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**Trading Sovereignty for Profit? A Critical Assessment of Corporate Ownership Structures in the German Energy Sector.**

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Author: Maximilian Gumz

Program: M. Sc. Business Science and Economics

First Supervisor: Prof. Dr. Jutta Günther

Second Supervisor: Prof. Dr. Torben Klarl

# Abstract

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# Introduction

In the course of the last century, complex international ownership structures have become an inevitable tool for large firms to stay competitive on globally accessible markets. Benefits like low transaction costs, economy of scale effects, accumulation of skills and experience, tax and regulation design, widespread and flexible sales opportunities, as well as the option to profit from arbitraging and transfer pricing (Dunning and Lundan 2008) give international firms immense advantages when competing with one another, often making it nearly impossible for local competitors to keep up with their pricing options and/or quality standards. Consequently, international companies have become experts to engage in increasingly sophisticated ownership structures pushing their cost-efficiency to the possible limit.

On the consumer side, however, the effects of international firm structures can be a lot more ambiguous. Even though it should be widely undisputed that most consumers would be happy to buy affordable high-quality products from highly efficient international firms, some other objectives of large multinational enterprises are not necessarily of mutual benefit. Examples of those cases are oligopolistic pricing policies, corporate tax avoidance, untransparent finance and asset structures, national sovereignty issues (like private control of infrastructure and basic supply sectors). Besides, a broader conflict may arise between market power and profit maximization, on the one side, and equality, human rights, and social justice on the other. Conflicts of interest of these kinds are often best solved by appropriate governmental moderation, allowing MNE’s to grow and progress as market competitors but also set boundaries for predatory or unethical behavior. Eventually, this is not always an easy task as MNE’s often have strong bargaining positions coming with their size, financial strength, market influence and role as an employer (Dunning and Lundan 2008).

This case becomes even more delicate when MNEs occupy central positions in essential industries like the food sector, telecommunications or energy supply. As we know from contemporary research, complex ownership structures are indeed nowadays common practice not only in production, retail or tech industries, but also in basic supply like the energy sector, concentrating corporate ownership in a few groups of internationally investing countries (Li et al. 2017). Since the basic needs of its citizens are widely seen as a governments responsibility, governments are put in a difficult situation when international firms take over industry parts designated to cover these basic needs. Ensuring the supply of its citizens essential goods and services is part of a nations sovereignty and should in the eyes of many be shielded from both geopolitical conflicts and the systemic risk of a global financial system. When allowing foreign investors to control large amounts of equity, the effected sector is exposed to both of these risk factors. In times of foreign political unrest, the question arises, how independent a nation can be, if a large share of its supply system is ultimately owned by another nation (Rugman and Kobrin 2009).

Regarding financial stability, we are still scarred by the events of 2006, when the world witnessed how a bursting housing bubble in the USA sparked a chain reaction of credit defaults leading to a global financial crisis and what we call “the Great Recession” today. International ownership structures usually come hand in hand with highly entangled international financing schemes. International financing, especially if so-called secrecy jurisdictions are involved, can lead to dangerous “off the book” liabilities circumventing regulatory boundaries and increasing financial fragility, which becomes particularly threatening in the case of an economic slump (Loomer and Maffini 2009; van Fossen 2003). This risk is currently highly relevant, since the corona pandemic of 2020 caused a worldwide recession that tops the events of 2006 in many respects. The more an industrial sector is enmeshed in the international finance system, the more it is exposed to its systemic risks. Consequently, to ask how safe even the basic supply system of a nation will eventually be in the prospect of global financial instability appears to be an unpleasant but urgent question. Moreover, ownership chains, often by using secrecy jurisdictions as a vehicle, are a common instrument to avoid not only regulations, but also taxes. For basic supply sectors, this seems particularly delicate regarding social justice as these sectors regularly receive subsidies of state money.

In this thesis, I want to highlight the German energy sector as a particular interesting case for showing and discussing the aforementioned problems coming with MNEs involvement in the basic supply system of a national economy. Currently, even though there is plenty of good literature about ownership structures, their development and dependencies overall and for the energy sector (Grosskurth 2019b; Garcia-Bernardo et al. 2017; Li et al. 2017), the problem of tax avoidance and financial instability and the impact of MNEs on national sovereignty (Rugman and Kobrin 2009), literature yet misses an attempt to assess the implications of these issues together and project them on the basic supply sector of a national economy. Furthermore, there is no attempt to evaluate the condition of a nation’s basic supply sector influenced by these factors as an indicator of governmental quality regarding social justice and security. In this sense, the German energy sector is an excellent example to illustrate such an assessment as central conflicts between MNEs and consumers (ergo most of a country’s citizens) are represented in this sector in a particularly demonstrative form for the following reasons.

German politicians have taken ambiguous political positions regarding its energy sector throughout the last decade, indicating difficulties to moderate conflicting interests between large multinational firms and other stakeholders. As an example, there has been an ongoing dispute about Chinese investments in German infrastructure or the German-Russian Nord-Stream 2 project over the last years. German politicians fear those investments might compromise so-called energy security (the uninterrupted availability of energy sources at an affordable price). Nevertheless, Germany has (in part to comply to European Union directives) progressively liberalized and privatized its energy sector since 1996 (Brandt 2006), allowing new international competitors to access the German energy infrastructure, which had formerly been occupied by a relatively static system of territorial monopolies.

This trend gathered even more pace when the “Energiewende”(Germanys transition to green energy) attracted international investors by offering investment options of a way lower volume (a wind farm, a single wind turbine or even small amounts of solar cells on the top of owns own residential building) than traditional energy investments (like a coal or nuclear power plant) (Hall et al. 2016). Of course, the liberalization of the German energy sector came with benefits like weaker market entry barriers and lower end-consumer prices. It also made the energy market more dynamic, consequently supporting structural changes like the Energiewende, which certainly has a lot of positive ecologic externalities. On the other hand, it made the market far more complex and, at many spots, less transparent. This lack of transparency comes with all the previously discussed issues.

Germany is furtherly known as a country offering a lot of location specific advantages (good infrastructure, asset protection, reliable legal institutions and skilled labor) to MNEs but also collecting relatively high corporate tax from them. Researchers have shown that the combination of these two characteristics motivate MNEs to use opportunistic tax policy options, shifting away a considerable share of local earnings to low tax countries.

Lastly, because of its stepwise liberalization, the German energy sector allows us to examine the impact (in terms of energy safety, market transparency and finally social justice) of its liberalization and consequently internationalization progress by means of a solid referential timeline. It is therefore the purpose of this thesis to thoroughly unveil, describe and discuss the development and scale of today’s underlying ownership structures in the German energy sector and analyze their impact on Germany as a national economy. These results will then be used to contribute to the broader discussion about the pros and cons of ownership structures in general and for the particular case of basic supply industries. To maintain a precise and controllable structure throughout our work, we formulated three overarching research questions:

1. How have the current ownership structures in the German energy sector developed over time?

As already mentioned, ownership chains tend to develop “hubs”, meaning that some countries take special roles in the ownership structure of certain industries. This has already been shown for MNE’s in Europe (Grosskurth 2019b) and the energy sector overall (Li et al. 2017). The identification of hubs or countries taking special roles in the ownership network is an important step for further analysis since countries usually embody their special roles for specific reasons. Identifying important countries in the ownership network can therefor give us information about which factors contribute to a country becoming an investor in Energy capital on the one hand or create attractiveness as a destination for foreign energy investments on the other hand.

1. What factors and/or events have driven or hindered the building of international ownership structures?

In order to answer this question, we will use the timeline of the liberalization process in Germany as well as the Energiewende to discover which steps caused changes in the ownership structure of the German energy sector. We will also consider other known dynamic factors of influence being e.g. tax differentials, political decisions about information exchange (Hanlon et al. 2015) or data leaks of secrecy jurisdictions (O’Donovan et al. 2019). The aim is to find out which factors promote which countries to increase/decrease their investment activities in the network to get deeper knowledge about the function and importance of certain countries. As already described, MNEs can extend their assets for many different reasons and not all of them have negative external effects. If e.g. a known traditional energy investor like Canada, Sweden or Finland sees the liberalization of the German energy sector as a chance to expand their business and diversify their product, that would have different consequences for the German economy in terms of energy safety than a couple of risk friendly investors buying a wind park without having any expertise in the energy business, maybe even shielding their investment from tax and regulation by using secrecy jurisdictions. A detailed selection of all factors considered and the rationale behind that choice can be found in the according chapter of this thesis.

1. How should the results of question one and two be evaluated in terms of energy safety, market transparency and finally social justice? How can we use the insights of those results to create an effective policy to foster the positive effects and diminish the negative effects of an internationally open energy market?

