BI

WISEflow
Europe/Oslo(CEST)
30 Jun 2022

Handelshøyskolen BI

GRA 19703 Master Thesis

Thesis Master of Science 100% - W

Predefinert informasjon

Startdato:	16-01-2022 09:00	**Termin:**	202210
Sluttdato:	01-07-2022 12:00	**Vurderingsform:**	Norsk 6-trinns skala (A-F)
Eksamensform:	T		
Flowkode:	202210||10936||IN00||W||T		
Intern sensor:	(Anonymisert)		

Deltaker

Jingxin Su, Ole Gunnar Henriksen Nordli

Informasjon fra deltaker

Tittel *:	Is the Electricity Market Efficient? - An Investigation of the Norwegian Electricity Market
Navn på veileder *:	Espen Rasmus Moen

Inneholder besvarelsen konfidensielt materiale?:	Nei	**Kan besvarelsen offentliggjøres?:**	Ja

Gruppe

Gruppenavn:	(Anonymisert)
Gruppenummer:	277
Andre medlemmer i gruppen:	

Is the Electricity Market Efficient? - An Investigation of the Norwegian Electricity Market

Hand-in date:

30.06.2022

Campus:

BI Oslo

Examination code and name:

GRA 19703 Master Thesis of Science

Supervisor:

Espen R. Moen

Ole Gunnar Henriksen Nordli

Master of Science with Major in Economics

Jingxin Su

Master of Science in Applied Economics

PREFACE

With this thesis, we finish our 5-years at BI Business School with a Master's degree in Business and Applied Economics. We offer our sincere gratitude to our supervisor, Espen Rasmus Moen, who has guided us through this project. We want to thank the Norwegian Consumer Council for their time, correspondence, and access to their databases for data extraction. We would also like to thank NVE-RME for helpful dialogue and for answering statistical questions regarding their database. Further, Felix Kampfhammer is much appreciated for multiple discussions regarding the data analysis. Every contributor has given us a deeper understanding of the thematics; their help leads our thesis to a satisfactory completion. Finally, it is worth mentioning that, with this dissertation, the goal is not to hang out with specific electric retailers but to point out the general business practice in today's market. We hope this study can be helpful and work as a bit of inspiration for future research.

CONTENT

List of Tables

List of Graphs

ABSTRACT

The electricity retailing market has been brought to attention recently for gaining massive revenues and confusing consumers in its pricing settings. This paper intends to examine the efficiency in the electricity end-user market and discuss potential influencing factors. The study's results indicate problems to certain degrees, such that retailers are reluctant to behave optimally on behalf of consumers. Many factors also hinder a large portion of passive consumers psychologically from switching retailers to obtain better benefits. Analyses show the significant scale of markups presenting a high level of market concentration; many results lead to the conclusion that the Norwegian electricity market is inefficient and at an imbalance.

1.0 INTRODUCTION

The electricity retailing market is debated for misleading consumers and gaining billions of NOK in yearly profit at the cost of consumers' welfare. As a result, the electricity market has received enormous complaints over many years. (Solli, 2019; Forbrukertilsynet, 2020; Forbrukerrådet, 2020A). The retail market is divided between private households and industry, where we will focus on the prior. This paper's initial and primary purpose is to investigate if the end-user market is at an efficient level that delivers maximum consumer welfare, along with discussing potential influencing factors. We want to explore whether and how the market is shifting and whether market players enforce market power and other strategies to gain favorable or monopolistic positions in the competitive arena.

We also want to explore how the electricity market performs regarding the competition. Here we discuss the concentration ratio and if today's market plays a role at a socio-economic cost or benefit to the overall society. Further, we discuss behavior perspectives with available aggregated data to establish an understanding of the consumers.

2.0 RESEARCH QUESTION

Norway liberated the electric retail market in 1991, striving for an efficient market. Therefore, we would like to investigate the development of the competitive environment in recent years and how business practice may affect consumer welfare. Our research question explores whether the electricity market and its business conduct deliver efficient welfare for the consumer. We will explore whether today's profits are optimal and how the contracts are designed to optimize consumers' willingness to pay. Additionally, given the recent energy crisis where electricity prices are abnormally high and have received attention and created debates, we intend to take advantage of current data to explore. In conclusion, our research question is as follows:

"Is the Electricity Market Efficient?
An Investigation of the Norwegian Electricity Market".

3.0 BACKGROUND INFORMATION

This section describes the history and framework of the electricity retailing market and its participants. Further, we go into detail about the three product types. After that, we discuss geographical relevance, and lastly, we dissect the invoice and specify the details that this thesis will primarily research.

3.1. Market Overview

The history of the liberation of the Norwegian electrical market started in 1990, the competition evolved until 1999, and it is broadly and internationally considered a success. This statement relies on the argument that large proportions of the market are fully competitive with a diverse product range where prices float around cost (von der Fehr & Hansen, 2010). However, according to the EU Consumer Markets Scoreboard of 2018 (European Commission, 2018), the electricity retailing market in Norway is ranked in the bottom three regarding market performance index (MPI) quality. This review " identifies markets that are not creating the expected benefits for consumers " (European Commission, 2018, p.8). The reduction in market performance quality is greater than in comparable markets in the EU (European Commission, 2018).

3.2 The retailer

A retailer is a participant who sells goods to the public in comparable small portions for use or consumption (Tushar et al., 2021). All electricity retailers need approval from RME (Regionalmyndigheten for energi) to be a part of the market. Retailing electricity to end-users defines a power retailer, even though they can have products that exceed this. For instance, retailers make purchases in the wholesale market, through Nord Pool, or from a private power producer on behalf of its end-users. To specify, the delivery of electricity is not the retailers' responsibility; this responsibility lies with the infrastructure owner and distributor, which is excluded in this paper due to their natural monopolistic perspective. One end-user cannot change its distributor but can change its retailer. The core business activity of a retailer includes sales, advertising, and customer support (Oslo Economics, 2021). A heterogeneity applies to the retailers; on one side, nationwide retailers work across different regions. On the other side, we have those who only operate within their area and region. The latter actively charges over market price and acts as proof that some exert their market power at the expense of their passive customers (von der Fehr & Hansen, 2010).

In later years most households have converted their consumption meter to digital AMS' (Advanced Measurement and Control Systems), which continuously track consumption compared to manual registration on a periodical basis (Elvia, n.d). This technology allows more intelligent pricing strategies to be implemented into hourly formats to balance the distribution power load in the distribution network more evenly. The price comparison perspective for consumers suffers as a result, as this erodes cost comparison possibilities between consumers and greatly relies on retailers to behave non-opportunistic. The argument is; that two households with identical consumption but at different times of the day would have a different total bill due to fluctuating hourly prices. Thus, consumers cannot compare their achieved prices without going through intricate calculations; only a specialist would be able to summarize (Bøhren, 2022), and consumers are left with little or no knowledge about the product.

3.3 The consumer

An end-user, or customer, is defined as a private consumer household with electricity installed. They are segmented into two groups; active/informed and passive/uninformed (Carlin, 2009; von der Fehr & Hansen, 2010; Spiegler, 2016). von der Fehr & Hansen (2010) found that the competitive pricing only reflects the active part of the customer base, whereas the passive, for their negligence, are charged what seems a non-negligible expense. The active consumers take charge and change their suppliers, which stimulates the competitive environment, whereas the passive consumers have never changed their electric plan or retailer and, as a result, are excessively overcharged (von der Fehr & Hansen, 2010).

3.4 Contract types

Retailers mainly offer three types of contracts in the end-user market: Spot, fixed, and variable. A visual representation of the distribution of contracts by Norwegian households is present in *Figure 3.1.*

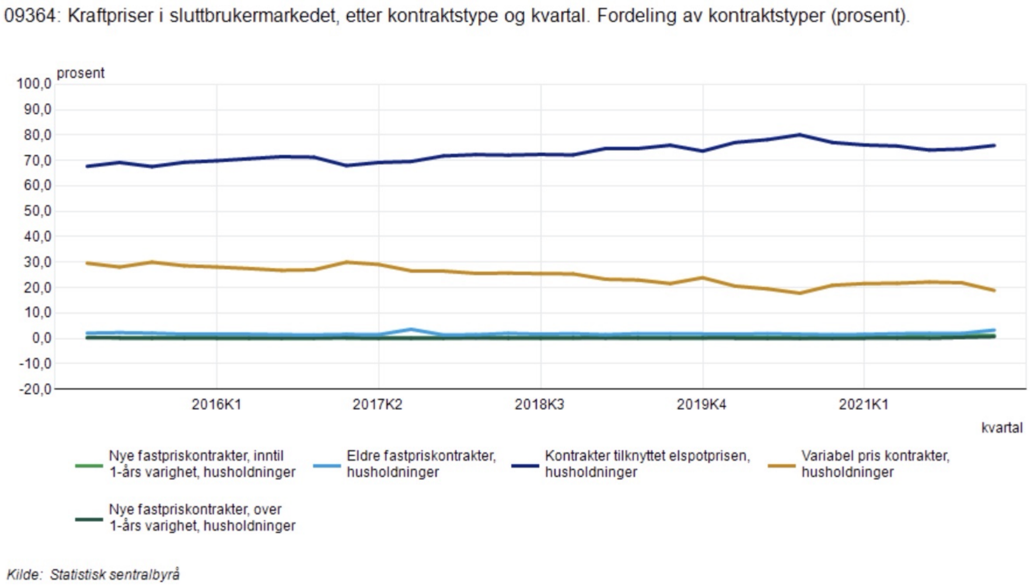


Figure 3.1 Quarterly distribution of power contracts in the retail market (SSB, n.d.B)

Figure 3.1 shows that most households are connected to spot price contracts, shown in the dark blue line, which has increased from about 67% to about 78% in the range of our dataset. The portion on variable price, the orange line, has declined from about 29% to around 18%. Fixed-price contracts, in light blue and green, hold about 4 % of the market share of contracts.

3.4.1 Spot price

With an hourly spot agreement, consumers are invoiced for actual hourly electricity consumption. The price is determined by the power stock exchange Nord Pool, in addition to a surcharge and any monthly fixed amount to the electricity retailer. The hourly spot is calculated by multiplying the hourly rate from Nord Pool by actual consumption for a current hour, and then the surcharge and the fixed monthly price are added. With hourly spot agreements, consumers can influence their electricity bill by shifting their consumption to parts of the day when the electricity price is lower, i. e. in the middle of the day or late at night (NVE, 2021A).

Spot prices have historically been the cheapest contract (NVE, 2020). The Norwegian Consumer Council also recommends this kind of contract to consumers. If consumers need the predictability of prices, a fixed or variable price contract is the option. The Consumer Council has, over time, also alerted and warned consumers against the latter contracts due to more complex languages and terms than ordinary spot price contracts (Strompris.no; Bugge, 2021).

3.4.2 Fixed price

A fixed-price contract is an agreement for a fixed price on power over a period, where the contract period typically ranges from three months to three years; with such an agreement, the supplier is obliged to supply electricity at the agreed price, regardless of price fluctuations in the market. A fixed-price contract gives customers "insurance" against varying electricity prices and can be considered by consumers if they require predictable electricity bills. However, during the agreement period, customers are not usually allowed to change suppliers without paying a breach fee to the old supplier. In addition to the fixed price on consumption, most suppliers also charge a monthly fee (NVE, 2021A).

3.4.3 Variable price

Variable power prices had traditionally been Norway's most widespread type of contract. However, the proportion of customers with this contract has fallen steadily in recent years, as seen in *Figure 3.1* above. Customers who have never made any changes to the agreement with their supplier probably have this agreement (NVE, 2021A). Standard variable power prices vary based on developments in the power market. However, suppliers must inform about price changes 14 days prior to implementation. The power supplier shall notify of changes in the form of a letter to the customer, or electronic messages, such as e-mail, SMS, or message through the "My Page" function on the supplier's page. In addition to the variable price on consumption, most suppliers also charge a monthly fee (NVE, 2021A).

3.5 Geographic limitations

The electric market is divided into five distribution regions; zone N01, N02, N03, N04, and N05, as shown in *Figure 3.2.* Pricing depends on the transmission interconnectors and capacity to transmit energy from one area to another. The segregation of the regions is due to fluctuations in consumption between the areas, where one part can supply another but is restricted by capacity constraints or so-called bottlenecks. The transmission bottlenecks in the infrastructure are taken into account when pricing, thus effectively stimulating energy production and consumption in each geographical area (Statnett, 2021). Prices differ between these zones both at wholesale and retail levels.

Figure 3.2 Distribution of zones in Norway (Statnett, 2021)

3.6 End-users total bill

The end-users total electricity bill includes the electricity wholesale price, surcharge, distribution cost, governmental taxation like "forbruksavgift" (el-avgift), electrical certificates fee, Enova energy foundation, and VAT. We will in this paper only evaluate the surcharge. The total amount a consumer pays for the electricity depends on several factors. Firstly, the wholesale market price, Nord Pool, is calculated depending on what price zone the end-user has its delivery target. Secondly, the distribution costs, taxations, fees, and surcharges are added, where the latter depends significantly on which contract type the consumer is bound to.

4.0 ECONOMIC THEORY

4.1 Market efficiency

In this chapter, we present a review of basic economics, primarily market efficiency, on both company's and consumers' sides of the market. We will also elaborate on information problems using the Varian model. Further, we will look at market power with Herfindal Index. Lastly, discuss relevant topics within behavioral economics, which has various topics that can contribute to the explanation of how consumers make decisions and how they can be influenced in their decision-making process.

4.1.1 Free competition

Free competition, also called perfect competition, arises in a market when "a perfectly competitive market has many buyers and sellers such that no single buyer or seller has any impact on price" (Pindyck & Rubinfeld, 2013, p. 8). According to Pindyck & Rubinfeld (2013), the prerequisites for a well-functioning market are that the players are price takers, product homogeneity, and free entry and exit exist. A player is a price taker when they are not large enough to influence the market price, making buyers and sellers perceive the price as given. Product homogeneity is when goods in a market are identical or substitutable. In this perspective, it does not matter to the consumers who produced the commodity. Free entry and exit refer to the fact that companies can enter and leave the market at no cost and that consumers can freely switch from one retailer to another.

In addition to these three assumptions, according to Grønn (2016), four other prerequisites constitute perfect competition. These are: perfect information in the market, absence of transaction & search costs, players are rational, and there are no public interventions. Perfect information occurs when all market players, buyers, and sellers, have acquired complete knowledge of all prices and other relevant details. No transaction costs guarantee that it must be free to use the market to obtain information about price and quality. It is also expected that players in the market should be entirely rational, which means retailers would try to maximize their profits while consumers aim to maximize their utility. Finally, it is expected that there should not be public interventions, which means that the authorities should not intervene and let the market price be set within the interactions between buyers and sellers. In reality, all these assumptions are unlikely to hold simultaneously; conversely, that does not indicate that the model is unusable. The properties of the model are solid even though not all assumptions hold, which means the theory does not diminish in the case of some deviation (Grønn, 2016).

Companies compete in price when products are homogeneous, where it does not matter to the consumer who produced a good (Riis & Moen, 2016). This type of competition is referred to as Bertrand Competition and appears as follows; the one company that sets the lowest price will win the whole market. Therefore, participants in the market have incentives to undercut other firms' prices, leading to every company setting prices equal to marginal cost, which is the most socioeconomic solution we will go into in the following chapters.

4.1.3 Company efficiency

To define company efficiency and explore the underlying understanding of efficiency, we present the following equations from Belleflamme and Peitz (2015).

$$\pi_i = p * q_i - c_i(q_i) \tag{4.1}$$

Where π is profit, i is retailer i, p is the price that the retailer charges, q_i is the quantity of products served by retailer i, $c_i(q_i)$ is the cost function for the retailer on the given quantity q_i.

A first order condition is applied in order to maximum retailer's profit

$$\frac{\alpha\pi_i}{\alpha q_i} = p - c'(q_i) = 0 \tag{4.2}$$

so that,

$$p = c'(q_i) \tag{4.3}$$

Retailer i achieves profit maximization when its prices charged equals the marginal cost, as seen in *Equation 4.3*.

4.1.4 Consumer efficiency

Marginal utility for consumers is the additional benefit of purchasing one more unit of a good, which can be defined as $u_j'(q_j)$. Regarding necessity goods, the marginal utility of buying an additional unit should be constant across the total consumption, as consumers' satisfaction does not decline when purchasing one more unit of electricity (Varian, 2014). Consumers choose to buy goods whose price corresponds to their marginal utility.

If the Pareto equilibrium hold, then

$$u_j'(q_j) = p = \bar{c}\,(q\ *) \tag{4.4}$$

Equation 4.4 shows that the marginal utility of consumers and the marginal cost of retailers equalize a market price, the market price that makes demand equal to supply.

Riis & Moen (2012) shows, in *Figure 4.1*, that when the market is efficient, optimal quantity is produced, marginal cost is the same between businesses, and products are evenly distributed among consumers. Area A stands for consumer surplus, and B is producer surplus; both have been researched to the optimal levels. In this case, there is no deadweight loss. The market is not only on an efficient level but socially optimal.

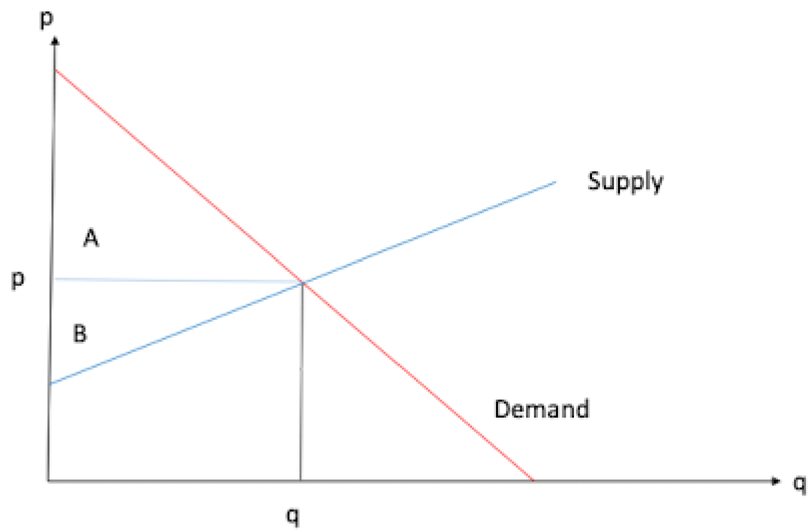


Figure 4.1. Equilibrium price p equalizes demand and supply at the quantity q (Moen, 2021, August 23)

4.2 The power of information

In regards to perfect information, as mentioned in section 4.1.1. We will, in this chapter, look deeper into the underlying nature of information concerning consumer welfare.

4.2.1 The Varian Model

In order to estimate the size of the effects of information asymmetry and how they impact consumer welfare, we initiate an economic model where an assumption will be elaborated. Getting inspired by Varian (1980) and Moen (2021), we would like to take a deeper look at the Varian model of sales combined with our research.

In the model, assume that consumers will purchase up to one unit of a homogeneous product, $I > 0$ of consumers is informed consumers, $U > 0$ of consumers is uninformed consumers, n is the number of companies, and uninformed consumers will be distributed on companies evenly while informed consumers are seeking for the companies who offer the lowest price, define a fraction λ^{I} as the proportion of informed consumers, $\lambda^{U} = 1 - \lambda^{I}$ as the fraction of uninformed consumers.

Define the informed consumers' willingness to pay is *p**, uninformed consumers are willing to purchase as long as the price is smaller than *r*, *r* >*p*, where *p* is the price that companies charge. All consumers' willingness to pay for one unit of a good is *r* > *c*, where *c* is the cost of producing the good.

A firm will get customers $I + U$ if it sets the lowest price, otherwise, it gets *U* consumers, their own share of uninformed customers. All companies sell a homogeneous product where the cost function *c(q)* is decreasing and concave.

Firm sets prices such that

$$(\underline{p} - c)(\lambda^{I} + \frac{1-\lambda^{I}}{n}) = (r - c)(\frac{1-\lambda^{I}}{n}) \tag{4.5}$$

Where $\underline{p}$ is the lowest price retailers can charge, r is the highest price retailers can charge, $\frac{1-\lambda^{I}}{n}$ is the proportion of uninformed consumers that is allocated to one firm.

Equation 4.5 holds that when one retailer charges the lowest price p in the market, all informed consumers will be attracted, in addition to the portion of uninformed consumers located at this retailer. The retailer will only choose this strategy if the profit from setting the lowest price equals the profit when it sets the price to be the highest in the market and attracts a fraction of uninformed consumers. Since retailers compete in the Bertrand manner, the optimal strategy for firms that cannot captivate informed consumers is to set prices to *r* to obtain maximum profit.

Equation 4.5 can be further developed as

$$n(\underline{p} - c)(\lambda^{I} + \frac{1-\lambda^{I}}{n}) = (r - c)(1 - \lambda^{I}) \tag{4.6}$$

$$(\underline{p} - c)(1 + \lambda^{I}(n - 1)) = (r - c)(1 - \lambda^{I}) \tag{4.7}$$

So $\underline{p}$ can be presented in equation 4.8.

$$\underline{p} = \frac{(r-c)(1-\lambda^{I})}{1+(n-1)\lambda^{I}} + c \quad (4.8)$$

According to the equation above, the lowest price goes to the cost under two scenarios. First, when the number of companies, *n,* goes to infinity, the lowest price converges to the cost, indicating that the market is in perfect competitive condition. Secondly, the lowest price is also approaching the cost if the share of informed customers is approaching 1, meaning that the share of the informed customers is approaching 100%.

Moreover, there is no equilibrium in pure strategies, as the companies do not choose one action on the probability of 1, symmetric mixed strategy Nash equilibrium where players randomize their actions indicates the optimal behavior of firms. In order to conduct an equilibrium in the pricing game, a situation where agents are to be indifferent between actions that they choose to randomize can be presented. Set *F(p)* as a cumulative distribution function, *Pr(p'<p) = F(p)*, where $p^{'} \in [c, r]$, indicating the probability of the price *p* that is set by one firm being higher than $p^{'}$ that is determined by its opponents. There are *n* companies in the market, which gives the following equation

$$(p - c)\left((1 - F(p))^{n-1}\lambda^{I} + \frac{1-\lambda^{I}}{n}\right) = (r - c)\frac{1-\lambda^{I}}{n} \quad (4.9)$$

Equation 4.9 indicates the firm's profit under the probability of setting the price the lowest to attract all informed consumers, and its portion of uninformed consumers should be equal to the profit when setting pierce to be the highest and obtain only uninformed consumers.

