Verein für Socialpolitik – Annual Conference 2019
Leipzig, 24th September 2019

The relative efficiency of public and private ownership

A critical assessment of quantitative empirical studies with a focus on electricity distribution

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This presentation is based on joint research activities with Nils Bieschke and Thorsten Beckers as well as Astrid Cullmann and Julia Rechlitz who provided special expertise on methodological questions. The research was (partly) funded by the Federal Ministry of Education and Research (BMBF) within the research project „INFRA-UBRAN".

Agenda

1) Background and motivation

2) Research questions and analytical approach

3) Challenges in quantitative empirical efficiency comparisons

    3.1) Different definitions or concepts of efficiency

    3.2) Different definitions of public and private ownership as well as different possible target systems of companies

    3.3) Sector and transaction characteristics

    3.4) General institutional framework and specific sector regulation

4) Concluding remarks

Agenda

Background and motivation

"Are certain goods provided more efficiently by private or public companies?"

- Ever since a frequently studied and discussed topic in economic science ...
- … and a highly relevant question in economic policy

Different policy trends in the past (particularly in infrastructure sectors)

- Extensive privatisations in the 1990s and the beginning of the 2000s
- Counter-trend in some sectors in recent years, especially on the municipal level ("remunicipalisation")
- ➢ The debate on efficiency differences between public and private (infrastructure) companies receives new impetus

Various theoretical approaches to analyse the efficiency of different forms of ownership

- Property rights theory, normative principle-agent theory, …
- Institutional economic approaches emphasise that a variety of aspects (such as technical characteristics) must be considered for the design of governance models for specific sectors

Besides theoretical works, an extensive quantitative empirical research branch has developed

- These studies are also frequently cited in both the scientific and political debate
- From an institutional economic perspective such quantitative empirical analyses face various challenges which may restrict …
  - … the validity of the individual studies
  - … the transferability of the results to concrete applications

Focus of this presentation

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Research questions and analytical approach

Research questions

- Do quantitative empirical studies consider all the complex aspects that must be taken into account from a theoretical perspective when comparing the efficiency of public and private companies?
- How do the authors deal with the respective issues?
- Can quantitative empirical studies thus provide valuable insights into the efficiency differences of public and private ownership in infrastructure sectors?

Analytical approach

- First, we identified potential challenges for quantitative empirical analyses that compare the efficiency of public and private companies
  - We derived the challenges from theoretical considerations mainly based on New Institutional Economics (NIE) with reference to the example of electricity distribution
  - However, the issues should apply in a similar way to other grid-bound infrastructures
- Second, we evaluated seven (peer reviewed) papers that contain quantitative empirical analyses on the relative efficiency of public and private electricity distribution companies
  - The data sets used in the studies cover a time span from 1970 to 2009 and different countries
  - Focus on electricity distribution but some studies also incorporate electricity generation and retail
  - Assessment whether authors mention or transparently disclose a certain issue and adequately consider it in the analysis and / or their interpretation of results

Reviewed studies

Bagdadioglu, N. / Waddams Price, C.M. / Weyman-Jones, T.G. (1996): Efficiency and ownership in electricity distribution: A non-parametric model of the Turkish experience; in: *Energy Economics*, Vol. 18, No. 1, pp. 1–23.

Berg, S. / Lin, C. / Tsaplin, V. (2005): Regulation of State-Owned and Privatized Utilities: Ukraine Electricity Distribution Company Performance; in: *Journal of Regulatory Economics*, Vol. 28, No. 3, pp. 259–287.

Borghi, E. / Del Bo, C. / Florio, M. (2016): Institutions and Firms' Productivity: Evidence from Electricity Distribution in the EU; in: *Oxford Bulletin of Economics and Statistics*, Vol. 78, No. 2, pp. 170–196.

Çelen, A. (2013): Efficiency and productivity (TFP) of the Turkish electricity distribution companies: An application of two-stage (DEA and Tobit) analysis; in: *Energy Policy*, Vol. 63, pp. 300–310.

Hjalmarsson, L. / Veiderpass, A. (1992): Efficiency and ownership in Swedish electricity retail distribution; in: *Journal of Productivity Analysis*, Vol. 3, No. 1, pp. 7–23.

Kumbhakar, S.C. / Hjalmarsson, L. (1998): Relative performance of public and private ownership under yardstick competition: electricity retail distribution; in: *European Economic Review*, Vol. 42, No. 1, pp. 97–122.