Like mentioned, some forms of ownership chains and their main function for an MNE can be controverse to the public interest. Question one and two will give us information about the shape of the ownership network behind the German energy sector and show which influence factors mattered the most in its building process. In order to answer question three, we will use this information to estimate to which degree ownership structures are used for purposes causing the negative side effects mentioned earlier. To sum them up concisely:

* 1. Financial instability: As said, secrecy jurisdictions are an instrument to avoid regulations and thereby cause financial instability. (Loomer and Maffini 2009; van Fossen 2003). How strong is the involvement of secrecy jurisdictions in the German energy sector? How large are ownership information voids, making ownership structures untransparent and hard to regulate? Can this lack of transparency and the involvement of secrecy jurisdictions be a thread to systemic financial instability of the global financial system and therefore ultimately endanger energy safety?
  2. Tax avoidance and social justice: To what extend is the German energy sector exposed to the problem of tax avoidance? Is this an especially delicate case of tax injustice because of the subsidies the energy sector (particularly in the case of renewable energy) receives? Do German consumers and employees benefit from the tax savings and overall cost efficiency of large Energy corporates by receiving higher loans or cheaper energy supply?
  3. National sovereignty: “The hierarchical or Fordist structure of the traditional MNE reinforces the core values of the modern international political system: state sovereignty and mutually exclusive territoriality” (Rugman and Kobrin 2009). How is the Energy Sector influenced by hierarchical MNE structures? Are state sovereignty and mutually exclusive territoriality endangered by the ownership structure of the energy supply sector as it is?

Then, we will use these insights to create an effective policy recommendation to foster the positive effects and diminish the negative effects of an internationally open energy market. Eventually, the quality of a democratic government can be measured by its effectiveness to realize the interests of its electorate as political decisions (Adsera 2003). In reference to the results from question one and two and the first part of question three we will evaluate if this is still the case for the political decisions made in the German energy sector and if not, which political actions could increase political effectiveness on a German as well as on the European Level.

Considering the aim and main objects of our research, a combination of network analysis and macroeconomic regression models appears to suite best as research methods. Network analysis, which was first used in social science, has become increasingly popular in economics over the last decades (Garcia-Bernardo et al. 2017; Grosskurth 2019b). By displaying individual entities (in our case countries) as nodes and their relations (in our case foreign ownership links) as edges, researchers are able to get information about an entities’ position and role in a complex network. The strength and direction of these links can be used to apply measures of centrality, identifying nodes as hubs or gateways. This approach suites very well to answer research question one and two. Unfortunately, high quality ownership information is not easy to come by. This is especially the case for time periods before 2010. Even though we will use Bureau van Dijk’s Orbis as a main data source for this, which is known as one of the most reliable and sophisticated provider of historical ownership data, some gaps still remain in the data set. Fortunately, these data restrictions still allow the application of network analysis by means of identifying important actors in the network and analyzing which influence factors led to their position. It will also still be possible to display the shape of the network as a whole, which can be interpreted as a valuable result already. However, when it comes to the analysis of quantitative data like foreign investment volume of a certain country, value of foreign assets or similar figures, data voids sharply restrict the validity of a model.

In this thesis, we will therefore use economic macro level data to fill that gap. While network analysis allows us to picture the ownership network behind the German energy sector in a vivid way and gain information about the centrality characteristics of involved countries, macro level data provides us with solid, quantifiable data to apply a panel data regression. Panel data regression comes with certain advantages for our purpose. First, it is well suited to discover causalities between quantitative figures. Second, it is especially suited for dynamic regression models of medium-length time ranges (Kennedy 2008). In our case, this method will be used to measure the quantitative effects of influence factors mentioned above (like political decisions about market liberalization) on economic figures representing international investments and income, being e.g. foreign affiliate statistics (FATS) or foreign direct investment (FDI) statistics. Panel data regression (Ramb and Weichenrieder 2005) as well as FDI and FATS data have already been successfully applied to uncover macroeconomic causalities very similar to those relevant for our topic. We are therefore convinced that this method can provide valuable information to answer our research questions. We furthermore hope to contribute to the current literature by showing a new and interesting application of the method.

The Chapters of this thesis will be structured as follows. Chapter one will dive deeper into the literature of ownership structures and give more details about the characteristics of the German energy sector. The reader will be introduced to how political decisions stepwise liberalized and privatized the sector and how the Energiewende furtherly fueled this trend. We will also highlight which benefits and downsides of ownership structures are particularly relevant for the energy sector as a part of the basic supply system. Chapter two explains how we applied our chosen methods on the data set in order to answer our central questions. Chapter three documents our data collection, explains why we chose our data sources and discuss the strengths and weaknesses of each source. Here, we will describe the conducted analysis technically detailed and show how it gives us the information we need to answer the research questions. Chapter four presents the results of the conducted model; chapter five discusses central findings and limitations and discusses the meaning and consequences of our results in order to offer new starting points for both political actions and further research.

# Literature Review

## Ownership Structures

*“The motive of business is pecuniary gain, the method is essentially purchase and sale. The aim and usual outcome is an accumulation of wealth.” – Thorstein Veblen, 1904[[1]](#footnote-1)*

The assumption that businesses in general aim to maximize their profits and individuals aim to maximize their utility is a central premise in neoclassical economics (Weintraub 2002). Even though we nowadays know that neoclassical theory at its very beginnings suffered a lot of shortcomings, this fundamental hypothesis has transitioned over to what we call “mainstream economics” today, which builds the major basis for academic teaching in both business science and economics (Mankiw 2014; Dunning and Lundan 2008). Despite meaningful critique that profit does not always have to be monetary in the form of personal wealth, but can also be interpreted as the psychological reward of entrepreneurial success (Scitovszky 1943), a firm operating in a competitive market must compete for and consequently maximize (or at least optimize) its monetary profits in order to preserve itself from extinction, even if it attempts to meet other, non-profitable goals (mainly stakeholder interests of various kinds) besides (Jensen and Meckling 1976). In this thesis, it will be taken as a fact that the German energy sector is a competitive market, profit maximization therefore is a central (direct or indirect) goal of the firms competing in it and ownership structures are accordingly an instrument to reach that goal.

Unlike these expositions, which were mentioned primarily for the sake of argumentative integrity and might appear self-evident to many, the question of *how* ownership structures are used to maximize profits requires a more thorough examination. In fact, it was until the 1970’s that business research and economic science provided a general theory to explain the behavior of multinational corporations (MNCs) to acquire, accumulate and, most importantly, *control* value generating capital beyond their home country borders (Buckley 2011). Following neoclassical logic, international *trade* was formerly explained mainly by factor-cost models stating that businesses located in different countries produce their commodities at different costs of labor and capital. Because businesses offering equal or substitutable goods compete with one another on an international market, those businesses having access to price-efficient production factors outperform their competitors as soon as their cost savings extend accruing transportation costs. On the long run, this systematic inevitably results in a spatial specialization of each trading nation depending on which goods can be produced at the most favorable factor costs (Samuelson 1948). Some authors, even in those early stages of international trade theory, did consider not only commodity, but also capital movement between nations. (Ohlin 1935), who was as well a general proponent of the factor-cost theory, explained the relocation of capital from one country to another mainly by differences in interest rates, motivating multinational corporates (as well as banks) to transfer capital (or even borrow it) from countries with low interest rates to those with high interest rates in order to maximize rate of return. [[2]](#footnote-2)

These theories do, by all means, incorporate a strong and plausible logic and their basic concepts still underpin influential theories of international and interregional trade (Krugman 1991). However, factor and transportation costs (or transaction costs in a wider sense) or difference in interest rates alone cannot explain why businesses would undergo the managerial risk of acquiring a majority stake in off-border capital instead of just engaging in trade with foreign companies or investing in a minority share under the prospect of monetary returns. The sheer occurrence of this behavior can be interpreted as an empirical phenomenon contradicting basic neoclassical principles and had therefor been categorically ignored by most of then established scholars (Williams 1929).

The key turnaround of early foreign direct investment (FDI) theory (which implies controlling shares in foreign businesses) was the assumption of imperfect markets, primarily driven by the contributions of Stephen Hymer. As it is widely accepted today, Hymer assumed that most markets are far from perfect. On the contrary, oligopolistic structures, entry barriers and applications of market power[[3]](#footnote-3) by large competitors distort the allocation mechanism of the market as it was understood by neoclassical theorists. To adapt to or even exploit these market imperfections, international corporations would therefore aim to build market power themselves in order to reap the maximum possible benefit from business operations abroad (Hymer 1976).

