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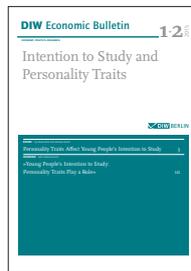
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A (re)municipalization trend among energy utilities: truth or myth?

By Astrid Cullmann, Maria Nieswand, Stefan Seifert, and Caroline Stiel

In the 1990s, a number of municipalities started privatizing their energy utilities; in recent years, there has been an intensive debate about whether a paradigm shift has taken place since then. Cities and municipalities have considered putting the energy, water, gas and heat supply back into the hands of public companies; Berlin and Hamburg are two prominent examples. But is there really an overarching trend toward (re)municipalization? According to the present study, which evaluates newly available microdata from official statistics, there is no evidence of a comprehensive (re)municipalization. The increase in public enterprises appears to have more to do with general restructuring in the energy sector, and has in fact been less pronounced than has growth in the private sector.

In recent years, the public discourse has increasingly centered on the government's economic activities at the federal, state, and municipal levels. This discussion has given way to the impression that cities and municipalities are once again starting to take charge of utilities, such as the energy and water supplies, instead of entrusting these tasks to private enterprises. The Monopolies Commission's latest biennial report also deals with the supposed increase in municipal economic activity, and critically debates its economic aspects.¹

The extent of this (re)municipalization is usually measured by the number of companies and several sales figures. The fact is, the number of companies under municipal ownership—taking into account all economic sectors²—rose by roughly 23 percent between 2000 and 2011, and their nominal revenue in relation to GDP increased by 60 percent.³

The increase in the number of public utilities is usually explained by two developments. The first, broadly speaking, is that municipalities reacquired previously privatized shares in utilities and disposal companies ("remunicipalization"). The second is that they created municipal utilities and took over concessions in order to take charge of certain public service tasks for the first time ("municipalization"). Given this background, the increase in local economic activity is often interpreted as a "trend towards (re)municipalization," which can give the impression that private economic activity has been displaced from these areas.⁴

¹ Monopolies Commission (2014): Hauptgutachten XX: Eine Wettbewerbsordnung für die Finanzmärkte. Kapitel 5. p. 439-511. Bonn.

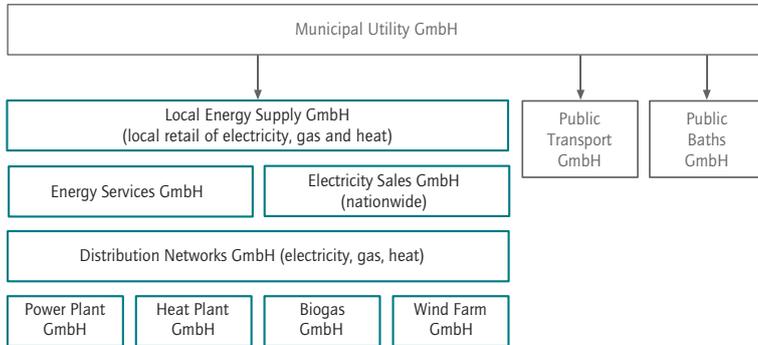
² Municipalities are active in many economic sectors, including housing, health, local public transport, telecommunications, utilities, and the disposal industry.

³ Monopolies Commission (2014): supra, p. 439-440.

⁴ For more on the economic controversies surrounding publicvs.-private service providers in the energy sector, please see the second article in this issue of the *Economic Bulletin*, Cullmann et al. (2016): No differences in efficiency between public and private utilities, DIW Economic Bulletin no. 20.

Figure 1

Example of corporate structure of a public utility



Source: Illustration by DIW Berlin.

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Debating the energy supply

Among others, the Monopolies Commission⁵ and the Federal Cartel Office⁶ have pointed out that the increase in municipal economic activity has taken place primarily in the energy sector. This growth is likely due to fact that concessions were reaching their expiration dates: between 2010 and 2015 alone, roughly 60 percent of the 14,000 concessions (which are typically valid for 20 years) were reissued.^{7,8}

Several municipalities that had previously privatized their energy utilities used this as an opportunity to consider reversing their previous decisions. Berlin and Hamburg’s recent efforts to take over the utilities companies had a major impact in the public eye: after acquiring 25.1 percent of the shares in local energy, gas, and district heating utilities in 2012, Hamburg took over the entire electricity distribution network in 2014 and negotiated a repurchase option with the previous owner, *Vattenfall*, for the district heating networks.⁹ In Berlin, on the other hand,

5 Monopolies Commission (2014), supra, p. 442 ff.
 6 Federal Cartel Office (2014): Der Staat als Unternehmer - (Re-)Kommunalisierung im wettbewerblichen Kontext. Hintergrundpapier. Bonn. p. 17.
 7 Berlo, K. and Wagner, O. (2013): Stadtwerke-Neugründungen und Rekommunalisierung. Energieversorgung in kommunaler Verantwortung. Sondierungsstudie. Wuppertal Institut für Klima, Umwelt, Energie GmbH. Wuppertal. P.1.
 8 A "reissuing" of a concession does not imply that the previous concession has been superceded by a new concession; concessions were also issued to former license holders.
 9 Monopolies Commission, supra, p. 442.

a 2013 referendum for the repurchase of the electricity distribution network did not gain the required majority approval; nevertheless, on March 14, 2016, the state-owned company *Berlin Energie* submitted a proposal for a complete buyback.¹⁰ Similar actions have been observed elsewhere and in other energy sectors.¹¹

New microdata enable detailed analysis of energy companies

Whether a "trend" is actually forming remains unclear, and an accurate assessment of the (re)municipalization in the energy sector requires a broader database than what is offered by anecdotal, high-profile cases. In addition, developments related to private companies in the energy sector need to be taken into account in order to differentiate which increases are due to a general restructuring of the energy sector (which could include, for instance, outsourcing by business units, or adaptations to new market conditions following liberalization and energy policy changes) and whether these developments really are due to new activity, which for the purpose of this report should be understood purely as (re) municipalization.

