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Public incumbent actors in network industries – investigating urban utility companies in the German and Swiss energy transition

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Abstract

The analysis and understanding of incumbents' behaviour in sustainability transitions in the energy sector is gaining more and more attention, aiming a more nuanced picture of incumbents' behaviour in the context of sustainability transitions – beyond the dichotomy of positive challengers and negative incumbents. However, two key characteristics of many incumbent actors are hardly explicitly taken into account: they are public companies acting in network industries. Furthermore, studies on incumbents in the energy sector do not consider the particular situation of federal states, like Germany and Switzerland, where incumbent actors are located on multiple political levels. In order to further work in these two research gaps, this paper is using an iterative theory building procedure - based on both, empirical evidence from a case study of urban utility companies in Germany and Switzerland and theoretical consideration from the triple embeddedness framework (Geels, 2014) as well as public corporate governance and network industries literature. As a results, the paper presents analytical perspectives, which can be applied, complementarily to the TEF in order to reveal the specifics of public companies in network industries. Finally, the paper discusses, how the presented analytical perspectives can also enrich the understanding of public incumbent actors in other network industries.

Keywords

Incumbent, triple-embeddedness framework, public corporate governance, network industries, energy transition, Germany, Switzerland, federalism

1 Introduction

This paper is driven by two fundamental questions: *Who actually makes the transition happen beyond the niche? And: How to transition a critical infrastructure system, like the energy system, which needs to remain functional while changing?*

The energy supply system needs to remain functional while undergoing fundamental changes like European integration, decarbonisation and digitalisation. Balancing the grids, compensating for overproduction and shortages on a large scale, as well as maintaining the critical infrastructures but also deconstructing old infrastructures are only a few examples of what needs to be done behind the scenes of the ongoing sustainability transition in European energy systems. But, who are the actors behind these tasks, what shapes their behaviour in the context of the transition and finally, what is their role for the large-scale success of the energy transition. These are the research interests lying at the core of this paper, which consequently focuses on the investigation of incumbent actor's behaviour in the energy transition.

The analysis and understanding of **incumbents' behaviour in sustainability transitions** in the energy sector is gaining more and more attention (van Mossel et al. 2017). Various scholarly contributions are aiming at a more nuanced picture of incumbents' behaviour in the context of sustainability transitions, to overcome the - in transition studies widely established - dichotomy of positive challengers and negative incumbents (Smink et al. 2015; Kishna 2015; Smink 2015; Wesseling 2015). Van Mossel et al. (2017) provide a very valuable overview on current endeavours and contributions to enhance the understanding of incumbent behaviour in the context of transition studies. Among these contributions, those which are related to the energy sector and question the role of incumbent actors in the energy transition context represent and increasing share (Heiskanen et al. 2018; Kungl 2015; Kungl, Geels 2017; Lauber, Sarasini 2014; Leitzinger 2015; Ngar-yin Mah et al. 2017; Nijland 2013; Sridhar 2010; Wassermann et al. 2015; Weigelt, Shittu 2013).

So far the **empirical work on incumbents' behaviour in energy transitions** was mainly focussed on large utility companies, often acting on a national scale (e.g. EON and RWE, see eg. Lauber, Sarasini 2014; Ratinen, Lund 2014, Kungl, Geels 2018; Kungl 2015), however, in federalist states, as e.g. Germany, Austria or Switzerland, incumbent actors are also located on the Länder / cantonal and the commune level. The so called "Regionalversorger" (regional energy utility companies on the Länder level in Germany) or "Kantonswerke" (utiliy companies on the cantonal level in Switzerland) as well as the "Stadtwerke" and the "Gemeindewerke" (local public service provider on the communal level in both countries) play an important role for federalist energy governance systems and thus for the long term success of the energy transition in these countries (Berlo, Wagner 2011a, 2011b; Finus 2012; Gochermann 2016). The analysis of incumbent actors on the regional and local scale, consequently builds a fundamental component for the understanding of the energy transition in federalist states.

Furthermore, they share two main characteristics with most of the "big national incumbents": they are public companies owned either by the Länder / cantons or by the cities/ communes, and they are not only energy suppliers and sometimes energy producers but also network operators and thus operate at the same time in a market-based regime (production / supply) as well as a monopoly regime (networks) (e.g. Brunekreeft et al. 2015). Thus their analysis can finally facilitate the general understanding and feed into theory building on incumbents in the energy sector.

In the context of the energy transition, the *triple embeddedness framework* (TEF), developed by Bruno Turnheim and Frank Geels (Turnheim, Geels 2013; Geels 2014), represents a comprehensive framework to analyse incumbent behaviour embedded in its systemic context and interacting with it in the context of transition. It provides a concise structure for empirical analysis and offers a set of theoretical considerations based on which influence factors on the incumbent's behaviour as well as their strategic responses can be explained. Especially, it combines the two major assumptions in organisational studies, that firms are on the one hand embedded in an actor-network and on the other hand in a set of formal and informal rules, respectively institutions (van Mossel et al. 2017). Therefore, this paper employs the TEF as the underlying analytical framework.