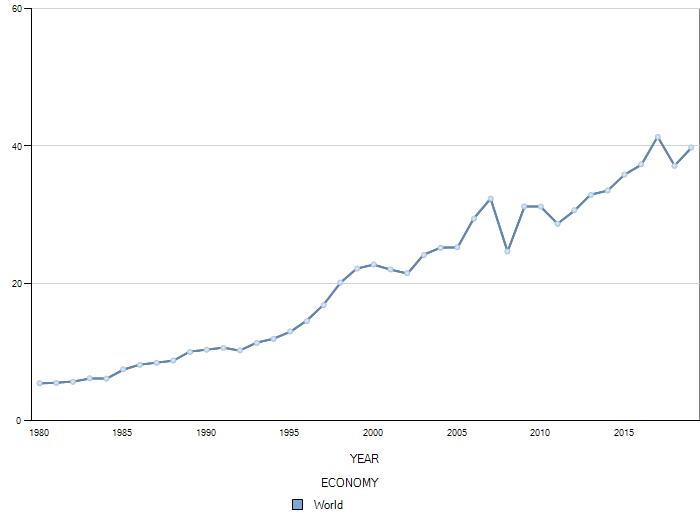


Figure : World outward FDI stock as percentage of GDP. Source: UNCTAD

As FDI skyrocketed since the 1980’s, explanatory literature became more copious and precise. Today’s scholarly consensus assesses the motivations behind FDI as diverse but systematic. A widely accepted, though not undisputed, theoretical system is Dunning’s eclectic paradigm. Dunning refers to and refines the assumptions of Hymer and converges it together with other attempts to explain FDI. He concludes and augments a large number of heterogenous theories that were previously not necessarily seen as connected (Vernon 1966; Lessard 1976; Johanson and Vahlne 1977; Penrose 1956; Aliber 1970) to what he calls an “envelope for economic and business theories of MNE activity” (Dunning 1977, 2000).

According to Dunning, composition and priority FDI incentives differ case specific but can be categorized in[[4]](#footnote-4):

*Ownership specific advantages* are advantages subsidiaries can profit from by being owned by a larger enterprise, or those the enterprise as whole profits from because it has built an “ownership portfolio” of diverse international assets. These advantages include property rights, intangible assets (know-how, intellectual property etc.), organizational advantages (efficiency gains caused by common corporate governance, knowledge transfer, minimization of intra-firm transaction costs, risk reduction through diversification) and institutional assets (incentive systems, corporate culture).

*Location specific advantages* are accessible by firms and/or their subsidiaries through the environmental conditions of geographic locations. Those include access to factor and recourse markets, infrastructure (also education), knowledge spillovers and jurisdictional benefits (investor protection, property protection etc.).

*Internalization advantages* primarily result from imperfect markets and can roughly be described as the capability to circumvent or exploit market failure by internalizing and controlling what would otherwise be sourced (firm-)externally. Examples being the avoidance of search and negotiation costs, control of recourse supply channels and market outlets or prevention of price discrimination.[[5]](#footnote-5)

It should be apparent that these advantages, especially in their combination, offer exceptional value to multinational corporations. In line with that reasoning, the expansion and sophistication of geographical and transnational ownership configurations (complex ownership chains) constitute an almost inevitable consequence. As of 2011, (Vitali et al. 2011) come to the conclusion that the lion share (roughly 80%) of MNCs’ worldwide value is controlled by 737 *top holders* via a complex configuration of entangled, multilevel ownership relations and the 147 top holders alone control roughly half of this 80%.

The consequences of the growing influence of MNCs are highly diverse and cannot be fitted to a black and white scheme. From a market perspective, it has been shown that the impact of international firms can positively influence productivity and technological process on host country markets due to empowering competition and transferring knowledge (Caves 1974). On the other hand, international investment, especially FDI can as well lead to capital concentration and market exits of domestic firms (crowding out effects) (Backer and Sleuwaegen 2003; Kosová 2010).

However, the influence that MNCs have due to their size, influence and often strictly hierarchical structures go beyond market conditions. As already discussed, the financial integration of large, entangled MNCs enables them to diversify their *downward* risk, meaning that the failure of one affiliate can be compensated by the success of another. On the other hand, dense financial relations in corporate ownership structures can be fatal in the case of a systemic shock (e.g. an economical or natural crisis scenario). In such a scenario, corporate network structures can be fatally impacted due to a lack of *circuit breakers* within their intra-firm financial dependencies (Stiglitz 2010a, 2010b). In economic terms, just as MNCs are less vulnerable to *unsystematic* risks by entertaining a diverse asset portfolio, there are more vulnerable to *systemic risks* because of strong interdependencies within their corporate structure (Allen et al. 2010; Allen and Gale 2000).

As said, there is no black and white about the impact of MNCs on market economies. MNCs are certainly not monsters overtaking markets, crushing local firms, looting natural recourses and putting whole nations at systemic financial risk. Neither are they saviors bringing wealth without cons, pushing technology and organizational finesse and providing a role model in terms of social responsibility, stakeholder services and the creation of positive externalities. Commonly, we therefor expect national governments to moderate and adjust MCSs’ impact for the good of its citizens. Conceptionally, it is much rather the role of a state to ensure factors like fairness, social justice, security and democratic autonomy to its people as MNCs are traditionally expected to preliminary care for their own profitability. Realistically, however, national states are not closed universes and politicians are often conflicted by trade-off considerations between efficiency gains of international business activity and exclusive territorial sovereignty of governments acting as the representative of their people (Kobrin 1999; Strange 1992).

Concerningly, as of today, there are strong indications that governments, in view of the prosperity FDI *can* bring to their nation, find themselves *bidding* for FDI by offering special concessions or privileges to MNCs (Oxelheim 1993). Especially when offering unique advantages (like sophisticated technology or knowledge) to an economy, MNCs recurrently hold strong bargaining positions towards their host country governments (Fagre and Wells 1982; Kobrin 1987; Charlton 2003). In many occasions, national governments are eventually willing to give up a considerable share of their sovereignty by ensuring international investors long term contractual rights (proprietary rights over natural resources, exclusive licensing, loss of profit compensation assurance in the case of political interventions) that cannot easily be revoked in the case of a subsequent disagreement (Elkins et al. 2006).

Some authors argue that many nation states, from an economic perspective, became so exposed to the influences of MNCs that they became “*once more as in the past, just one source of authority among several, with limited powers and resources*.” [[6]](#footnote-6). Before I will discuss why this development is of particular concern for the (German) energy supply industry, the next section assesses the role of secrecy jurisdictions as a particular vehicle to circumvent aspects of border-bound national authority by exploiting the international maneuverability of MNCs, effecting not only national sovereignty but also financial stability and social justice in a crucial way.

## Secrecy Jurisdictions

*A lot of it is legal, but that’s exactly the problem. It’s not that they’re breaking the laws, it’s that the laws are so poorly designed that they allow people, if they’ve got enough lawyers and enough accountants, to wiggle out of responsibilities that ordinary citizens are having to abide by.*

*– Barrack Obama, 2016[[7]](#footnote-7)*

At the beginning of this chapter, it is extremely important to differentiate between *healthy*, or *natural* tax competition that, as said, naturally occurs through market mechanisms when nations states entertain international companies with mobile capital, and *harmful*, unsustainable tax avoidance schemes occurring mainly because of certain market imperfections. Even though secrecy jurisdictions provide more various service than just tax optimization, this is still one of their main functions and will therefore briefly be discussed.

I am mentioning free markets again because the positive effect of free market mechanisms is regularly brought up by defenders of tax haven regimes (Hodge 2018; Edwards and Mitchell 2008; Baldwin and Forslid 2002; Teather 2006). Now in my opinion, this argumentation oversees or ignores a crucial flaw. The free market character of tax competition was first argued by Charles Tiebout (Tiebout 1956). Tiebout argues, that nation states in an international economy compete in a way similar to private companies. Just as private companies with the best input / output efficiencies are naturally preferred by buyers, states with the best input / output efficiency are naturally the preferred location choice for both private individuals and corporates. As private companies use work, labor and capital and produce commodities, nation states use tax revenue to offer public goods and services. Those nations with low taxes but good public deliverables are therefore more efficient and the natural choice for people to live and do business in. Tiebout called this *voting by feet*, a market mechanism driving states to strive for an efficient state body.

If one observes the current reality of tax competition, Tiebout has been proven right in the matter that nation states apparently do tend to compete for international capital by offering low tax rates (Devereux et al. 2008). On the other hand, current practices also show how the automatisms identified by Tiebout manifest in a world where markets are not perfect, unlike he presumed. Especially two unforeseen consequences of early tax competition theory are (1) taxes are principally paid where profits are booked, not necessarily where economic value is generated (Tørsløv et al. 2020) and (2) not all forms of capital (or workers) have the same degree of mobility (Sinn 1990) and not all market competitors have the same extend of access to tax lowering instruments. Especially multinational corporations and very wealthy individuals appear to have exclusive or at least preferential access to the services of secrecy jurisdictions services (Slemrod 2007; Wilson 2009; Trautman 2017; Alstadsæter et al. 2019; Palan et al. 2010). Even though the full portfolio of tax optimizing instruments secrecy jurisdictions can be used for is hard to estimate for researchers, especially three major types have been identified by research as *common practices,* especially referring to MNCs (Gumpert et al. 2016).