As part of the project *Municipal infrastructure companies against the background of energy policy and demographic change (KOMIED)*,¹² DIW Berlin created a comprehensive dataset on energy companies in Germany for the years 2003 to 2012.¹³ This dataset is based on newly available energy statistics microdata from official statistics, as well as financial statements from public funds, institutions, and enterprises as well as the business register. For the first time, the alleged increase in municipal activity in the energy sector over the past decade can be empirically evaluated—both at the federal level as well as for individual states—and compared to the development of private energy companies. In addition, public companies can be viewed according to individual sections of energy supply¹⁴ so that a detailed representation is possible.

10 <http://www.berlinenergie.de/abgabe-indikatives-angebot-fuer-eine-vollstaendige-rekommunalisierung-des-berliner-stromnetzes/> (abgerufen am 18. April 2016).
 11 See Berlo, K., Wagner, O. (2013). supra, p. 8.
 12 The project homepage can be accessed through the following link: http://www.diw.de/de/diw_01.c.467702.de/forschung_beratung/projekte/projekt_homepages/komied/komied.html
 13 Stiel, C. (2015): Official Data on German Utilities (Energiestatistiken der amtlichen Statistik) 2003-2012. DIW Data Documentation Series. Nr. 80.
 14 The energy supply can be divided up horizontally into multiple sectors (electricity, gas, heat) as well as vertically into various steps of the value chain (generation, transmission, distribution, and sales).

Changes in municipal utilities' corporate structure

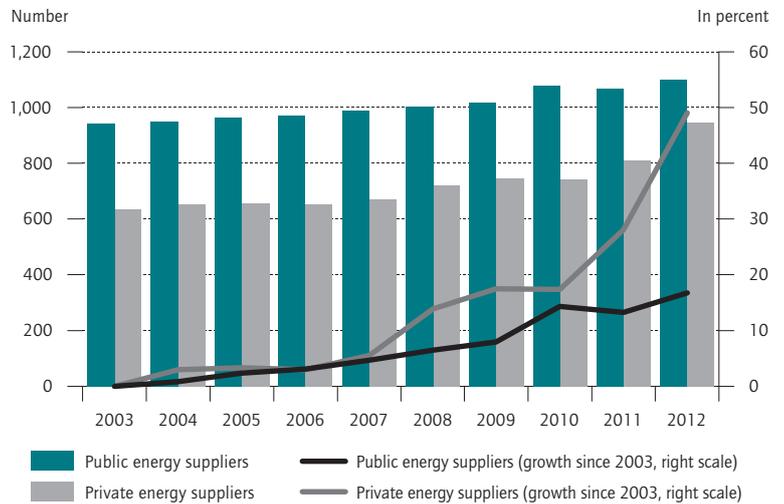
In 2012, there were 1,100 public energy utilities, the majority of which were entirely under public ownership. Only one-quarter of these companies had private companies as minority shareholders. *Energy utilities* in this case includes all companies active in the electricity, gas, and heating sectors, and includes the various stages of the value chain, from production to sales.¹⁵

The development of public activity in the utilities sector should not be measured by the sheer number of companies alone: the fact that the corporate structure of utility companies has changed over the past decade must be taken into account. Where activity was often concentrated in one company, there has been an increase in corporate spin-offs in recent years, which means that energy utilities may now be made up of several smaller entities (Figure 1). For instance as part of the network unbundling¹⁶ many public utilities have chosen to set up network companies for pooling the power, gas, heating, and water networks and to establish specific sales companies specialized in targeting certain products (such as energy services or nationwide electricity sales). However, the legal spin-off of existing activities does not necessarily indicate an increase in public activity, and it must be distinguished from actual (re)municipalization. Else it is possible to overestimate the trend or see a trend where there is none at all.

Thus in order to avoid double counting, companies that belong to the same enterprise group must be grouped together. One way to identify these affiliated companies is through tax group relationships.¹⁷ Information about such affiliations can be found in the business register and in the energy statistics from the statistical office. These data reveal that in 2012, one third of all public utilities were part of a tax group. In the private sector, this proportion is similarly high. Taking into account all public

Figure 2

Number of public and private energy suppliers in Germany



Source: Energiestatistiken der amtlichen Statistik 2003–2012, Jahresabschlüsse öffentlicher Fonds, Einrichtungen und Unternehmen 2003–2012. Unternehmensregister 2003–2012.

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The number of public firms increased by 17 percent, the number of private firms by 49 percent.

companies that, according to the business register, belong to a tax group, the number of public utilities rose by 17 percent between 2003 and 2012 (Figure 2).¹⁸ Ignoring the tax group relationships, by contrast, would lead to an increase of 26 percent.

Restructuring in the energy sector: private sector showing even more growth

Up until now, the extent of the (re)municipalization has been judged solely on the number of public companies.¹⁹ In order to assess the growth of cities' and municipalities' economic activity in the overall context, however, the entire sector must be taken into account, including companies that are mostly or entirely under private ownership.

The analysis shows that the number of private utilities rose by 49 percent between 2003 and 2012, or roughly

¹⁵ For a look at the water sector, see Zschille, M. (2016): Kaum Kostenvorteile durch Unternehmenszusammenschlüsse in der Trinkwasserversorgung, DIW Wochenbericht no. 20.