However, the TEF has been designed as a framework of general validity and was logically not explicitly developed for the analysis of public companies operating in market-based and monopoly-based regimes at the same time. For the application of the TEF to regional incumbents, this paper thus proposes to complement it with theoretical considerations from *public corporate governance* (Frentrup 2008; Lienhard 2009; Schedler et al. 2011) and *network industries* literature (Finger, Jaag 2015; Finger, Künneke 2011; Künneke 2009). The development of these analytical perspectives is based on an iterative process, combining the complementary theoretical considerations with empirical evidence on urban utility companies in Germany and Switzerland (section 2). In so doing, this paper provides analytical perspectives for the actor type of urban utility companies, conceptualised as public company in network industries, which can be used complementary to the TEF (section 3). Finally, the paper results in discussing the explanatory value of these analytical perspectives for other incumbent actors in the energy sector as well as other network based infrastructure sectors (Section 4)

This paper aims at contributing to the scholarly endeavours to draw more nuanced pictures of incumbent behaviour in transitions. By providing additional theoretical considerations from public corporate governance and network industries, it enhances the theory-based understanding of incumbents in the energy sector, which are mostly publicly owned and grid operators. Finally, it aims at fuelling the discussion of parallels in the analysis of incumbent behaviour in other network based infrastructure sectors like water, railways or telecommunication.

The paper addresses the following **research questions**:

- Which (additional) analytical perspectives for incumbent actors in the energy sector can be derived from the analysis of urban utility companies – conceptualised as public companies in network industries?
- How can these analytical dimensions enrich the understanding of other incumbent actors in the energy sector and other network based infrastructure sectors?

2 Iterative research design

This paper is based on an iterative research design, combining theoretical considerations and empirical evidence in a cross-fertilising manner (see Figure 1). In order to support an iterative theory-building procedure, the empirical results from a case study, based on the TEF, are discussed against the background of the complementary theoretical considerations from public corporate governance and network industries. Finally, they are validated again by the empirical data and finally linked back to the theoretical discourse on incumbent behaviour.

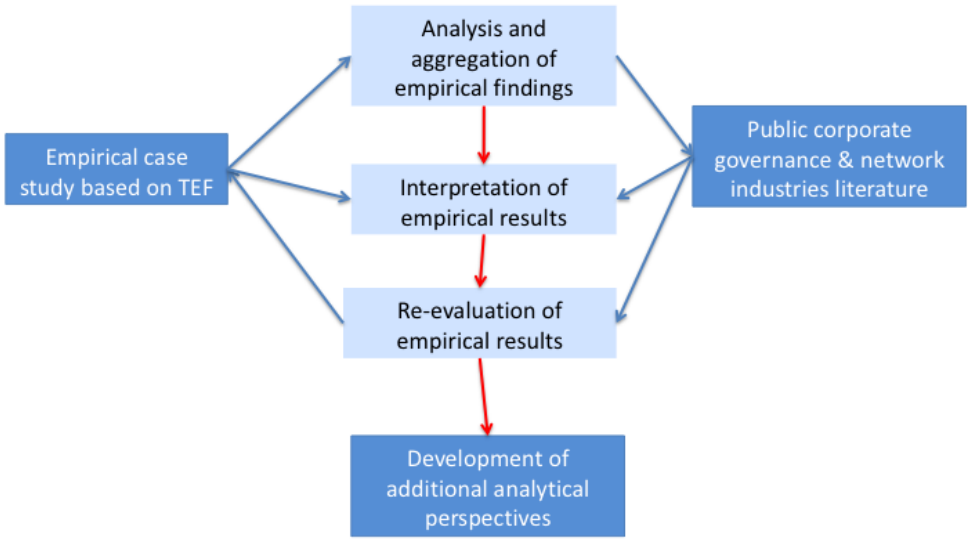

Figure 1: Overview on the iterative research design (author's own representation)

1.1 The object of research

Among the regional and local incumbent actors in a federal energy governance system, this paper focuses on the analysis of large "Stadtwerke" – for the remainder of this paper, called urban utility companies. Urban utility companies (UUC) are owned by cities and are thus public companies, located on the communal level. Nonetheless, they belong to the biggest players in the national energy sector and have a high system relevance, which makes them a particularly interesting object of research (see Figure 2).

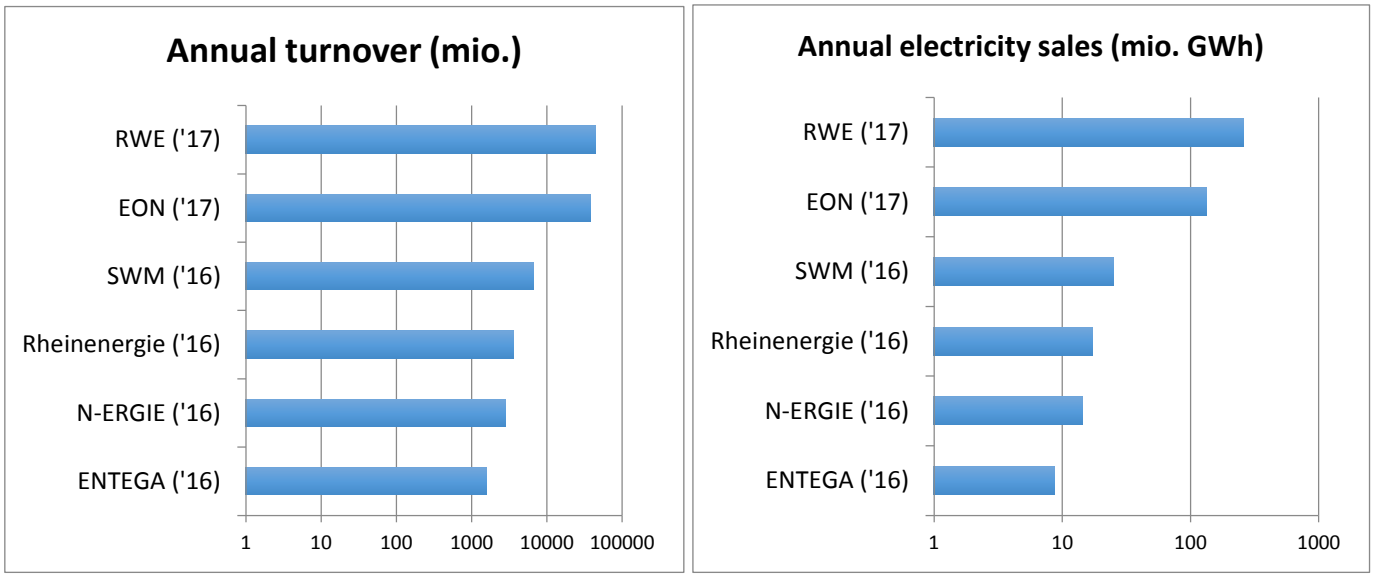

Figure 2a-b: Annual turnover and electricity sales of large German utility companies (author's own representation, based on annual reports)