*Transfer pricing* (Clausing 2003; Vicard 2015) is a term for the strategic mispricing of intra firm trading objects in order to either create revenue in the selling country and expense in the buying country (overpricing) or vice versa (underpricing).

*Debt shifting* (Egger et al. 2010; Buettner and Wamser 2013) exploits intra-firm loans to shift profits in the form of interest revenue (or expense on the opposite site).

The *strategic location of intangible assets and intellectual property* (Dischinger and Riedel 2011; Karkinsky and Riedel 2012) works by paying tax-deductible royalties from a business unit located in a high-tax country to another business unit located in a low-tax country (which holds the ownership rights).



Figure : Total worldwide share of assets, liabilities, GDP, and population of a selected group of small states specialized in financial services in 2007. Source: (Lane and Milesi-Ferretti 2011)

Now preferential tax avoidance schemes distort the allocation function of a market in two major ways. First, because of higher tax burdens market competitors without access to these schemes can hardly compete with those having access. Consequently, a firms factor efficiency (cost of input factors in relation to price and quality of the output factors, meaning mainly consumer goods and services) is no longer the determining factor whether a business survives or succeeds. Hence, the competitive motivation to improve quality and reduce production costs is weakened, market entry barriers are heightened, and oligopolistic structures are promoted (Goerke and Runkel 2011; Martin et al. 2020). Second, on a state level, especially nations that are primarily used as a location for the creation of economic value (production, extraction, R&D etc.), struggle to refinance public goods MNCs make use of but do not pay for (Radu 2012). The second factor can consequently increase the tax burden of the middle-class. Eventually, middle-income earners can end up paying for public goods primarily exploited by MNCs to compensate for fiscal losses (Harrington 2017), which further amplifies unequal competition, leading again to higher market share of large MNCs who have larger options to avoid tax and so on. On the long term, this cycle can lead to a fiscal dilemma in which state administrations and the working class eventually do not profit from the *welfare* international capital is supposed to bring (OECD 2013; Crivelli et al. 2015; Avi-Yonah 2000).

Because tax are eventually necessary for governmental spending, small economies have the best chances to profit from undercutting other countries’ tax rates. That is for two reasons. Due to their small economy size, they naturally have “less to lose but more to gain” competing with larger economies who consequently have larger tax bases (Wilson 1999). Even a small share of international finance revenue taxed at low rates can be enough to let an extremely small economy thrive. Large economies on the other hand could hardly attract enough foreign capital to ensure a necessary level of governmental spending while suffering low tax revenue caused by inefficiently low tax rates within their own borders (Genschel and Schwarz 2011). Additionally, small countries, especially if there were strong incentives to become financial *shelter* states before their economies developed independently (most British Overseas Territories fall into this category, see (Shaxson 2011)) , do not have to spend tax revenues on public goods that are beneficial or even necessary to entertain an industrial sector[[8]](#footnote-8). As a consequence, some larger economies introduced schemes to assign privileges exclusively to foreign shell companies while keeping domestic firms regularly taxed (Palan et al. 2010). It is important to mention this now as later parts of this thesis will provide empirical evidence of the function of and interplay between both types.

Even though I purposely use the term *secrecy jurisdictions* instead of *tax havens* to name what, to my opinion, was best defined by Thomas Rixen as “states or dependent territories which intentionally create regulations and tax rules for the primary benefit and use of those not resident in their geographical domain”[[9]](#footnote-9), this chapter yet mainly focuses on tax related issues. That is because tax heavily relate to the central concerns of this thesis regarding both social justice and national (at this stage particularly fiscal) sovereignty. However, another considerable characteristic of secrecy jurisdictions is their willingness to hide economic activity with the potential to spark ample concern among international politicians and regulative institutions. As I will now elaborate, financial secrecy can induce supranational financial instability at arguably the same scale as tax avoidance instruments induce social and economic discrepancies.

When wanting to finance a car, a house or some kind costly asset the natural choice of most people will most probably be to go to a bank and ask for a loan. As of 2020, banks were still the most represented lenders of capital in the majority of large industrialized and developing economies worldwide (FSB 2020). However, besides a small dip resulting from the global financial crisis in 2008, we are experiencing a continuing growth of so-called *non-bank financial institutions* (NBFI), which by today hold a larger share of global financial assets than traditional banks do (FSB 2020). The crucial distinction between traditional banks and NBFIs is that traditional banks always have to oblige to some kind of supervising system regularly assessing their asset structures and evaluating their risks (Barth et al. 2008). They are also integrated in a central bank level regulation in form of (central bank) money reserves. That means that banks have to *back* their deposit liabilities with central bank reserves to a set percentage. In return, traditional commercial banks can access additional reserves from the central bank in the case of a liquidity drain (basically a bank running out of money) (Gray 2011).

Resultingly, these measures make it possible for monitoring institutions like central banks or ministries of finance to keep track of how much funds are circulating and how well this money is backed by the reserve system. NBFIs, as they are not *banking* in a traditional sense, do not comply to those control measures. Now not all NBFIs are shadow banks. Pension funds and insurance companies e.g. also fall into this category. The term *shadow bank* has established when an NBFI acts like a traditional commercial bank by the means of getting involved in financial intermediary activities and thereby participating in significant transformation or leverage of liquidity (like lending, credit intermediation or the setup of investment vehicles) (FSB 2017, 2020).

Now, as said, the share of NBFIs in the financial industry of most large economies is smaller than that of traditional banks. The reason why this is reversed on the aggregated global measure is that NBFI activity is highly concentrated in very few national economies[[10]](#footnote-10) (FSB 2020), of which almost everyone is classified as a secrecy jurisdiction by multiple scholars (Hines 2010; Tørsløv et al. 2020; Philips et al. 2017). Now there is a logical reasoning for locating shadow banking activities inside the borders of secrecy jurisdictions. The lax regulations of these jurisdictions give NFBI additional freedom and thus a much larger playground for financial asset management and speculation (Rixen 2013). Moreover, banks and institutes that are supervised by regulative bodies can dodge or impede the assessment of risk-exposed balance sheet items by relocating and repacking them via offshore jurisdictions to which national regulators have no access. This can be convenient for a bank since risky activities can be very profitable and instead of foregoing potential profits, those activities can be pushed *off the books* (Chick 2008).

The cause and problem of secrecy jurisdictions and their role in shadow banking can be described as closely similar. The concept of *elsewhere*, meaning something happening out of the reach of whatever institutions’ regulation is attempted to be avoided, remains the core reasoning and the most fatal consequence of offshore finance. This concept would also explain the occurrence of some extremely complex, multilevel ownership models behind business entities that I will later focus on. Rhetorically speaking, somewhere between the multinational stages of such an *ownership chain*, elsewhere becomes *nowhere* (Murphy 2009; Palan and Nesvetailova 2013) since none of the individual entities within a chain can be isolated as responsible in case of an unpleasant event. In fact, many scholars by now think that a considerable share of international wealth and financial assets lies behind a cloak of special purpose vehicles (SPV), untraceable, unlocatable and certainly unregulatable by any central governance (Zucman and Fagan 2015; Shaxson 2011; Palan et al. 2010).

Even though scholars are not consensus about the precise extend to which offshore finance increases financial instability and the risk for financial crises, a majority assumes that the build-up process and amplitude of the international financial crisis and the following great recession of 2007-2008 (McCulley 2009; Nesvetailova 2017; Sharman 2010; Chick 2008; Loomer and Maffini 2009; Bengtsson 2013)[[11]](#footnote-11) have been substantially influenced by it. Despite progress in terms of financial regulation has happened since the crisis, offshore finance remains a risky vague space for financial and economic stability of every country directly or indirectly involved[[12]](#footnote-12). The entanglement with secrecy jurisdictions will therefore be included as an (in)stability measure in my model.

## Network analysis and its application on ownership configurations

The origins of todays applied network analysis are often traced back to the early works of Georg Simmel, who started to speak about humans’ connections to different social circles (soziale Kreise) and resulting potentials of attraction and mediation between groups by individuals. The terms he uses to describe the social dynamics of individuals belonging to different groups and those groups being mediated by individuals come astonishingly close to modernly used terms in network analysis (e.g. what Simmel calls “soziale Fäden” can basically be seen as edges from today’s perspective) (Simmel 1890). Simmel’s ideas where later conceptualized and visualized by the psychologist Moreno who observed group dynamics in a girls hospital (Moreno 1934). A first economic adoption was done by Levine, who studied *interlocked* boards between major banks and major industrials (Levine 1977).