Equation 4.9 can be further expressed as

$$(1 - F(p))^{n-1} = \frac{(r-p)(1-\lambda^{I})}{n\lambda^{I}(-c)} \quad (4.10)$$

So that

$$F(p) = 1 - \left(\frac{(r-p)(1-\lambda^{I})}{n\lambda^{I}(p-c)}\right)^{\frac{1}{n-1}} \quad (4.11)$$

Equation 4.11 indicates that if the share of informed customers converges to 1, the probability of one setting prices lower than competitors in the market is also approaching 1, which is in line with the situation above, as more customers are familiar with the price distribution in the market, there is a higher chance for retailers to strategize prices to the lowest in the market. Both *equations 4.8* and *4.11* show a significant gain in consumer surplus if the share of informed consumers is prominent in the market, indicating that companies have less aggressive pricing strategies when consumers have more information about the price distribution in the market.

4.2.2 Entry at a cost of K

Assume that companies can enter the market at a cost of *K*, so the number of retailers is adjusted so that the expected profit equals *K,* it follows

$$\frac{(1-\lambda^I)\,(r-c)}{n} = K \tag{4.12}$$

so that there is no social gain.

If one company sets up the lowest price, it will attract all informed consumers and its own share of uninformed consumers, then it follows:

$$(\underline{p} - c)(\lambda^I + \frac{1-\lambda^I}{n})\text{=K} \tag{4.13}$$

Where $\underline{p}$ is the lowest price retailer set up.

The result shows

$$\underline{p} = c + \frac{K}{\lambda^I + \frac{k}{r-c}} \tag{4.14}$$

If *K* converges to 0, then $\underline{p}$ goes 0 as $\frac{K}{\lambda^I + \frac{k}{r-c}}$ goes to infinitely small.

Equation 4.14 indicates the lowest price in the market converged to the market cost if companies can enter the market without or with extremely small costs. Furthermore, the market entry barriers are very low so that retailers can enter and exit freely.

4.2.3 Searching cost

This perspective refers to costs consumers use to engage in market transactions, such as time, energy, or monetary funds. Customers can, as earlier stated, be split into two groups: active customers and passive customers; active customers are lively at searching for relevant information in the market to achieve better deals with benefits, and passive customers are, on the contrary, reluctant to do such. It is logical to assume that active customers are better off obtaining cheaper end-user prices and more benefits such as coupons or campaign deals (Stahl, 1996; Carlin, 2009; Spiegler, 2016).

Stahl (1996) proposed a model on the top of the Varian model, where a fraction of consumers know all prices distributed in the market with zero search cost, and the complementary fraction of consumers pay a cost *z* to get the new price quote.
With all other assumptions being the same with the Varian model, assume that retailers are able to the set the highest price at $p^{max} \leq r$, if $p^{max} \leq r$, the value of searching for a new price for the consumer must be *c*, there are two reasons; first of all, if the cost is bigger than *z*, consumers are willing to pay more if they get drawn on p^{max}, retailers then will lower *p*, there is no equilibrium. On the other hand, if the cost is smaller than *z*, retailers can rise *p* up slightly without inducing consumers to search for new prices.

For uninformed consumers who end up p^{max}, the gain from searching is

$$g(p^{max}) = p^{max} - \underline{p} - \int_{\underline{p}}^{p^{max}} (1 - F(x))dx \tag{4.15}$$

This is valid as long as $g(r) \leq z$.
Equation 4.15 can the be presented as

$$g(p^{max}) = \frac{p^{max}}{r} g(r) \tag{4.16}$$

When $g(r) > z$, Consumers are motivated to search if getting drawn on *r*. So in equilibrium, the cost of searching in the market equals the gain from searching for the consumer on the base of the highest price is adjusted. i.e.,

$$\frac{p^{max}}{r} g(r) = c. \tag{4.17}$$

From the equation above, it is said that *z* will decrease on comparative statistics of $p^{max} < r$, so that consumers have less cost on searching in the market. p^{max} will also decrease if the portion of informed consumers λ^{I} increases; as $g(p^{max})$ shifts up, *F(x)* goes down, so the gain from searching rises up. So for certain *z*, p^{max} will decrease. p^{max} will also drop on the increase of *n*, the number of retailers, *F(x)* shifts down with the increase of *n*, given that the highest price *r* in the market will decrease due to more severe competition among retailers. $g(p^{max})$ is shifted up, which results in a decrease in p^{max}. In conclusion, more informed consumers and more companies in the market result in a direct lower profit for retailers and more consumer surplus in return.

4.3 Market power

As a continuum from the section above where the number of players affects the market, we want to focus on the concentration of competition. The Herfindahl-Hirschman index (HHI), or sometimes HHI-score, is used to indicate the competition level among firms. Market power is an essential factor indicating market concentration (Rhoades, 1993). Rhoades (1993) defines it as:

$$HHI = \sum_{i=1}^{n} MS_i^2$$

Where i indicates firm i , and MS_i is the market share of firm i, there are n firms in the market. U.S. Department of Justice and the Federal Trade Commission (2015) published different indicators for measuring the scale of HHI; an HHI below 0.01 shows a highly competitive market situation, HHI ranges between 0.01 and 0.15 indicates a market with uncertainties, HHI ranges from 0.15 to 0.25 indicates a moderate concentration, and HHI being above 0.25 is considered as a high concentration in the market. From the equation above, the market's competitiveness level can be evaluated with empirical data and further analyzed, which will be elaborated on in a later chapter.

4.4 Behavioral economics

Behavioral economics is a direction within economics that has received much recognition in later years. The subject combines economics with psychology and tests to explain economic behaviors, such as why and how people make financial decisions (Thaler, 2015). When it comes to how consumers make their decisions in the market, this can be of pure self-interest or influence from others - whether they know it or not. Rational sellers want to maximize profit and therefore have the opportunity to influence consumers into choosing their product or service. Selection architecture and “nudging” are two important, professional concepts and will be explained below.

Architecture or architect is often associated with the design of surroundings. However, when it comes to selection architecture or selection architect, an organization representative is responsible for the context in which people make decisions (Thaler, 2015; Thaler & Sunstein, 2021). An example of a selection architect can be a school canteen which places healthy food at eye height instead of unhealthy food. The selection of opportunities students have has not changed, but the consumer's behavior has changed significantly.

For people to choose, they must have several options; how these options have been presented influences their decisions, which can be done by, for example, presenting an option at the very beginning or end, showing special features or benefits of the option, or setting "default option" where consumers need to change the selection actively. Putting the correct default setting will, therefore, significantly affect the outcomes, and this can be done while the freedom to choose still exists (Thaler, 2015).

Behavioral economists disavow the belief in pure rationality and regard real-world decision-makers, "humans," as cognitively biased. Individuals systematically make decisions that deviate from what is considered rational behavior. Deviations arise using heuristics, which simplify the decision-making process under uncertainty by basing judgments on previous experiences, interpretations, or similarities in the field of the topic. Behavioral economics claims that rational individuals lack the valiant qualities of the Homo Economicus and argue that "humans" are fallible and lack self-control in their decision-making. Their decisions are biased-based, inconsistent, and liable towards bounded rationality regarding lack of information towards all alternatives. Not to forget that they are unrealistically optimistic (Thaler & Sunstein, 2008).

In Thaler & Sunstein's view, the traditional economic perspective is simplistic and unambiguous regarding the foundations of rational decision theory. Default options can be put in place to harness people towards a desired behavioral outcome. Default options, or non-educative nudges, are simply the option that a person 'selects' if they do nothing and take advantage of people's assumed inertia, procrastination, and loss aversion (Thaler, 2015).

5.0 METHODOLOGY

This section elaborates on the method and research design to be used. Firstly, we intend to apply quantitative research methodology to empirical analysis to evaluate markups of retailers. Secondly, we would like to investigate whether market power exists in the market by applying quantitative approaches.

5.1 General information

5.1.1 The data

As the main research question is to examine the efficiency of the electricity market, we aim to define efficiency from two perspectives, retailers and consumers. We have limited our data collection to the end-user market and related statistics. The two primary data categories applied in the analysis are retail and wholesale prices. Retail prices are retrieved from the Consumer Council of Norway's database, Strompris.no, to which every retailer must report their prices. Wholesale prices are obtained from the Nordic power exchange market Nord Pool.

The data ranges from 2015 week 27 to 2021 week 52, a total seven years period. The data is shown weekly and split into three pricing types; spot, fixed, and variable contracts. Given the different natures of these three contracts, we divide the market into spot, fixed, and variable, respectively.

5.1.2 Wholesale prices

Wholesale price is the price that electricity retailers pay. Retailers in Norway place quantity and price bids for electricity in the day-ahead power trading system Nord Pool, which uses the bidding results as a base for price-setting for the next 24-hour period (Nord Pool, n.d.). Nord Pool prices are therefore the most influencing factor contributing to the algorithm of end-user prices. All prices are presented as per kWh; the price per kWh will be regarded as the price for one unit of the good. Since retailers retrieve electricity from the distributor and then further transmit it to end-users, the marginal cost for retailers to produce one more unit of goods is the wholesale price the retailers pay to Nord Pool.

5.1.3 Retail prices

Retail prices are the final prices paid by the consumer. This section extracts data from the Consumer Council of Norway, Forbrukerrådet, which has explicit weekly average prices across the market, including monthly fixed fees that consumers are required to pay in order to maintain the current pricing contracts. There are different consumption groups corresponding to different prices, where one consumption group can be represented by a household with the average consumption contract.

The kWh consumption groups given by the Consumer Council are listed as: 40.000, 20.000, 16.000, 10.000, and 5.000, which correspond with Statistics Norway (SSB)' consumption groups named enebolig; rekkehus, kjedehus, andre småhus; boligblokk, and others. We distribute different percentage weights on different household types contributing to final average prices. The accordingly percentage distributions are, therefore:

- "Enebolig" is regarded as one house type with the most significant portion of household electricity consumption, accounting for 53%, and the representative consumption is 25.776 kWh (SSB, n.d.A). We then calculate the consumption type of 20.000 and 40.000 in our data set, concluding that the allocated importance percentage on these two contracts are 64% and 36%, respectively.
- "Rekkehus", "kjedehus", and "andre småhus" are ones with 17% among all house types, and representative consumption is 16.000 kWh.
- Boligblokk has 10.000 kWh in general consumption and is calculated as 25% of all house types.
- For the remaining 5%, we allocate their consumption type as "others", which have a 5.000 kWh consumption.

5.2 Economic model

The methodology is replicated from the paper "Electricity Retailing in Norway" by Nils-Henrik M. von der Fehr and Petter Vegard Hansen (2010). They examined the efficiency of the market by calculating gross mark-ups on different contract types. Their economic model is presented as *equation 5.1*.

$$p_t^r = \beta_0 + \beta_1 p_t^f + \beta_2 p_{t-1}^r + e_t \tag{5.1}$$

Where p^r_t is the retail price for week t, p^f_t is the wholesale price for week t, p^r_{t-1} is the retail price for the preceding week, e_t are the white noises, $t \in [1, 53]$ indicating the week number in each year. All prices are calculated in NOK.

p^r as the retail prices are divided into three categories, spot, fixed, and variable. We intend to use weekly data in the regression for the following reasons: For spot prices, they are updated hourly with the connection to the algorithm of Nord Pool; a weekly average can still catch the variations in hourly data. Due to the contracts' conditions in fixed and variable prices, new customers who are registered and old customers who leave the contracts are on a rolling basis; prices are collected simultaneously with many fluctuations. Therefore, weekly data seems to be an appropriate choice.

Validity is shown in this model; two independent variables have strong explaining powers on the dependent variable. First, retailers rely heavily on wholesale prices to foresee the retailing price trend. Secondly, the past statistics of retail prices significantly influence price-setting strategies. Both independent variables show substantial values in determining the retailer prices.

In order to calculate the markup, equation 5.1 can be further developed, such that

$$\frac{p^r_t}{p^f_t} = \frac{\beta_0+\beta_2 p^r_{t-1}}{p^f_t} + \beta_1 \tag{5.2}$$

It can also be presented as

$$\frac{p^r_t}{p^f_t} = \frac{\beta_o}{p^f_t} + \beta_2\frac{p^r_{t-1}}{p^f_t} + \beta_1 \tag{5.3}$$

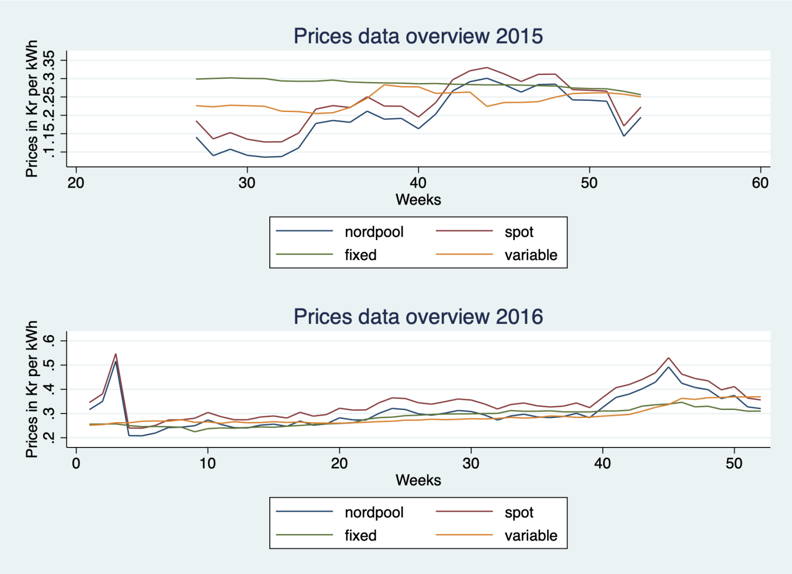
Where $\frac{p^r_{t-1}}{p^f_t}$ can be regarded as the gross markup of retailing price from week t-1 over the Nord Pool price of week t. This component can be an informative tool for predicting the changes in the current markup. This way, the markups on different pricing contracts can be calculated precisely. One thing to pay attention to is that the markups discussed in this paper are gross margins for retailers; they are calculated including labor costs, operational costs, taxes, and other costs; the "purely calculated" markups will be, in reality, smaller.

6.0 DATA ANALYSIS

In this part, we will present the results of the analysis. We will go into variations in gross margins of the three contract types from 2015 to 2021. Also, discuss the main deviations in our findings, looking at variations across different regions and whether the number of competitors in the market affects margins.

6.1 Data overview

The data in *Figure 6.1* below presents the weekly average price for three contracts and Nord Pool as a reference point. Detailed data overviews per year are presented in *Appendix 1-7*.



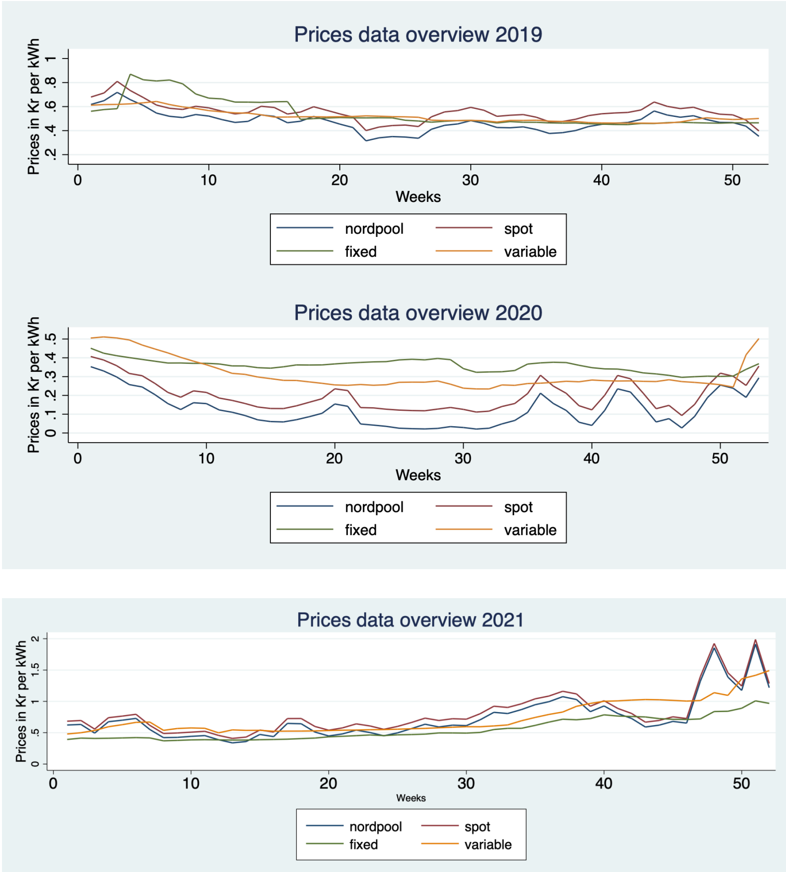


Figure 6.1 Data overview on Nord Pool, Spot, Fixed, and Variable prices

In general, Nord Pool has the lowest average prices, which is in line with the reality that Nord Pool prices are regarded as wholesale prices. This wholesale price is a reference point for our margin calculation of the three contracts in later sections. Nord Pool prices and spot prices fluctuate daily, while fixed and variable contracts, due to the nature of these two contracts having a binding period, operate with lags and thus experience a smoothing effect. As a result, fixed and variable contracts experience prices being lower than Nord Pool prices in some periods. The average spot price has never been lower than Nord Pool, since the spot contract is set to follow Nord Pool plus an additional markup.

Price changes from 2015 to 2019 are generally minor and subtle, especially from 2015 to 2017, where differences between contract prices and Nord Pool prices are small. Starting from 2018, gaps in the various contracts become more apparent compared with Nord Pool prices. These differences are more extensive from 2020 than before. Further, data in 2021 shows fluctuations with the energy crisis emerging by the end of 2021.

In von der Fehr & Hansen's (2010) paper, the markup varies between 4.8 and 10.9 percent in addition to the wholesale price. Up to 2010, markups are said to have been facing a downwards trend explained partly by new entrants with lower margins and individual adjustments (von der Fehr & Hansen, 2010). Additionally, they argue that the highest retail prices have been recognized over what can be considered the average (von der Fehr & Hansen, 2010).

6.2. Contract analysis

6.2.1 Spot prices

Spot prices are based on the hourly fluctuations in Nord Pool prices; they change daily and are the most correlated type with the Nord Pool prices. It is the most purchased consumer contract (SSB, n.d. B). The spot price market coverage has surged below 10% (von der Fehr, 2010) to 78.9% in SSB's latest measurement, as seen in *Figure 3.1.* By adding spot prices and Nord Pool prices into *Equation 6.1*,

$$p_t^r = \beta_0 + \beta_1 p_t^f + \beta_2 p_{t-1}^r + e_t \qquad (6.1)$$

As earlier stated, p_t^r is the spot price for week t, p_{t-1}^r is the spot price for the preceding week, and p_t^f is the wholesale price for week t, e_t here is ignored.

We have obtained regression statistics where all coefficients are significant at the 1% level, seen in *Table 6.1*, β_0 as the constant is 0.049, β_1 is 0.97, showing that if Nord Pool price increases with 1 kr, the current spot contract retailing price will increase by 0.97kr. β_2 at 0.06, indicates an 0.06kr increase in the current spot contract retailing price if there was a 1 kr increase in the spot contract retailing price from last week.

	(1)
nordpool	**0.970***
	(0.017)
spot_past_week	**0.060***
	(0.021)
Constant	**0.049***
	(0.004)
Observations	**339**

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Tabel 6.1 The regression statistics of Spot contracts

By inserting coefficients from *equation 6.1* into *6.2*,

$$\frac{p_t^r}{p_t^f} = \frac{\beta_o}{p_t^f} + \beta_2 \frac{p_{t-1}^r}{p_t^f} + \beta_1 \qquad (6.2)$$

Average markup sorted by year from 2015 to 2021 are obtained and loisted in *Table 6.2*. All numbers are presented in numeric forms.

Year	Summary of markup_spot Mean	Std. dev.	Freq.
2015	**.3370091**	**.14775576**	**26**
2016	**.20415813**	**.03999512**	**52**
2017	**.18768648**	**.0185248**	**52**
2018	**.13424937**	**.02130697**	**52**
2019	**.14847934**	**.02341756**	**52**
2020	**.8475433**	**.713752**	**53**
2021	**.11631648**	**.03490676**	**52**
Total	**.2796705**	**.37897688**	**339**

Table 6.2. Summary of markups in spot contracts, yearly

Our calculations show that the yearly average spot contract markup from our data range, in percentage, amounts to 27.97%. They range from 11.63% in 2021 to 84.75 in 2020. The rationale behind large markups is the decrease of Nord Pool prices, making the share of monthly fees and other markups in contrast with the energy cost substantially higher. In the year 2020, Nord Pool yearly average price is at its lowest in our data range (*Appendix 8*). Wholesale prices averaged 0.125kr while spot prices, including margins, averaged 0.201kr (*Appendix 9*); this further strengthens our findings regarding large markup scales.

Figure 6.2 below reveals that the markup distributions show large fluctuations in 2020, ranging from 17.66% to 265.01%, whereas markups indicate more minor scales ranging from approximately 4% to 65% in other years. The detailed overview of yearly markups clearly shows positive markups in all periods, not only in 2020 but in all other times.