¹⁶ The second amendment to the Energy Act in 2005 stipulated that after July 1, 2007, all distribution system operators with more than 100,000 customers must be independent—in terms of legal structure, organization, and decision making—from energy suppliers that act on other steps of the value chain (for example, production or retail). This would ensure non-discriminatory access to electricity distribution networks. Several energy utilities with fewer than 100,000 customers also decided to outsource their networks to independent distribution companies as a result.

¹⁷ Under certain conditions, companies that are closely integrated in terms of economic, financial and organizational issues form a tax group. Tax groups may exist for corporate tax, trade tax, or sales tax. In the case of sales tax groups, businesses in the same tax group can avoid paying sales tax on transactions with one another. See Federal Ministry of Finance (2016): Umsatzsteuer-Anwendungserlass from October 1, 2010. Konsolidierte Fassung. As of March 2, 2016.

¹⁸ The business register primarily includes sales tax entities and to a lesser extent, corporate tax entities. However, since not all of the businesses of a public utility and/or a business group meet all the requirements of an "affiliation" and the data quality is somewhat limited, not all actual business networks could be included. The method does allow for a more accurate analysis than does the observation of individual companies, but the results must be still seen as an upper bound on the true number of utilities.

¹⁹ See Monopolies Commission, supra, 439ff., Lichter, J. (2015): Rekommunalisierung – Zwischen Wunsch und Wirklichkeit. Handelsblatt Research Institute.

three times as much as did the number of public utilities. The fact that there is now a higher number of public as well as private utilities in the energy sector is likely due to general restructuring. This includes, for instance, the establishment of enterprises to develop new business segments or technologies related to the energy transition. Not all new companies join tax groups, and so the number of companies also increases when taking into account tax group relationships. This is the case for new companies with multiple shareholders.

As part of the energy transition and the liberalization of the electricity and gas markets, the sector has seen major changes since 1998. Many public utilities participate in joint wind-farm projects or invest in their own renewable energy plants. Electricity is procured partly through specialized trading companies, which can also be a consortium of several public utilities (examples include *Trianel GmbH*, *Syneco Trading GmbH*, and *SüdWestStrom*). New business segments in the field of energy services (heat contracting²⁰, energy data management, energy efficiency consulting), technical services (IT, maintenance, external management of generating plants) or the bundling of networks in network companies can also lead to the creation of new enterprises—all without municipalities taking up any new activities.

Sales shares of public utilities are in decline

A comparison of sales developments for the period between 2006²¹ and 2012 shows that the price-adjusted proceeds of public utilities increased by 54 percent, while they have more than doubled among private utilities (Figure 3).

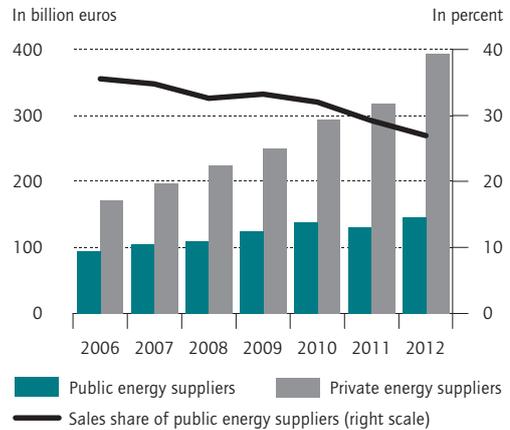
Accordingly, public utilities' share in total energy sector revenues has decreased by nine percent since 2006: in 2012, they generated only slightly more than a quarter of sales in the energy sector, even though they made up the majority of all companies. The low share of sales can be explained firstly by smaller-sized businesses, since the service area of most public utilities is geographically linked to the town or community. But the fact that private companies concentrate their efforts in lucrative sectors like electricity and gas supply could also play a role. The following is thus a closer examination of the relative developments of public and private companies within individual energy sectors and stages of the value chains of energy supply.

²⁰ "Heat contracting" refers to the energy utilities supplying heating to end customers in regions where no district heating is available. For this purpose, a local production unit is installed in the consumer's house and operated by the energy supplier. The customer (usually) pays only for heat they have actually used.

²¹ Due to flaws in the data, only calculations from 2006 onwards are possible.

Figure 3

Sales figures in energy supply



Source: *Energiestatistiken der amtlichen Statistik 2003–2012, Jahresabschlüsse öffentlicher Fonds, Einrichtungen und Unternehmen 2003–2012. Unternehmensregister 2003–2012. Price-adjusted, base year 2010.*

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Public energy suppliers lost shares.

Growth primarily in the electricity sector

Utilities are typically active in several sectors, simultaneously generating, distributing and selling electricity, heat, and gas to end customers. This raises the question of whether there are differences in the increase in activity among different types of energy. In 2012, 78 percent of public utilities were reportedly active in the electricity sector, 57 percent in the gas sector, and 63 percent in the heating sector. The number of public companies has seen the most increases in the electricity sector (Figure 4). A similar picture emerges in the case of private companies, except that growth rates are higher: the number of private electricity suppliers increased by 66 percent between 2003 and 2012.²²