Chart

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Figure 3: Pioneering attempts of network analysis. Left (red): Social group formations within dormitories of a girls’ hospital, from: Moreno (1954). Right: "Interlockings" of the General Electric board with other industrials and banks, from Levin (1977).

Further sophistication and mathematization (Harper and Coleman 1965; Freeman 1978) of network metrics together with a steady increase in computation power and data availability fostered network analysis to become a strong empirical research tool with wide multidisciplinary applications.[[13]](#footnote-13) One of the most sophisticated and recent research applications of economic network analysis comes from CORPNET. The researchers of CORPNET use the instruments of network analysis to reveal dependencies, positions and functions of corporates, financial institutions and host nations within a deeply and complexly enmeshed web of control relations (Garcia-Bernardo et al. 2017; Vitali et al. 2011; Reurink and Garcia-Bernardo 2020). This thesis is heavily inspired by and builds on this pioneering accomplishment.

The crucial value network analysis brings to research about regulation and tax avoidance of complex corporate structures is that instead of just revealing the scale of it, the specific *functions* that are needed in order for complex ownership models to bring benefit can be allocated to specific firms or specialized host countries. Now there were attempts to classify different kinds of secrecy jurisdictions before. (Kudrle and Eden 2003) assume that secrecy jurisdictions can be classified in *production havens, headquarter havens, sham havens* and *secrecy havens*. Other works found some theoretical logic as well as empirical indication that MNC intermediates are strategically located in certain states in order to circumvent repatriation tax (Mihir A. Desai et al. 2003; Altshuler and Grubert 2003).

In very recent literature, the assumption of different roles of host countries in complex ownership chains has been strongly confirmed by large scale empirical evidence. (Garcia-Bernardo et al. 2017) show that there are *sinks* and *conduits* in the global ownership network. Conduit states identify by passing large amounts of income and capital from the source of their creation unto reaching their *sinks*, states in which ownership chains and profit flows end. (Reurink and Garcia-Bernardo 2020) detect specific *attraction profiles* of states that attract international firms to locate either strategic intermediates or global headquarters depending on specific policy (e.g. investor protection, withholding tax) or factor (e.g. knowledge, specialized labor, infrastructure) advantages. The relevance and increasing usage of intermediate affiliates (“in-betweeners”) have been furtherly confirmed by other recent network analysis research (Phillips et al. 2021; Nakamoto et al. 2019).

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| Figure : "conduit" and "sink" OFCs in the global network. Size displays relevance as conduit. Red colour stands for relevance as sink. Source and detailed description: Garci-Bernardo et al (2017) | Figure : European states by their main function for businesses. IRQ = interquartile range, SSC = shared service centre, VA = value added. Red cells = successful, blue cells = unsuccessful. Profit centres (green), Coordination centres (blue), Innovation centres (yellow), Back-office centres (magenta) and Manufacturing centres (Gray). Source: Reurink & Garcia-Bernardo (2020) |

## The Case of the Energy Sector in Germany

When discussions are held about opaque and complex ownership chains, tax avoidance and secrecy, we often intuitively associate these topics with large high-tech or finance companies going by media coverage and public image. However, there is some research indicating that similar practices are increasingly impacting basic supply sectors, too (Li et al. 2017; Finér and Ylönen 2017)[[14]](#footnote-14). Now the energy sector is a particularly interesting case in terms of tax and regulation avoidance exposure in my opinion. Firstly, a financial collapse of the energy sector would presumably lead to a particularly strong motivation to set up burdensome governmental rescuing schemes in order to prevent widespread and potentially long-term load shedding. Secondly, the energy sector, as part of the basic supply sector, recurringly receives special privileges or subsidies from the government making a debate about social justice (in this case mainly represented by tax justice) especially delicate. [[15]](#footnote-15)

I picked Germany as an exemplary case for several reasons. The German energy sector liberalization is in its exact form a rare occurrence in economic history. Liberalization measures have been implemented in many European states. However, Germany, before the liberalization was initiated, was not predominantly dominated by a public monopoly like it was the case in France or Great Britain (Dickhaus and Dietz 2004). Instead, the energy market was occupied by a fairly oligopolistic group of large private energy suppliers (e.g. E.on, RWE, EnBW) on a supra-regional level generated the lion share of electricity (around 80%) and held control over strategic infrastructure and the distribution network. These eight in total energy “giants” were almost exclusively active within regionally restricted territories. The generated electricity was distributed to the local levels by around 80 companies from which it was furtherly allocated to around 900 municipal utilities which were partly private and partly public (e.g. municipal energy suppliers called “Stadtwerke”) (Brandt 2006). This system was, though oligopolistic for sure, fairly stable and profitable for many years which is probably the main reason why the liberalization in Germany took place as a reaction to pressure from EU initiatives instead of predominantly national intentions like in most formerly monopolistic markets in Europe (Dickhaus and Dietz 2004). Interestingly, the structure of the natural gas sector followed a very similar systematic with the only exception of supra-regional companies being about half *importers* and half *generators*. Moreover, the supra-regional oligopoly of gas was occupied by different individual companies (with an overall of 16 regional monopolies) than the supra-regional oligopoly of electricity with RWE being the only company taking a spot at the supra-regional level in both markets. Nevertheless, the distribution system with its long-term, contract-bound structure and mixed private and public entities was closely the same (Mez 2003; Lohmann 2006).

Before I discuss the impact of the progressive liberalization policies that were adopted from 1996 on, it is important to also mention the political process of the clean energy transition (Energiewende). Since around 1990, policy measures targeting market liberalization on the one hand and green energy transition on the other hand have been somewhat entangled and should therefore best be discussed as a parallel, partly interdependent process.[[16]](#footnote-16) First ambitions for a move from fossil and nuclear energy to renewables were sparked by the oil crisis in 1973 and the Chernobyl accident in 1986 (Lauber and Mez 2006). However, since these early politics mainly consisted of a number of subsidies for research and stock investment in renewable energies that had little impact on a national scale (Hake et al. 2015; Rechsteiner 2020), I will define the “start” of the Energiewende in 1990. In 1990, the Act on Supply of Electricity from Renewable Sources into the Grid (Stromeinspeisungsgesetz – StrEG) obliged electricity distributers to prioritize renewable energy over conventional energy at a minimum price. This price was, at that time, still bound to the average cost of electricity, including conventional sources. Even though the impact of the StrEG on the electricity market was marginal, it can be seen as a first monumental step to promote the transition to the prioritized use of renewable energy sources (Hake et al. 2015).[[17]](#footnote-17)

In the end of the 1990s, several crucial policy changes happened at roughly the same time. The EU directive 96/92/EC (first EU energy act, sometimes also called “package”) and the transition into German law by the National Energy Act (Energiewirtschaftsgesetz, EnWG) invalidated the legal base of formerly existent territorial monopolies in favor of an open, liberal market. Ironically, after a short phase of competition (around 1996-2003 in the electricity market, around 1996 to 2000 in the natural gas market) the break-up of the territorial monopolies led to an even stronger market concentration towards large, supra-regional firms (Brandt 2006; Lenz et al. 2019; Lohmann 2006). However, the desired effect of lowering electricity/natural gas prices did not happen in both markets.

In 2000, the first version of the Renewable Energy Recourses Act (Erneuerbare Energien Gesetz – EEG 2000) decoupled the minimum price of renewable energy from the overall average energy price and obliged electricity distributors to prioritize electricity from renewable sources at fixed feed-in tariffs (Einspeisevergütung) (Hake et al. 2015; Rechsteiner 2020). This decision (in contrast to the StrEG of 1990) caused the market share of renewable energies to rise sharply for the first time (Lenz et al. 2019). While this merely effected the electricity prices, the natural gas prices (potentially adding to the previously described market concentration effects) sharply inclined during this year[[18]](#footnote-18) (Eurostat 2021a).

Figure : Source: Eurostat Figure : Source: Eurostat. See Appendix 3

The prices in both sectors continued to increase steadily in the following years. In the natural gas sector, the next sharp incline happened in 2005, potentially caused by the EnWG 2005, which introduced a regulation of third-party access to the distribution network through a legal authority (Bundesnetzagentur). Both sectors then experienced another sharp incline in 2007. From that year on, consumer prices were no longer authorized by public regulators (Bundesnetzagentur) (Brandt 2006).