The UUC's main task is the operation of all "critical" infrastructure networks of the city (e.g. the electricity grid, gas network, district heating networks, the water, telecommunication and often also the public transport network) (Rentsch 2017; Schedler et al. 2007). Consequently, they are not mere energy suppliers, but are also in charge of other public services for the city (water, waste, public transport etc.) and have a large breadth of value creation. Additionally, they are also not mere grid operators, but they are in charge of the energy production, trade, retail and services to the custom-

ers. In their energy division, they are fully integrated firms, which operate along the whole value chain in the energy sector. Consequently, they act in market-based competition in the area of production, trade, retail and services, but also operate the infrastructure networks – often with subsidiaries - in a monopoly and heavily regulated context (unbundling). In Germany the Stadtwerke München (Munich), Mainova (Frankfurt), Rheinenergie (Cologne), enercity (Hannover) belong to the largest "Stadtwerke" and are thus considered as UUC.

In comparison to the regional and the cantonal utilities, their value creation is traditionally broader and can also comprise waste, telecommunication and public transport. However, the differences among the UUC might be higher than in comparison to the regional utility companies, since the cities organise their infrastructure management differently (see table 1). In comparison to communal utility companies, they are decisively larger and cover the full depth of the energy value chain (also production and trade) for which the communal utilities often are too small.

However, the UUC share the two main characteristics of being a public company and operating critical network infrastructures with all other regional incumbents as the regional, cantonal or communal utility companies. Hence, they are employed as case study for investigating the particularities of this actors group.

1.2 Empirical examples

The UUC were selected according to their size (the largest UUC in the two countries) long history (established before Word War 2) and their ownership structure (min. 75 % ownership of the city, respectively a city canton, where the city area corresponds to the cantonal area) (see Table 1).

Table 1: Overview on selected UUC in Germany and Switzerland (based on the UUC's homepages)

UUC	**Annual turn-over**	**Foundation year**	**Ownership structure**	**Organisational form**	**Business areas**
Stadtwerke München SWM (GER)	6675 million Euro (without public transport and swimming pools) (2017)	1899 Städtische Elektrizitäts- und Gaswerke, 1939 Stadtwerke München, 1998 corporatisation.	100% city of Munich	Limited Company	Electricity, gas, district heating, services (water, telecommunication, public transport)
Rheinenergy AG and Rheinenergie group (including e.g. trade) (GER)	3647 million euro (2016)	1873 Gas- und Wasserwerke Stadt Köln, 1960 corporatisation, 2002 Rheinenergie AG	80% City of Cologne, 20 % Innogy	Listed corporation	Electricity, gas, district heating, services (water)
Enercity AG (GER)	2101 million Euro (2017)	1922 Städtische Betriebswerke, 1970 corporatisation, 1996 enercity	75 % city of Hannover, 24 % Thüga, 1 % region	Listed corporation	Electricity, gas, district heating, services (water)

		AG	of Hannover		
Services Industriels de Genève SIG (CH)	1065 million CHF (2017)	1896 as municipal company of the city of Geneva, 1931 public company of the city, the canton and the other communes of the canton	55 % canton of Geneva, 30% city of Geneva, 15% communes of the Canton	Independent public company	Electricity, gas, district heating, services (water,
Elektrizitätswerke Zürich EWZ (CH)	0.859 million CHF (2016)	1890 as department of the city administration	100 % City of Zurich	City administration department	Electricity, Water, services, (telecommunication)
Industrielle Betriebe Basel IWB (CH)	0.727 million CHF (2016)	1868 municipalisation of the gas supply, 1899 establishment of the electricity supply, 1908 separation of the electricity supply from water and gas, 1978 refusion in IWB,	100% Canton of Basel	Independent public company	Electricity, Gas, district heating, services (water, telecommunication)

1.3 Empirical Data collection

The data collection for the empirical study was structured by the analytical dimensions of the TEF and based on the analysis of sector reports and annual reports of the UUC in 2017. This secondary data was complemented by 40 expert interviews conducted in Summer 2017 in Germany and Switzerland. Interview partners were chosen from research, consultancies, administration, associations and CEOs or members of the strategic department of UUC (see Table 2). The interviews were semi-structured, based on an interview guideline, held face-to-face, in German or French, enrolled through a snowball sampling (Flick et al., 2004: 125; Flick, 2009: 168) and recorded in agreement with the interviewees. Main interests lied in "structural and cultural characteristics" of UUC, "relations to other actors", "past, current and future challenges" as well as "strategic responses" and finally their "role in the transition".