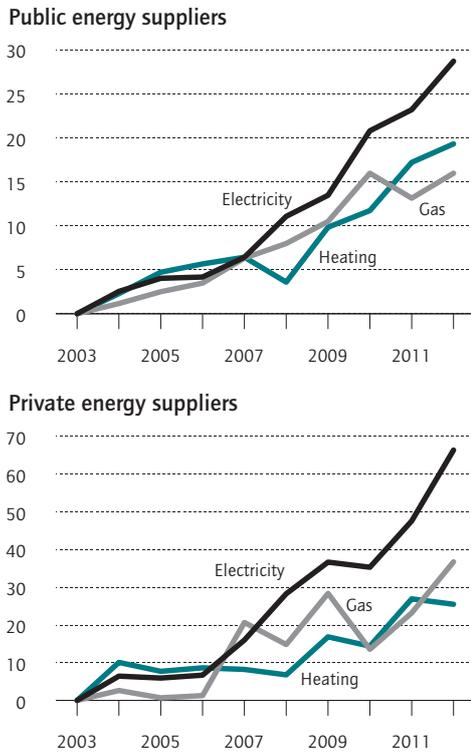
A look at the various steps of the value chain in the power sector reveals that the increase in the number of public companies was concentrated in electricity trade (plus 23 percent) and retail (plus 18 percent) (Figure 5).²³ This suggests that the growth of public companies is primarily attributable to the above-discussed restructuring, includ-

²² An analog comparison of revenues was not possible due to a lack of available data.

²³ It must be noted, however, that generating plants using renewable energy sources are insufficiently accounted for in the official energy statistics, and are therefore underrepresented.

Figure 4

Increase in numbers of public and private energy suppliers by branch
In percent



Source: Energiestatistiken der amtlichen Statistik 2003–2012, Jahresabschlüsse öffentlicher Fonds, Einrichtungen und Unternehmen 2003–2012. Unternehmensregister 2003–2012.

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Growth rates were highest in the electricity sector, both for public and private firms.

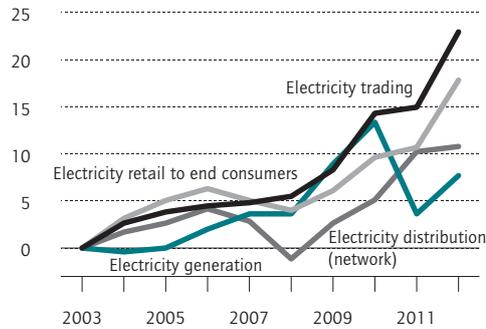
ing the specialized spin-offs and the establishment of specialized trading companies. Although many towns and communities are using the (re)purchasing of networks as a starting point to increase economic activity, and thus (re)municipalization, the number of public electricity network operators only increased by eleven percent. It is unlikely that newly established sales companies were not combined with an existing stage of the value chain.

No regional pattern

A regional breakdown by state shows that there is no uniform pattern: between 2003 and 2012, some states experienced an increase in shares of public utilities while others experienced a decline (Figure 6). In 2003, Rhineland Palatinate recorded the highest share with 83 percent, closely followed by Mecklenburg-Western Pomerania with 79 percent. Saxony-Anhalt had the lowest share,

Figure 5

Increase in number of public electricity firms by activity
In percent



Source: Energiestatistiken der amtlichen Statistik 2003–2012, Jahresabschlüsse öffentlicher Fonds, Einrichtungen und Unternehmen 2003–2012. Unternehmensregister 2003–2012.

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Broken down to stages of the value chain, it is trade and retail which exhibit the greatest increases in the electricity sector.

with 49 percent. By 2012, there had been a decline in the shares of states where public utilities once made up a relatively high share, and an increase in the shares of states where public utilities once made up a low share. A prime example of this is Hesse, where the share of municipal companies increased by 17 percentage points, from 56 to 73 percent.

Considering public utilities in an isolated fashion when trying to determine the existence of a (re)municipalization trend can lead to false conclusions, as in the example of Saarland. According to official statistics, the number of public utilities in Saarland rose by 75 percent—but the number of private companies more than tripled (Figure 6).

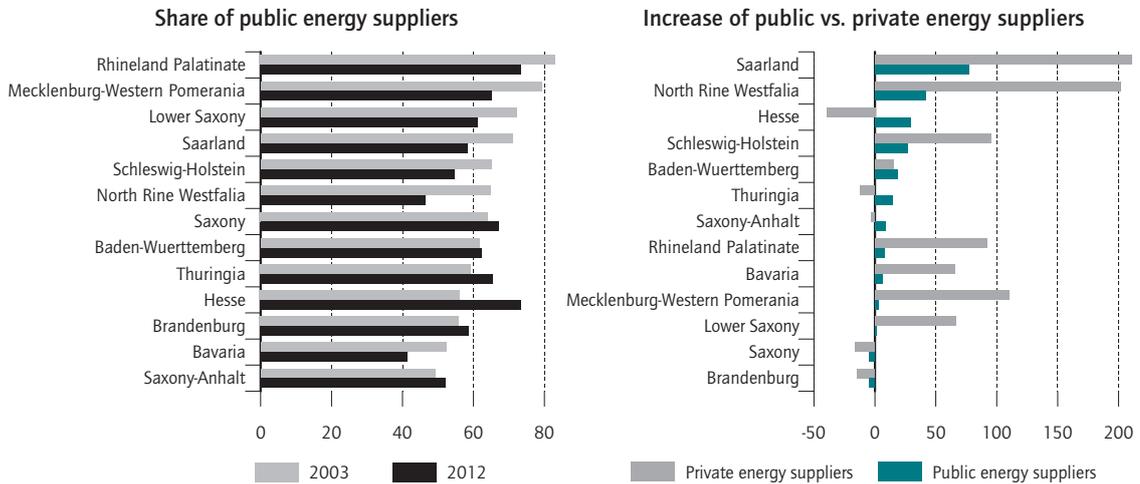
However, it should be noted that which companies belong to which states can only be determined through locating the corporate headquarters. Private utilities are often active transregionally—for example, as surface network operators or in nationwide electricity sales—but it can be assumed that public companies, in contrast, are more likely to carry out their main activity at the company headquarters or in the immediate vicinity.