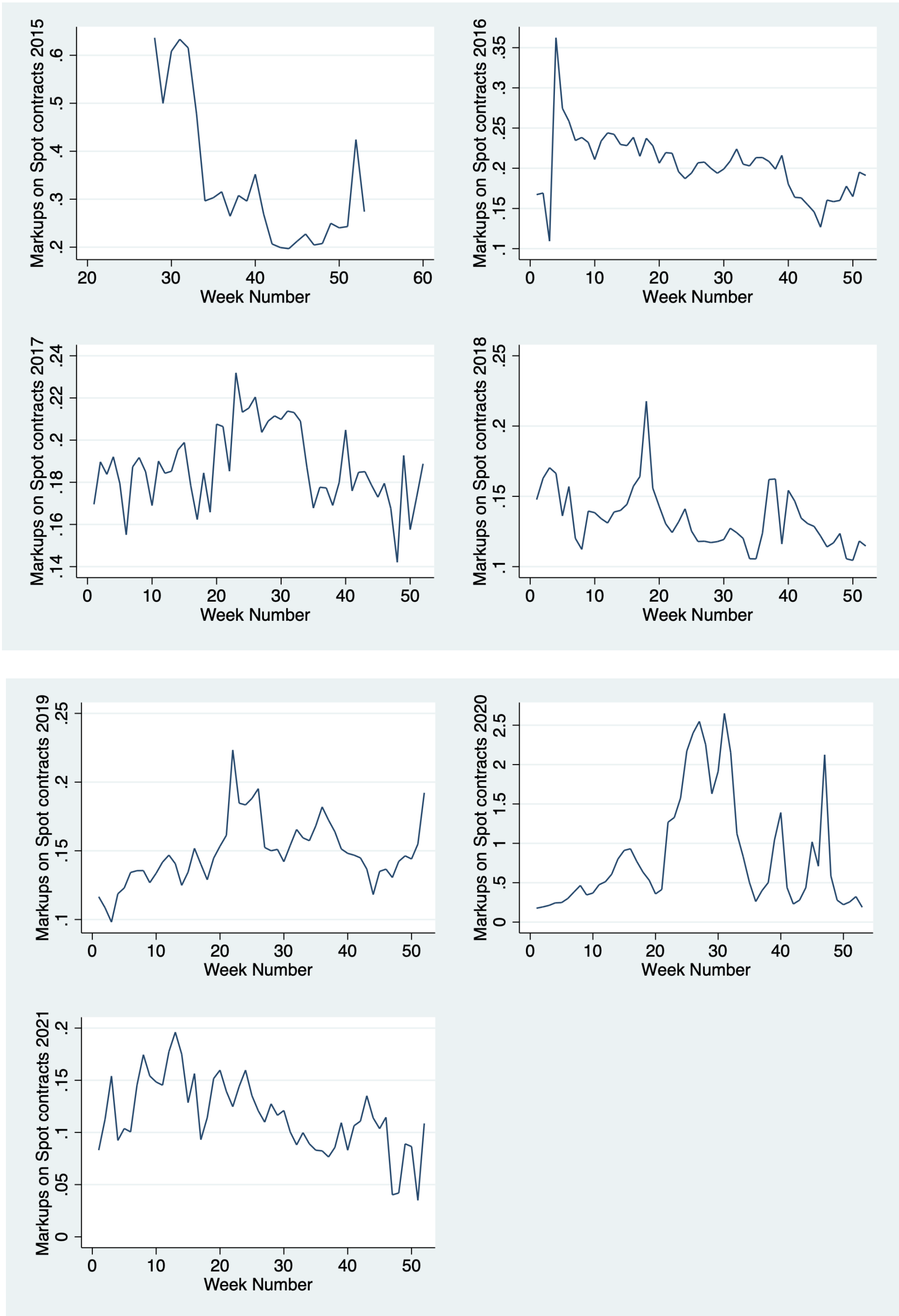


Figure 6.2 Weekly markups from spot price contracts

6.2.2 Fixed prices

By applying the same methods from *equations 6.1* and *6.2* with the fixed price statistics, we obtained the following coefficient results in *Table 6.3* and final markups in *Table 6.4* below. All coefficients show significance at a 1% level, where fixed-price contracts depend heavily on past fixed prices and little on Nord Pool prices. However, both factors show significant influences.

	(1)
nordpool	**0.057***** **(0.010)**
fixed_past_week	**0.937***** **(0.018)**
Constant	**0.005** **(0.005)**
Observations	**339**

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

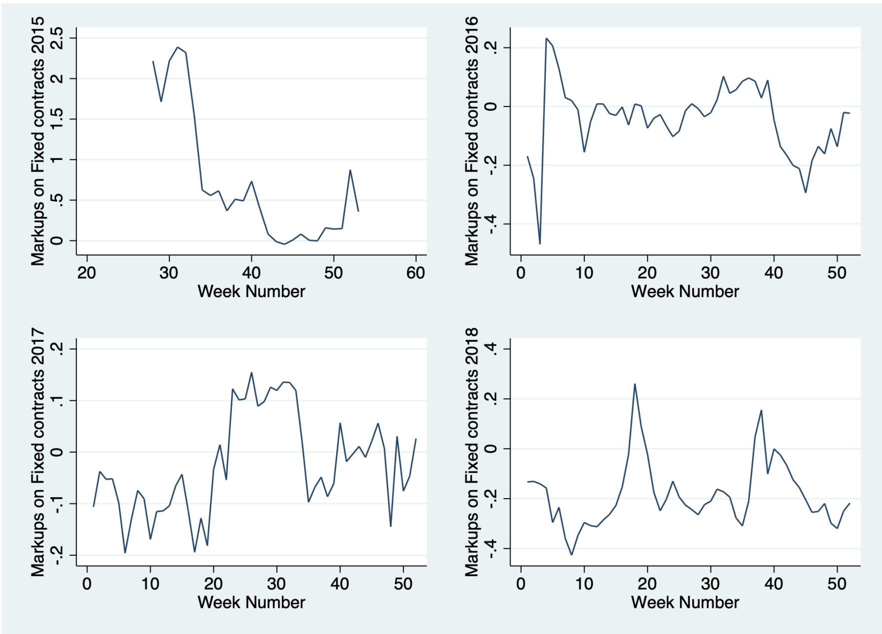
Table 6.3 Regression statistics of fixed contracts

Year	Summary of markup_fix Mean	Std. dev.	Freq.
2015	**.71288122**	**.81268504**	**26**
2016	**-.04255148**	**.12259348**	**52**
2017	**-.02434509**	**.09570612**	**52**
2018	**-.18257825**	**.13116384**	**52**
2019	**.15501019**	**.2169124**	**52**
2020	**4.2033263**	**4.5308134**	**53**
2021	**-.18664247**	**.1834187**	**52**
Total	**.66871278**	**2.36665**	**339**

Table 6.4 Summary of markup in fixed-price contracts, yearly

The overall result from *Table 6.4* shows that the average markup in the period 2015-2021 for fixed contracts is 66.87%. The markup for fixed-price contracts in 2020 shows the most considerable profits compared with others, demonstrating 420.33%. This result, following the wholesale price, demonstrates over four times turnover. In some other years, retailers also experienced negative markups. Both gains and losses can be conducted due to the nature of fixed contracts; when wholesale prices dropped substantially in 2020, the fixed price stayed at the same level, contributing to an increase in markup. The opposite effects can be seen in years that have negative margins. When wholesale prices surge, lagged long-term contracts' in prices induce a loss for retailers, representing a gain for consumers.

The fixed-price contracts express insurance properties against large fluctuations in the market price and, as such, should feature a risk premium. When wholesale prices increased, retailers suffered for not taking enough precautions to cover such eventualities. The retailer's wholesale price variations depend on many market factors. It is challenging to predict pricing trends, upcoming crises, and shocks and thus maintain profits, which can explain the negative markups from 2016 to 2018 and 2021.



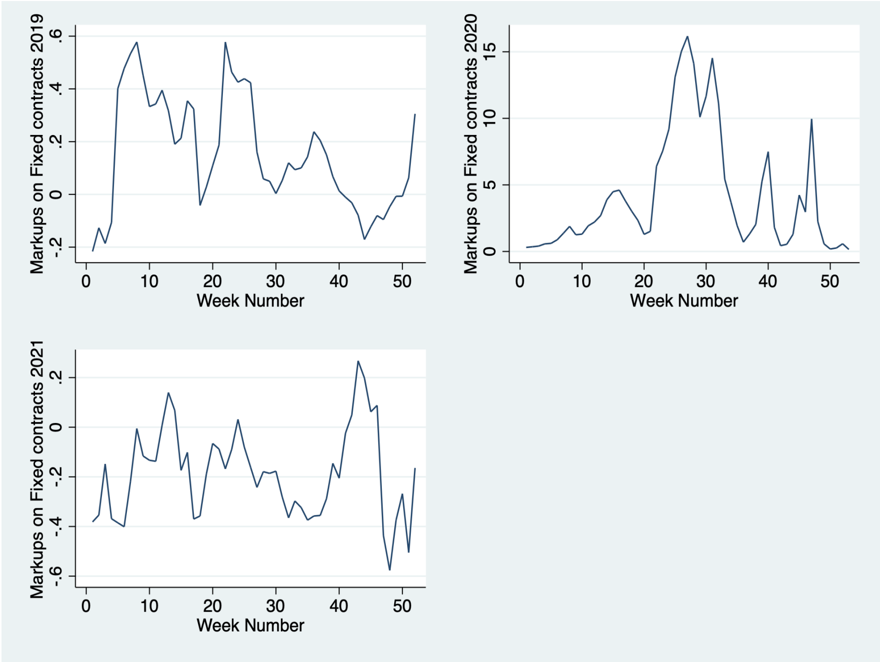


Figure 6.3 Weekly markups from fixed-price contracts

Figure 6.3, 2020 displays the majority of variations and markups. The markup in 2015 revealed high profits for retailers, the same for 2019. On the other hand, negative markups also appeared in the fluctuations of the market.

6.2.3 Variable prices

Variable price contracts vary with the market fluctuations, same as spot price contracts, but are lagging for at least two weeks. Results from regression show significant results with a 1% significance level in *Table 6.5*, the yearly average markups of variable contracts are listed in *Table 6.6*.

nordpool	**0.062***** **(0.012)**
variable_past_week	**0.965***** **(0.018)**
Constant	**-0.006** **(0.006)**
Observations	**339**

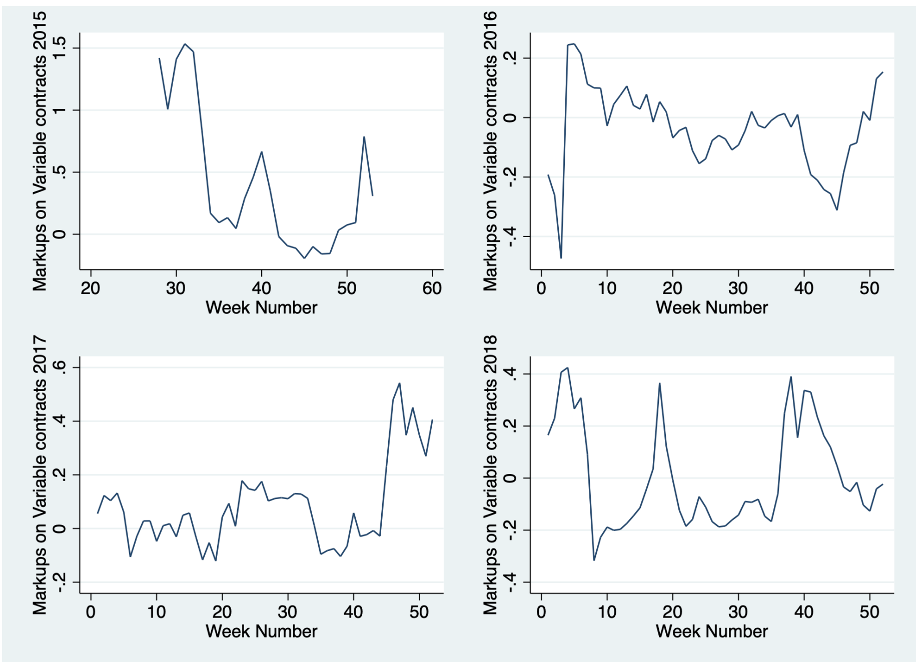
Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Tabel 6.5 The regression statistics of Variable contracts

Year	Summary of markup_var Mean	Std. dev.	Freq.
2015	.39824863	.56162294	26
2016	-.03748274	.13988541	52
2017	.08409106	.15675729	52
2018	.00582156	.19734667	52
2019	.1322883	.17072193	52
2020	3.0332577	3.0221701	53
2021	.06990423	.2771075	52
Total	.54382739	1.6186546	339

Table 6.6 Summary of markup in variable price contracts, yearly

To summarize, the yearly average markup amounts to 54.38%. Again, the year 2020 outperformed earlier and later years and achieved a markup of 303.32%, and the same reasoning can be conducted with the fixed cost; high markups can be achieved when wholesale prices are lower while add-ons charged by retailers take a more significant portion in comparison. The lowest score was in 2016, with a negative 3,75%. The contract shares similarities with fixed- and spot-price contracts, regarding 2020 being the primary driver of markups.



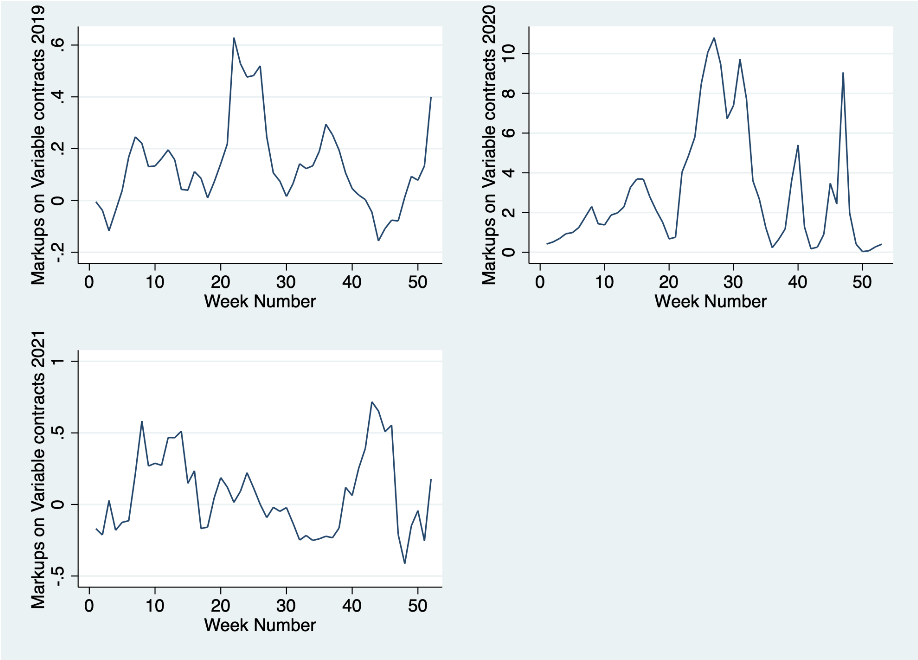


Figure 6.4 Weekly average markup in variable contracts

From *Figure 6.4*, it is seen that 2020 has the most significant markup scale with the maximum point of 10-time turnover; though it lasts for a brief period, the finding is somewhat surprising. Fluctuations are seen across the whole data period, with negative markups for all years except 2015 and 2020, from when markups are shown as the highest and second-highest.

6.2.4 The primary driver of raising markups

From the statistics presented above, it is evident that 2020 has the highest markups in all three contracts, meaning that price gaps in 2020 are also the highest, becoming the main driver of the high markups.

We want to investigate the markups prior to 2020 and compare the results with those in the previous sections. We can retrieve the following results by adapting equation 6.1 with sample data ranging from 2015 to 2019.

6.2.4.1 spot prices

Statistics in regression are presented in *Table 6.7,* whose coefficients can be used to conduct markups, following the equation 6.2.

	(1)
nordpool	**0.946***** **(0.039)**
spot_past_week	**0.159***** **(0.034)**
Constant	**0.009***** **(0.003)**
Observations	**234**

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6.7 The regression statistics of Spot contracts, excluding 2020 and 2021

If 2020 and 2021 are excluded from the spot contracts markup calculation, spot-price contracts achieve an average markup of 15.7% (*Table 6.8*), along with all markups being below 20%, which confirms that 2020 is the primary driver of the average markup.

Year	Summary of markup_spot_pre Mean	Std. dev.	Freq.
2015	**.19342869**	**.06541272**	**26**
2016	**.15578537**	**.04009652**	**52**
2017	**.15476754**	**.01628218**	**52**
2018	**.14424335**	**.02013483**	**52**
2019	**.15487763**	**.01887563**	**52**
Total	**.15697516**	**.0349658**	**234**

Table 6.8 Markups on Spot contracts, excluding 2020 and 2021

6.2.4.2 fixed contracts

After inputting data into equation 6.1, coefficients from the regression are shown in *Table 6.9*. Combined with equation 6.2, the yearly average markups from 2015 to 2020 are shown in *Table 6.10*.

	(1)
nordpool	0.063***
	(0.020)
fixed_past_week	0.932***
	(0.023)
Constant	0.002
	(0.008)
Observations	234

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6.9 The regression statistics of Fixed contracts, excluding 2020 and 2021

Year	Summary of markup_fix_pre Mean	Std. dev.	Freq.
2015	.69457584	.80087329	26
2016	-.04977463	.12051509	52
2017	-.03072037	.09453886	52
2018	-.18518381	.12983197	52
2019	.14997079	.21524608	52
Total	.0514622	.39037965	234

Table 6.10 Markups on Fixed contracts, excluding 2020 and 2021

The markup of fixed contracts is 5.1 % (*Table 6.10*), and the number is relatively small. From competitive market economic theories, a perfectly competitive market can be conducted with prices approaching marginal cost; wholesale prices are regarded as marginal costs in this case. As electricity is a homogeneous product, most of the cost components are sunk costs; thus, the marginal cost in one more quantity of electricity is on the same level as other quantities. The overall markup of fixed contracts shows good patterns of a competitive market compared with the statistics above. However, the markup in 2015 revealed high profits for retailers. On the other hand, negative markups also appeared in the fluctuations of the market.

6.2.4.3 Variable contracts

The same procedures apply with variable contracts; coefficients from the regression are demonstrated in *Table 6.11* after assigning data to equation 6.1.

	(1)
nordpool	0.032**
	(0.015)
variable_past_week	0.957***
	(0.021)
Constant	0.006
	(0.004)
Observations	234

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6.11 The regression statistics of Variable contracts, excluding 2020 and 2021

	Summary of markup_var_pre		
Year	Mean	Std. dev.	Freq.
2015	.42703135	.58849486	26
2016	-.03538262	.14517061	52
2017	.08109695	.15525983	52
2018	-.00914336	.1986126	52
2019	.11889156	.17319334	52
Total	.08199516	.28419313	234

Table 6.12 Markups on Variable contracts, excluding 2020 and 2021

By following the formula in equation 6.2, the results are shown in *Table 6.12*. After eliminating 2020 and 2021 in the sample, variable contracts' markup is reduced dramatically from 70.97% to 8.2% (Table 6.12), amounting to a 62% reduction. The markup indicates a better competitive circumstance, with markup being positive in three years, from which 2015 has the highest markup and slightly negative in two years, the profitability for retailers displays good results.

In general, markups decrease after eliminating 2020 and 2021, ranging from 5.1% to 15.7%. Compared with the markups from 6.2.1, 2020 seems to be the year with major distortion for markups; this is also reconfirmed by the numerous fluctuations and changes in end-user prices in 2020.

6.2.4 Regional analyses

The market is divided into five pricing zones with specific market capacities to maintain the output market's efficiency. A visualization of the different Nordpool prices in different regions can be seen in *Appendix 26*. We have made calculations of markups in each zone and compared them; the results are in *Table 6.13*, and explicit calculations are present in *Appendix 10 - 24*.

	Spot Contract Markup	**Fixed Contract Markup**	**Variable Contract Markup**
Zone 1	**47.36%**	**94.6%**	**73.88%**
Zone 2	**46.89%**	**94.27%**	**70.92%**
Zone 3	**49.62%**	**100.89%**	**81.62%**
Zone 4	**32.21%**	**64.69%**	**56.46%**
Zone 5	**44.89%**	**80.36%**	**73.81%**

Table 6.13 Aggregate markup in contracts 2015-2021, per zone.

Markups of fixed contracts are the highest for all five zones; spot contracts generally have the lowest markups, while variable contracts remain in the middle. The regional statistics show similarities with national results in 6.2, with visible variations within each contract type. The most extensive dispersion is found in fixed contracts, where zone 4 has the lowest markups in all contract types, whereas zone 3 experiences a 36.2% higher markup than zone 4. In *Appendix 25*, averaged prices of fixed and variable prices in zone 4 are the lowest among all zones, indicating the efforts of lower prices can devote lower markups. On the other hand, zone 3 displays the highest profits in all contracts.

Regional markups show much higher scales than national markups; 2020 is the year that devotes the highest markups of all price contracts in all zones (*Appendix10-24*). Fixed-contract markup in zone 3 has a 100.89% turnover, indicating that retailers have more power in regions; this is likely to be linked with the discussion in section 7.7.1 in a later chapter, which explains the loyalty of local consumers to their regional retailers.

6.2.5 Data validity

Earlier sections show large markups across the years; the most outstanding results lie within 2020. In order to testify to the accurateness of our methodologies, we also applied a calculation on the retailer prices over wholesale prices in all periods to compare the accuracy of outcomes; the calculation is present as:

$$markup = \frac{retail\ price}{wholesale\ price} = \frac{p^r}{p^f} \tag{6.3}$$

Where p^r is the retail price, p^f is the wholesale price.

Comparisons are listed below in *Table 6.14*:

	Regression Mehodology	Validity Check
Spot contracts markup	27.98%	32.74%
Fixed contracts markup	66.87%	69.21%
Variable contracts markup	54.38%	56.57%
Zone 1 Spot contracts markup	31.3%	38.36%
Zone 1 Fixed contracts markup	94.6%	97.55%
Zone 1 Variable contracts markup	73.88%	76.2%
Zone 2 Spot contracts markup	30.43%	37.39%
Zone 2 Fixed contracts markup	94.27%	97.02%
Zone 2 Variable contracts markup	70.92%	73.45%
Zone 3 Spot contracts markup	31.36%	39.42%
Zone 3 Fixed contracts markup	100.89%	102.87%
Zone 3 Variable contracts markup	81.62%	84.03%
Zone 4 Spot contracts markup	26.37%	30.55%
Zone 4 Fixed contracts markup	64.69%	66.24%
Zone 4 Variable contracts markup	56.46%	57.3%
Zone 5 Spot contracts markup	28.17%	32.1%
Zone 5 Fixed contracts markup	80.36%	82.18%
Zone 5 Variable contracts markup	73.81%	73.89%

Table 6.14 Cross examination

The validity check provides similar patterns to the regression methodologies, assuring the accuracy of outcomes in our regression technique; the deviations are minor. The statistics in the regression method yield lower results; this can be contributed by the robustness effects of regression, which protects the data from being contaminated by any outliers or influential observations. The regression methodology seems to be appropriate based on the validity check.