Table 2: Overview on the interviewees

	Large UUC	**Middle-sized UUC**	**Research**	**Consultancies, service provider**	**Industry association**	**Environmental association**	**Politics**
GER	4	1	5	7	2	1	
CH	4	3	4	4	3		1

1.4 Data analysis

For data analysis, the interview records were anonymised, transcribed and analysed, using the software MAXQDA (www.maxqda.de). The content analysis of the transcripts (Mayring 1991, 2014) was based on a semi-structured procedure: the texts were sorted in pre-defined categories "structural and cultural characteristics", "past, current and future challenges" as well as "strategic responses" and "role in the transition" and afterwards further sorted and aggregated according to emerging structures (e.g. in structural characteristics "depth" and "breadth of value creation", "market" and "monopoly" regime etc.).

The results of these structured transcripts (codes and codings) were discussed with peers and senior researchers against the background of contributions in *public corporate governance* and *network industries* and resulted in the analytical perspectives presented below. For a comprehensive presentation of the empirical results see (Mühlemeier submitted, 2018)

3 Analytical perspectives for UUC as incumbent actors and public companies acting in network industries

In the subsequent section, I first present the theoretical considerations of the TEF and explain how they are particularly valuable for the case of UUC, based on the empirical evidence from the case study analysis. Subsequently, I present the results for the additional analytical perspectives in an overview-table, summarising their theoretical foundation and the empirical evidence. Finally, I discuss the individual analytical perspectives in detail, based on theoretical considerations from *public corporate governance* and *network industries* literature and the empirical evidence from the UUC in Germany and Switzerland.

3.1 The triple embeddedness framework (TEF)

The TEF provides a systematic framework how to analyse firms as embedded organisations and investigate their role in the socio-technical transition (Geels 2014). Additionally, it provides theoretical considerations how to interpret the findings on influencing factors and the firms' behaviour. The TEF, thus, explicitly elaborates on the interaction between the institutions, the systemic context and the agency of firms in transitions (see Figure 3).

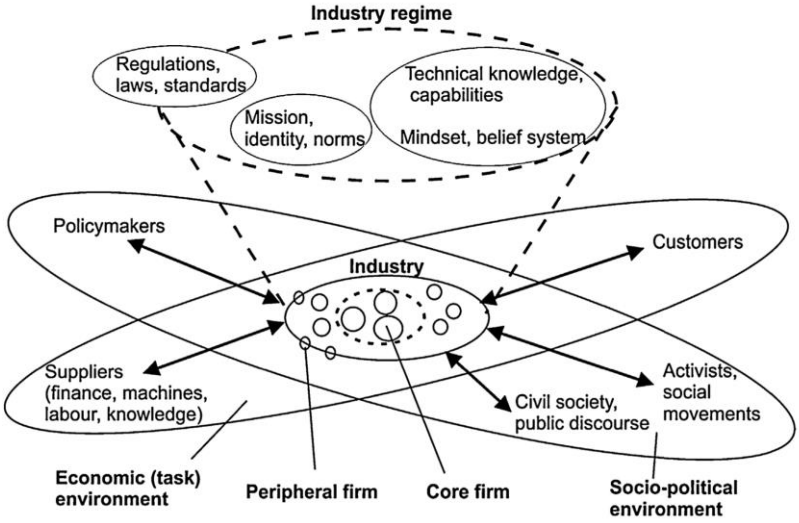

Figure 3: The Triple Embeddedness Framework (Geels, 2014)

Based on insights from evolutionary economics, neo-institutional theory and economic sociology, the TEF conceptualises companies as "firms-in-industries" which are embedded in three different layers.

Firstly, their industry with a particular industry regime, which encompasses all types of institutions typical for the industry (regulations, norms, types of knowledge, mind-sets or worldviews). Secondly, the firms-in-industries are embedded in their direct "economic task environment", which encompasses relations to customers, suppliers, competitors or administrative bodies who are directly linked to the sector but also all the assets they possess or use for their business. Thirdly, the firms are embedded in the wider socio-political environment, which contains general administrative bodies, political parties, NGOs, citizens etc. (Geels, 2014). Hence, the TEF conceptualises two types of embeddedness: the institutional in the firms-in-industries regime and the systemic with the socio-political and economic relations to other actors. From all these layers of embeddedness, there may occur changes and pressure, which affect the firms and to which they need to react, e.g. through lobbying or framing towards the socio-political context; innovation strategies, investments or mergers in the economic context but also learning, organisational change, the incorporation of new knowledge and mind-sets in the regime (see Figure 4)

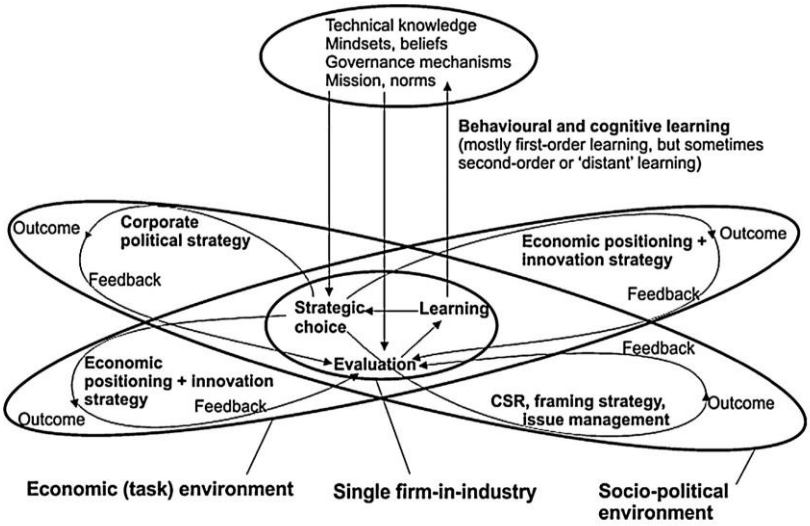

Figure 4: Reaction of firms to challenges on the different levels (Geels, 2014)

Based on the TEF the behaviour of UUC can be explained by major changes in the "industry regime" or in the "economic" or "socio-political environment" and subsequent (strategic) reactions to these changes.

