the size of the service territory fixed. Economies of customer density (*ECD*) can thus be defined as

$$ECD = \frac{1}{\dfrac{\partial \ln TC}{\partial \ln y} + \dfrac{\partial \ln TC}{\partial \ln CU}} \tag{5}$$

We will talk of economies of customer density if *ECD* is greater than 1, and accordingly, identifies diseconomies of scale if *ECD* is below 1. In the case of $ECD = 1$ no economies or diseconomies of customer density exist. This measure is relevant for analysing the cost of distributing more electricity to a fixed service territory as it becomes more densely populated.

Economies of scale (*ES*) are defined as the proportional increase in total costs brought about by a proportional increase in output, the number of customers and the size of the service territory, holding all input prices and the load factor fixed. Economies of scale (*ES*) can thus be defined as

$$ES = \frac{1}{\dfrac{\partial \ln TC}{\partial \ln y} + \dfrac{\partial \ln TC}{\partial \ln CU} + \dfrac{\partial \ln TC}{\partial \ln ST}} \tag{6}$$

We will talk of economies of scale if *ES* is greater than 1, and accordingly, identifies diseconomies of scale if *ES* is below 1. In the case of $ES = 1$ no economies or diseconomies of scale exist. This measure is relevant for analysing the impact on cost of merging two adjacent electricity distribution utilities.

3 Data

The estimating form of the total cost model consists of equation (4) plus two share equations defined in (5).[8] Estimation was carried out using iterative Zellner's technique (1962). The resulting estimates are

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[8] To implement this regression system we assume the conventional error specification proposed by Christensen and Greene (1976).

equivalent to maximum likelihood estimates, and they are invariant to which share equation is deleted (Barten 1969).

The models are estimated for cross-sectional samples of publicly-owned electricity distribution utilities operating in Swiss cities.[9] In Switzerland, there are approximately 130 companies that could be included in a study of city electricity distribution utilities. The Swiss Federal Statistical Office and the Swiss Federal Energy Office collect financial data only for a sample of about 60 utilities serving cities. Twenty-one of the companies listed in this sample, however, are not appropriate for the purpose of our analysis because the amount of self-generated electricity is high. Since the aim of this study is to analyse the cost structure of distribution, companies who had more than 20 per cent of their capital invested in generating activities in 1989, were excluded.[10]

Placing the above restrictions on the data results in a sample of 39 city electricity distribution utilities for which appropriate data are available. For estimation, panel data for four years, 1988, 1989, 1990 and 1991, has been used. The primary sources were the Swiss Federal Statistical Office's *Wertschöpfungsstatistik* and the Swiss Federal Energy Office's *Finanzstatistik*; additional data were taken from the annual publication of the Swiss Cities Association and from a mail questionnaire sent to the utilities.

The necessary data include the total cost, load factor, the prices of purchased power, capital and labour, the quantity of kWh delivered as well as the number of customers and the size of the service territory. All input prices, total cost and variable cost were deflated to 1982 constant Swiss francs using the Consumer Price Index.

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[9] The Swiss electric power industry is composed of about 1200 firms, public and private, that are engaged in the generation, transmission and/or distribution of electric power. There is a great divergence both in terms of size and activities of these companies. In particular, approximately 900 utilities, or 74 per cent of the total, are merely distributors of electric power. The majority of these companies are municipal and provide power service exclusively for their community. In addition they are surrounded by 300 electric utilities which operate within an urban or regional area. This group of firms operates in all three stages of provision listed above, but generally the amount of generated power is small. The municipals and the regional electric utilities purchase most of their power from 10 utilities which form the backbone of the industry.

[10] This group of firms is involved in generation, transmission and distribution, but the amount of generated power is small and is determined by the ability to exploit favorable hydroelectric power generation possibilities.

Table 1—Descriptive statistics

Variables	Unit of measurement	1. Quartile (small)	Median (medium)	3.Quartile (large)
Total cost	SwF.	9,116,800	13,491,000	38,078,000
Labour price	SwF. for worker unit	51034	64726	76382
Purchased power price	SwF./kWh	0.07	0.081	0.089
Capital price	SwF. for a unit of capital	46.929	65.057	90.110
Load factor		0.50	0.53	0.57
Number of customers		2120	9599	28890
Size of the service territory	squares km	1149	2312	6789
Output	kWh	73,350,000	99,500,000	307,350,000

For simplicity, total production cost is equated to total expenditure as reported by the companies. Average yearly wage rates are estimated as the labour expenditure divided by the number of employees. The price of purchased power is constructed according to the definition used by Nelson and Primaux (1988) by dividing the expenditure on purchased power by deliveries of power, measured in kWh. Following Friedlander and Wang Chiang (1983) and Filippini and Maggi (1993), the capital price is calculated from the residual capital costs divided by the capital stock. Residual cost is total cost minus labour and power cost. According to Callan (1991), the capital stock is defined as total installed distributing capacity, measured in KW.[11] Due to lack of data, the number of single-family homes, apartments and firms in 1990 is utilized as a proxy for the number of customers of a given service territory.