Kwoka, J.E. (2005): The Comparative Advantage of Public Ownership: Evidence from U.S. Electric Utilities; in: The Canadian Journal of Economics / Revue canadienne d'Economique, Vol. 38, No. 2, pp. 622–640.

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Different definitions or concepts of efficiency …

‘Efficiency‘ commonly refers to an optimal ratio of inputs to outputs but can be interpreted and conceptualised in different ways

Examples for different <u>concepts of efficiency</u>:

(Assumption: the outputs to be provided are given exogenously)

- *Firm-specific* efficiency:
  - “Technical efficiency”: minimisation of used input factors (quantity-weighted)
  - “Cost efficiency”: minimisation of used input factors under consideration of their (relative) prices
- *Overall economic* efficiency:
  - “Welfare economic efficiency”: minimisation of (price-weighted) overall resource consumption (but without taking into account distribution issues between producers and consumers)
  - “Cost efficiency from a consumer perspective”: minimisation of (long-term) payments by consumers

No normative statement which definition or concept of efficiency *should* be chosen possible

- ➢ Discretion of the scientist(s)
- Yet, the applied efficiency concept can have relevant influence on the measured efficiency differences
  - For example, “technical efficiency” neglects input price differences between public and private companies
  - Thus, certain efficiency concepts can systematically favour or disadvantage a certain form of ownership

The applied efficiency concept should be transparently disclosed and the choice and its possible influence on the results should be explained (if relevant)

… and how the reviewed studies deal with this issue

Study	Efficiency concept
Hjalmarsson / Veiderpass (1992)	+
Bagdadioglu / Waddams Price / Weyman-Jones (1996)	+
Kumbhakar / Hjalmarsson (1998)	+
Berg / Lin / Tsaplin (2005)	–
Kwoka (2005)	+
Çelen (2013)	+
Borghi / Del Bo / Florio (2016)	+

Key
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( ) Aspect only of minor relevance

- The underlying efficiency concept is transparently disclosed in almost all selected studies
- All of the studies measure (some kind of) technical efficiency
- However, this choice is rarely explained in more detail and the potential implications that would have resulted from a different definition of efficiency are not addressed

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Different definitions of public and private ownership …

No generally accepted distinction between public and private ownership in economic literature

- Some authors focus on the capital or voting majority
- Some authors define public companies as companies wholly owned by the public sector
- Some authors even refer to public ownership (in a narrow sense) only if the respective territorial entity is the owner of a company

The distinction between public and private companies can potentially influence the results of an empirical efficiency comparison

E.g. since the target system of public companies may vary depending on the underlying definition of public ownership (see next slide)

The chosen definition of public and private ownership should be transparently disclosed, clear distinguishing features should be indicated and the choice and its possible influence on the results should be explained (if relevant)

… as well as different possible target systems of companies …

The target systems are essential characteristics in which private and public companies (may) differ

- Private companies are generally assumed to aim for (short-term) profit maximisation
- Public companies on the other hand can pursue diverse target systems, depending on the specifications of their public owners
  - E.g. short-term profit maximisation, long-term minimisation of prices for their consumers, maximisation of public incomes, etc.

If the objectives of public companies differ from those of private companies …

- … they might not even provide the same outputs
- … they might provide outputs of varying quality
- ➢ This impedes empirical comparisons of their efficiency

- **The possibility that (public and private) companies pursue different target systems must be considered when conducting an empirical comparison of their efficiency**
- **If a (short-term) profit-maximising behaviour is uniformely assumed, this is likely to disadvantage public companies that might pursue a different target system**

In addition, the present state of knowledge on the management of public and private enterprises with regard to the target system ("internal efficiency") may be relevant

This aspect will not be considered further here

… and how the reviewed studies deal with these issues

Study	Ownership definition	Target system of companies
Hjalmarsson / Veiderpass (1992)	–	–
Bagdadioglu / Waddams Price / Weyman-Jones (1996)	– –	–
Kumbhakar / Hjalmarsson (1998)	+ +	– –
Berg / Lin / Tsaplin (2005)	–	+
Kwoka (2005)	+ +	–
Çelen (2013)	– –	– –
Borghi / Del Bo / Florio (2016)	+	–

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Ownership definition

- In most of the selected studies it is at least mentioned that there exist different forms or definitions of public and private ownership
- However, only in a few studies a clear distinguishing feature is indicated