In 2009, the EU directives 2009/72-73/EC (Third Energy Package) sparked an immense surge of foreign affiliates (Eurostat 2021b). The directive introduced a EU level agency to ensure fair competition among EU member states and support national regulation agencies to cooperate and communicate with each other (Agency for the Cooperation of Energy Regulators - ACER) (Rimmler 2015). Additionally, the EU directive 2009/28/EC (Renewable Energy Directive) followed by the Renewable Energy Sources Act 2009 (EEG 2009) set new goals for renewable energy generation and caused the respective sector to accelerate its growth (Rechsteiner 2020; Lenz et al. 2019). Whereas the natural gas market got hit hard by the financial crisis of 2008 and prices therefore declined, the political decisions of 2009 did not counteract the ongoing price increase in the electricity sector. However, as mentioned, those decisions had a tremendous effect on the clean energy transition and can, from that view, be taken as an achievement.

For the natural gas market, the year 2011 was the beginning of a rather turbulent time. After the decoupling of gas and oil prices in 2010, the accident of Fukushima in 2011[[19]](#footnote-19), the Russia/Ukraine conflict in 2014 and an unusually mild winter in the same year caused the gas prices to fluctuate heavily (Bukold 2015). On the electricity market, the 2012 novelle of the Renewable Energy Sources Act 2012 (EEG 2012) introduced market premiums (Energieumlage) for renewable energies as an optional sales channel to feed-in tariffs. These premiums ensured that price-efficient renewable energy producers that use free marketing instead of feed-in tariffs to sell their electricity receive a bonus payment equaling the difference between their sale price and an ex-post assessed average electricity price (Rimmler 2015). Since distributors were still obliged to prioritize renewable energies and the costs for the market premium were financed by end-consumer prices, the energy prices sharply increased from 2012 to 2014. At the same time, this premium system stopped the foreign affiliate “boom” and furtherly increased the market share of renewable energies (Eurostat 2021b; Rimmler 2015).

Potentially as a response to the skyrocketing energy prices and some “overfinancing” problems especially regarding the photovoltaic sector (Getachew 2019), the EEG 2012 was amended in 2014 by another novelle of the Renewable Energy Sources Act (EEG 2014). The EEG 2014 revoked the whole system of guaranteed returns in the form of market premiums or feed-in tariffs and exposed the renewable energy sector to market forces (while maintaining the set renewable energy market share targets) (Getachew 2019; Brunn and Sprenger 2014). These measures immediately stopped electricity prices from rising and simultaneously caused a second boom in foreign affiliate activity (Eurostat 2021a, 2021b).

# Hypothesis Development

The previous chapters discussed current scientific work and data in order to an appropriate starting point for my research. I will quickly sum up the most important insights for the first hypotheses:

* MNCs usually look for competitive advantages
* Ownership structures are an instrument to increase cost-efficiency and set MNCs ahead of their competitors
* Some ownership “configurations” include the exploitation of tax and regulation advantages by utilizing secrecy jurisdictions, a competitive advantage that domestic firms cannot use to the same extend. These configurations are regularly found on open markets
* Policy measures progressively enhanced international competition and market liberalization over the last centuries, competition was furtherly promoted by a stepwise reduction of subsidies and funds in favor of market forces
* These measures have increased the turnover share of foreign energy affiliates in Germany

From these premises, I conduct my hypotheses:

* H1: Due to the rising share of foreign affiliates in the Germany energy market, **Germany’s average position in international ownership chains in the energy sector has changed from “top to central” since 1996**.
* H2: Because of fierce competition and MNCs looking for an edge, tax and regulation avoiding ownership structures have built up in Germany since 1996, therefore: C**ountries that are known as established players in tax and regulation avoiding ownership chains are increasingly represented in the German energy market since 1996**. And accordingly:
  + H2.1: *States known for entertaining “conduit firms” (like Luxembourg, Netherlands or Switzerland) show an increasingly high betweenness centrality in the ownership network of the German energy sector since 1996.*
  + H2.2: *States known for entertaining “sink firms” (like UK Virgin Islands, Bermuda, the Cayman Islands etc.) mostly take top positions of ownership chains in the network.*
* H3: As conduits, **nations with a high betweenness centralities are as well regularly connected to sink states and vice versa**.
* H4: **Foreign affiliates with upward ownership links to tax haven states are object to significantly lower effective tax rates than their domestic (German) counterparts**.
* H5: **Foreign affiliates with upward ownership links to tax haven states report significantly less profits in relation to the average factor profitability of the overall sector than their German counterparts**.
* H6: **German energy firms are increasingly owned by NBFIs**.
  + H6.1: *The share of NBFI owners is particularly high in secrecy jurisdictions*
* H7: **The number of ownership chains passing through** (H6.1) **or ending at** (H6.2) **tax haven states is positively related with political decisions towards a liberalization of the energy market**.
* H8: **The number of ownership chains passing through** (H7.1) **or ending at** (H7.2) **tax haven states are positively related to the number of renewable energy providers located in Germany**.

# Data & Methodology

My main data source for firm data is Orbis. The Orbis database from Burau van Dijk is considered one of the most complete and accurate micro-level databases available to researchers and suits well for my purpose. In order to conduct the models, some adjustments need to be applied to the Orbis list-exports. The detailed description of this process can be retraced in appendix III[[20]](#footnote-20). However, due to the novelty of this method I will briefly explain each single step I applied to the dataset in this chapter for the sake of transparency and methodological contribution to economic science.

The original dataset was exported from Orbis on the 13th of March 2021. The search scheme identifies all (active and inactive) companies available on Orbis that are located in Germany. Furthermore, only companies that are categorized in the Statistical Classification of Economic Activities in the European Community ("nomenclature statistique des activités économiques dans la Communauté européenne" – NACE) space 35xx (electricity, gas, steam and air conditioning supply) where included. Additionally, I added all subsidiaries owned by these companies by at least 50.01% and all shareholders controlling them (also defined by a held share of at least 50.01%).

For my model, it is not sufficient to use a static ownership dataset (snapshot). Firstly, the evolution of the German energy ownership network is a substantial part of my descriptive results. Secondly, it has been shown that research regarding firm characteristics (like tax burden) can be significantly distorted by ownership changes (Grosskurth 2019a). However, the (re)creation of dynamic ownership chains is not an easy task and a relatively new approach in economic network analysis. Orbis, by standard, only supports current snapshots of ownership links in list format (detailed historical ownership information are until now only available at the individual firm profile pages).

There are a handful approaches to solve this problem. For those having access to “Orbis Historical”, one can recreate historical ownership information by merging a current Orbis snapshot with historical snapshots that can be exported from Orbis historical year by year (Kalemli-Ozcan et al. 2015). This method, though definitely an improvement to just assuming ownership has not changed over time, comes with two major drawbacks. First, Orbis historical is a costly extra package of the already fee based Orbis access. Accordingly, Orbis Historical is only available to a very small group of researchers, making Orbis Historical based models hardly reproducible to a fairly large researcher base. Second, and this is particularly important for research with a focus on ownership, Orbis coverage of ownership links has significantly improved over time, making Orbis Historical based models vulnerable to be “skewed” towards the present (Bajgar et al. 2020).

In my opinion, the currently second-best practice to recreate historical ownership data with Orbis is to merge a current Orbis snapshot with some kind of mergers and acquisition (M&A) dataset. This approach is, even though it is not at all perfect, currently recommended by the OECD (Bajgar et al. 2020). In their paper, Bajgar et al recommend the Zephyr database of Bureau van Dijk. Other researchers have achieved high levels of validity by merging Orbis with the EU Emissions Trading System (EU ETS) transaction database (Jaraitė et al. 2014; Jaraitė et al. 2016). This is, in general terms, also the approach that I apply in this thesis. However, there is one approach that would arguably have a more accurate outcome.

To use a web scraper program (a program that can retrieve information from a html page) to extract historical ownership from each firm’s Orbis report sheet individually and combine the resulting data with a bottom-up ownership merging process (Alabrese and Casella 2020) would overcome two central limitations of my method. However, this approach would need enormous amounts of bandwidth and processing power that are both not available to me at the moment. I will therefore settle with the M&A data method as a *best possible* approach in this work, complemented by a careful analysis and discussion of its limitations.

Instead of Zephyr (which I currently not have access to) I use a light version of the same that is included in my Orbis access. Though some details (that are mostly not relevant to my model) are missing, this light version still contains the most important M&A information including deal type, acquirer ID and country, vendor ID and country, target ID and country, deal structure and date of competition. After exporting all available deals in which the companies from the initial dataset are included (as acquirer, vendor or target) I pre-filter these deals to exclude all those not containing transfers of controlling shares by a series of string detections (Appendix II – 4). Next, I apply a matching algorithm between the company set and the M&A set. I found this to be necessary since Orbis does not always reliably classify if controlling shares were transferred or not by its deal structure information. There are e.g. some deals classified as “Patent sale” that imply a transfer of ownership whereas other deals with the same classification do not.