Some details of these variables are presented for small, medium-sized, and large electricity distributing firms in Table 1.

4 Estimation Results

In this section we report the econometric results obtained from estimating the total cost function model specified in equation (2) and (3) and using the data described in the previous section. For

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[11] Unfortunately no data are available which would allow the calculation of the capital stock using the perpetual inventory method.

comparison purposes, we also present the results obtained from estimating a fixed-effects version of the cost model (1).[12] The fixed effects model treats unmeasured differences between utilities as shifts in the constant term allowing a separate intercept for each electric utility. These intercepts capture effects on total cost of all utility-specific, time-invariant characteristics such as size of the service territory, the network structure and the topography.[13] The shortcoming of the fixed-effects version of model (1) is that it does not allow the estimation of the coefficient of the time-invariant variables size of the service territory and number of customers. Therefore, the estimation results of Model 2 do not allow the calculation of the economies of scale and the economies of customer density.

The estimated coefficients and their associated standard errors of these two versions of the cost model (1) are presented in Table 2. The estimated functions are well behaved. Most of the parameter estimates are statistically significant and the coefficients of Model 1 and Model 2 are similar.

Since total cost and the regressors are in logarithms and have been normalized, the first order coefficients are interpretable as cost elasticities evaluated at the sample median. All these coefficients have the expected signs and are highly significant. The output elasticity is positive and implies that an increase in the production of output will increase total cost. A 1 per cent increase in the delivery of power will increase the total cost in models 1 by approximately 0.86 per cent and in the models 2 by 0.82 per cent, respectively.

The cost elasticity with respect to load factor is negative in all versions of the cost model, indicating that a 1 per cent improvement in load factor will reduce cost by approximately 0.20 per cent. To improve the load factor, the Swiss electric utilities could more strongly differentiate the time-of-use rates. Filippini (1995) shows a general responsiveness of electricity consumption in the Swiss residential sector to changes in peak and off-peak prices. Thus, time-of-use rates represent an instrument to promote efficient utilization of existing electric plants and to reduce cost.

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[12] The fixed-effects model specification precludes biases in the coefficients of the included explanatory variables that might arise from the exclusion of unobserved service characteristics variables that are constant over time for a firm and are correlated with other explanatory variables (see Mundlak, 1978).

[13] For a similar attempt to capture firm specific differences in the electric industry that remain unchanged over the period, see Nelson (1990) and Callan (1991).

Table 2—Total-cost parameter estimates

Coefficient	Model 1[a]	Model 2[b]
α_0	16.425***	16.646***
	(0.006)	(0.018)
α_y	0.864***	0.823***
	(0.011)	(0.022)
α_l	0.117***	0.126***
	(0.002)	(0.003)
α_c	0.289***	0.279***
	(0.003)	(0.003)
α_{CU}	0.086***	—
	(0.011)	
α_{ST}	0.026***	—
	(0.004)	
α_{LF}	−0.228***	−0.204***
	(0.039)	(0.029)
α_{yy}	−0.030*	−0.019
	(0.018)	(0.019)
α_{cc}	0.141***	0.166***
	(0.003)	(0.004)
α_{ll}	0.049***	0.026***
	(0.003)	(0.005)
α_{CUCU}	0.020	
	(0.017)	
α_{STST}	−0.010***	
	(0.001)	
α_{LFLF}	0.076	0.206***
	(0.047)	(0.057)
α_{yl}	−0.028***	0.006**
	(0.004)	(0.003)
α_{yc}	−0.061***	−0.011***
	(0.006)	(0.003)
α_{yCUCU}	0.002	—
	(0.016)	
α_{ySTST}	0.020***	—
	(0.004)	
α_{yLF}	0.074**	0.013
	(0.026)	(0.020)
α_{cCU}	0.036***	—
	(0.006)	
α_{cST}	0.011***	—
	(0.001)	
α_{lCU}	−0.166	—
	(0.017)	
α_{lST}	0.025***	—
	(0.004)	
α_{cLF}	−0.100***	−0.166
	(0.016)	(0.017)
α_{lLF}	−0.004	−0.061***
	(0.015)	(0.016)

α_{LFCU}	0.007	—
	(0.023)	
α_{LFST}	−0.069***	—
	(0.009)	
α_{CUST}	−0.011***	—
	(0.004)	
α_{cl}	0.019***	0.009***
	(0.002)	(0.003)
i_T	−0.001	0.001
	(0.001)	(0.007)
Generalized R^2 for the system	0.989	0.997
Log likelihood	967.60	1094.30

*, **,***: significantly different from zero at the 90%, 95%, 99% confidence level.