For the analysis of UUC the TEF notion of the "industry regime" is of particular importance, since it highlights one of the most relevant influence factors on the UUC: the regime shifts to which the UUC as incumbent regime actors needed and still need to react. Firstly, from a public administration - monopoly regime to a liberalised, market-based, entrepreneurial regime (liberalisation). Secondly, from a centralised mainly non-renewable system to a decentralised and renewable energy system (decarbonisation, de-nuclearisation) and thirdly, from an analogue, wire-based system to a digital and smart system (digitalisation). ["Five years ago energy market design was not even a term in the discourse, so this shows how things change" DE8].

These fundamental changes in the regime of the UUC caused the actual emergence of an "economic task environment" with shareholders, customers, suppliers and competitors as well as a general exponential increase of new actors in their economic environment. Furthermore, it resulted in fundamental changes of the political goals for the energy supply (affordable, secure but also renewable), and most recently the emergence of a second resource layer (digital data) which opens new possibili-

ties for smart grid management and decentral production in collaboration with prosumers (e.g. virtual power plants) but also further increases the amount competitors ["Start-ups, energy retail platforms (e.g. verivox) but also Google, Telecom, actors who are able to deal with data" DE9]. Thus the changes in the energy sector regime caused and increasing complexity, regulatory openness, increasing speed of change and an accumulation of tasks for the UUC. The UUC strategically reacted through organisational and cultural changes (establishing of innovation management, new business areas and models, but also cultural changes and new job profiles), cooperations with other UUC and their customers, the establishment of lobbying agencies and international investments in renewable energies (for a more detailed analysis of the empirical findings see Mühlemeier (2018).

Hence, the notion of the "industry regime" facilitates the investigation of fundamental changes in regulations but also mind-sets and required competences of the UUC. Additionally, the notions of "economic" and "socio-political environment" allow to locate the related changes in the actor network, which surrounds the UUCs. The overlap of the "economic task environment" and the "socio-political environment" also perfectly mirrors the position of UUC at the intersection of societal, political and economic performance expectations (see Figure 3). The major challenge for incumbent actors like the UUC, however, is that certain fundamental societal values remain constant (e.g. the democratic control on the firm, the service public expectations) while others change fundamentally (e.g. economic efficiency of the firm or revenue generation). These particular aspects of public companies in network industries are further developed in the subsequent section.

3.2 (Additional) perspectives for the analysis of public companies in network industries

Table 3 summarises the proposed additional analytical perspectives, their related theoretical references and alludes to empirical evidence from the analysis of the UUC in Germany and Switzerland. The individual perspectives are described and explained in the subsequent sections *3.3 Public corporate Governance* and *3.4 Network industries.*

Table 3: Overview on analytical perspectives for public companies in network industries (author's own elaboration)

Analytical dimension	**Theoretical reference**	**Empirical evidence**
Public service vs. market performance	(Schedler et al. 2011; Schedler et al. 2007; Schedler, Finger 2008)	The city as owner and political actor has diverging expectations on profitability of the UUC and its compliance with energy transition goals, e.g. the investment in renewable energies, energy efficiency measures or the divestment from non-renewable energies.
Democratic control vs. competitiveness	(Rentsch 2017; (Gnan et al. 2011). Jensen, Meckling 1976)	The city wants to execute as much democratic control as possible, but wants the UUC to be as competitive and profitable as possible, thus there are e.g. discussions on how to staff the administrative board (with policymakers, engineers or business experts).
Multidimensional roles of the owner	(Lienhard 2009)	The city encounters the UUC as owner, legislative (different parties), executive (different ministries) and judicative with diverging interests.

Federalist governance – multiple political goals and means	(Schäfer, Otto 2016; Rave 2016).	The bottom-up subsidiary organisation of the sector traditionally regulated UUC on the communal level, however liberalisation, energy transition and digitalisation are regulated top-down on a European and national level, which causes mismatching regulations.
Corporatisation and public entrepreneurship	(Bernier, Hafsi 2007; Greiling et al. 2013)	The liberalisation caused the corporatisation of UUC and their adaptation to market-based logics, including organisational change (e.g. establishment of innovation management) and cultural change (e.g. developing new competences).
Infrastructure network operation: natural monopolies and re-regulation	(Finger, Künneke 2011; Finger, Jaag 2015; Künneke 2009)	The natural monopoly of networks results in public ownership and in the analysed cases the network operation by UUC. The UUC operate in market and monopoly, influenced by strong regulations. Recently, renewable energies and digitalisation trigger the discussion on how to manage and finance grid balancing (e.g. with strategic reserves or smart steering measures like virtual power plants).

3.3 Public corporate governance

Public corporate governance literature (e.g. Schedler et al. 2011; Lienhard 2009; Frentrup 2008) particularly focuses on questions of (good) governance of publicly owned companies in liberalised contexts and thus proposes some typical challenges of public companies, which guided the development of the following analytical perspectives.

Public service vs. market performance

An UUC provides a city with all critical public services, such energy, water, and public transport. Their major task is the provision of these public services to the inhabitants and they are expected to offer them as accessible, affordable and qualitative services to all inhabitants, even though this might not be always profitable. At the same time - due to liberalisation and the resulting corporatisation - the UUCs are also expected to gain revenues for the city, mainly to finance other, non-profitable public services. [“Cities are more than just owners, they are stakeholders – they have political expectations and they are in a double-role: owner and political actor, so the claim political goals as owner” DE10; “earning money is the main expectation from the politics. Of course they always say please think also about the Energiewende but still the main claim is, it needs to be profitable” DE18].