6.3 Competitors' effects

Our research from sections 6.2.1 to 6.2.3 shows that retailers gained annual markups ranging from 28% to 67 % in three contract types, which are considerably higher than the Europe energy industry average margin of 19.85% (Damodaran, 2022). By including the competitors' numbers in the analysis, we could dive deeper into the explanations.

6.3.1 Competitor market overview

All retailers are required to have licenses in order to trade electricity in the market. One license is valid for five years, and retailers must renew the licenses if they wish to continue trading in the market. By summarizing how many licenses are registered in the market, we can count how many active retailers exist. Data retrieved from Reguleringsmyndigheten for Energi (RME) shows how many licenses are registered yearly from 2015 to 2021. Even though the licenses have a certain period of validity, retailers are granted access to the market at different times, depending on other conditions such as retailers applying at different times or using different processing times. However, all the licenses have the same ending time, which allows us to estimate the number of market players every year.

6.3.2 National effects

Over the years, the number of competitors in the market can be a good indicator in estimating competitors' effect on market prices. *Figure 6.5* below specifies the changes of national competitors over the years; there is a clear upward trend in retailers with contracts across all regions.

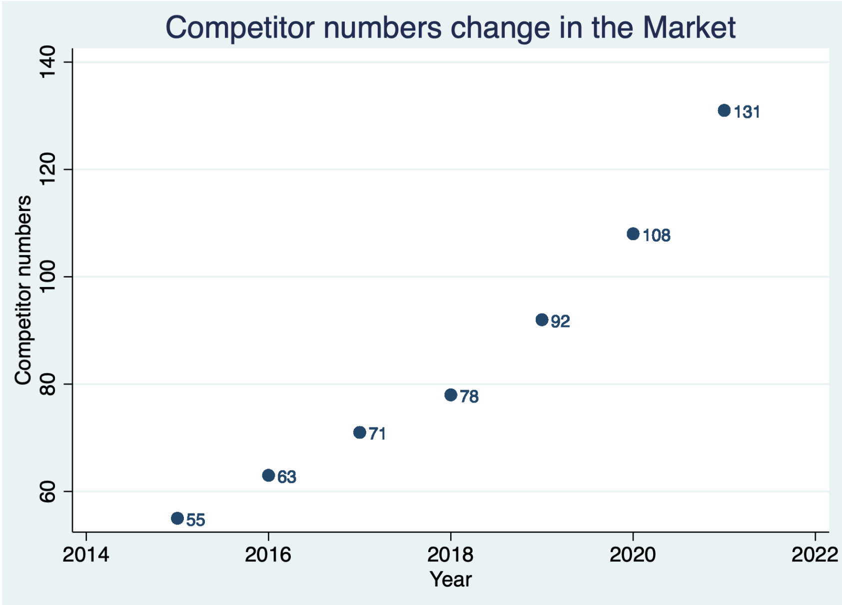


Figure 6.5 Numbers of nationwide competitors, yearly

The regression equation is presented as:

$$p_t^r = \beta_0 + \beta_1 p_t^f + \beta_2 p_{t-1}^r + Competitor\_nr_t + e_t \qquad (6.4)$$

Where p_t^r is the retail price for week *t*, p_t^f is the wholesale price for week *t*, p_{t-1}^r is the retail price for the preceding week, $Competitor\_nr_t$ states the numbers of retailers in the market for week *t*, e_t are the white noises. All prices are calculated in NOK and represent the value of 1kr.

Regression results of competitors' effects on spot price contracts are shown in *Table 6.15*.

```
Linear regression                               Number of obs     =        338
                                                F(3, 334)         =   34695.17
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9951
                                                Root MSE          =     .01728
```

spot_avg	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
nordpool	.9594765	.0124232	77.23	0.000	.9350388	.9839141
spot_avg_past	.0529537	.0171708	3.08	0.002	.0191771	.0867302
competitor_nr	.0005495	.0000411	13.36	0.000	.0004686	.0006304
_cons	.0084621	.0035721	2.37	0.018	.0014354	.0154888

Table 6.15. Competitors numbers' effects on spot price market

After including the competitors' numbers in *Equation 6.4,* all crucial statistics are present in *Table 6.15*, which shows that an increase in competitor numbers has a positive effect on spot prices, indicating that for one more competitor entering the market, the spot price will be increased by 0.05495 øre/kWh where 1 kr = 100 øre. Regression results of competition effects on fixed- and variable-price contracts are shown in *Tables 6.16* and *6.17*.

```
Linear regression                               Number of obs     =        338
                                                F(3, 334)         =    2920.73
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9734
                                                Root MSE          =     .02196
```

fix_avg	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
nordpool	.057383	.0096828	5.93	0.000	.038336	.07643
fix_avg_past	.9275477	.0223066	41.58	0.000	.8836686	.9714269
competitor_nr	.000132	.0000573	2.30	0.022	.0000192	.0002448
_cons	-.0032612	.0037281	-0.87	0.382	-.0105948	.0040724

Table 6.16 Competitors numbers' effects on fixed price market

```
Linear regression                               Number of obs     =        338
                                                F(3, 334)         =    1350.37
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9799
                                                Root MSE          =     .02693
```

var_avg	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
nordpool	.0726101	.0126466	5.74	0.000	.0477331	.097487
var_avg_past	.9342642	.0241138	38.74	0.000	.88683	.9816983
competitor_nr	.0001883	.000087	2.16	0.031	.0000171	.0003595
_cons	-.0134198	.006802	-1.97	0.049	-.0268	-.0000395

Table 6.17 Competitors numbers' effects on variable price market

Similar patterns from spot-price contracts are found in fixed- and variable-price contracts, where competitor numbers positively affect retail prices. Results are minor but positive and significant at a 5% significance level for all three contract types. The results reveal that the number of competitors does not significantly affect price change. In this sense, a firm's entry does not lead to a decrease in the price, indicating inefficiency in the retailing market.

6.2.4 Regional effects

Some possibilities leading retailers in different regions are not the same because they have different representative retailing areas, and competition situations might also differ. We, therefore, conduct regional analysis to retrieve a more in-depth regional overview.

An overview of the numbers of competitors in 5 regions is in *Figure 6.6*; it is clear that there are upward trends in all five regions from 2015-2021. As mentioned before, even though retailers are registered in the system from day 1 of the license's validity period, they might be granted the license later; this explains the trend of competitor numbers, in that more retailers are granted licenses gradually during the period, and numbers of firms are accumulated in the market over the years.

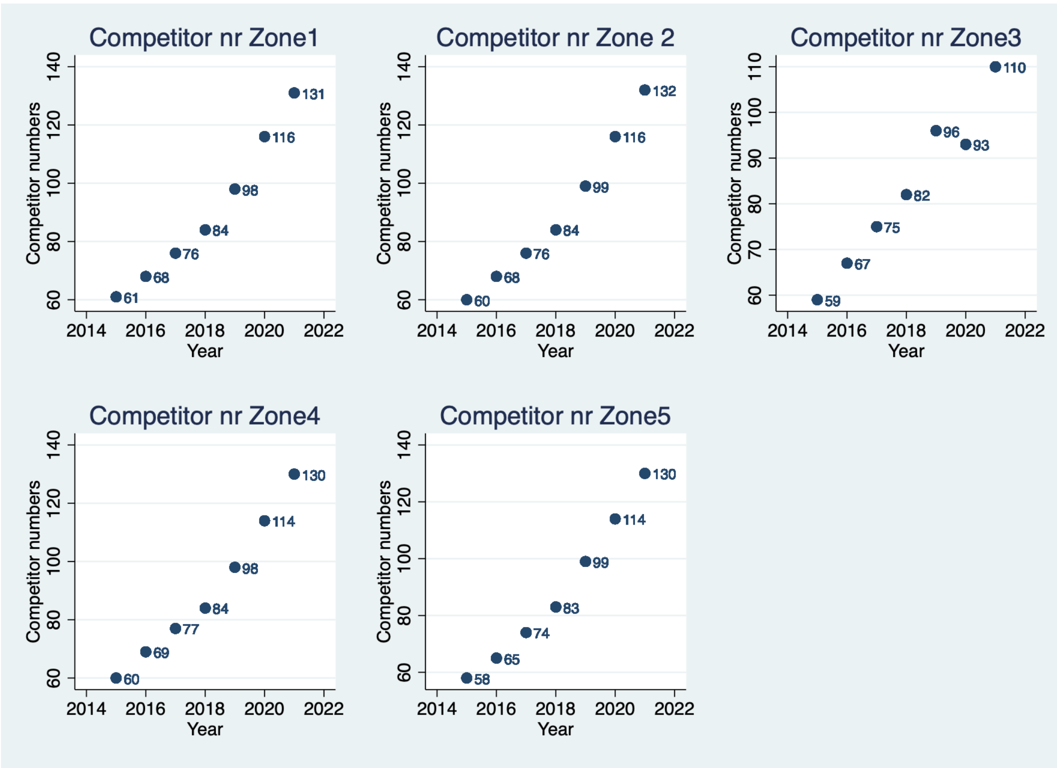


Figure 6.6 Competitors' numbers in 5 regions (2015-2021)

We develop the regression further to the following in *equation 6.5,* where $p^{r}_{t,i}$ is the retail price for week t in region i, $p^{f}_{t,i}$ is the wholesale price for week t in region i, $p^{r}_{t-1,i}$ is the retail price for the preceding week in region i, $Competitor\_nr_{t,i}$ states the numbers of retailers in the market for week t in region i, e_t are the white noises, $i \in [1, 2, 3, 4, 5]$. All prices are calculated in NOK.

$$p^{r}_{t,i} = \beta_0 + \beta_1 p^{f}_{t,i} + \beta_2 p^{r}_{t-1,i} + Competitor\_nr_{t,i} + e_t \qquad (6.5)$$

Combining *equation 6.5* with regional data, we receive the following results. *Table 6.18* shows the effects of competitor numbers on spot contracts in different regions; no1_nr, no2_nr, no3_nr, no4_nr, and no5_nr represent the competitor numbers in different regions, respectively. All regions share the same characteristics regarding the competitors' effects; an increase in competitor number will increase the regional retailing prices, which is in line with the finding in national effects. Effects in 5 regions are significant at a 1% significance level. However, the scales are minor; for example, for one more firm entering Zone 1, spot prices will increase by 0.0639 øre/kWh; the increase is relatively small compared with the average spot prices, and the same logic applies to the other four zones.

	(1)	(2)	(3)	(4)	(5)
no1_nordpool	0.962908***				
	(0.013)				
no1_spot_past_week	0.054822***				
	(0.018)				
no1_nr	0.000639***				
	(0.000)				
no2_nordpool		0.965407***			
		(0.012)			
no2_spot_past_week		0.050979***			
		(0.017)			
no2_nr		0.000591***			
		(0.000)			
no3_nordpool			0.966531***		
			(0.013)		
no3_spot_past_week			0.035064**		
			(0.016)		
no3_nr			0.001115***		
			(0.000)		
no4_nordpool				1.022308***	
				(0.012)	
no4_spot_past_week				-0.002374	
				(0.009)	
no4_nr				0.000732***	
				(0.000)	
no5_nordpool					1.032971***
					(0.014)
no5_spot_past_week					-0.016115**
					(0.008)
no5_nr					0.000629***
					(0.000)
Constant	-0.003719	-0.000389	-0.032714***	-0.010743**	0.001780
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Observations	339	339	339	339	339

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6.18 Competitor effects on spot contracts, regional (number (1),(2),(3),(4) and (5) in the headline are presented as zone 1,2,3,4,5 respectively)

	(1)	(2)	(3)	(4)	(5)
no1_nordpool	0.054958***				
	(0.013)				
no1_fixed_past_week	0.925234***				
	(0.036)				
no1_nr	0.000087				
	(0.000)				
no2_nordpool		0.054651***			
		(0.015)			
no2_fixed_past_week		0.934951***			
		(0.047)			
no2_nr		0.000064			
		(0.000)			
no3_nordpool			0.041200***		
			(0.011)		
no3_fixed_past_week			0.933077***		
			(0.049)		
no3_nr			0.000152		
			(0.000)		
no4_nordpool				0.055896***	
				(0.012)	
no4_fixed_past_week				0.930145***	
				(0.041)	
no4_nr				0.000225*	
				(0.000)	
no5_nordpool					0.071325***
					(0.017)
no5_fixed_past_week					0.937416***
					(0.042)
no5_nr					0.000305**
					(0.000)
Constant	0.002775	0.001509	0.000484	-0.011373**	-0.023059***
	(0.006)	(0.006)	(0.008)	(0.005)	(0.007)
Observations	339	339	339	339	339

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6.19 Competitor effects on fixed contracts, regional

The findings in *Table 6.19* indicate that the competitors' numbers have the same positive effects on regional fixed contracts, though the effects are not significant in Zone 1, 2, and 3, but in zones 4 and 5. However, the effects are unlikely to change the prices substantially; for one more competitor in the market, fixed prices will only increase by 0.0225 øre/kWh in Zone 4 and 0.0305 øre/kWh in Zone 5, respectively.

	(1)	(2)	(3)	(4)	(5)
no1_nordpool	0.065080**				
	(0.026)				
no1_variable_past_~k	0.940139***				
	(0.053)				
no1_nr	0.000065				
	(0.000)				
no2_nordpool		0.064092***			
		(0.021)			
no2_variable_past_~k		0.940280***			
		(0.043)			
no2_nr		0.000079			
		(0.000)			
no3_nordpool			0.099774**		
			(0.043)		
no3_variable_past_~k			0.814541***		
			(0.093)		
no3_nr			0.000590		
			(0.000)		
no4_nordpool				0.032596**	
				(0.015)	
no4_variable_past_~k				1.001252***	
				(0.027)	
no4_nr				0.000128*	
				(0.000)	
no5_nordpool					0.018918
					(0.019)
no5_variable_past_~k					1.003348***
					(0.039)
no5_nr					0.000167
					(0.000)
Constant	-0.002807	-0.004386	-0.005622	-0.021252***	-0.019178*
	(0.006)	(0.005)	(0.025)	(0.005)	(0.010)
Observations	339	339	339	339	339

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6.20 Competitor effects on variable contracts, regional

Findings in variable contracts from *Table 6.20* specify a significant positive effect from competitors' numbers only in Zone 4 at a 10% significance level, an increase of 0.0128 øre/kWh will appear on variable contracts in Zone 4 with one more firm entering into the market.

Compared with the effects of spot contracts, competitors have less influence over fixed and variable contracts in the regions; this could be because spot contracts are the most purchased type among consumers, and retailers put more weight on pricing on spot contracts than the other two contracts.

6.2.4 Seasonal effects

Due to different demand levels in different seasons, electricity prices vary in seasonal times; prices are the most expensive in the winter (Norwegian Ministry of Petroleum and Energy, 2021A), given that consumption is also the highest due to a high proportion of energy is used for heating. However, it is the opposite case in the summer (Norwegian Ministry of Petroleum and Energy, 2021B). In connection with the unique feature of the seasonal price distribution, we conduct research to test if efficiency variations exist for consumers in different seasons. The general seasonal markups will be calculated in different pricing types.

Data ranging from March to May defines the spring season, June to August is summer time, September to November is regarded as autumn, and winter ranges from December to February.

A regression methodology is present in equation 6.6, where $p^r_{t,s}$ is the retail price for week *t* in season s, $p^f_{t,s}$ is the wholesale price for week *t* in season s, $p^r_{t-1,s}$ is the retail price for the preceding week in season s, e_t are the white noises, $s \in [spring,\ summer,\ autumn,\ winter]$. All prices are calculated in NOK.

$$p^r_{t,s} = \beta_0 + \beta_1 p^f_{t,s} + \beta_2 p^r_{t-1,s} + e_t \tag{6.6}$$

The seasonal markup can the be present as

$$\frac{p^r_{t,s}}{p^f_{t,s}} = \frac{\beta_o}{p^f_{t,s}} + \beta_2 \frac{p^r_{t-1,s}}{p^f_{t,s}} + \beta_1 \tag{6.7}$$

Results are tabulated in *Table 6.21; markups* achieve the highest in summer and the lowest in winter in all three contracts while maintaining the same scales in the other two seasons. Markup in fixed contracts is below 5% in winter and receives the lowest score among all, as consumers pay an agreed price over a certain period; despite fluctuations in the market, it is challenging for retailers to predict the precise trend long termly and preserve profits, which will lead to a low markup level.

	Spot	Fixed	Variable
Spring	24.56%	49.19%	42.91%
Summer	71.9%	171.7%	114.76%
Autumn	23.34%	43.88%	41.61%
Winter	14.75%	4.09%	20.08%

Table 6.21 Seasonal markups on spot, fixed and variable contracts 2015-2021

Generally, there are great extents in markups across different seasons, with summer being the most profitable and winter being the lowest. Retailers tend to smooth profits over seasons, given that it is difficult to expand the room for profits when wholesales pieces are already high in winter; they choose to extract more from consumers in summer to reach the purpose of obtaining stable revenue flows.

6.2.5 Market power - The Herfindahl-Hirschman Index

There are 172 active firms in the whole market, indicating signs of good competition. However, based on the data analysis and the numbers of retailers, there are large markups among retailers starting from 2020, showing retailers' intentions of extracting more customer benefits, which is also confirmed in the data analysis section. Moreover, markups before 2020 also offer a large potential for profits to the retailers. Five companies take an average of 90% of the market share, with the rest of 167 retailers sharing 10% of the market share. Along with the market share distribution data for the biggest five retailers from March 2019 to March 2022 in 5 regions (*figure 6.7*), we would like to take a deeper scope on the competition situation.

The leading retailers in different regions are not the same, given that retailers have different representing sales areas, as informed by Oda Kristine Østbye Bratlie, client consultant at NVE-RME through email correspondence on May 20th 2022. One retailer with a weak market position in one region could have a dominating market share in another region. Therefore, conjuring a regional analysis of the market powers of retailers will give us an overall overview of the regional concentrations; it can also be developed further by investigating the averaged national attention.

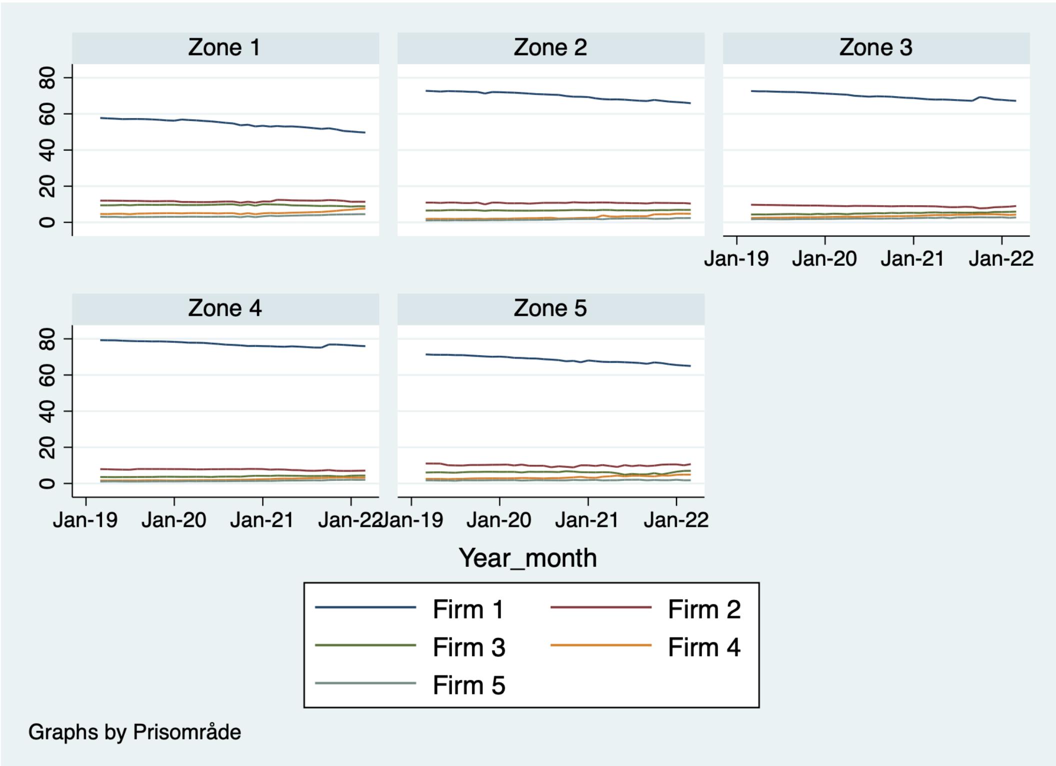


Figure 6.7 Market share distribution, divided into zones, in percentage forms

The regional overview of market shares for the top five leading firms is listed in *Table 6.22*. Detailed descriptions of different zones can be found in *appendix 27-31*. All numbers are presented in percentage forms.

	Firm numbers	Firm1 Market Share	Firm 2 Market Share	Firm3 Market Share	Firm 4 Market Share	Firm5 Market Share	Rest of Market Share
Zone 1	131	54,43%	11,70%	9,50%	5,32%	3,43%	15,62%
Zone 2	132	69,86%	10,74%	6,67%	2,79%	1,64%	8,30%
Zone 3	110	69,74%	8,96%	5,03%	3,44%	2,20%	10,63%
Zone 4	130	77,15%	7,68%	3,92%	2,27%	1,44%	7,54%
Zone 5	130	68,48%	10,05%	6,14%	3,40%	1,80%	10,13%
Sum	127	67,93%	9,83%	6,25%	3,44%	2,10%	10,44%

Table 6.22 Average market share for top five leading firms in 5 Zones.