The algorithm roughly works as follows[[21]](#footnote-21) : Starting from the company list snapshot of 2021, I check for each deal of 2021 whether the respective *acquirer* is the owner of the according *target* in the company dataset of 2021. If that is the case, I assume a transfer of ownership since companies rarely “acquire” their own companies and even if they do (stock increase, share buyback), these cases can be assumed to be reliably pre-filtered by the previously described string detection. For those deals that have been validated, the owner of 2021 is replaced by the vendor of the respective deal in 2021 and a modified dataset is created for 2020. The same process is repeated from a vendor’s perspective. I check again for each deal that happened in 2021 whether the *vendor* is still the owner in 2021. If that is the case, the deal is assumed to be invalid, and no modifications are applied. If the vendor of the deal is not the owner in 2021, I assume a valid deal respecting those vendors must own their companies before they can sell it. Again, exceptions (stock increase, share buyback) are assumed to be already filtered by aforementioned string detections. If a deal got validated, the owner of 2021 is replaced by the vendor of the according deal in 2021 in the modified 2020 dataset.

This method unfortunately has one weakness. For the case of public takeovers, no string filter can be applied since there are both public takeovers that imply the transfer of controlling shares from one shareholder to another, and those implying a number of minority holders selling a *summed up* controlling share to the new controlling shareholder. Unfortunately, the Orbis M&A database I use does not contain information about the formerly held percentage of share vendors. I had to decide whether to exclude all public takeovers or assume the formerly largest shareholder of a deal (always on top of the list of all former shareholders at Orbis) to be the past controlling shareholder. In respect to my hypotheses, I chose the second method since it rather *overestimates* the count of past shareholders than to *underestimate* it, which would, if at all, rather weaken my results than falsely empowering it. This can be seen as a measure of robustness, even though it inarguably is an inaccuracy. However, for the 50 deals I validated manually by looking up respective Orbis individual company reports, I did not find a single error of the applied algorithm. Nevertheless, I cannot guarantee for a hundred percent that the reconstructed past datasets are entirely free of errors of the described kind.

This matching algorithm was applied to create modified company datasets for all years until the earliest noted deal in Orbis in 1996, which covers the whole range of my main research timespan. Afterwards, all these *new* owners of the years before 2021 that are not already included in the original 2021 Orbis dataset were again exported from Orbis together with their current ownership links. These links have then been attached to the respective companies in all years before 2021. Since I do not know if these *levels* of ownership also changed in the past, I now repeated *all* the steps yet described in this chapter until the algorithms applied no further changes to the datasets in any year.

Next, in all datasets (including 2021), companies that were not founded until the respective year or withdrew from the market until the respective year were deleted from the set going by Orbis information about founding and exit dates. If a deleted company is positioned in the middle of an ownership chain, this chain will be split in two parts before and after that company. Afterwards, all ownership chains without at least one German energy company *with a known date of incorporation* were removed from the sets. [[22]](#footnote-22)

I furtherly apply adjustments to the location information of all companies and their controlling shareholders. The main location indicator used in this thesis is the ISO country code. Problematically, some secrecy jurisdictions are not entirely politically independent and therefore have no unique ISO. Instead, they share the ISO code of their superordinate sovereign. However, since many of these “non-nation” jurisdictions have significantly different laws and embody (this will later be discussed in more detail) significantly different positions and roles in the ownership network, they must be separated for my research purpose.

In my sample, these “non-nation” jurisdictions are the City of London (local government district of the United Kingdom), Jersey, Guernsey, the Isle of Man (all three are British Crown Dependencies) and the US state of Delaware, which can be seen as a special political zone inside the USA since its corporation law differs substantially from all other US states (State of Delaware 1897; Strine, Jr. 2015). Every legal entity located in one of these special law zones is identified by a combined string search of postcodes, city names and company names (appendix II – 7). The entities ISO code is then changed in order to differ to the ISO code of the superordinate sovereign.

At this stage, the preparation of the datasets is finished. For every year from 1599 to 2021 (the earlier years mainly serve illustrative purposes) each dataset consists of unique firms and their complete upward ownership chains starting at the lowest subsidiary level. Each of these chains, as said, contains at least one German energy company with a known date of incorporation. Because I share the conviction of many researchers that a lucid and appealing visualization of complex and extensive quantitative data is the most effective way to transfer information (Tufte 1983), I decided to geo-map all companies throughout the dataset and create an interactive web-interface which can be used to look at the ownership networks over time. This can be accessed at <https://maxmlgz.github.io/Masterthesis/>. Even though these visualizations alone cannot provide “tangible” research results like numeric results attempt to, visual appeal is a particular strength of network analysis and can give whoever perceives it an additional, more intuitive angle to interpret the results of this thesis.[[23]](#footnote-23)

In order to check H1, H2 and H3 I use two network indicators. The first one is *betweenness centrality*. Betweenness centrality is a network metric that measures to which degree a network node falls on the shortest path between two other nodes (Freeman 1977). In mathematical terms, betweenness centrality g defines as:

With v being any given node in the network, being the number of shortest paths from node s to node t and the number of shortest paths between s and t running through v. In my case, network nodes represent the host countries of the companies in my dataset and paths are edges (connection between two nodes, in my case ownership links) or a chain of edges connecting one node to another.[[24]](#footnote-24) *Shortest* path, in this context, does not mean the geographically shortest path but the path with the minimum number of nodes on its way. Betweenness centrality is widely regarded as an accurate measure to identify central intermediaries (or proxies) within a network, which is exactly what I am looking for in order to pinpoint *conduit* nations.

To measure the characteristic of a host country (node) to be on top of (long) ownership chains, I came up with an own indicator h (ownership score) defined as:

with n being all ownership chains a host country *v* is part of, *pos* being the position of *v* in an ownership chain *i* (starting at 1 = global ultimate owner, GUO) and *length* being the total number of entities that are part of the chain *i*. This indicator may by very simple from a mathematical perspective. Nevertheless, it expresses very well the tendency of a country (node) to host entities at a high level of long ownership chains.

# Discussion

# Conclusion

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# Appendix I – Additional Tables and Diagrams

## Chronological overview of energy policy in Europe and Germany [[25]](#footnote-25)

|  |  |  |
| --- | --- | --- |
| 1990 | The Act on the Supply of Electricity from Renewable Energy Sources into the Grid (Stromeinspeisungsgesetz): - Electrical power generated from renewable sources were granted priority on the energy market - Distributors were obliged to prefer renewable energies whenever possible at a minimum price  - Minimum price as percentage on average electricity price (including conventional generation) | StrEG |
| 1996 | EU directive 96/92/EC:  -Free entry to the transport segment must be assured and regulated for all energy supply companies  -Different regulation modes of access to the transport segment are possible (e.g., regulated or negotiated third party access). | First Act |
| 1997 | First mergers and acquisitions of large energy supply companies |  |
| 1998 | National Energy Act of 1998: - Complete seamless liberalisation; - Access to the transport net had been regulated by the “negotiated access” though “association agreements between energy producers and industrial consumers” (without a special regulatory agency); - Unbundling from production- and supply segments from the network segment through “separation of accounts” | EnWG 1998 |
| 1999 | New electricity provider appeared; electricity prices declined |  |
| 2000 | Strong increase of market concentration due to mergers and acquisitions of energy supply companies |  |
| 2000 | Renewable Energy Sources Act 2000: - Introduction of independent feed-in tariffs (Einspeisevergütung)  - Obligatory acceptation of renewable energy by grid operators at fixed prices (not bound to conventional energy prices anymore) | EEG 2000 |
| 2001 | Further merger waves; new electricity provider disappeared due to low energy prices |  |
| 2001 | EU Directive 2001/77/EC - overall renewable energy source target set to 10% by 2010 | RES 2001 |
| 2002 | Electricity prices increase |  |
| 2003 | EU acceleration directive (2003/54/EC):  - Obligation for “regulated third party access” through a regulatory agency - “legal unbundling” of electricity production and supply from the network segment until 1 July 2004 | Second Act |
| 2004 | Renewable Energy Sources Act 2004: - Reduction of feed-in tariffs for wind turbines - Adjustment to European legal requirements | EEG 2004 |
| 2005 | National Energy Act of 2005: - “regulated third party access”, - a regulatory agency for the network segment and - legal unbundling have been enacted delayed | EnWG 2005 |
| 2006 | First electricity net price reductions, nevertheless (end) electricity prices for private households increased considerably |  |
| 2007 | Price authorisation of end consumer prices will end in July 2007 |  |
| 2008 | Start of net price regulation, based on incentive regulation |  |
| 2009 | EU directive 2009/72-73/EC:  - Unbundling of generation and supply  - Regulators must now be independent from both industry and government - Founding of ACER (Agency of the Cooperation of Energy Regulators) - Further enforcement of EU energy markets and discrimination-free markets - Transfer of national legislative power in favour of EU-authorities | Third Act |
| 2009 | EU directive 2009/28/EC (Renewable Energy Directive): -overall renewable energy source target set to 20% by 2020 | RED 2009 |
| 2009 | Renewable Energy Sources Act 2004: - New target of 30% of overall power generation should be generated by using renewable energies until 2020 - Improved cost control if photovoltaic power plants | EEG 2009 |
| 2010-2012 | Massive increase in foreign affiliates |  |
| 2011-2012 | National Energy Act of 2011:  - Enhanced market transparency guidelines - Prohibition of insider trade - Introduction of new consumer rights (mediation institutions, poverty protection) | EnWG 2011 |
| 2012 | Renewable Energy Sources Act 2012: - Acceleration of nuclear phase-out, setup of new renewable supply percentage targets, - Market premium ("EEG Umlage") for renewable energy sales below an ex-post assessed "average electricity price" | EEG 2012 |
| 2012-2013 | Energy prices rise sharply again |  |
| 2014 | Renewable Energy Sources Act 2014: - Invocation of guaranteed returns (feed in tariffs) - Overall decrease of public funding options, especially in biomass and offshore-wind power plants | EEG 2014 |
| 2017 | Renewable Energy Sources Act 2017: - Introduction of competitive bidding system for public funds - Regulated "sector linking" (Sektorkopplung) to equal out generation fluctuations by conventional power plants | EEG 2017 |
| 2018 | Revised renewable energy directive 2018/2001/EU: - Overall renewable energy source target set to 32% by 2030 | RED II 2018 |
| 2020 | EU directive 2018/844,2001,2002,1999,943,944,941,942 - aims at insuring fully competitive supply prices without public intervention - full opening of national energy markets (including access of distribution infrastructure) in favour of a joint, European energy market | Fourth Act |