Conclusion

When the growth in private utilities is taken into account, it is not possible to confirm the existence of a general (re)municipalization trend in the energy supply. Although

Figure 6

Public and private energy suppliers by federal state between 2003 and 2012
In percent



Source: Energiestatistiken der amtlichen Statistik 2003–2012, Jahresabschlüsse öffentlicher Fonds, Einrichtungen und Unternehmen 2003–2012. Unternehmensregister 2003–2012. Assignment by company domicile.

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In many Länder, the number of private energy suppliers increased much faster than that of public energy suppliers.

there has been an increase in economic activity in the public energy sector from a numbers perspective, this change must be viewed in the context of fundamental restructuring within the industry. Examples include the outsourcing of certain activities to legally independent subsidiaries (e.g., in the case of network operation and in the field of technical services) and the development of new business areas (e.g., EEG systems and energy services) that are closely related to previous activities. There are no signs that public utilities are displacing private utilities. On the contrary, the number of private utilities has

increased more than that of public utilities, which lost revenue shares between 2003 and 2012. A tangible (re) municipalization trend cannot be definitively proven—or at the very least, it appears to be less pronounced than commonly assumed.

Nevertheless, there are a number of individual (re)municipalization projects—particularly in the case of electricity distribution grids—that indicate that municipalities are definitely considering playing a bigger role in local energy supply since the privatization wave in the 1990s.

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No differences in efficiency between public and private utilities

By Astrid Cullmann, Maria Nieswand, Stefan Seifert, and Caroline Stiel

The increase in municipal economic activity in the utilities sector frequently comes under scrutiny. It is presumed that public utilities have less incentive to provide efficient service than private companies. This could result in excessive costs and prices for end users. New microdata on German energy supply companies allow to conduct an empirical analysis for the whole of Germany for the first time. The findings indicate that there is no difference in efficiency between public and private utilities. This applies to both the competitively structured electricity retail sector and regulated electricity distribution sector. General restructuring in the energy sector such as the increased competitive pressure or the introduction of a more stringent regulatory regime have led to changes in the efficiency of all energy supply companies. The dichotomy between public and private utilities that has been suggested in the (re)municipalization debate therefore appears to be exaggerated.

In the context of the increasing municipal economic activity in the energy utilities sector,¹ energy and climate policy considerations as well as the economic aspects have been under heavy discussion. The latter was also the subject of recent detailed examinations by the *Monopolies Commission*² and the *Bundeskartellamt* (Federal Cartel Office).³

Apart from the general question as to what conditions justify business activity on the part of the state from an economic perspective, the debate focuses in particular on how efficiently municipal enterprises fulfill their remit and whether they have less incentive to provide efficient service than private companies.

The allegedly lower level of efficiency of municipal enterprises is often explained by the fact that—compared to private companies whose primary aim is to maximize their profits—they pursue a wider range of objectives. These include energy and environmental policy goals, for instance, as well as fiscal targets in the form of profit transfers to the local government budget, or cross-subsidization of loss-making sectors such as local public transport. One of the aims expressed by the municipalities is also to contribute to economic growth in the region through public enterprises. Economic theory states that inefficiencies can also arise because municipal enterprises are subject to lower budget constraints, are disciplined to a lesser extent by financial and capital markets, and a large number of stakeholders are involved in their decision-making processes.

Irrespective of intensity of competition and due to the differing objectives and interests of public and private

¹ For more on this, see "(Re-)Municipalization trend among energy utilities: truth or myth?" in this issue of *DIW Economic Bulletin*.

² Monopolies Commission, chap. 5 in *Hauptgutachten XX: Eine Wettbewerbsordnung für Finanzmärkte* (Bonn: 2014), 439–511.

³ Bundeskartellamt, "Der Staat als Unternehmer – (Re-)Kommunalisierung im wettbewerblichen Kontext," background paper (Bonn: 2014): 17.

Box 1

Measuring differences in efficiency using econometric production functions

In order to allow us to make comparative statements about the efficiency of an enterprise, the production process of the enterprises has to be mapped out using a production function.¹ Here, the outputs produced by the energy provider (amount of electricity sold) is set against the inputs (labor input and external services). Other important factors that explain structural differences between the enterprises and consequently might have an effect on the quantity of goods produced are also taken into consideration. These include the customer structure of the electricity retailers (the ratio of industrial consumers to household consumers) and the amount of electricity supplied to other electricity suppliers as a share of total electricity supplied.

The latest structural econometric methods are used to estimate the production function on the basis of the entire panel dataset, i.e., by determining the coefficients of the input factors.² Annual efficiency scores for each enterprise can then be calculated on the basis of the estimated production function.³ Based on this, the average of the annual efficiencies can be determined for all enterprises combined and separately according to whether they are public or private enterprises. The annual mean values can then be compared between the two groups. This enables us to analyze rates of change in average efficiency over the entire observation period for all enterprises combined and separately by ownership for the base year 2003.

Furthermore, the estimated production functions allow us to draw conclusions as to whether or not there is a direct correlation between the efficiency of an enterprise and the ownership by econometrically testing the statistical effect of the variable ownership on firm-specific efficiency.

1 Here, we refer only to enterprises' productive technical efficiency, without taking into consideration costs and allocative efficiency. The Monopolies Commission notes in its report that it is primarily productive inefficiency which is more apparent in public enterprises and allocative inefficiency is less noticeable, see Monopolies Commission, *Hauptgutachten XX*, 458.