Top one retailers in 5 regions take over more than half of the market shares, indicating a dominating market position, followed by the second-largest retailer taking market shares which range from 7.68% to 11.7% of the market share. In general, all five leading players average 90% of the market share.

The Herfindal-Hirschman index is a method of detecting the scale of market concentration, the general formula is represented as

$$HHI = \sum_{i=1}^{n} MS_i^2$$

Where $MS_{i,z}$ is the market share of the firm i in zone z, there are n firms in the market, $u \in [1, 2, 3, 4, 5]$.

The first five retailers have nearly 90% market share, leaving 10% for the other players in the market. We have no access to the market share distribution of the rest of the retailers but would like to make a reasonable assumption for the purpose of taking a grasp of *HHI.* With 5 known market shares, it is credible to lay out an assumption that the last 10% of the market share is distributed evenly among the rest of the retailers.

Results show:

	Herfindal-Hrischman Index
Zone 1	**0,32**
Zone 2	**0,51**
Zone 3	**0,50**
Zone 4	**0,60**
Zone 5	**0,48**
Sum	**0,48**

Table 6.23 HHI in 5 Zones

The U.S. Department of Justice and the Federal Trade Commission (2015) advise that an *HHI* over 0.25 indicates high concentration, indicating oligopolistic or monopolistic tendencies in the market. Firms are becoming reluctant to compete, resulting in a lack of motivation for technology development and cost reduction, leading to lower consumer welfare and market efficiency.

Regional HHI shows a high level of market concentration in all regions. The fact that the first leading retailer acquired more than half of the market share implies the presence of reliable market power among some retailers. *HHI* shows that the market lacks competition, with the disincentives of pushing end-user prices toward marginal costs.

7.0 DISCUSSION

This chapter will discuss our findings with relevant literature and debates. Firstly, we will go through general perspectives regarding efficiency. Further, we will investigate factors and business conduct that may explain how retailers harvest their gross margins. Lastly, we will look at regional effects.

7.1 Electricity market

Electricity is considered a homogeneous product, which the consumers can not differentiate. Retailers, therefore, are competing by prices; this is likely to be Bertrand competition. “Although electricity (or gas) is considered a homogenous product, retailers differentiate themselves through customer loyalty bonuses, green products, level of service and customer satisfaction, discounts or price caps” (He & Reiner, 2017, p. 25). However, it is argued that electricity should still be considered a homogeneous good even with these add-ons and supplementary services (von der Fehr & Hansen, 2010).

The electric market was earlier defined as a market where the participants compete in price since there are no quantity restrictions, making it a Bertrand competition. With pure Bertrand, price equals marginal cost even with only two participants, since every consumer goes for the retailer which offers the lowest price for the goods. Each player will then try to undercut the other to gain the whole market, which proceeds until the marginal cost is achieved (Riis & Moen, 2016). It is eminent that this is not the case in this retail market. Therefore, we will explore potential influencing factors to uncover how retailers operate to earn margins over marginal cost.

7.1.1 Differentiation

Since electricity is a homogeneous product, it induces a strategy incentive to differentiate the product with numerous contracts, pricing models, level of customer service, supporting charity, and a variety of loyalty benefits to achieving a profit margin that otherwise would be priced at marginal cost (Chioveanu, 2008; Smith, 1956; Porter, 1997; Chamberlin, 1933, in Anderson & Renault, 1999). Product differentiation eliminates the "all or nothing" nature of the market, showing that Bertrand's perfect price was not achieved even when consumers had complete information about competitors' prices (Waldman & Jensen, 2013).

The effect of differentiation results in a second-degree price discrimination perspective in the electric market, where consumers are informed of the availability of different price contracts and, based on their inertia and preferences, self-select into a suitable contract (Riis & Moen, 2016). The hypothesis regarding these strategies revolves around the fact that retailers have several sets of contracts that exploit the reluctance of some customers while simultaneously competing for active customers (von der Fehr & Hansen, 2010; Carlin, 2009; Spiegler, 2016), which shows similarities to the Varian model.

The practices with differentiation twist the market structure and apply price/loyalty discrimination to its customers, which allows active consumers the benefit of paying the price under marginal cost at the expense of a passive consumer. As a result, loyal customers have higher costs than unloyal ones. The difference in cost between them is called loyalty tax or loyalty premium (Mountain & Bruce, 2020). This industry may, in time, evolve into third-degree price discrimination as technology and information flow evolves. Still, it would be too costly for retailers to identify each consumer type and adjust each product accordingly (Waldman & Jensen, 2013).

The most significant national retailers offer various add-on services and products together with the contract. Examples include

- Insurance against high prices, sickness, or unemployment.
- Green-choice donations to relevant organizations
- Guarantees of production from renewable resources
- Solutions for smart homes and self-production of energy.

Market & communication manager Geir Arne Gundersen at NorgesEnergi informed us through e-mail correspondence 20.06.2022 that many customers pay for add-on services and products, like insurance. However, only a relatively small share of customers use them, which supports the argument that the add-ons and differentiations do not lead to an increase in utility, but instead induce an extra cost to the consumer.

7.1.2 Efficiency

A properly functioning market with efficient competition enforces the effectual utilization of society's resources, which gives socio-economic advantages. From this perspective, a reduction of the overall surcharges induces incentives for innovation (Belleflamme & Peitz, 2015). Riis & Moen (2012) shows that when the market is efficient, optimal quantity is produced, marginal cost is the same between businesses, and this marginal cost equals consumers' marginal willingness to pay. In the case where price equals marginal cost, there is no deadweight loss.

There are several factors within this optimal efficiency; for example, having information transparency such that buyers and sellers make adequate choices for their needs, having zero cost for switching retailers, and minimal costs regarding entry (Boroumand, 2015; Dahl, 2004). Together with an abundance of buyers and sellers with no market power, and lastly, rationality amongst players. Consumer welfare will be maximized if these criteria are met, making the foundation of a well-functioning market.

For the electricity end-user market, most of these factors are met. There are over 170 retailers in this market, even though we see oligopolistic tendencies (von der Fehr & Hansen, 2010). In our findings, we see that the dominant company, on average, within each zone respectively, has half of the market and that the top five companies have between 80-90% market share. These findings are also supported externally (Brenna, 2021A; NVE, n.d.). A market dominated by one or a few firms is often led by the presence of economies of scale (Waldman & Jensen, 2013). There exist economies of scale in electricity retailing. For example, costs to make software, website, and advertising are sunk costs, but the marginal cost of having one more customer on the electricity band is nearly zero (Lo et al., 2016), which will allow the system's fixed costs to be spread among more users.

Conversely, the Norwegian energy market is ranked as one with the least market entry barriers compared with 27 other countries in Europe (Felsmann & Vékony, 2021). With free entry/exit of firms, in the long run, the number of firms in the market should adjust so that p = c (q*) (Moen, 2022, August 23), where c is the average cost of the optimal quantity q* in the market. In this way, efficiency on the retailers' side is complete. These low entry barriers have not been enough to outweigh the benefits of a large customer base and thus converged price towards the marginal cost. Other factors contributing to a dominant firm-competitive fringe market structure are when the dominant firm(s) has cost advantages compared to its rivals (Waldman & Jensen, 2013). Such factors can be superior technology, increased efficiency, better management, and geographical location; thus, retailers should be able to lower costs. This synergy effect can also be achieved through horizontal mergers (Waldman & Jensen, 2013), for example, when Fjordkraft acquired Gudbrandsdal Energi (Fjordkraft, 2020).

The information asymmetry issue is brought to our attention in several papers and figures (Carlin, 2009; von der Fehr & Hansen, 2010; Spiegler, 2016). These papers help explain why competition in this particular market is less offensive than it should be, considering these homogeneous characteristics. Research on the 40 largest competitors shows that revenues and margins vary much amongst participants (Oslo Economics, 2021), indicating that the competition intensity is not enough to eliminate mark-ups and converge prices towards the marginal cost. Damodaran (2022) shows statistics covering energy companies in Europe, showing an average of 19.85% gross margin, and 4.20% in net margin. Our findings show yearly average margins of 28%, 67%, and 54% in the three contract types, spot, fixed, and variable contracts, which vastly outperform the European average. Conversely, marginal cost cannot be obtained since one must bear fixed costs (Riis & Moen, 2016) and a risk premium retailers need regarding hedging electricity (Boroumand et al., 2015). The high margins in the market are most likely concerning lack of information; we will go deeper into the information perspective.

7.2 Asymmetry

This chapter highlights the challenges that asymmetric information applies to the consumer welfare perspective in the electric retail market. Hereunder are various strategies and procedures which retailers have implemented that negatively affect the consumer surplus and thus misalign optimal efficiency, limiting consumers' ability to assemble information and compare products for good choices. We will go through economic criteria which fulfill the standard economic theory of effective competition and check to which degree these are met in the Norwegian electricity retail market.

7.2.1 Limited knowledge and interest in product and price

A prerequisite to making informed choices regarding electricity contracts is that the consumer understands the details around the price and product. Several aspects of the market and product work contrary to the consumers' favor. Research by Sitzia et al. (2012) in He & Reiner (2017) shows that consumers are reluctant to switch from incumbents due to "inattention," leading them to have suboptimal contracts. Essential characteristics of the product limit consumers' interest, the fact that which retailer the consumer uses has zero effect on the quality of the electricity in the outlet (Dulsrud & Alfnes, 2015). Zohuri & McDaniel (2019) define electricity as not just a commodity but a necessity that every household needs to function in their everyday way of modern life. This perspective shows similarity in regards to the Water Diamond paradox, where consumers neglect the value of essential commodities in their everyday life, which could lead to consumers investing less effort into exploring potential benefits, therefore experiencing a loss in welfare.

Why anyone would buy an identical product for a higher price in the same market is related to the concept of bounded rationality, "which places limits on knowledge, foresight, skill and time constraints on individuals' ability to solve complex problems" (Waldman & Jensen, 2013, p. 252). Relatively small levels of bounded rationality can result in price offers that diverge and, thus, fail to move towards the Bertrand equilibrium (Waldman & Jensen, 2013). Hehenkamp in Boroumand (2015) refers to consumers as "sluggish," which does not check competitor pricing that, results in an unobtained Bertrand equilibrium and converges retailers towards monopolistic pricing.

7.2.3 Business model

Electricity is a subscription business model with monthly invoices. Research shows that subscription business models reduce the involvement of their customers, relieving them from making active choices (Thaler, 2015). In contrast to, for instance, grocery shopping, where one has to make active choices in each purchase. Payment often goes through automatic bill payment (ABP) systems like "Avtalegiro," which allows completion of payment without any customer involvement, up to a predetermined value. This payment process goes through without the consumer even being aware of the payment (Thaler & Sunstein, 2019). The practice works as an information hindrance since consumers actively have to go into the bank portal or the retailer's log-in interface to gather information regarding their consumption, kWh price, and other invoice details (Sexton, 2015; Dulsrud & Alfnes, 2015). Sexton (2015) also found that customers enrolled in ABP forgo the inspection of their recurring bills and therefore neglect the cost, leading to a 4% increase in electricity consumption.

Earlier business models for electricity retailers did not bundle their electricity with other products. However, some companies included customer benefits as a source of information regarding energy conservation and receiving discounts on electrical appliances, like heat pumps and energy-saving lights (von der Fehr & Hansen, 2010). Today, this bundling has extended, where retailers have incentives to take advantage of their market power in one field over another (Jacobsen et al., 2006). These incentives include; Economies of scope, where retailers can expand their products/services to the same customer base. Examples of this are Fjordkraft and NorgesEnergi, expanding their product line with insurance, origin certificates, price locking, starting their own mobile phone subscription service, and more. The advantages are the possibilities to use available resources and enjoy synergy effects from established systems, like invoicing procedures, IT systems, customer service, and other administrative resources. These effects should be positive from a competitive perspective and compete in reducing customer prices. Altogether they reduce the combined price risk by having alternative revenue sources (Jacobsen et al., 2006). Customer lock-in works as typing products as leverage (Jacobsen et al., 2006), where one retailer uses its monopoly power to extract profits from another market. One example is that Fjordkraft only provides exclusive access to discounts and deals if consumers have Fjordkraft in their outlet.

Regarding economies of scope, there are occasionally entrants in electricity retailing with other main core businesses that already have a vast customer base. Today, some entrants with other main core businesses are Circle K. with petroleum retailing, Talkmore, Telinet, and Trollfjord, all providing mobile phone services (Bytt.no, n.d). Enters like Circle K. were marked as a flop (Henney, 2006 in Boroumand, 2015). Still, they have made their mark on the competitive environment and stimulated towards reduced prices, better customer service, and innovative price contracts (Boroumand, 2015). Companies with generic products with other core businesses share telephone contracts as their main business. This bundling can induce competition limiting incentives that these suppliers align their strategy to a parallel pricing behavior since in a multimarket position may be concerned of retaliation in their telephone contracts (Boroumand, 2015; Greenlee et al., 2015). Most of the multimarket entrants are called temporary since they, after a short period, eighter (i) went out of business or (ii) were acquired by the incumbents (Boroumand, 2015).

7.2.4 Complexity vs competition

Complexity is an important determinant of price formation in retail markets with homogeneous products (Carlin, 2009). In contradiction to general beliefs of an ordinary competitive environment, the models reviewed by Carlin (2009), Chioveanu & Zhou (2013), and Spiegler (2016) show an increase in complexity of the formulations around a product/service as the competitive environment intensifies. Carlin (2009) reveals findings that disown the law of one price with homogeneous products, even when the market has many competitors. As the number of competitors increases, the symmetric-equilibrium probability that firms use the most advanced setup converges to 1 (Spiegler, 2016). However, findings in *Tables 6.15* to *6.17 show that* the price dispersion increases as the number of competitors increases.

In our example, an end-user market with 172 retailers that serve homogeneous goods ought to have commensurable characteristics within a retail market (Chioveanu & Zhou, 2013), which should favor good competition.

Counterintuitively, general market conduct shows that retailers have incentives to deliberately increase complexity and obfuscate the trade frames when quality is indistinguishable. As a result, the product becomes incommensurable as competition increases (Spiegler, 2016). In general economics, competitors undercut each other by adding clarity to their price structure until the marginal cost is achieved (Carlin, 2009; Chioveanu & Zhou, 2013). On the contrary, He & Reiner (2017, p. 41) found that "The more difficult an average individual finds to understand his or her household energy bills, the more likely he or she is to switch.".

With homogeneous products, on the other hand, adding clarity would, in the end, erode all industry surplus, inducing the underlying market trend where retailers present their product descriptions and contracts in a technical language and unorganized manner that only a specialist would interpret (Spiegler, 2016; Carlin, 2009; Chioveanu & Zhou, 2013; Forbrukertilsynet, 2021; Regjeringen, n.d.; NVE, 2021). High-price competitors work towards higher complexity, increasing the share of uninformed customers, U in the Varian model, which again increases market share and margins (Carlin, 2009). The logic behind this is that as the competitive environment increase, the firms' demand from expert customers decreases. Thus, their best response to maximize the bottom line would be to decrease industry price transparency and increase producer surplus. This tactic substantially lowers consumer surplus since it increases the share of uninformed customers and prevents this group from acquiring knowledge about price setting. Scitovsky (1950) refers to ignorance as a means toward oligopoly market power, which induces welfare implications. This complexity strategy is a means that takes advantage of consumers' bounded rationality (Spiegler, 2016).

A disputed case where Norwegian retailers use the same terminology but with different perspectives and meanings (Forbrukertilsynet, 2021A; NVE, 2021) makes a complicated and costly transaction for the consumer to measure and compare products and retailers. An example of how retailers name comparable spot price contracts is "innkjøpspris," "spot pris" or even "markeds pris". This practice is also used the other way around, where incomparable contracts have very similar names, making it difficult for consumers to get a complete perspective; *figures 7.1* and *7.2 are examples*.

Figure 7.1 Screenshot from agva.no 05.04. 14:20

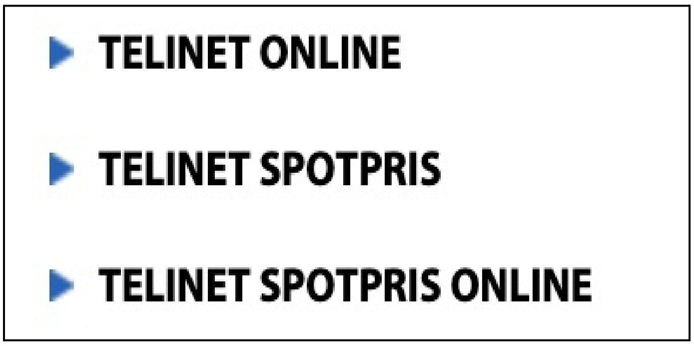


Figure 7.2 Screenshot from Telinet.no 05.04. 14:46

Even though there are mainly three types of contracts, it is frequent for retailers to have several similar contracts within each category. Still, within each contract category, consumers find it challenging to compare terms and pick the best contract (Bugge, 2021; Kristiansen, 2021) due to planned obfuscation.

7.2.5 Campaign offers (buy baits)

In the end-user market, campaigns or discounts with a negative surcharge on the spot price for a limited period, so-called "bargain-then-ripoff" pricing (Farrell & Klemperer, 2007), are extensively used (Forbrukerrådet, 2020; Garden & Bugge, 2019). A visual representation of how this accumulates profit is in *Figure 7.3*, where a loss in the first period is regained with a long period of profit. Not all contracts are formed like this; in many sales, each customer would be profitable already from day one, which gives retailers incentives to be active in marketing activities.

Alteration of contracts and such inefficient marketing of homogeneous goods would have a marginal effect on expected consumer utility (Oslo Economics, 2021; Farrel et al., 2007), which results in massive efforts and resources swapping customers from one retail company to another. Further, direct efficiency loss mitigates competition and amplifies incumbency advantages (Farrel et al., 2007). Finally, resulting in increased total costs for the consumer and raised incumbent retailer profit. The market-level equilibrium of advertising with existing oligopolistic tendencies is said to have a high cost from a social welfare perspective (Dixit & Norman, 1978).

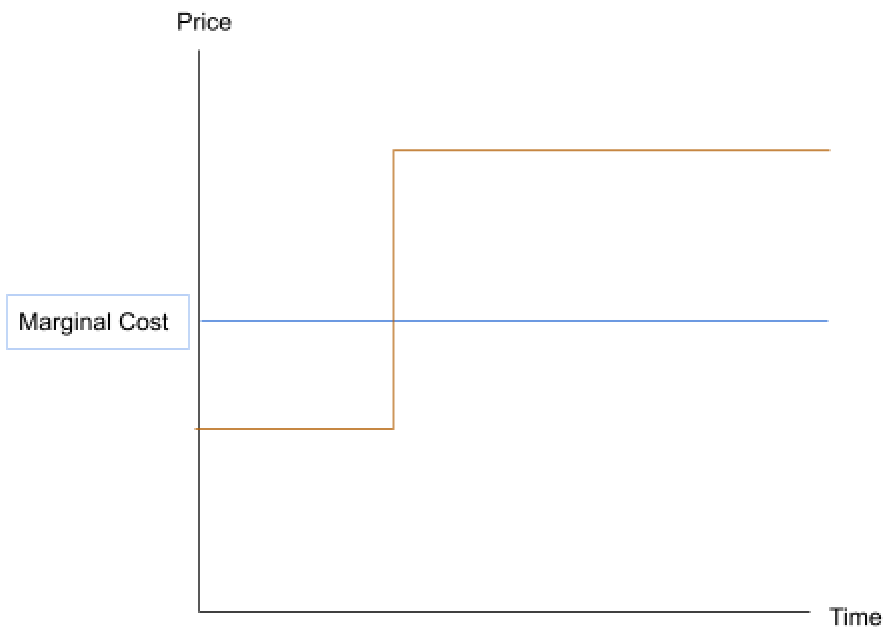


Figure 7.3 Buy bait business model. Inspired by Oslo Economics (2021)

Discounts are generally good for the consumer, but when consumers have difficulties understanding the length of the campaign and the contract jargon, these campaigns often end up as a loss for the consumer rather than a win on a long-term basis (Kristiansen, 2021; Finstad et al. 2021; Hagfors, 2020; Forbrukerrådet, 2020A). The rationale behind this is that the contracts are confusing, and the terms are set as default options; it is not presented to the consumer at the time of purchase that the prices in the agreement are valid for only a limited timeframe (NVE, 2020; NVE, 2021; Garden & Bugge, 2019). von der Fehr & Hansen (2010) found that weekly switching could reduce 20% of a consumer's yearly cost. Therefore, it would be beneficial for active consumers to take advantage of these introductory offers and swap retailers regularly. Still, it would be preferable for those more passive consumers to have a contract with competitive pricing over time without keeping up to date on market details and movement (Carlin, 2009; von der Fehr & Hansen, 2010; Spiegler, 2016).

7.2.6 Notification

There is a great variety of practices on how customers are informed regarding changes in price and contract terms (Forbrukertilsynet, 2021B; Brenna, 2021B). The various information channels are not restricted to email, SMS, letters, and notifications through the "My page" on the retailer's online portal. However, these platforms lack a market standard regarding the updates, making them harder to track (Regjeringen, 2021; NVE, 2020; NVE, 2021B). In addition, while those who are updated through email or SMS, the price and term notification are sent as a part of a more extensive newsletter where the terms regarding price change do not appear as the primary information and are, therefore, "hidden" (Oslo Economics, 2021), which is seen as a negative nudge. Fjordkraft is one of the many retailers who have been sanctioned for misleading practices after being alerted by the Norwegian Consumer Council (Forbrukerrådet, 2021).

As earlier stated, customers are not aware of the timeframe of the campaign contract, nor are they adequately informed or reminded at the point in time when their promotion plan changes and higher prices are implemented (Oslo Economics, 2021). This practice takes advantage of consumers' bounded rationality, where consumers are likely to forget or neglect terms that come in the future (Thaler, 2015). This practice combines with the strategy of timing the contract transition to when most customers have established ABP and stopped looking into the invoice details (Sexton, 2015). This "misbehaving" business practice today (Thaler, 2015), i.e., ABP systems encourage undermining information at the expense of the consumer.