Target system of companies

- The possible influence of different target systems is pointed out in some of the reviewed studies, but this aspect is not methodically integrated into the analyses in any of the studies
- It is generally assumed that any behaviour that deviates from (short-term) profit maximisation or input minimisation for the outputs defined by the authors is to be classified as inefficiency

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Sector and transaction characteristics in general …

First of all, the <u>supplier or market structure</u> can have a significant impact on the relative efficiency of public and private ownership

- This aspect and its influence must be taken into account in analyses across different sectors or across different stages of the value chain
- However, since we focus on electricity distribution, this aspect plays a minor role here

This aspect will not be considered further here

"<u>Contractability</u>" is a key characteristic of a sector or – more precisely – the transactions within a sector from the perspective of contract theory (as a subfield of NIE)

- In a narrow sense this term refers to the extent to which the goods and services to be provided are describable and measurable
- In a broader sense it can also include the traceability of the production process

A poor contractability implies that …

- … it can be difficult to even capture and quantify all relevant outputs that companies produce and the respective quality of the provision
- … potentials for opportunistic behaviour arise, which companies – depending on their target system – will exploit to different extents

… as well as the problem of "substance quality" in particular …

The contractability of the "substance quality" of assets is a particular problem in grid-bound infrastructure sectors (like electricity distribution)

- Grid-bound infrastructures are characterised by a high capital intensity and a high longevity of assets
- Maintenance and (in some instances) capacity expansion measures as well as the associated costs can be postponed without changing the quality of supply perceived by consumers
- Substance quality is an indication for the need for future maintenance measures and thus describes the actual substance or condition of assets, but it is usually difficult to assess
- By deviating from the efficient level of substance quality, companies can report lower costs in the short term, while the additional costs of an inefficient maintenance strategy occur only in the longer term

If sector and transaction characteristics in general and the problem of substance quality in particular are not adequately considered within an empirical efficiency analysis …

- … the validity of the results may be substantially diminished
- … public companies might be disadvantaged if they do not (exclusively) seek to maximise (short-term) profits

… and how the reviewed studies deal with these issues

Study	Contractability in general	Substance quality
Hjalmarsson / Veiderpass (1992)	– –	– –
Bagdadioglu / Waddams Price / Weyman-Jones (1996)	–	– –
Kumbhakar / Hjalmarsson (1998)	– –	– –
Berg / Lin / Tsaplin (2005)	– –	– –
Kwoka (2005)	+	– –
Çelen (2013)	– –	– –
Borghi / Del Bo / Florio (2016)	– –	– –

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Contractability in general

- The impact of the contractability on the efficiency of public and private companies is the focus of the study by Kwoka (2005), which indicates the relevance of this aspect
- The problem of contractability is nevertheless not mentioned in most of the other studies and is also not taken into account in the analyses

Substance quality

- The problem of substance quality is not considered in any of the reviewed studies
- The analyses do not include an assessment of the actual condition of the infrastructure assets
- And they usually only cover relatively short time periods, so that inefficient maintenance strategies are not revealed

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General institutional framework …

The established external rules and incentives significantly influence the behaviour of (regulated) companies

- The institutional framework in general …
- … and the sector-specific regulation in particular

The <u>general institutional framework</u> here comprises all formal and informal rules beyond the specific sector regulation

- Its influence particularly has to be considered in comparisons over long time spans or with companies from different sectors and / or countries
- The general institutional framework may, moreover, include different rules for public and private actors
  - For example, public procurement requirements for the tendering of services or restrictions regarding the design of internal incentive systems for public (and in some cases private) companies
  - However, since such rules are often introduced for overriding reasons, the question arises whether their influence should not therefore be part of an efficiency analysis between public and private companies

… as well as the specific sector regulation …

The <u>sector-specific (external) regulation</u> is the main incentive scheme for regulated companies

- Companies may react differently to the (dis-)incentives from regulation, depending on their respective target systems

  For example, in a regulatory regime that grants relatively high returns on invested capital, profit-oriented companies tend to expand their use of this input factor, accepting possible inefficiencies
- In order to conduct and interpret empirical analyses on the efficiency of public and private (electricity distribution) companies, a sound understanding of the applied regulatory regime and the resulting (dis-)incentives is indispensable
- This also applies when studies explicitly aim to determine the (in-)efficiency of companies under a given regulatory regime

If the general institutional framework and the specific sector regulation are not adequately considered within an empirical efficiency analysis …