2 For details on econometric approach, see C. Stiel, A. Cullmann, and M. Nieswand "Productivity in Electricity Retail after Market Liberalisation: Analysing the Effects of Ownership and Firm's Governance Structure," *DIW Diskussionspapier* 1531 (2015). This approach is based on structural models to estimate production functions following G. Olley and A. Pakes, "The Dynamics of Productivity in the Telecommunications Equipment Industry," *Econometrica* 64 (6) (1996): 1263–1297; and Akerberg et al., "Identification Properties of Recent Production Function Estimators," *Econometrica* 83 (6) (2015): 2411–2451.

3 In this context, the efficiency of an enterprise is defined as the deviation of the firm's realized output level from the average output of all firms that cannot be explained by other use of input factors.

enterprises as well as the resultant potential differences in efficiency, the *Monopolies Commission* and the *Bundeskartellamt* express fundamental reservations about the increase in state involvement in performing municipal functions such as energy supply. They fear that possible inefficiencies in the public sectors lead to higher costs and hence inflated prices for consumers. These conclusions are mainly based on older theoretical principles and empirical evidence from other countries.⁴ Yet international analyses show no indication whatsoever that public enterprises in the energy sector perform less well than private enterprises in general.⁵

No robust national analysis on efficiency differences between public and private enterprises in the energy sector is available for Germany to date. Using a recently compiled micro dataset as part of the project *Municipal infrastructure enterprises against the background of energy policy and demographic change (KOMIED)*⁶ for the electricity sector, which accounts for the lion's share of municipal enterprises' revenue, the link between public or private ownership and efficiency is examined in more detail. The efficiency of enterprises both in the competitively structured retail electricity and in regulated electricity distribution is estimated and compared in two separate analyses.⁷

In the competitively structured retail electricity sector ...

The first analysis focuses on electricity retailers, known as electricity suppliers or electricity providers. These supply the end users with electricity and are responsible for billing them. The micro dataset compiled allows us to make a direct comparison of public and private enterprises for the period 2003 to 2012.⁸ The sources of the firm-level data are the Official Data on German Utilities and the financial statements from public funds, institu-

4 See W. L. Megginson and J. M. Netter, "From State to Market: A Survey of Empirical Studies on Privatization," *Journal of Economic Literature* 39 (2) (2001): 321–389.

5 J. E. Kwoka, "The comparative advantage of public ownership. Evidence from US electric utilities," *Canadian Journal of Economics* 38 (2) (2005): 622–640; H. Mühlkamp, "Öffentliche Unternehmen aus der Sicht der Neuen Institutionenökonomik," *Zeitschrift für öffentliche und gemeinschaftliche Unternehmen* (2006): 390 ff.

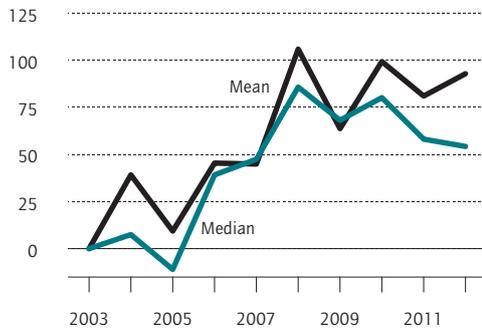
6 *Municipal infrastructure enterprises against the background of energy policy and demographic change (KOMIED)* is a three-year research project funded by the Leibniz Association (see www.diw.de/de/diw_01.c.467702.de/forschung_beratung/projekte/projekt_homepages/komied/komied.html).

7 The electricity sector is characterized by three stages of the value chain: power generation, transmission and distribution, and sale to the end user. Municipal enterprises are involved in all three of these stages but the present report only focuses on the last two stages: distribution and sales.

8 Overall, we had access to 212 observations on pure electricity suppliers (65 public and 147 private enterprises) for the period 2003 to 2012. This means that our findings are based on a subset of German power suppliers.

Figure 1

Efficiency growth rates over time (electricity retail)
In percent



Source: Own calculations by DIW Berlin.

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Average efficiency increases over the years.

tions, and enterprises, both collected by the the statistical offices of the *Länder*.⁹

The company-specific efficiencies of the electricity retailers and the impact of ownership on differences in efficiency are estimated using a structural production function approach (see Box 1). In accordance with EU Directive 2000/52/EC, companies are considered to be public if public authorities (municipalities) hold more than 50 percent of voting rights or nominal capital.¹⁰

... efficiency increases observed over time for all electricity retailers

Figure 1 shows the development of efficiency over time and the average growth (mean and median) using 2003 as the reference year. The average growth rate of all electricity retailers primarily increases in the years from 2003 to 2008 and remains relatively stable from 2008 onward. A look at the growth rates by ownership of the electricity retailers shows more volatility but no fundamental differences between public and private enterprises over the course of time.

⁹ For a more detailed description of the data, see C. Stiel, "Official Data on German Utilities (Energistatistiken der amtlichen Statistik) 2003-2012," *DIW Data Documentation Series* 80 (2015).

¹⁰ Since energy supply is considered to be a municipal function, it is mainly the municipalities that hold shares in the public enterprises; the *Länder* or federal states only hold a very limited number and the German central government has no shares in the energy supply companies included in the present study.

Table 1

Testing mean equality of efficiency scores between public and private firms (electricity retail)

Mean public firms	Mean private firms	Mean all firms
0.59	0.548	0.576
Hypothesis test		
p-value		
0.332		

Source: Calculations by DIW Berlin.

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No significant difference between mean efficiency scores of public and private electricity retailers.