7.2.7 Sale platforms

There is extensive use of sales and marketing methods in the electricity market, which is the initiator of most movements in customer turnover, like tele-/TV-marketing, sales on stands, special offers on electronic retailers, and real estate transactions (Gulbrandsen, 2018; Forbrukerrådet, 2020A; Dulsrud & Alfnes, 2015). However, the Norwegian Consumer Council reports that these platforms induce information asymmetry between consumers and retailers since consumers are unprepared to get approached with a sales request in their private sphere (Forbrukertilsynet, n.d). Furthermore, sales requests within these platforms can, for some consumers, be challenging to decline due to the lack of information and time provided to evaluate adequately and compare within these frames (Forbrukertilsynet, n.d; Lillo-Stenberg, 2021).

In an example of acquiring a new home, the electricity prices regarding the purchasing price of a house are marginal when compared, and thus the anchoring effect comes to play. This anchoring effect means that consumers tend to neglect the actual cost of additional purchases when the sum is large (Thaler, 2015). Altogether it is not easy to prove what has been said and to which terms the customer commits (Oslo Economics, 2021). Regarding telemarketing, complaints about electric retailers are the largest share of complaints that the Consumer Council gets (Forbrukertilsynet, 2020).

The report from Oslo Economics (2021) finds correlations with information asymmetry concerning real estate transactions. For example, the new owner cannot continue changing their address through the digital platform without choosing a new electric retailer. The information given in the context is relatively limited, where only a few retailers, who have paid for this placement, are presented as options. Limitations in available information on the platform restrict consumers from navigating efficiently and making rational and utility-maximizing choices, affecting the market's competitive dynamics.

7.3 Transaction costs

Transaction costs are barriers that allow a firm to price its products above the perfectly competitive equilibrium price (Waldman & Jensen, 2013). Retailers benefit from "the elicitation of consumers' willingness to pay for noninterruptibility" (Joskow & Tirole, 2006, p. 813), where consumers would rather pay a premium than endure search or switching costs. In addition, consumers dislike establishing new business relationships, have a natural distrust for new things, and are reluctant to lose emotional ties with a firm (Thaler, 2015; Thaler & Sunstein, 2019). Thus, a retailer has incentives to increase the search and switching costs to stimulate a low churn rate. He & Reiner (2017) discuss a finding by Giulietti et al. (2005), which shows that consumers accept substantially higher prices at an incumbent since consumers' perception of search costs is higher than reality.

Transaction costs make consumers less price-sensitive, affecting the competitive environment and inducing passive behavior (Thaler, 2015). As transaction costs increase, the expected gain of changing retailers declines, discouraging active behavior and resulting in an increased share of passive consumers, lower consumers' sensitivity to price changes, and lower price elasticity. Increased transaction costs would work as a lock-in effect and place consumers in a position where retailers can execute their market power and harvest profit. Without losing customers, retailers' higher margins give an image of their market power. On another approach, this shows how challenging consumers find the procedure of changing to a better contract. Customers would need to learn a new operating system, review "my page" infrastructure, set up new payment details with the bank, and lose potential historical data and loyalty rewards, which we will return to later. Significant transaction costs are challenging to give away for slight differences in payment.

Giulietti et al. (2001) researched switching & search costs and found that the latter was more significant in consumer behavior, which means consumers are more sensitive to searching costs regarding a switch rather than the cost of the switch itself. Sturluson (2003) found that switching costs are approximately ten times higher than expected consumer gains. The estimated cost of the search is lower but still much higher than the expected gain. Research on the Swedish markets found that consumers perceive relatively low gains from switching in electrical markets (Gabmle et al. 2009 in He & Reiner, 2017), which supports the findings of Sturluson (2003). Therefore, implementing governmental policies toward lowering consumer search costs would be beneficial, as the Norwegian Consumer Council adopted in 2015. They launched an information platform, Strompris.no, which seems like an adequate response to Giulietti et al. (2001).

7.4 Strompris.no

Strompris.no is a platform by the Consumer Council to balance the information asymmetry and respond to the lack of standardized price information in the market (NVE, 2020; NVE, 2021; Regjeringen, n.d). As earlier mentioned, several aspects of contracts are formed to make it difficult for the customers to compare prices and contract terms, even within the same type of contract (Regjeringen, n.d; von der Fehr & Hansen, 2010). Since the good is homogeneous, retailers are incentivized to add several attribution services, products, and other terms to make a profit.

Strompris.no has been criticized for not working efficiently in the way it was meant. In its earlier edition, products were ranked only by the price per kWh, which led to price competition with hidden price elements and short-term contracts (Brenna, 2020). Consumers would get additionally charged for products and services not specified by the platform, resulting in a price that was not accurate or even close to advertised. The newly modified version of Strompris.no now only recommends half-year contracts as a minimum. Strompris.no has helped the consumer find a contract with a timeframe of over two weeks but still needs to relate to the market to find favorable contracts over time (Dulsrud & Alfnes, 2015).

Although statistics show that consumer inertia towards this market is high, Strompris.no is a service that reduces the market complexity so that consumers can navigate different contracts (Dulsrud & Alfnes, 2015). Yang (2014 in He & Reiner, 2017) discussed that to reduce inertia for "potential switchers" and inspire them to switch to diminish psychological impediments by informing of potential gains and explaining the switching process in detail, which is aligned with the findings of Dulsrud & Alfnes (2015).

On June 15, 2022, Strompris.no launched "Sjekk din avtale," a new service to help consumers check whether they have a good contract. Since this service is entirely new, there are no available statistics, but it does help consumers get an idea of what their price should be, given their area and consumption. Unfortunately, this function does not look into the time of their consumption; as such, this service has flaws and cannot compute the individual households' correct surcharge. If the service could connect and retrieve data from the governmental consumption service, ElHub, this service would be complete.

It is highlighted that the comprehensive service that Strompris.no provides is a crucial source of information for consumers because they have the prerequisite to make good choices (Dulsrud & Alfnes, 2015). ECME Consortium (2010) in He & Reiner (2017, p. 26) finds that "Despite government interventions to promote consumer activity, consumers often fail to take advantage of the potential benefits available from changing providers in liberalized energy markets."

Several companies share some of Strompris.no's services as a business model, which makes revenue from transporting customers from one electricity provider to another. Some of them are Elskling.no, Bytt.no, Strombytte.no, and Dagensstrompris.no.

7.5 Changing behavior

Consumers are likely to switch retailers when they perceive the gains as greater than the cost (He & Reiner, 2017). Also, Flores & Waddams Price (2013 in He & Reiner, 2017, p. 29) found that "the more consumers believe they can gain by switching, the more active they will be". We see the relevance as we see a change in switching behavior as prices peak, as seen in Figures 7.4 and 7.5, which tells us that Norwegian households are somewhat price-sensitive.

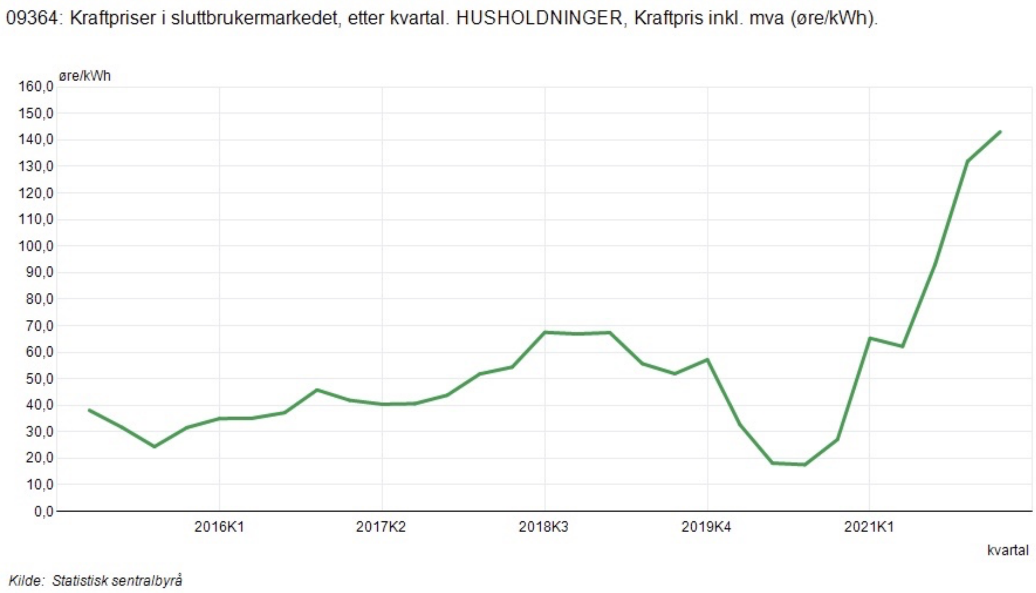


Figure 7.4 Power prices in the retail market (SSB, n.d.C).

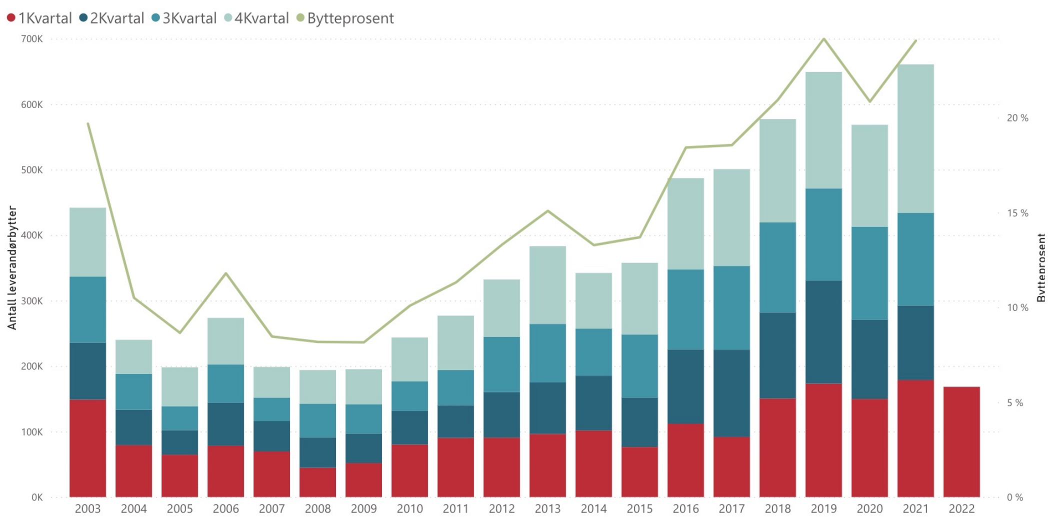


Figure 7.5 Retail provider changes for households (NVE-RME, n.d.).

There is an overrepresentation of customers who rarely switch to other retailers (Oslo Economics, 2021). As shown in figure 7.5, approximately 25% of households changed retailers, and even less in previous years. That means that about 75% of households are passive consumers. These numbers do not consider that some consumers may have switched more than once in the same period, meaning that the percentage of households that changed, in reality, is lower (NVE, 2020B). Both marketing research by Rande & Håskjold. (2017) and research done by Forbrukerrådet (2020B) show that about 85% of consumers never have or do not recall ever-changing their retailer/contract, which is in line with the previous statement. Rande & Håskjold (2017) also concluded that 59% of all consumers who thought of changing retailers thought it was too complicated or challenging to understand. In regards to the Varian model, *Figure 7.5*, together with the research just shown, gives an assumption that the result of the calculation would be on the lower side in [0,1], meaning that the share of informed consumers is low, indicating that a price can be charged higher than marginal cost.

An upward trend in switching behavior originated prior to the launch of Strompris.no, even though we can assume that the platform has contributed to further strengthening this direction. Further advancements in Strompris.no and an increasing switching trend would accumulate to even more switches as a spiral effect. This explanation arrives from the research of Giulietti et al. (2005) and Wirtz et al. (2014) from He & Reiner (2017). They "conclude that consumers are more likely to switch in one market if they have previously switched in other markets" (He & Reiner, 2017, p. 30) since consumers are more experienced and thus have a reduced perception of risk.

7.6 Price setting tactics

Retailers have different strategies depending on the regions they operate; Boroumand (2015) argues that retailers entering new areas would generate a down price alignment for themselves and other competitors in that and every other regional market (Boroumand, 2015). There is an event called "mutual forbearance," which is tacit collusion without any separate agreement.

Mirza & Bergland (2012) found that with variable pricing models in Norway, retailers behave opportunistically regarding fluctuations in price. Findings prove that variable contracts take three weeks to follow when wholesale price increases. On the other side, it takes four weeks to implement lower wholesale prices, which gives retailers one week of higher price revenue at consumer expense (Mirza & Bergland, 2012), which can be a part of the large markups found in fixed- and variable price contracts.

Other services which are assimilating Strompris.no, like Dagensstrompris.no, have received much attention regarding fraudulent behavior. The owners behind this service are also the same as the electric retail company, Nordlysenergi. Dagensstrompris.no, with whatever configuration of the site's specifications, favors their own Nordlysenergi, which always comes out as the best choice for the consumer. The Norwegian Consumer Council calls the site rigged (Lea & Svendsen, 2021). The electric retail company, Huskraft Energi AS, is under investigation by the State Regulatory Authority (RME) for conducting misappropriate invoicing where the payable amount surpasses what it should be (Bøhren, 2022). Fraudulent behavior does exist in the market.

7.7 Consumer loyalty

The market has regionality regarding wholesale & retail prices and retailer & consumer. Consumers are greatly loyal to their local energy retailer, even though they would be better off choosing a national provider. This regionality loyalty is visually represented in *Figure 7.8*, which shows where the customers of selected retailers are placed. Boroumand (2015) refers to these zones as a multimarket, and he has identified asymmetries in the pricing behaviors that assimilate oligopolistic conditions regarding retail price versus wholesale price (Boroumand, 2015).

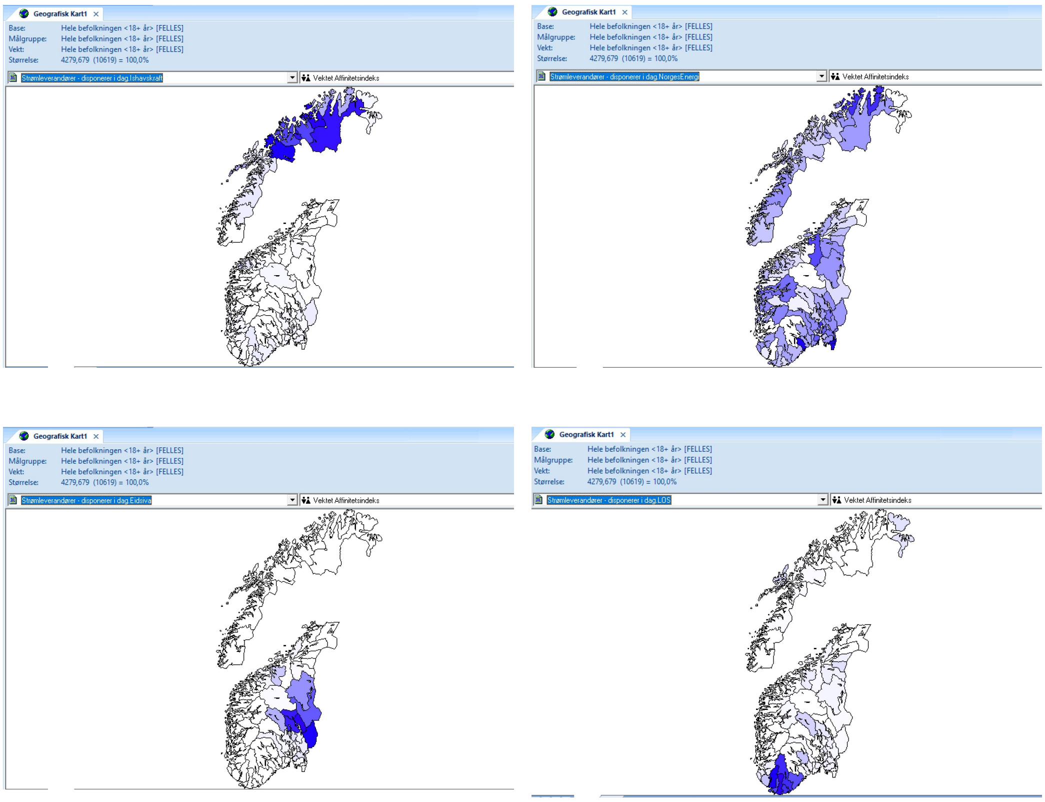


Figure 7.8. Geographical representation of different retailers' customer bases in different regions. Kantar (2022).

Olsen et al.(2006); Elkforsk (2007) in Finon & Boroumand (n.d), and von der Fehr & Hansen (2008) have found that several retailers take advantage of their customers, especially those who remain in their geographical area, it is done by having a relatively high price on the default contracts holding passive core customers whilst having other, more attractive, contracts to attain active customers from other regions (Finon & Boroumand, n.d.). This is an underlying perspective that enhances the view of bounded rationality and consumer preferences that dispute the general law of the lowest price gains the entire market.

8.0 CONCLUSION

By evaluating the efficient market criteria given by Grønn (2016); Boroumand (2015); Dahl (2004), we learn there are key indicators of market efficiency. They are; information transparency such that buyers and sellers make adequate choices for their needs, have zero cost for switching retailers, and minimal costs in regards to entry, together with an abundance of buyers and sellers with no market power, and lastly, rationality amongst players.

We see apparent information transparency issues, which hinder consumers from making rational decisions for their needs. The market overflows with misleading names, confusing structures, and complex language in contracts. In addition, hidden notifications that the terms regarding price changes do not appear as the primary information are problematic; also, default options and systems like ABP encourages undermining information at the expense of the consumer.

The criteria of zero cost for switching for an efficient market can be seen from two sides; one is that there is no monetary cost for the consumer in switching between retailers. On the other hand, factors are deliberately made that affect many sides of the consumers' psychology towards switching. Higher transaction costs affect their perspective of perceived gains are evident in preventing consumers from changing their electric retailer in our research.

A situation with abundant retailers has not resulted in balanced market shares. One retailer with over 1/2 of the entire market gives extraordinarily high concentration results on the Herfindahl Index from a general market perspective.

Lastly, full rationality amongst players does not appear to apply to consumers as traditional economics implies. Consumers suffer from bounded rationality which retailers act opportunistically upon.

Researches show that average markups range from 28% to 67%, with one year specific staggering 420% in one of the electricity contracts. The gross margins are much higher than the Europe Energy industry's average markup of 19.85%. Additionally, results in regionality and seasonality indicate that retailers tend to extract more profits from consumers; they adopt a "smoothing method" in different seasons and contracts in order to balance profits. Such substantial levels in retailers' revenue could indicate market inefficiency. Analyses also show that entrants in the market influence prices positively, and consumers suffer from higher prices when new players enter the market. Even though these effects are relatively minor, the market should be alarmed because a bigger portion of entrants might create more significant effects.

Given the above, several policy recommendations can be made;

- Strompris.no has simplified the consumer search quest and is crucial in balancing the information asymmetry between consumers and retailers. Continuing developing Strompris would be an important policy to follow.
- Adding services such as ElHub into their new service "Sjekk din strømpris" could be efficient, and the share of active and informed consumers can be improved.
- Governmental tools that put restrictions on pricing strategies.
- Funding state-owned retailers so that competition in the market can be enhanced.

These would result in an increased share of active and informed consumers, leading them to better decisions, reducing social welfare losses, and increasing efficiency.

9.0 REFERENCES

Anderson, S. P., & Renault, R. (1999). *Pricing, Product Diversity, and Search Costs: A Bertrand-Chamberlin-Diamond Model.* The RAND Journal ofEconomics, 30(4), 719. https://doi.org/10.2307/2556072

Belleflamme, P., & Peitz, M. (2015). Industrial Organization: Markets and Strategies. In *Google Books*. Cambridge University Press. https://books.google.sh/books?id=4tImCgAAQBAJ&printsec=frontcover#v=onepage&q&f=false

Boroumand, R. H., Goutte, S., Porcher, S., & Porcher, T. (2015). Hedging strategies in energy markets: The case of electricity retailers. *Energy Economics*, *51*, 503–509. https://doi.org/10.1016/j.eneco.2015.06.021

Boroumand, R. H. (2015). Electricity markets and oligopolistic behaviors: The impact of a multimarket structure. *Research in International Business and Finance*, *33*, 319–333. https://doi.org/10.1016/j.ribaf.2014.04.004

Brenna, A. L. (2020, October 22). *Forbrukerrådet må slutte å "reklamere" for dårlige strømavtaler.* Europower. https://enerwe.no/forbrukerradet-kommentar-strompris/forbrukerradet-ma-slutte-a-reklamere-for-darlige-stromavtaler/383760

Brenna, A. L. (2021A, 25. February) *De fem største strømselskapene har 65 prosent av husholdningskundene.* Europower. https://enerwe.no/nettselskap-nve-rme/de-fem-storste-stromselskapene-har-65-prosent-av-husholdningskundene/398099

Brenna, A. L. (2021B, March 2). *Dette krever Forbrukertilsynet av strømselskapene.* Europower. https://enerwe.no/forbrukertilsynet-stromavtale-strompris/dette-krever-forbrukertilsynet-av-stromselskapene/398778

Bugge, S. (2021, February 22). *Forbrukerrådet mener strømkundene blir lurt*. E24. https://e24.no/olje-og-energi/i/1BV4GK/forbrukerraadet-mener-stroemkundene-blir-lurt

Bytt.no. (n.d). *Se oversikt over alle norske strømleverandører.* https://www.bytt.no/strom/stromleverandorer

Bøhren, L (2022, 20. March). *Flere strømkunder melder om overfakturering fra Huskraft.* E24. https://e24.no/naeringsliv/i/qWMoJg/flere-stroemkunder-melder-om-overfakturering-fra-huskraft

Carlin, B. I. (2009). Strategic price complexity in retail financial markets☆. *Journal of Financial Economics*, *91*(3), 278–287. https://doi.org/10.1016/j.jfineco.2008.05.002

Chioveanu, I. (2008). Advertising, brand loyalty and pricing. *Games and Economic Behavior*, *64*(1), 68–80. https://doi.org/10.1016/j.geb.2007.12.004

Chioveanu, I., & Zhou, J. (2013). Price Competition with Consumer Confusion. *Management Science*, *59*(11), 2450–2469. https://doi.org/10.1287/mnsc.2013.1716

Coase, H. (2020). *Man and the Economy*, *7*(1), 20200009. https://doi.org/10.1515/me-2020-0009

Dahl, C. (2004). International energy markets (1st ed.). PennWell Corporation.