- … the validity of the results may be substantially diminished but …
- … the impact on the measured efficiency of public and private companies remains unclear and depends on the respective institutional design

In addition, the present state of knowledge with regard to the design of an external regulation that was available in the analysed cases can be relevant

This aspect will not be considered further here

… and how the reviewed studies deal with these issues (1/2)

Study	General institutional framework	Sector regulation
Hjalmarsson / Veiderpass (1992)	(– –)	+
Bagdadioglu / Waddams Price / Weyman-Jones (1996)	(– –)	+
Kumbhakar / Hjalmarsson (1998)	(– –)	+
Berg / Lin / Tsaplin (2005)	(–)	+ +
Kwoka (2005)	– –	– –
Çelen (2013)	(– –)	– –
Borghi / Del Bo / Florio (2016)	+	– –

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General institutional framework

- Borghi / Del Bo / Florio (2016) focus on the influence of the quality of institutions on efficiency differences between public and private electricity distribution companies and include the general institutional framework on a rather aggregated level in their analysis
- In the other reviewed studies the general institutional framework is rarely taken into account, but it should be noted that most of the studies use data from only one country and the same sector and cover a relatively short time period, so that this aspect is of minor importance

… and how the reviewed studies deal with these issues (2/2)

Study	General institutional framework	Sector regulation
Hjalmarsson / Veiderpass (1992)	(– –)	+
Bagdadioglu / Waddams Price / Weyman-Jones (1996)	(– –)	+
Kumbhakar / Hjalmarsson (1998)	(– –)	+
Berg / Lin / Tsaplin (2005)	(–)	+ +
Kwoka (2005)	– –	– –
Çelen (2013)	(– –)	– –
Borghi / Del Bo / Florio (2016)	+	– –

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Sector regulation

- In some studies the respective sector-specific regulation is described in detail and used as an explanation for the empirical results
- Moreover, Bagdadioglu / Waddams Price / Weyman-Jones (1996) discuss to what extent the concession regime in Turkey (as part of the sector-specific institutional framework) provides a possible explanation for the differences in efficiency found between private and public electricity distribution companies
- However, in the other evaluated studies the sector-specific regulation is not taken into account

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Overview of the results of the assessment

BACK UP

Publication	Efficiency concept	Distinction of public and private ownership as well as different target systems of companies		Sector and transaction characteristics		General institutional framework and the specific sector regulation	
		Ownership definition	Target system of companies	Contractability in general	Substance quality	General institutional framework	Sector regulation
Hjalmarsson / Veiderpass (1992)	+	–	–	– –	– –	(– –)	+
Bagdadioglu / Waddams Price / Weyman-Jones (1996)	+	– –	–	–	– –	(– –)	+
Kumbhakar / Hjalmarsson (1998)	+	+ +	– –	– –	– –	(– –)	+
Berg / Lin / Tsaplin (2005)	–	–	+	– –	– –	(–)	+ +
Kwoka (2005)	+	+ +	–	+	– –	– –	– –
Çelen (2013)	+	– –	– –	– –	– –	(– –)	– –
Borghi / Del Bo / Florio (2016)	+	+	–	– –	– –	+	– –

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Concluding remarks

The assessed quantitative empirical studies reveal substantial deficits with regard to the consideration of essential influence factors from an institutional economic perspective

- Some authors explicitly focus their analysis on certain issues described here
- But in none of the studies the outlined challenges are fully considered and adequately addressed
- ➢ This ultimately limits the validity of the results obtained in the individual studies

The identified deficits can be starting points for further methodological developments

- However, some of the issues to be considered from an institutional economic perspective may be difficult to integrate directly into the quantitative empirical methodology for measuring efficiency
- If a direct consideration of certain aspects is not possible, at least qualitative estimates can or should be made with regard to the influence their neglect has on the results obtained

All of the evaluated studies consider the "overall efficiency" of companies across all business areas, cost types, etc.

- Due to the complexity of the tasks and the longevity of assets in the infrastructure sectors, particularly high methodological challenges arise when considering companies as a whole
- An alternative approach could be to consider individual tasks (e.g. investment, operation and maintenance) or cost types (e.g. cost of capital) separately
  - In this case extensive technical-systemic knowledge is required
  - Through a combination of theoretical and quantitative empirical analyses, statements on the "overall efficiency" of companies (depending on their ownership) could be derived

Thank you for your attention!

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