[a] Pooled data model.

[b] Fixed-effects model.

Standard errors in parentheses.

The cost elasticities with respect to service territory and to the number of customers are positive and imply that an increase in the size of the territory or an increase in the number of customers will increase total cost.

The labour, purchased power and capital cost shares are positive, implying that the cost function is monotonically increasing in input prices. In all versions of the cost model the purchased power accounts for approximately 61 per cent of the electricity distribution utilities costs while labour accounts for approximately 12 per cent and capital for the remaining 27 per cent of total cost. Moreover, in model 2, approximately 90 per cent of the fixed-effects coefficients (firm-specific dummy variables) were significantly different from 0.[14]

Parameter estimates of the four versions of the translog cost function satisfy the regularity condition of concavity in input prices at the median point of approximation, which requires that the own-price elasticities of inputs be negative and that the Hessian Matrix, $[\partial^2 C/\partial w_i \partial w_j]$, be negative semi-definite. Because homogeneity in input prices and symmetry of the second order terms were imposed, the estimated functions satisfy all regularity conditions of a theoretically valid total cost model.

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[14] Table 2 omits the estimated coefficients of the firm specific dummy variables; a copy of these coefficients is available from author.

Table 3—Economies of scale and density

Utilities size	Small y=73,350,000 kWh, CU=2120 ST=1149	Medium y=99,500,000 kWh, CU=9599 ST=2312	Large y=307,350,000 kWh, CU=28890 ST=6789
EOD	1.21	1.16	1.15
ECD	1.16	1.14	1.12
ES	1.10	1.05	1.02

5 Assessment of economies of density and scale

The empirical evidence supports the hypothesis of density and scale economies in the electricity distribution industry. Table 3 presents the estimates of economies of output density, customer density and economies of scale evaluated using the estimation results from model 1. In order to gain a better idea of economies of scale and density in this industry, we calculated equation (4), (5) and (6) for small, medium, and large electricity distribution utilities, respectively.[15]

We note that all indicators for economies of scale and economies of output and customer density are greater than 1, which means that the majority of the Swiss electricity distribution utilities operate at an inappropriately low scale and density level. The economies of output density and customer density are substantial, whereas the economies of scale are small. Furthermore, all cost economies indicators decrease with increasing size.

Concerning large electric utilities, it can be concluded, that they operate a service territory of optimal size. Thus, electricity distribution utilities that increase output, number of customers, and service territory proportionally will not experience economies of scale if the electric utility 's values are above the sample medium.

The estimated indicators of economies of output and customer density can clarify the efficiency of side-by-side competition at all points of a given service territory versus monopolistic provision of electric power. The finding shows that the cost of serving a market of size y over a municipal territory with one utility is lower than the cost of serving the same market with n competitive utilities which install

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[15] Equations (4), (5) and (6) have been evaluated at the input prices and load factor of the median company.

parallel facilities everywhere. Therefore, side-by-side competition is less cost-efficient than the monopolistic distribution of electric power. In general, at the distribution level, the companies should continue to operate as local franchised monopolies with legally-defined services territories.

In countries where the idea of retail competition in the electric industry has been introduced, for example Norway and Great Britain, the local distribution companies continue to operate as local franchised monopolies only for the distribution function and not for the retail sale function.[16]

The results on economies of scale can help to clarify the issue of optimal service territory size for the monopolistic distribution of electricity. The results show that the small and medium-sized electricity distribution utilities operate at an inappropriately low scale. The service territory area of most of these utilities appears too small. Therefore, mergers between two small electricity distribution companies whose service territories are adjacent would improve the scale efficiency of these companies. Without giving a detailed description of the situation, it can be said that in our sample we find several configurations of city electricity utilities where mergers would be feasible.

5 Conclusions

The purpose of this study was to analyse the cost structure of the Swiss electricity distribution utilities in order to assess economies of output and customer density and economies of scale. In particular, policy-makers have been interested in cost information in this industry for decades because it can help them to determine the desirability of competition in the distribution of electric power. A translog cost function was estimated using panel data for a sample of 39 municipal utilities over the period 1988–1991.