Damodaran, A. (2022). *Operating and Net Margins by Industry Sector: Europe.* https://pages.stern.nyu.edu/~adamodar/pc/datasets/marginEurope.xls

Dixit, A., & Norman, V. (1978). *Advertising and Welfare.* RAND Corporatiopn. https://www.jstor.org/stable/3003609

Dulsrud, A., & Alfnes, F. (2015). *Strømkunder på vandring? Forbrukernes bytting av strømavtaler* (No. 4). SIFO. https://oda.oslomet.no/oda-xmlui/bitstream/handle/20.500.12199/5314/file80414_fagrapport_nr._4-2015_-_forbrukernes_bytting_av_stromavtaler.pdf?sequence=1&isAllowed=y

Elvia. (n.d). *AMS-måler: Dette må du vite.* https://www.elvia.no/smart-forbruk/alt-om-din-strommaler/ams-maler-dette-ma-du-vite/

Energifaktanorge. (2022, May 13). *Kraftmarkedet*. https://energifaktanorge.no/norsk-energiforsyning/kraftmarkedet/#:~:text=Str%C3%B8m%20er%20et%20homogent%20produkt,er%20derfor%20kraftkontraktene%20de%20tilbyr.

European Commission. Directorate General for Justice and Consumers. (2018). *Consumer markets scoreboard: Making markets work for consumers : 2018 edition.* Publications Office. https://data.europa.eu/doi/10.2838/25750

Farrell, J., & Klemperer, P. (2007). *Chapter 31 Coordination and Lock-In: Competition with Switching Costs and Network Effects.* In Handbook of Industrial Organization (Vol. 3, pp. 1967–2072). Elsevier. https://doi.org/10.1016/S1573-448X(06)03031-7

Felsmann, B., & Vékony, A. (2021). *European Barriers in Retail Energy Markets Project: Index Report.* Luxembourg: Publications Office of the European Union. ISBN 978-92-76-30267-4, doi:10.2833/559113

Finion, D. & Boroumand, R. H. (n.d.) *Electricity retailers' competition: From survival strategies to oligopolistic behavior.* https://www.city.ac.uk/__data/assets/pdf_file/0004/107392/Boroumand_Finon_Electricity_retailers_competition.pdf

Finstad, Ø., Lund, K. & Kværnes, M. (2021, October 22). *Fastpris på strøm tilbys under spotpris - Forbrukerrådet anbefaler likevel spotpris.* DN. https://www.dn.no/energi/strom/energi/kraft/fastpris-pa-strom-tilbys-under-spotpris-forbrukerradet-anbefaler-likevel-spotpris/2-1-1087114

Fjordkraft. (2020, July 17). *Fjordkraft kjøper to strømleverandører*. https://www.fjordkraft.no/pressemeldinger/fjordkraft-kjoper-to-stromleverandorer/#:~:text=Eierne%20av%20str%C3%B8mleverand%C3%B8rene%20Gudbrandsdal%20Energi,sitt%20felles%20selskap%3A%20Innlandskraft%20AS.

Forbrukerrådet. (2020A). *Forbrukere blir lurt når de kjøper strøm.* Forbrukerrådet. https://www.forbrukerradet.no/siste-nytt/forbrukere-blir-lurt-nar-de-kjoper-strom/

Forbrukerrådet. (2020B, June). *Befolkningsundersøkelse: Bytte av strømavtaler.* Forbrukerrådet. https://fil.forbrukerradet.no/wp-content/uploads/2020/06/undersokelse-bytte-av-stromavtale.pdf

Forbrukerrådet. (2021, January 29). *Krever at Fjordkraft tilbakebetaler etter ulovlig prisøkning.*

https://www.forbrukerradet.no/siste-nytt/krever-at-fjordkraft-tilbakebetaler-etter-ulovlig-prisokning/

Forbrukertilsynet. (n.d.). *Forbrukertilsynets retningslinjer for stands- og dørsalg.* Forbrukertilsynet. https://www.forbrukertilsynet.no/lov-og-rett/veiledninger-og-retningslinjer/forbrukerombudets-retningslinjer-stands-dorsalg

Forbrukertilsynet. (2020, February 11). *Dette fikk Forbrukertilsynet flest klager på i 2019.* Forbrukertilsynet. https://www.forbrukertilsynet.no/dette-fikk-forbrukertilsynet-flest-klager-pa-2019

Forbrukertilsynet. (2021A, June 23). *Forslag til endringer i prisopplysningsforskriften*. Forbrukertilsynet. https://www.forbrukertilsynet.no/wp-content/uploads/2021/08/Forslag-til-endringer-i-prisopplysningsforskriften856723.pdf

Forbrukertilsynet. (2021B, March 2). *Forbrukertilsynet krever direkte varsling av prisendringer i strømavtaler.* https://www.forbrukertilsynet.no/forbrukertilsynet-krever-direkte-varsling-av-prisendringer-i-stromavtaler

Garden, V. A., & Bugge, S. (2019, February 4). *Forbrukerrådet advarer: SLik lokkes strømkunder i prisfelle.* VG. https://www.vg.no/nyheter/innenriks/i/0ERW5G/forbrukerraadet-advarer-slik-lokkes-stroemkunder-i-prisfelle

Giulietti, M., Price, C. W. & Waterson, M. (2001), *Consumer choice and industrial policy: A study of UK energy markets.* Center for Competition and Regulation. Working Paper CCR 01-5.

Greenlee, P., Reitman, D., & Sibley, D. S. (2008). An antitrust analysis of bundled loyalty discounts. *International Journal of Industrial Organization*, *26*(5), 1132–1152. https://doi.org/10.1016/j.ijindorg.2007.11.001

Grønn, E. (2016) *Mikroøkonomi på norsk.* Oslo: Cappelen Damm.

Gulbrandsen, C. (2018). *Derfor bør du ikke kjøpe strøm fra telefonselgere eller fra selgere på gata eller døra.* Aftenposten. https://www.aftenposten.no/bolig/i/AdbjWq/derfor-boer-du-ikke-kjoep-stroem-fra-telefonselgere-eller-fra-selgere-paa-gata-eller-paa-doera

Hagfors, C. L. (2020, October 21) *Mistenker prisjuks hos strømselskaper: - Umilig å si hvor mye kundene har tapt.* VG. https://www.vg.no/nyheter/innenriks/i/x3PoKj/mistenker-prisjuks-hos-stroemselskaper-umulig-aa-si-hvor-mye-kundene-har-tapt

Hayes, A. (2021, August 5). *Why End Users Matter*. Investopedia. https://www.investopedia.com/terms/e/end-user.asp

He, X., & Reiner, D. (2017). *Why Consumers Switch Energy Suppliers: The Role of Individual Attitudes.* The Energy Journal, 38(01). https://doi.org/10.5547/01956574.38.6.hxia

Jacobsen, H. K., Fristrup, P., & Munksgaard, J. (2006). *Integrated energy markets and varying degrees of liberalisation: Price links, bundled sales and CHP production exemplified by Northern European experiences.* Energy Policy, 34(18), 3527–3537. https://doi.org/10.1016/j.enpol.2005.08.002

Joskow, P., & Tirole, J. (2006) *Retail electricity competition.* RAND Journal of Economics. https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1756-2171.2006.tb00058.x

Kantar. (2022). Forbruker & Media (21/4-MGI) [Datasett].

Kenton, W. (2021, April 14). *Wholesale Trade Definition*. Investopedia. https://www.investopedia.com/terms/w/wholesale-trade.asp#:~:text=Wholesale%20trade%20is%20an%20economic

Konkurransetilsynet. (2016). *Konkurransen i Norge*. https://konkurransetilsynet.no/wp-content/uploads/2018/08/rapport-konkurransen_i_norge.pdf

Kristiansen, K. R. (2021, September 30). *Slik lokker strømleverandørene deg.* TV2 Hjelper Deg. https://www.tv2.no/a/14257863/

Lea, A., Svendsen, M. (2021, November 17). *Nordlysenergi-sjef står bak strømprissammenlikningsside: - Ser ut som at tjenesten er rigget.* E24. https://e24.no/naeringsliv/i/z79oy9/nordlysenergi-sjef-staar-bak-stroemprissammenlikningsside-ser-ut-som-at-tjenesten-er-rigget

Lillo-Stenberg, H. (2021, October 5). *Ber nordmenn sjekke strømavtalen: - Mange sitter på dyre og dårlige avtaler.* Dagsavisen. https://www.dagsavisen.no/nyheter/innenriks/2021/10/05/ber-nordmenn-sjekke-stromavtalen-mange-sitter-pa-dyre-og-darlige-avtaler/

Lo, H., Blumsack, S., Hines, P., & Meyn, S. (2019). Electricity rates for the zero marginal cost grid. *The Electricity Journal*, *32*(3), 39–43. https://doi.org/10.1016/j.tej.2019.02.010

Mirza, F. M., & Bergland, O. (2012). Pass-through of wholesale price to the end user retail price in the Norwegian electricity market. *Energy Economics*, *34*(6), 2003–2012. https://doi.org/10.1016/j.eneco.2012.08.004

Moen, E. R. (2021, August 23). *GRA 6669 Theoretical IO, Lecture 1. Introduction*. [PowerPoint slides]. Itslearning. https://bi.itslearning.com/

Moen, E. R. (2021, October 14). *GRA 6669 Theoretical IO, Lecture 8. Uninformed consumers ctd*. [PowerPoint slides]. Itslearning. https://bi.itslearning.com/

Mountain, B., & Burns, K. (2021). Loyalty taxes in retail electricity markets: Not as they seem? *Journal of Regulatory Economics*, *59*(1), 1–24. https://doi.org/10.1007/s11149-020-09418-9

Nord Pool. (n.d.). *The main arena for trading power.* www.nordpoolgroup.com. https://www.nordpoolgroup.com/en/the-power-market/Day-ahead-market

Norwegian Ministry of Petroleum and Energy. (2021A, May 11). *Electricity production*. Energifakta Norge. https://energifaktanorge.no/en/norsk-energiforsyning/kraftproduksjon/#:~:text=Norway%20has%20the%20highest%20share

Norwegian Ministry of Petroleum and Energy. (2022B, May 13). *The power market*. Energifakta Norge. https://energifaktanorge.no/en/norsk-energiforsyning/kraftmarkedet/#price-formation

NVE. (n.d.) *Leverandørskifter, markedsandeler og leveringsplikt.* [Statistikk]. https://www.nve.no/reguleringsmyndigheten/publikasjoner-og-data/statistikk/statistikk-over-sluttbrukermarkedet/leverandoerskifter-markedsandeler-og-leveringsplikt/

NVE. (2020, February 12). *NVE-RME vil vurdere tiltak for et bedre strømmarked.* https://www.nve.no/reguleringsmyndigheten/nytt-fra-rme/nyheter-reguleringsmyndigheten-for-energi/nve-rme-vil-vurdere-tiltak-for-et-bedre-strommarked/

NVE. (2021A, December 2). *Alt om strøm.* https://www.nve.no/reguleringsmyndigheten/kunde/strom/alt-om-strom/

NVE. (2021B, November 11). *Forslag til endringer i forskrift og mulige tiltak for et effektivt sluttbrukermarked.* https://www.nve.no/media/12507/forslag-til-endringer-i-forskrift-og-mulige-tiltak-for-et-effektivt-sluttbrukermarked.pdf

NVE-RME. (n.d.). *Antall leverandørskifter husholdningskunder.* https://www.nve.no/reguleringsmyndigheten/publikasjoner-og-data/statistikk/statistikk-over-sluttbrukermarkedet/leverandoerskifter-markedsandeler-og-leveringsplikt/

Olsen, O. J., Johnsen, T. A., & Lewis, P. (2006). A Mixed Nordic Experience: Implementing Competitive Retail Electricity Markets for Household Customers. *The Electricity Journal*, *19*(9), 37–44. https://doi.org/10.1016/j.tej.2006.09.011

Oslo Economics. (2021). *Tiltak for et effektivt sluttbrukermarked for strøm: RME Ekstern rapport nr. 5/2021*. Reguleringsmyndigheten for energi.

Pindyck, R. S., & Rubinfeld, D. L. (2013). *Microeconomics* (8th ed). Pearson.

Porter, M. E. (1997). Competitive strategy. Measuring business excellence. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=differentiating+product+increase+price&btnG=#:~:text=of%20Science%3A%2013-,%5BPDF%5D%20emerald.com,-Find%20%40%20BI

Rande, M., & Håskjold, R. (2018, January). *Forbrukerens tilpasning i strømmarkedet 2017* (No. 8–2018). NVE. https://publikasjoner.nve.no/rapport/2018/rapport2018_08.pdf

Regjeringen. (n.d.). *Høringsnotat Forslag til endringer i prisopplysningsforskriften og forskrift om kraftomsetning og nettjenester*. https://www.regjeringen.no/contentassets/cf7067c4db434c7bb629993797721196/horingsnotat-forslag-til-endringer-i-prisopplysningsforskriften-og-forskrift-om-kraftomsetning-og-nettjenester-l1071461.pdf

Regjeringen. (2019). *Enklere merverdiavgift med én sats.* https://www.regjeringen.no/no/dokumenter/nou-2019-11/id2645213/?ch=10

Rhoades, S. A. (1993). The herfindahl-hirschman index. *Federal Reserve Bulletin, 79(3),* 188-189.

Riis, C., & Moen, E. R. (2012). *Moderne mikroøkonomi med digital arbeidsbok*. Gyldendal akademisk.

Riis, C., & Moen, E. R. (2016). *Moderne mikroøkonomi*. Gyldendal akademisk.

Saastamoinen, Bjørndal, E., & Bjørndal, M. (2017). *Specification of merger gains in the Norwegian electricity distribution industry*. Energy Policy, 102, 96–107. https://doi.org/10.1016/j.enpol.2016.12.014

Scitovsky, T. (1950). *Ignorance as a source of oligopoly power. The American Economic Review, 40(2)*, 48-53. https://www.jstor.org/stable/pdf/1818022.pdf

Sexton, S. (2015). Automatic Bill Payment and Salience Effects: Evidence from Electricity Consumption. *Review of Economics and Statistics*, *97*(2), 229–241. https://doi.org/10.1162/REST_a_00465

Smith, W. R. (1956). Product Differentiation and Market Segmentation as Alternative Marketing Strategies. Journal of Marketing, 21(1), 3–8. https://doi.org/10.1177/002224295602100102

Solli, M. (2019). *Strømsjokket: Nordmenn har betalt én milliard for mye.* Avisa Nordland. https://www.an.no/strom/norge/forbrukertips/stromsjokket-nordmenn-har-betalt-n-milliard-for-mye/s/5-4-975731

Spiegler, R. (2016). Choice Complexity and Market Competition. *Annual Review of Economics*, *8*(1), 1–25. https://doi.org/10.1146/annurev-economics-070615-115216

SSB. (n.d.A). [Dataset] Table 10573: Average energy consumption per household, by house type 1995 - 2012 https://www.ssb.no/en/statbank/table/10573/

SSB. (n.d.B). [Dataset] Table 09364: Power contracts in the retail market, statistical variable and quarter. https://www.ssb.no/statbank/sq/10069457

SSB. (n.d.C). [Dataset] Table 09364: Power prices in the retail market, by type of contract, statistical variable and quarter. https://www.ssb.no/statbank/sq/10069557

SSB. (n.d.D). [Dataset] Table 09364: Power prices in the retail market. https://www.ssb.no/statbank/sq/10069478

SSB. (n.d.E). [Dataset] Table 10580: Husholdningenes energibruk, etter region, statistikkvariabel og år. https://www.ssb.no/statbank/sq/10069600

Stahl, D. O. (1996). Oligopolistic pricing with heterogeneous consumer search. *International Journal of Industrial Organization*, *14*(2), 243–268. https://doi.org/10.1016/0167-7187(94)00474-9

Statnett (2021, December 13). *Hvorfor har vi prisområder?* https://www.statnett.no/om-statnett/bli-bedre-kjent-med-statnett/om-strompriser/fakta-om-prisomrader/

Sturluson, J. T. (2003). *Chapter 1 - Consumer Search and Switching Costs in Electricity Retailing.* [Doctorgraduate, Handelshögskolan i Stockholm]. ACADEMIA. https://scholar.google.no/scholar?hl=en&as_sdt=0%2C5&q=sturluson+electicity&btnG=#:~:text=for%20sturluson%20electicity-,%5BPDF%5D%20academia.edu,-%5BPDF%5D%20Consumer

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge.* Yale University Press.

Thaler, R. H. (2015). *Misbehaving : the making of behavioural economics* (pp. XIV, 415). Allen Lane.

Thaler, Sunstein, C. R., & Velsand, K. (2019). *Nudge : hvordan ta bedre valg om helse, penger og lykke.* Dreyers forlag.

Tushar, W., Yuen, C., Saha, T., Chattopadhyay, D., Nizami, S., Hanif, S., Alam, J. E., & Poor, H. V. (2021). Roles of retailers in the peer-to-peer electricity market: A single retailer perspective. *IScience*, *24*(11), 103278. https://doi.org/10.1016/j.isci.2021.103278

U.S. Department of Justice and the Federal Trade Commission. (2015, June 25). *Horizontal Merger Guidelines (08/19/2010)*. Justice.gov. https://www.justice.gov/atr/horizontal-merger-guidelines-08192010

Varian, H. R. (1980). A Model of Sales. *The American Economic Review*, *70*(4), 651–659. https://www.jstor.org/stable/1803562?seq=1

Varian, H. R. (2014). *Intermediate microeconomics with calculus*. New York W.W. Norton & Company.

Vining, A. R., & Weimer, D. L. (1988). Information asymmetry favoring sellers: A policy framework. *Policy Sciences*, *21*(4), 281–303. https://doi.org/10.1007/BF00138305 von der Fehr, N.-H. M., & Hansen, P. V. (2010). Electricity Retailing in Norway. *The Energy Journal*, *31*(1), 25–45. https://www.jstor.org/stable/41323269?seq=1#metadata_info_tab_contents

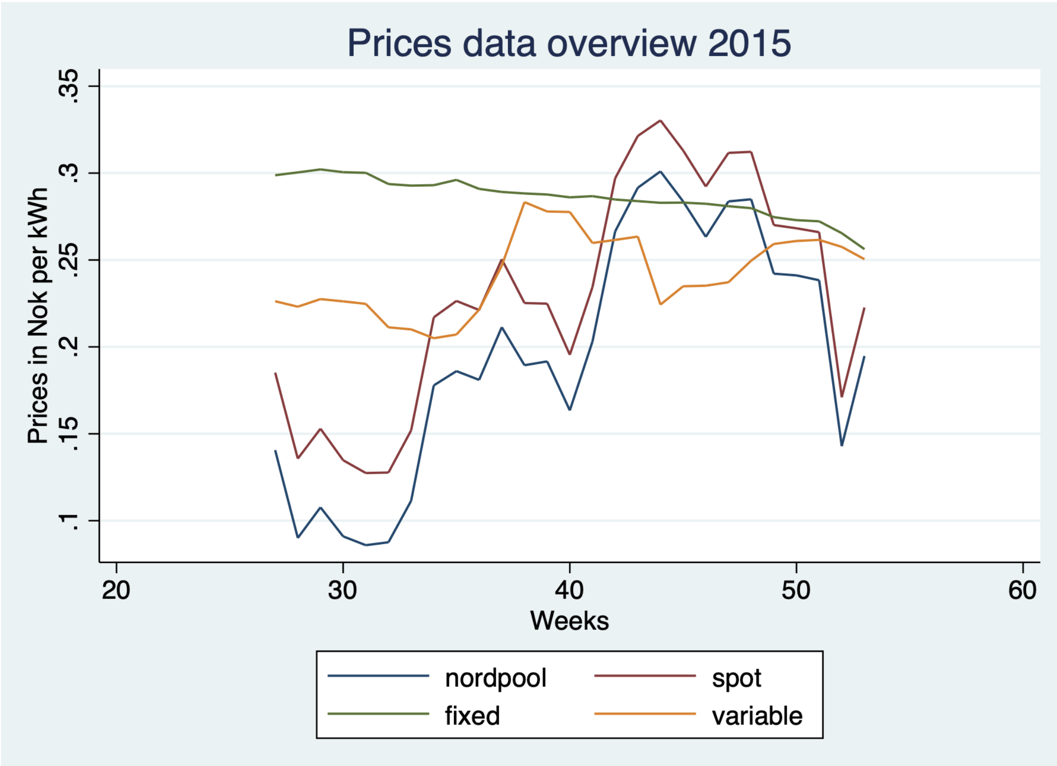
von der Fehr, N.-H. M., & Hansen, P. V. (2009). *Nils-Henrik M. von der Fehr Petter Vegard Hansen Electricity Retailing in Norway*. https://www.sv.uio.no/econ/english/research/Memoranda/working-papers/pdf-files/2009/Memo-02-2009.pdf Thaler. (2015). *Misbehaving : the making of behavioural economics* (pp. XIV, 415). Allen Lane.