The increase in the first five years can be explained by considerable restructuring and company reorganization: the liberalization of energy markets in 1998—which left all consumers free to choose their electricity provider—combined with the European unbundling requirements (Directive 2003/54/EC),¹¹ led to more competition and consequently a better input use.

Differences in efficiency between electricity retailers not down to ownership structure

First, the mean values of both groups were determined for the entire observation period. The mean values for public electricity retailers appear to be slightly higher than for private providers at first glance. However, a statistical test shows that the mean values of both groups do not differ statistically from each other (see Table 1). The findings of the test show that there is no difference between the levels of efficiency of public and private enterprises.

Using a further regression of efficiency on the ownership, it was also possible to confirm that the ownership factor did not explain the efficiency differences between the enterprises. No statistically significant effect was found for the coefficient of the variable ownership (public enterprises).¹²

Several different models were used to test the robustness of the findings for the ownership effect. First, the specification of the production function was varied, which had no effect on the main result. Second, a further re-

¹¹ Unbundling refers to the legal requirement for separation of network operation and distribution by energy supply companies.

¹² For the precise figures, see the relevant discussion paper, Stiel et al. "Productivity in Electricity Retail."

Box 2

Measuring efficiency differences using benchmarking methods

The company-specific efficiency of the network operators was determined using a new semiparametric, multilevel benchmarking method.¹ Here, in line with previous analyses, the production process of the enterprises is illustrated on the basis of the relevant output produced (amount of electricity transmitted and number of customers) and input factors (labor, capital), as well as environmental factors (features of the supply area). In the benchmarking method, efficiency refers to the ratio of

1 The analytical approach is based on the semiparametric smooth coefficient stochastic cost frontier model developed by K. Sun, S. C. Kumbhakar, et al., "Productivity and Efficiency Estimation: A Semiparametric Stochastic Cost Frontier Approach," *European Journal of Operational Research* 245 (2015): 194–202. Compared to previous approaches, this has the advantage that no strict functional assumptions have to be made concerning the production function and this can be estimated nonparametrically instead.

output to input factors. The most efficient enterprises constitute what is known as the efficient frontier, against which all other enterprises are compared (benchmarked). The fewer input factors required to provide the level of output, the more efficient the enterprise. The approach also makes it possible to break down total inefficiency into a persistent component (inefficiencies that do not change over time) and a time-varying component (inefficiencies that change over time). The findings indicate that, in the period under review, inefficiencies are mainly determined by time-varying inefficiencies, changing over time in the individual enterprises, and there is no persistent inefficiency.² Therefore, the focus in the following sections is on time-varying inefficiency.

2 The main reason for this is the short observation period. Another reason is the restructuring and reorganization in the sector in response to the unbundling requirements and the incentive regulation.

gression was used to test whether efficiency differences might not be due to the difference between public and private enterprises *per se* but instead be linked to their legal form. In the energy sector, the most common form for both public and private enterprises is a limited liability company (*GmbH*). The regression showed no statistically significant difference between the two groups. No difference between public and private GmbHs was found in terms of their efficiency.

In regulated electricity distribution, too ...

A second analysis focuses on possible efficiency differences among network operators, i.e., enterprises responsible for the distribution of electricity on the energy market. Due to the specific features of network operation,¹³ which do not permit any competition in this sector *per se*, the prices (known as network charges for the distribution of electricity) are regulated by the relevant national and regional authorities. Public and private enterprises are subject to the same regulatory requirements.

Against the background of expiring concessions, there has been some discussion in the public sector about buying back previously privatized networks. Critics have

13 Electricity distribution is characterized by features of natural monopolies. What characterizes these monopolies is that the supply (distribution of electricity to end users) can be provided by a single enterprise at the lowest possible cost. Competition would lead to considerably higher costs here.

warned against this, since they believe public enterprises would operate their networks less efficiently than private ones, resulting in inflated prices for end users. For this sector, too, there has been an absence of robust empirical analysis for Germany to date explicitly examining the impact of ownership on efficiency.

Supplementing the microdata from the official statistics with network-specific data from the service provider Ene't¹⁴ allows us to conduct a detailed efficiency analysis of German network operators for the period 2008 to 2012 with a total of 1,474 observations. These include 199 observations on private enterprises and 1,275 on public ones. The company-specific efficiency values of the network operators are calculated using benchmarking approaches (see Box 2).

... public and private network operators are more or less equally efficient

Table 2 shows the descriptive statistics on the efficiency values determined using the benchmarking method.¹⁵ The network operators achieve an average level of effi-

14 Ene't is a service provider of professional databases on electricity and gas network usage. For the present study, we use the "Netznutzung Strom" database (see <https://download.enet.eu/uebersicht/allgemein>).

15 Due to data protection regulations, the minimum and maximum values cannot be subdivided according to ownership structures.

Table 2

Descriptive statistics of efficiency values for the whole sample (electricity distribution)

	mean	median	25% quantile	75% quantile
2008	0.869	0.874	0.862	0.890
2009	0.887	0.891	0.883	0.901
2010	0.863	0.864	0.852	0.876
2011	0.846	0.852	0.836	0.862
2012	0.866	0.879	0.860	0.893

Source: Calculations by DIW Berlin.

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Average efficiency values do not change much over time, considerable difference exist, however, among single distributors.

ciency of 0.867 (87 percent). This means that, on average, approximately 13 percent of the input could be saved if all enterprises measured their performance against the most efficient (benchmarks) in the sector.¹⁶

Between 2008 and 2012, taking the average (mean value and median) across all network operators, there were virtually no changes in efficiency. The range of estimates (i.e. the differences between the minimum and maximum efficiency values), however, indicates considerable differences in efficiency between the network operators.