This necessarily results in two conflicting logics and the related conflicting expectations: societal performance and market performance expectations (Schedler et al. 2011; Schedler et al. 2007; Schedler, Finger 2008) (see Figure 5)

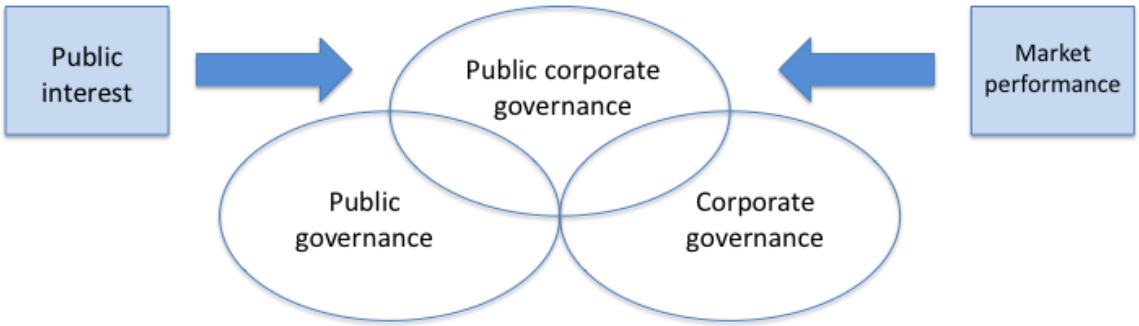

Figure 5: Public and private interest on public companies (based on Schedler et al. 2011: 19)

The political goals on decarbonisation of the electricity and heat supply and the required infrastructure investments are challenging particularly UUCs whose business is still largely grounded on gas supply, as e.g. IWB, the UUC of Basel. Besides offering energy services, they mainly finance the expansion of "new" renewable energies (photovoltaic, solar heat or biomass) and the extension of e-mobility infrastructure based on their revenues form the gas supply (IWB is one of the largest gas suppliers in Switzerland). In so doing, they manage to implement the political goals mainly based on firm-internal financial resources – and generate revenue for the city of Basel so that they can finance the non-profitable public services. If they would additionally be required to reduce their gas business and even deconstruct the existing pipeline infrastructure (which is an ongoing political discussion), they could not finance this anymore from their corporate budget, but would need to rely on direct financial support from the city - which the city again would need to generate via taxes.

Thus, the particularity of public companies is, that these conflicting societal expectations are not external to the company, as for a private company offering public services (e.g. a private gas supplier), but they are integral part of their owner strategy and thus internal to the company. Consequently, the city can directly steer its infrastructure services and can design a transition process based on public and "private" financial sources. This leads directly to the second important aspect of public corporate governance: the democratic control.

Democratic control vs. competitiveness

The city as the public owner, aims at exercising direct democratic control over the company. However, due to liberalisation and the corporatisation of the company, she is not part of the operative business of the firm, but in charge of the definition of strategic goals and the control of their achievement. In this context, public corporate governance literature emphasis the challenge of the principal-agent problem. The principal (the city) wants to overcome the knowledge gap to the operative business of the agent (UUC) to exercise the democratic control (Rentsch 2017; Jensen, Meckling 1976). As a results of this gap in information, the principal fills the advisory board of the company with policymakers to ensure the democratic control (Gnan et al. 2011).

Additionally, the city exercises the democratic control also directly via the owner strategy and the respective owner goals. Figure 6 shows the political process of an owner strategy definition in public companies: the parliament defines the general public interest, the ministries or the executive operationalises the general public interest in an owner strategy with owner goals. These two political agencies form the outer controlling circle. Afterwards, the administrative board represents the owner goals and together with the operative management the firm strategy is defined and implemented by the operative management. These two entities are part of the public firm and thereby of the inner

controlling circle. The administrative board ideally guarantees the translations of the owner goals from the outer to the inner controlling circle (marked with an overlap).

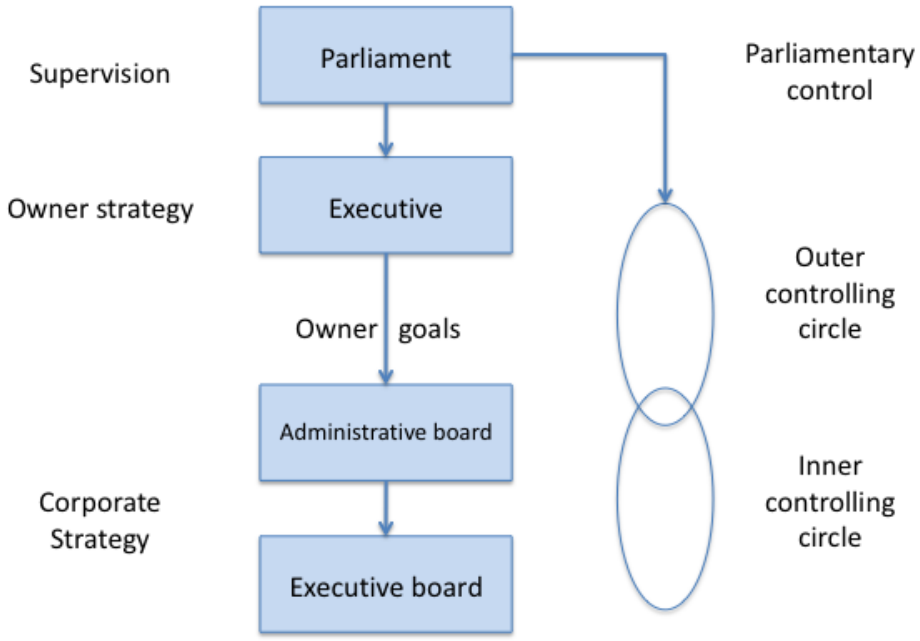

Figure 6: Democratic control of a public company (Schedler et al. 2011: 78)