## 

## Growth of the renewable energy sector from 1990 to 2019

Chart, funnel chart

Description automatically generated

Figure : source: (Lenz et al. 2019)

Timeline

Description automatically generated

Figure : source: (Rechsteiner 2020)

## 

## Development of natural gas prices

For electricity prices:

Consumer: 1991 – 2006 = 3500 – 7500kWh / year; 2007 – 2020 = 2500 – 5000kWh/year

Industry: 1991 – 2006 = 2000 – 10000MWh/year; 2006 – 2020 = 2000-20000MWh/year

Small Industry: 2004 – 2006 = 160 – 1250MWh/year; 2006 – 2020 = 20 – 500MWh/year

Large Industry: 2004 – 2006 = over 70000MWh/year; 2006 – 2020 = 70000 – 150000MWh/year

For gas prices:

Consumer: 1985 – 2007 S1 = all consumers (single tariff); 2007 S2 – 2020 = 20 – 200 GJ/year

Industry: 1985 – 2007 S1 = 41860 – 418600GJ/year; 2007 S2 – 2020 = 10000 – 100000GJ/year

Small Industry: 1985 – 2007 S1 = 4186 – 41860GJ/year; 2007 S2 – 2020 = 1000 – 10000GJ/year

Large Industry: 1985 – 2007 S1 = 418600 – 4186000GJ/year; 2007 S2 – 2020 = 1000000-4000000 GJ/year

# Appendix II – Technical details of the model

## Filter scheme for M&A dataset

## Detailed description of the matching algorithm

## Detailed description of the founding / closing date algorithm

## Detailed description of special law zone string match

## About the network diagrams

1. Veblen 1904, first page of chapter two [↑](#footnote-ref-1)
2. In fact, Ohlin even mentioned single cases of companies holding controlling shares in foreign branches to ensure constant supply of foreign raw materials (Ohlin 1935 Those considerations can be interpreted one of the first recognitions of internalization motives. The author, however, did not systematically define foreign direct investment (controlling shares) from portfolio investment (minority, yield driven share), neither did he attempt to generalize a theory of foreign direct investment. [↑](#footnote-ref-2)
3. In this case competitive market power such as predatory pricing, control over recourse channels or bargaining power towards governments or industry partners resulting in favorable or privileging regulations. [↑](#footnote-ref-3)
4. Based on Dunning and Lundan 2008 p. 101 f. [↑](#footnote-ref-4)
5. Tax avoidance strategies, especially transfer pricing, mainly fall into this category but will be discussed later. [↑](#footnote-ref-5)
6. From Strange 1996 p. 73 [↑](#footnote-ref-6)
7. The White House, Remarks by the President on the Economy, available at: https://obamawhitehouse.archives.gov/the-press-office/2016/04/05/remarks-president-economy-0 [↑](#footnote-ref-7)
8. Research has indicated that regions with larger primary and secondary sectors tend to overtax those sectors in the attempt to compete for low taxation tertiary sector at the cost of overall welfare (Stöwhase 2005). [↑](#footnote-ref-8)
9. From Rixen 2013p 437-438 [↑](#footnote-ref-9)
10. Most of these economies also show the highest activity of shadow banking withing the NBFI sector, FSB 2020. [↑](#footnote-ref-10)
11. Loomer and Maffini differentiate between offshore finance and tax havens arguing that many onshore off-balance banking is equally dangerous. As examples for non-offshore banking centres, they name London and New York. I agree to this differentiation but still argue that this does not diminish the risk secrecy jurisdictions bear. Moreover, in this work, at least the City of London will be treated as if it was a tax haven. (This will be justified later). [↑](#footnote-ref-11)
12. An assessment of the political progress and its impacts would exceed the scope of this thesis. For empirical data about the ongoing relevance of offshore finance see FSB 2020 A political reflection of countermeasures is brought by Helleiner 2014. [↑](#footnote-ref-12)
13. An exemplary assortment of applications in different fields of science can be found in Fu et al. 2017. [↑](#footnote-ref-13)
14. Li et al show reoccurring chain patterns in minority stock investments regarding to global energy investments. Finér and Ylönen demonstrate how Finnish corporates use multilevel ownership models to lower their tax burden. [↑](#footnote-ref-14)
15. This, as of today and in the German context, applies for both conventional and renewable energies. See Zerzawy et al. 2021 or IEA 2020. [↑](#footnote-ref-15)
16. Appendix 1 gives an overview of political actions regarding both market liberalization and clean transition. The table contains both EU directives German policies. In this section, I will only comment on a smaller selection of most the impactful measures. [↑](#footnote-ref-16)
17. Appendix 2 shows two diagrams about the growth of renewable energy generation absolute and in relation to other sources. It can be used as a reference to evaluate the impact of historic energy policy and the content of this chapter. [↑](#footnote-ref-17)
18. It is generally difficult to pinpoint these price developments to one or two specific events. This is especially relevant for the natural gas price, which was until 2010 bound to the oil price and therefore highly sensitive on external factors. This chapter is therefore best taken as a description of the circumstances of the research model later on. Nevertheless, I wanted to at least add some possibilities about political causes behind these price developments. For a detailed overview of the natural gas prices in Germany see Appendix 3. [↑](#footnote-ref-18)
19. The accident forced Japan to import large amounts of liquified natural gas, see Bukold 2015. [↑](#footnote-ref-19)
20. Full R-code available at <https://github.com/MaxmlGz/Masterthesis> [↑](#footnote-ref-20)
21. Detailed description in Appendix II - 5 [↑](#footnote-ref-21)
22. I thought a lot about this step. But after some trial-and-error, I found this to be the best method to create a consistent and comparable dataset. Since I use date of incorporation as a filter criterion, it only makes sense to kick out companies with no available incorporation date. By expanding this filter to German energy companies, I prevent to filter out GUOs that are for example located in secrecy jurisdictions and do not reveal their company details. I also filter out branches that are, for whatever reason, not assigned to their owner by Orbis while keeping those that are correctly assigned. This is because correctly assigned branches are now part of the same chain as their owning non-branch company, which in almost every case has a valid date of incorporation. This also prevents double-counting of branches. [↑](#footnote-ref-22)
23. For detailed information about the network graphics and the reasoning behind shape and color-code can be found in appendix II-8 [↑](#footnote-ref-23)
24. I use the normalized version of betweenness centrality defined as in order to ensure comparability within the networks of different years which have different amounts of nodes and edges. [↑](#footnote-ref-24)
25. Own composition, used sources: Brunn and Sprenger 2014; Lenz et al. 2019; Getachew 2019; Brandt 2006; Elspas et al. 2016; Rimmler 2015; Meeus and Nouicer 2018 Green = focus on renewables, orange = focus on market policy, light tint = EU policy, dark tint = German policy [↑](#footnote-ref-25)