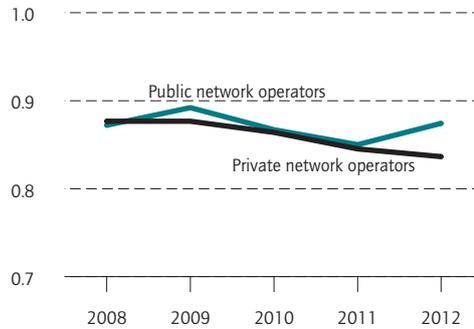
If we look at efficiency values over time subdivided by ownership (see Figure 2), it becomes apparent that the differences cannot be attributed to the ownership structure. Except for the year 2012, efficiency values for public and private firms do not differ notably.

Table 3 shows the descriptive statistics on efficiency values subdivided by ownership structure. The findings of a formal test to ascertain whether or not the distributions are equal (Mann-Whitney-Wilcoxon test) lead us to conclude that public and private network operators are subject to the same distribution and so also have the same mean values. Consequently, public network operators do not show lower efficiency values than private ones.

¹⁶ Compared to the efficiency values used by the Federal Network Agency in incentive regulation, we obtain a lower average efficiency level. This can be partly explained by the fact that the final efficiency values provided by the Federal Network Agency are based on the highest value of several models and, across the board, no efficiency value lower than 60 percent is attributed to enterprises.

Figure 2

Yearly average efficiency values of network operators by ownership structure



Source: Own calculations by DIW Berlin.

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Efficiency values of public and private electricity distributors show the same trend over time.

Table 3

Descriptive statistics of efficiency values of network operators by ownership structure

	mean	median	25% quantile	75% quantile
Private distributors				
2008	0.877	0.889	0.868	0.921
2009	0.877	0.889	0.868	0.919
2010	0.864	0.868	0.852	0.899
2011	0.845	0.856	0.823	0.871
2012	0.836	0.873	0.811	0.911
2008-2012	0.860			
Public distributors				
2008	0.872	0.877	0.865	0.892
2009	0.892	0.895	0.887	0.903
2010	0.867	0.867	0.856	0.878
2011	0.850	0.855	0.842	0.865
2012	0.874	0.882	0.866	0.896
2008-2012	0.870			

Results from Mann-Whitney-Wilcoxon test.
Null hypothesis: observations come from the same distribution (and have the same mean).
p-value: 0.787, Null hypothesis cannot be rejected.

Source: Own calculations by DIW Berlin.

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There are small differences in the efficiency values. However, they are not statistically significant.

Conclusion

Using newly available microdata on German energy supply companies, two empirical analyses have addressed the question as to whether public utilities differ from private enterprises in terms of efficiency. The empirical findings indicate that there are no efficiency differences among electricity retailers or network operators. According to the findings, public enterprises do not gen-

erally operate any less efficiently than private enterprises, as is sometimes assumed in the (re)municipalization debate. From an efficiency perspective, there is no reason to argue against further involvement of municipalities in the energy supply sector. Despite sometimes disparate objectives and various stakeholders, these public enterprises are able to provide their service just as efficiently as their private counterparts.

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SIX QUESTIONS TO ASTRID CULLMANN

»Private utilities are no more efficient than public utilities«

1. Ms. Cullmann, in recent years many communities have been reacquiring previously privatized shares in energy companies. Does this point to a trend toward remunicipalization? We have created a new microdata set of German energy companies in order to analyze this question for the first time in Germany. Our empirical analysis shows that both the number as well as the turnover of public companies in the energy supply has indeed increased. But we also compared these changes to the development of private enterprises within this sector, and our results show that there really is no strong trend toward remunicipalization.
2. How have the respective market shares of private and public utilities developed in recent years? There has been an increase in the number of both public and private utilities. However, the number of private enterprises has seen greater increases than that of public enterprises; as well, turnover of private enterprises is increasing faster than that of public enterprises. From this, we can conclude that the public companies' share in turnover has actually declined. So it's really not possible to claim that the public companies are displacing private ones in the energy supply sector.
3. You have studied the efficiency differences between municipal and private energy companies. Are municipal utilities less efficient than private ones? Critics often suggest that public companies have fewer incentives for efficient service provision. We have looked into this question using our new microdata, first by investigating the competitively organized electricity retail and second by examining the regulated network operation. Our analyses were not able to turn up any evidence of efficiency differences between public and private companies with regard to electricity retail or network operation.
4. What explains this result? It is always assumed that the public companies have many divergent goals and are not as oriented toward profit maximization as are the private enterprises. Municipal companies may want to implement, for example, anything from energy policy objectives to climate policy objectives to fiscal objectives. Our analysis shows that in spite of divergent objectives, public companies perform just as efficiently as do private companies, as they are not very different in terms of efficient service provision in their production processes.
5. Aren't there advantages to having the power supply under municipal ownership? Whether to remunicipalize remains an individual decision for each municipality—here, we've really just considered the efficiency aspects. Municipal companies are certainly in a position to combine their other goals with efficient service provision, but we would not want to draw conclusions about individual municipalities and their remunicipalization plans from these general analyses based on our data.
6. What is the situation for the network operators? Since numerous concessions have expired in recent years, the municipalities have been considering taking a bigger role in the electricity distribution sector. There is no competition here per se, and so the network charges are generally fixed by the respective regulatory authorities. Although public and private enterprises are subject to these same regulatory requirements, you often hear the criticism that public network operators would operate their networks less efficiently than would private operators. But our analyses clearly show that there are no efficiency differences to be found here.

Interview by Erich Wittenberg