However, as mentioned above, there are still the economic performance expectations from this same principal. The public company should act as successful and profitable as possible in a competitive setting. However, competitiveness requires a certain amount of secrecy and rather widens the knowledge gap to the principal (e.g. offers of a public agency in a tendering process need to be accessible to any citizen, whereas corporatized public companies can keep them private – accessible only to the responsible representatives). Consequently, there are often target conflicts in the owner strategy or e.g. "cast" of the advisory board is questioned. Whether to fill the board with democratic representatives or experts from the sector to match the owner goals best. ["Who is sitting in the administrative board of a UUC? Local politicians. And the minority has a profound understanding and knowledge of the energy sector – the rest has communal political interests and basically wants money for the service public" DE3; "In the administrative board, who are the politicians? Are they experts in the energy field or in politics or are they more like knowledgeable citizen?" DE12]

Multidimensional roles of the owner

The principal-agent problem also alludes to another particularity of public companies: the owner is not only approaching them as an owner, but in a multitude of roles and "faces". Most prominent, the dichotomy of the classical owner and the democratic representative, which results in the conflicts mentioned above. Moreover, the city as the public owner approaches the company simultaneously also as regulatory agency (judicative), different ministries e.g. the environmental, the financial and the social ministry (executive) and different political parties with diverging visions, representing the diversity of the urban society (legislative). Additionally, the civil society can also directly influence the UUC – even "against" in the parliament. The city of Zurich wanted to corporatise its UUC in 2015, however the citizens voted against it. The UUC of Munich wanted had plans to quit coal power plants on the long run, the Munich citizens, however, voted for quitting coal power in 2022.

Additionally, the temporal horizons and changes of personalities differ among the different political realms, too. Regulatory mismatches and strategic conflicts might be the effect on the public company (Lienhard 2009).

Federalist governance – multiple political goals and means

UUC are located and regulated on the communal level of the federalist governance system. The UUC therefore are part of a subsidiary and bottom-up type of regulation. However, the regime shifts mentioned above are mainly regulated on the national level (often following EU directives) and need to be implemented on all levels of the federalist governance system (top-down). Consequently, this leads to regulatory mismatches and often parallel or even contradictory targets and subsidy schemes among the different political layers (Schäfer, Otto 2016; Rave 2016).

The city of Munich has very ambitious decarbonisation targets, however, the Bundesland Bavaria has a very conservative distance regulation for wind power plants which basically makes it impossible to install any wind power plants in Bavaria and the Stadtwerke Munich invest in the North Sea to match the cities goals. The city of Zurich aims at reaching the 2000-Watt society and included this goal in the communal regulation (the overall energy demand of every citizen must not exceed an equivalent of 2000 Watt per capita), whereas the Swiss federation aims at reducing the CO2 emission per capita. The communal regulation was only recently complemented by the addition of an equivalent of 1 ton CO2 per capita.

These four additional analytical perspectives explain and exemplify why the overlap of the "economic" and the "socio-political environment" in the TEF are of particular relevance for public companies, as the UUC.

Corporatisation and public entrepreneurship

Finally, the public corporate governance literature particularly elaborates on the mentioned regime shift in infrastructure sectors from a public administration towards a liberalisation regime. In theory, the role of the public agencies on all federal levels should have changed from the actual provider of the public service to the mere guarantor of it (Schedler et al. 2011).

In reality, path dependencies, fundamental values (as e.g. democratic control over critical infrastructures) led to the corporatisation of the formerly administration agencies to public companies which still produces and supply energy. The UUC consequently needed to develop competencies and knowledge types which are necessary in a liberalised market-based regime, while still meeting the public expectations of their owner on the public services and acting under direct democratic control.

Thus, keeping the old competences while establishing new competences might be one of the most challenging tasks for the UUC ["we are characterised by a particular type of employee: an engineer, oriented towards technology, who at the same time thinks in societal dimensions and doesn't focus on the profit for the city administration, but who aims at the functionality of the whole city" DE16, "we are of course conservative, which matched our business for a long time – we install pipelines and wires, they last for hundred years. There one did not need a very flexible mind. But this is changing rapidly right now and this process demands a lot of cultural change from our side" DE10, "it doesn't depend on the structures but on the people's mind set and this one won't change over a few months" DE3]

In the public corporate governance literature, therefore, the concept of *public entrepreneurship* was developed (Bernier, Hafsi 2007; Greiling et al. 2013). It conceptualises and discusses the develop-

ment of necessary competences for the development of entrepreneurship in the public sector and e.g. the development of new business models for public companies.

3.4 Network Industries

Infrastructure network operation: natural monopolies and re-regulation

One additional aspect, which is not yet considered explicitly in public corporate governance literature is the fact, that most of the public companies are not only operating in a market-based competitive regime, but they also operate "critical" network infrastructures to ensure the quality, accessibility and affordability of the public services (in the energy sector e.g. the electricity grid, the gas and the district heating networks) (see Figure 7).