The results indicate the existence of economies of output and customer density and economies of scale for most output levels. These output levels include small, medium, and large companies. The

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[16] Under retail competition the customer can choose to purchase electricity from a marketing company, from the local franchise or directly from a generator. Electricity is delivered to customers by the local distribution company. See Hogan (1994) and Hunt and Shuttleworth (1996).

empirical evidence suggest that franchised monopolies, rather than side-by-side competition, is the most efficient form of production organisation in the electric power distribution industry. Further, the majority of the utilities are not operating at an optimal scale. Therefore, consolidation of small utilities whose service territories are adjacent is likely to reduce costs.

In addition, this study finds that improvement in load factor can significantly reduce cost. This result suggest that time-of-day pricing, which encourages electricity consumption to be shifted to periods when excess capacity is available, could improve the load factor and thus reduce cost.

Though the future potential for side-by-side competition in the distribution of electric power may be limited due to the existence of scale economies, the results of our study are important for policy development in this regulated sector. Regulators may well be advised to develop policies that would promote mergers between small and medium companies whose service territories are adjacent and a widespread adoption of time-of-day rates. Moreover, more emphasis should be put on promoting competition for franchised monopolies.

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Les services municipaux de distribution d'électricité sont-ils des monopoles naturels?

L'objet de cette étude est d'analyser la structure des coûts des services suisses de distribution d'electricité afin d'évaluer les économies d'échelle et de densité et la désirabilité de la concurrrence dans le domaine de la distribution de l'électricité. Une fonction de coût translog est estimée à partir d'un ensemble de données en panel pour un échantillon de 39 services municipaux au cours de la période 1988–1991. Les résultats indiquent l'existence d'économies de densité pour la plupart des niveaux d'output et l'existence d'économies d'échelle uniquement pour les petites et moyennes entreprises d'électricité. L'analyse empirique suggère que la *forme d'organisation de production la plus efficace dans le secteur de la distribution de l'électricité est celle des monopoles franchisés, plutôt que la concurrence côte à côte. En outre, la majorité des entreprises étudiées n'opèrent pas sur un territoire de taille optimale. La consolidation de petites unités dont les territoires d'activité sont contigus est dès lors susceptible de réduire les coûts.*

Sind städtische Elektrizitätsverteilungsunternehmen natürliche Monopole?

Der Zweck dieser Untersuchung besteht darin, die Kostenstruktur der schweizer Elektrizitätsverteilungsunternehmen zu analysieren, um Skalen- und Dichte-Effekte sowie die Wünschbarkeit von Wettbewerb bei der Verteilung von elektrischer Energie abzuschätzen. Es wurde eine translog Kostenfunktion unter Verwendung der Daten einer Stichprobe von 39 städtischen Versorgungsunternehmen im Zeitraum 1988–1991 zugrunde gelegt. Die Ergebnisse belegen das Vorhandensein von Dichte-Effekten bei den meisten Output-Niveaus und das Vorhandensein von Skaleneffekten nur bei kleinen und mittelgroßen Elektrizitätsversorgungsunternehmen. Der empirische Befund läßt vermuten, daß konzessionierte Monopole und nicht "Side-by-side"-Wettbewerb die effizienteste Form der Produktionsorganisation im Sektor der Verteilung elektrischer Energie ist. Außerdem operiert die Mehrzahl der untersuchten Versorgungsunternehmen nicht in einem optimal großen Versorgungsgebiet. Deshalb würde wahrscheinlich die Konsolidierung kleiner Versorgungsunternehmen, deren Versorgungsgebiete aneinandergrenzen, zu Kostenreduzierungen führen.

¿Son monopolios naturales los servicios municipales de distribución de electricidad?

El objetivo de este estudio es el de analizar la estructura de costes de los servicios suizos de distribución de electricidad a fin de evaluar las economías de escala y de densidad y la conveniencia de la competencia en el campo de la distribución de electricidad. En él se estima una función de costes translogarítmica a partir de un conjunto de datos de una muestra de 39 servicios municipales en el período 1988–1991. Los resultados muestran la existencia de economías de densidad para la mayor parte de los niveles de output y la existencia de economías de escala solamente en las pequeñas

y medianas empresas de electricidad. El análisis empírico sugiere que la forma organizativa más eficaz en el sector de la distribución de electricidad es la de los monopolios franquiciados, más que la competencia. Además, la mayoría de las empresas estudiadas no operan sobre un territorio de dimensión adecuada. La consolidación de pequeñas unidades en territorios de actividad contiguos es susceptible de reducir costes.