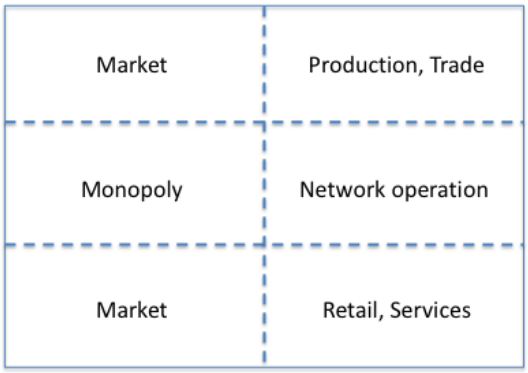

Figure 7: Market and Monopoly based business areas in the energy division of public companies (based on Brunekreeft et al. 2015)

It is the raison d'être of these networks, that a competing parallel network infrastructure, providing the same service, does not make any economic sense. Consequently, network infrastructures tend to "natural monopolies", which is further elaborated in the network industries literature (Finger, Künneke 2011; Finger, Jaag 2015; Künneke 2009). The combination of this physical logic and the societal public service expectations causes either public ownership and operation of the network infrastructure (which is the case in Switzerland), or a heavily regulated concession system, where private actors can compete for concession rights (German energy sector). Consequently, public companies act in actually heavily regulated contexts, even though they are labelled as "liberalised". This is often neglected in the public corporate governance literature, since it's background lies in new public management and the introduction of corporate governance mechanisms in the realm of public companies. Hence, network industries literature draws not only attention to the physical reality of infrastructure sectors but also to the influence of regulation on them, even though they have been liberalised (Finger et al. 2005).

On the one hand, Germany only recently regulated the installation of reserve capacities for the grid balancing – the network operators are allowed to install two GWh through a tendering procedure and are compensated by public money. On the other hand, UUC are more and more discovering the opportunities of smart grid balancing by actively including prosumers in virtual power plants (e.g. SWM and Rheinenergie). Digitalisation thus provides new solutions, which questions the initial separation of network operation, production and supply of energy. ["The whole unbundling regulation was made before the energy transition and the digitalisation and it hinders it right now. The utility companies get no feedback on the needs and the reaction of the customers – this is still designed for

the uni-directional system and need to be revised in the future" DE3; "if somebody has the responsibility, he should also have the possibility to interfere" DE12]

In the Swiss governance system, it is still discussed, whether and if so which capacity mechanism scheme should be implemented. So far the UUC play a highly important role for the balancing of the grid, since they operate production and distribution still in the same organisation, so that they can directly react to grid instabilities. ["Integrated resource planning is really complicated with unbundling - even when there are contracts of data exchange, so the classical full integrated firm works, they can decide: do we want to install LED or do we want to build a new plant" CH10].

5 Discussion and concluding remarks

The previous sections elaborated "which (additional) analytical perspectives for incumbent actors in the energy sector can be derived based on the conceptualisation and analysis of UUC as public companies in network industries" (research question 1). This section aims at kicking off the discussion on research question 2: "How can these analytical dimensions enrich the understanding of other incumbent actors in the energy sector and other network based infrastructure sectors?"

The proposed analytical perspectives have their biggest explanatory value for public companies in network industries and thus can also be applied to other public and larger incumbent actors in the energy sector e.g. EON or EnBW. They also have been corporatised and still have public owners, thus, they also act as publicly owned companies in a market-based environment and face the discrepancy of democratic control vs. competitiveness. The recent discussion on the splitting and re-merging among EON and RWE, thus, can be interpreted as a strategic bit on the profits in renewable energies (innogy) versus the future profits in the regulated network business (EON). The parallel existence and overlap of the market-based and the monopoly logic apparently still shape their business models. And, although they have been corporatized and act in international competition and appear as competitive and innovative companies, they also have their roots and historical development in the former monopoly, centralised and analogue regime. These considerations enrich the understanding, why they their behaviour is shaped by path dependencies, why they struggle to adapt to regime shifts, to develop the necessary competences and to implement related organisational change – as finally all incumbent actors do.

Furthermore, the proposed analytical perspectives can also be applied to incumbent actors in other network industries like the railway or communication sector. These sectors have been liberalised in the context of the European integration, they are both based on network infrastructure, which builds natural monopolies and is thus often publicly owned or highly regulated. They all represent critical public services and still have traditional public companies acting in a market-based regime (e.g. deutsche Bahn, Telecom, Swisscom) (Finger 2014; Lang et al. 2013; Welfens, Yarrow 2012). Thus the analytical perspectives proposed in this paper could also be applied to other network industry sectors in which public enterprises play a major role and could facilitate the understanding of their behaviour as incumbent actors in times of fundamental change.

This strength of the perspectives, however, represents at the same time one of their limitations: the perspectives were especially developed for public companies and do not answer the question whether public companies act differently than private or public-private incumbent actors. Moreover, this paper necessarily remained conceptual and did not analyse e.g. how the UUC behaviour influenced the course of the energy transition process. Finally, the proposed analytical perspectives indeed were developed based on the thoroughly selected cases for regional federalist incumbent ac-

tors, however, the further empirical application of the proposed analytical perspectives to other UUC (e.g. of smaller size, or with a larger share of private shareholders) or to regional and cantonal utility companies would definitively enrich the further theory building.

Further research on incumbent actors in transitions of infrastructure sectors should definitively consider the particularities of public companies as well as network industries to enhance the general understanding of incumbent behaviour. A comparison among private and public incumbents, as well as local, regional and national incumbents could be very fruitful. Moreover, employing empirical evidence from other federal states as e.g. Austria or the U.S.A. or states with a strong tradition of communal self-governance (e.g. Sweden and Norway) could also add interesting additional insight to the discourse of incumbent behaviour in transition studies.

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