Waldman, D., & Jensen, E. J. (2013). *Industrial Organization: Theory and Practice*. Pearson Education. https://books.google.no/books?id=iXAvAAAAQBAJ

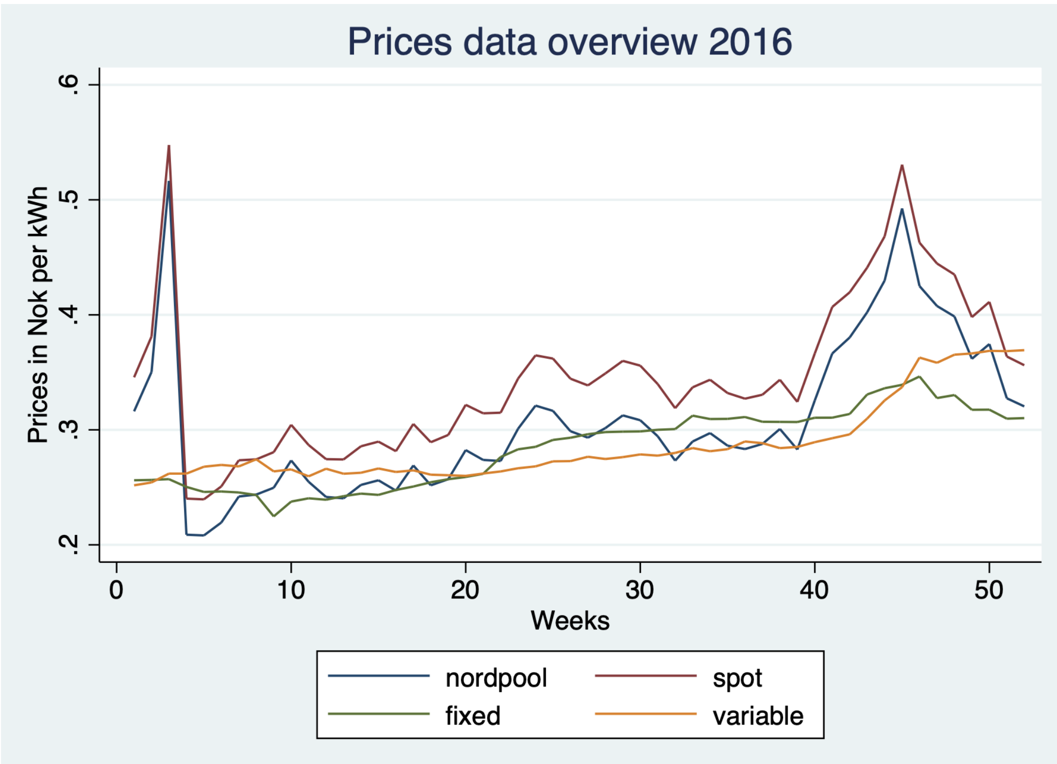
Zohuri, B., & McDaniel, P. (2019). *The Electricity: An Essential Necessity in Our Life.* In B. Zohuri & P. McDaniel, Advanced Smaller Modular Reactors (pp. 1–21). Springer International Publishing. https://doi.org/10.1007/978-3-030-23682-3_1

10. APPENDIX

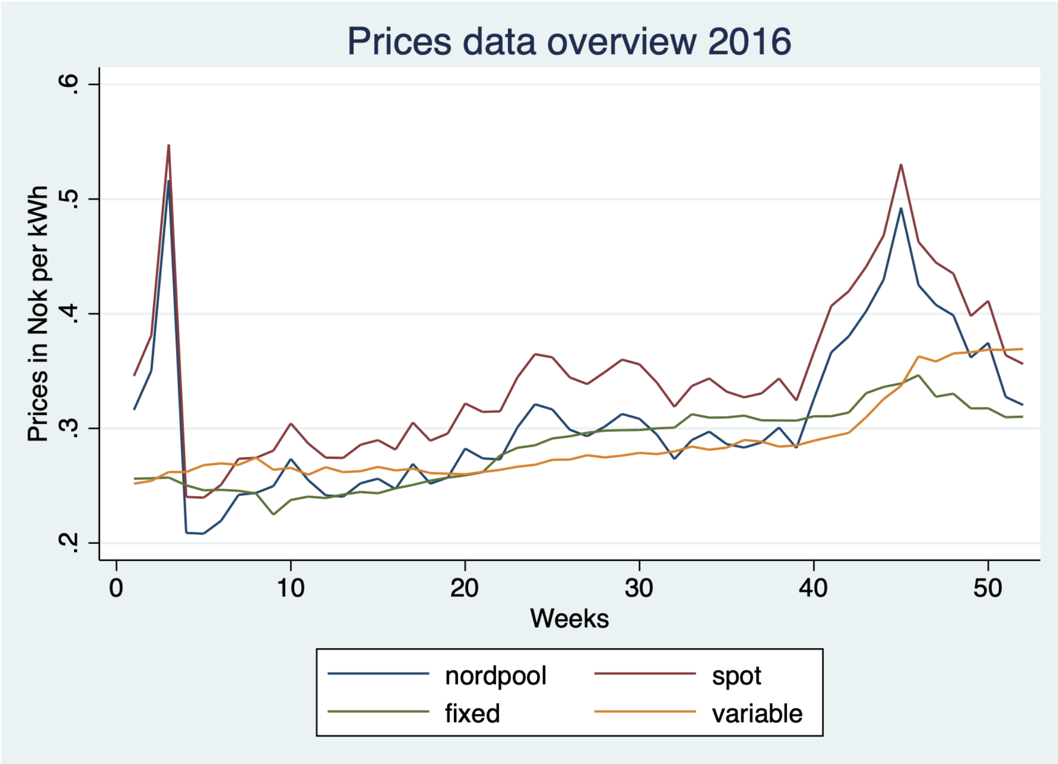
Appendix 1: The prices overview in 2015



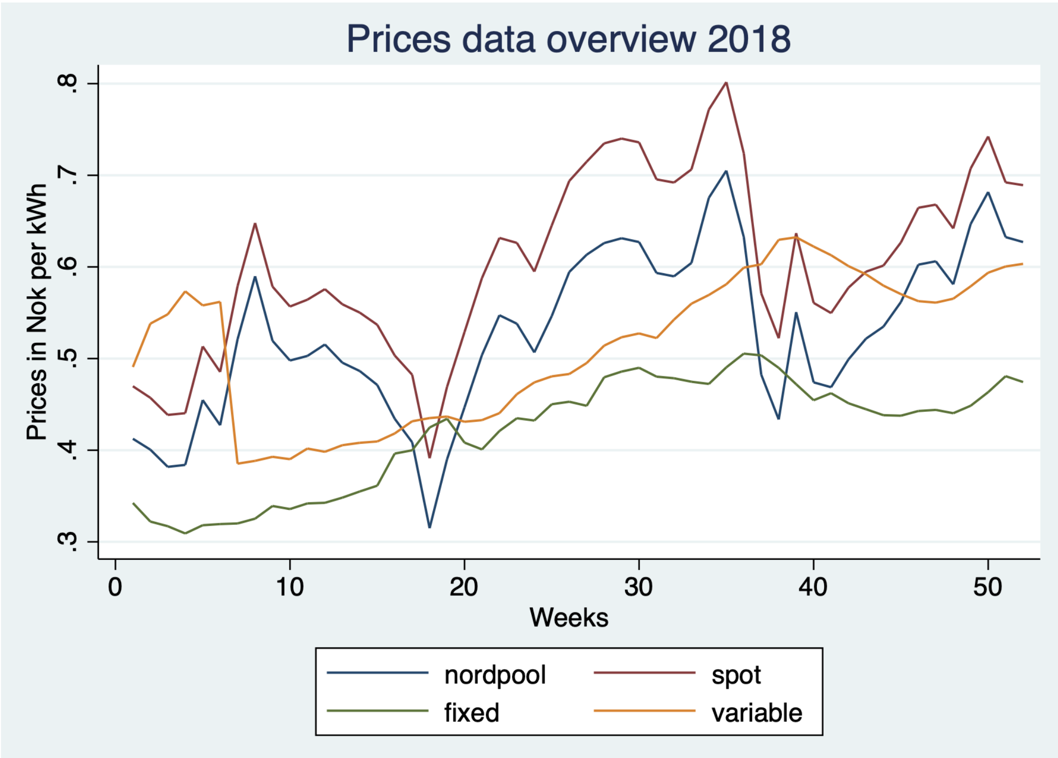
Appendix 2: The prices overview in 2016



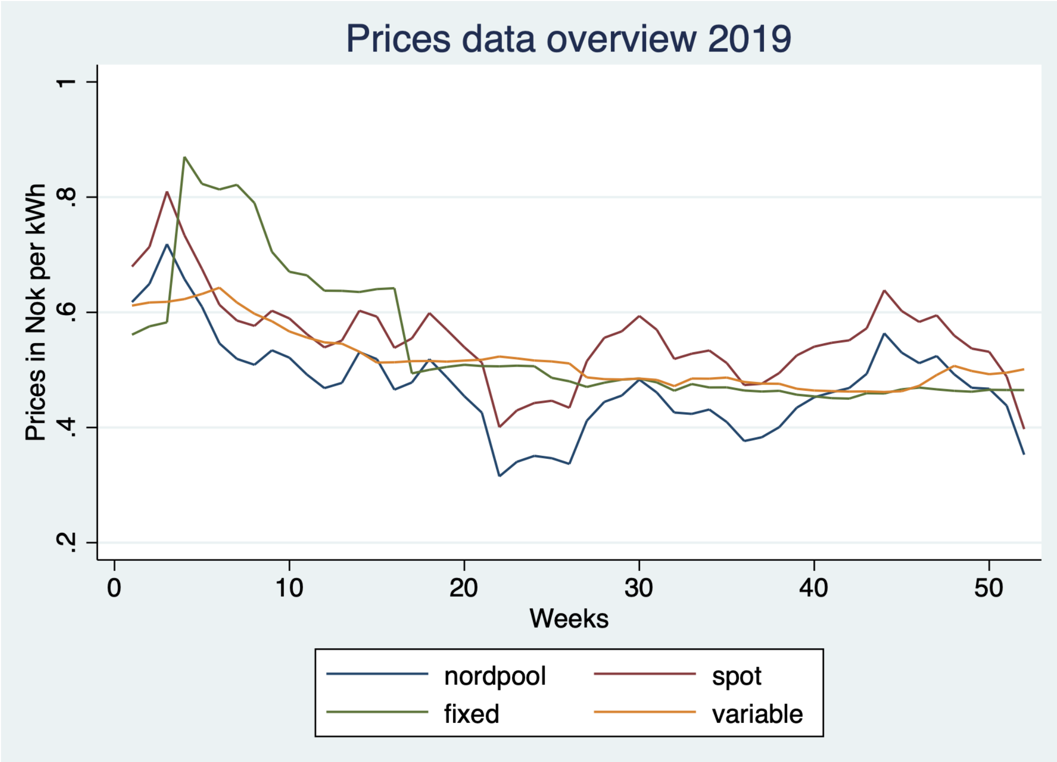
Appendix 3: The prices overview in 2017



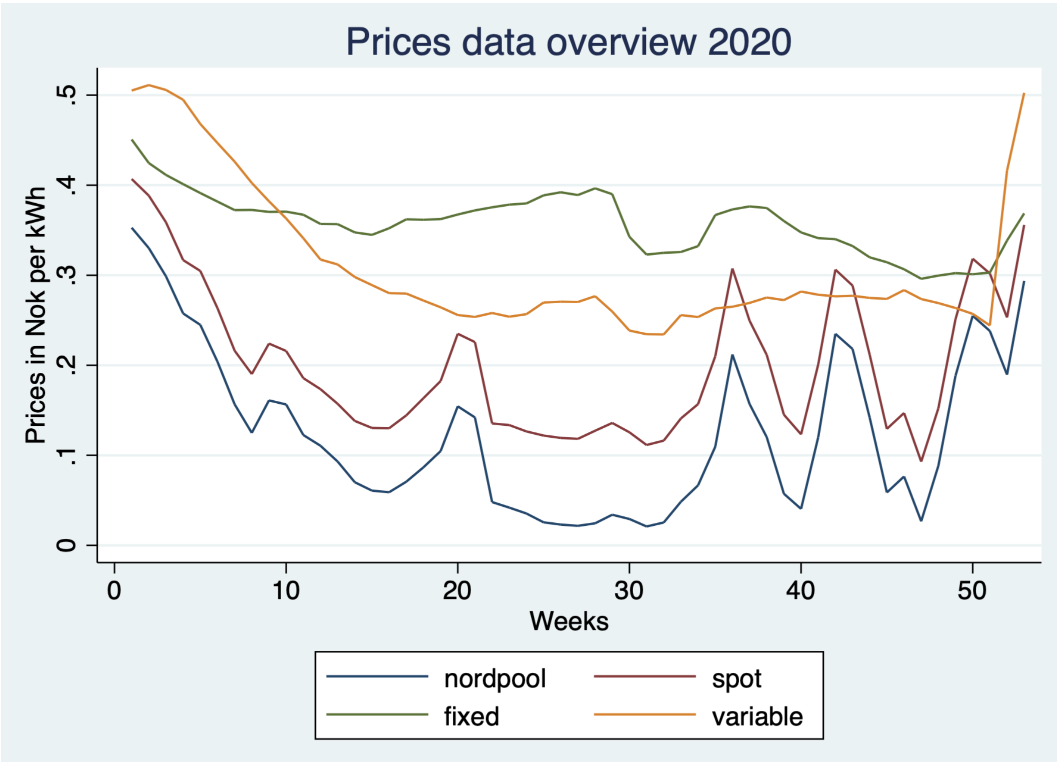
Appendix 4: The pricss overview in 2018



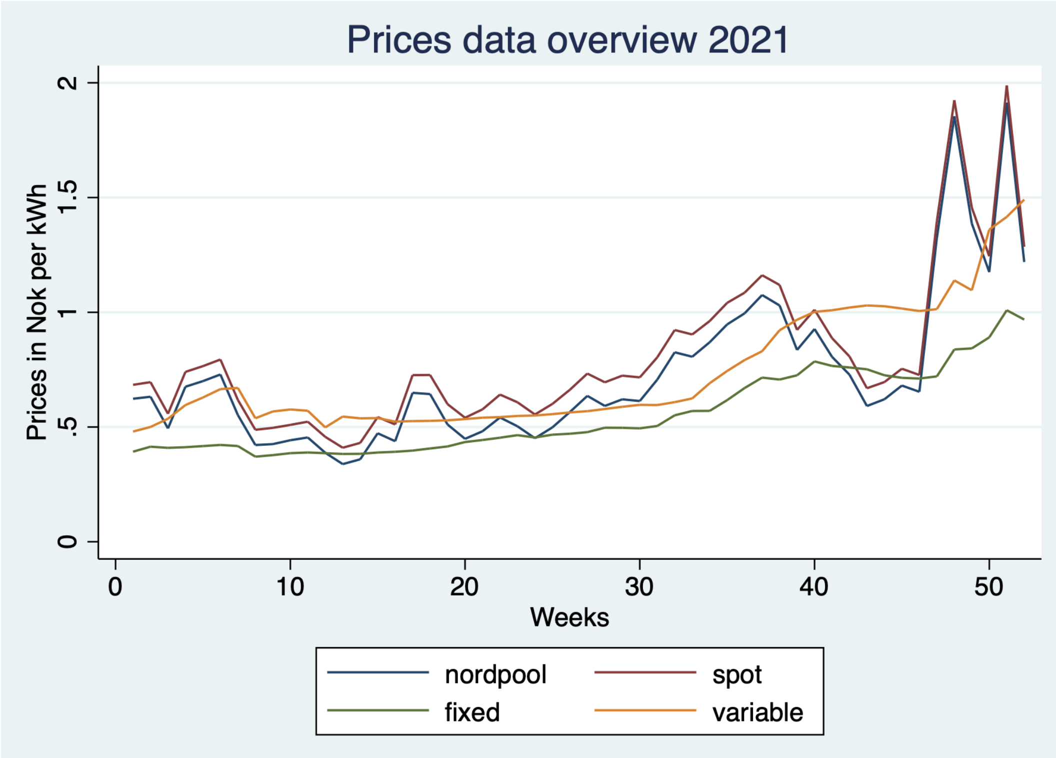
Appendix 5: The prices overview in 2019



Appendix 6: The prices overview in 2020



Appendix 7: The prices overview in 2021



Appendix 8: Nord Pool prices listed by Year

Year	Summary of nordpool Mean	Std. dev.	Freq.
2015	.1945314	.07012359	27
2016	.30748125	.06696609	52
2017	.33334283	.03630649	52
2018	.52877608	.08937949	52
2019	.47414115	.08342862	52
2020	.12519741	.08979152	53
2021	.72838966	.33910155	52
Total	.39776065	.24315067	340

Appendix 9: Spot prices listed by Year

Year	Summary of spot_avg Mean	Std. dev.	Freq.
2015	.2291441	.06501014	27
2016	.34600754	.06772318	52
2017	.38254995	.0439482	52
2018	.60523833	.09712165	52
2019	.55582508	.07857892	52
2020	.20148664	.08115377	53
2021	.80961369	.33789361	52
Total	.46242906	.25066493	340

Appendix 10: Zone 1 Spot Contracts Markup

Linear regression

Number of obs	=	339
F(2, 336)	=	292.63
Prob > F	=	0.0000
R-squared	=	0.9409
Root MSE	=	.06099

no1_spot	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no1_nordpool	.4715398	.0548914	8.59	0.000	.3635656	.579514
no1_spot_past_week	.3598581	.0799775	4.50	0.000	.2025383	.5171779
_cons	.0930671	.0190402	4.89	0.000	.0556141	.1305202

Year	Summary of markup_spot_zone1 Mean	Std. dev.	Freq.
2015	.52879641	.35030141	26
2016	.21337935	.1409871	52
2017	.15440907	.05638347	52
2018	.064988	.07096998	52
2019	.09860779	.06777161	52
2020	2.3356146	2.6717074	53
2021	-.08868061	.10860264	52
Total	.47361907	1.3341248	339

Appendix 11: Zone 1 Fixed Contracts Markup

Linear regression

Number of obs	=	339
F(2, 336)	=	2103.59
Prob > F	=	0.0000
R-squared	=	0.9690
Root MSE	=	.03134

no1_fixed	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no1_nordpool	.055597	.0127826	4.35	0.000	.030453	.080741
no1_fixed_past_week	.9301446	.0325598	28.57	0.000	.8660979	.9941913
_cons	.0084613	.0083548	1.01	0.312	-.007973	.0248956

Year	Summary of markup_fixed_zone1 Mean	Std. dev.	Freq.
2015	.88084807	.84828962	26
2016	.03671739	.17463653	52
2017	-.01099231	.10158569	52
2018	-.1428118	.14429122	52
2019	.27112405	.31073896	52
2020	5.7600617	6.9256359	53
2021	-.29842925	.13621946	52
Total	.94594967	3.4426943	339

Appendix 12: Zone 1 Variable Contracts Markup

```
Linear regression                               Number of obs     =        339
                                                F(2, 336)         =    2489.01
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9647
                                                Root MSE          =     .04532
```

no1_variable	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no1_nordpool	.0660151	.027292	2.42	0.016	.0123303	.1196998
no1_variable_past_week	.9417818	.0504319	18.67	0.000	.8425798	1.040984
_cons	.0020884	.010194	0.20	0.838	-.0179637	.0221405

Year	Summary of markup_variable_zone1 Mean	Std. dev.	Freq.
2015	.3992111	.60034875	26
2016	.00118174	.16401597	52
2017	.23647984	.47652733	52
2018	.13725738	.44948627	52
2019	.14695338	.16278383	52
2020	4.1851482	4.820232	53
2021	-.17073048	.20089784	52
Total	.73879563	2.4312045	339

Appendix 13: Zone 2 Spot Contracts Markup

```
Linear regression                               Number of obs     =        339
                                                F(2, 336)         =     289.61
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9384
                                                Root MSE          =     .06216
```

no2_spot	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no2_nordpool	.4619958	.0537079	8.60	0.000	.3563497	.5676419
no2_spot_past_week	.3700595	.0795421	4.65	0.000	.2135962	.5265229
_cons	.092477	.0192054	4.82	0.000	.054699	.1302549

Year	Summary of markup_spot_zone2 Mean	Std. dev.	Freq.
2015	.52005731	.33447343	26
2016	.23045271	.12293824	52
2017	.15757998	.05611361	52
2018	.07056401	.07006576	52
2019	.09917607	.06657297	52
2020	2.2904182	2.6231269	53
2021	-.09516181	.11079422	52
Total	.46893636	1.3082017	339

Appendix 14: Zone 2 Fixed Contracts Makeup

Linear regression

Number of obs	=	339
F(2, 336)	=	1630.28
Prob > F	=	0.0000
R-squared	=	0.9466
Root MSE	=	.0528

no2_fixed	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no2_nordpool	.0558421	.0159109	3.51	0.001	.0245445	.0871397
no2_fixed_past_week	.9367814	.044197	21.20	0.000	.8498437	1.023719
_cons	.0061739	.0110414	0.56	0.576	-.015545	.0278929

Year	Summary of markup_fixed_zone2 Mean	Std. dev.	Freq.
2015	.82038562	.77864347	26
2016	.02314372	.14220058	52
2017	-.03386881	.1024683	52
2018	-.15709676	.13869057	52
2019	.43709643	.57838323	52
2020	5.6575761	6.808053	53
2021	-.3003496	.13550344	52
Total	.94267156	3.3857356	339

Appendix 15: Zone 2 Variable Contracts Markup

```
Linear regression                               Number of obs     =        339
                                                F(2, 336)         =    2850.60
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9743
                                                Root MSE          =     .03721
```

no2_variable	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no2_nordpool	.0646749	.0221718	2.92	0.004	.0210619	.1082879
no2_variable_past_week	.9435173	.0390845	24.14	0.000	.8666361	1.020399
_cons	.0012904	.0074941	0.17	0.863	-.0134508	.0160316

Year	Summary of markup_var_zone2 Mean	Std. dev.	Freq.
2015	.37218637	.56973464	26
2016	-.00228057	.13934951	52
2017	.12884361	.38768738	52
2018	.09246675	.34530513	52
2019	.13492127	.15826559	52
2020	4.182181	4.8346482	53
2021	-.17933085	.19717161	52
Total	.70918198	2.4359163	339

Appendix 16: Zone 3 Spot Contracts Markups

Linear regression			
	Number of obs	=	339
	F(2, 336)	=	292.04
	Prob > F	=	0.0000
	R-squared	=	0.9393
	Root MSE	=	.0617

no3_spot	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no3_nordpool	.4687829	.0549545	8.53	0.000	.3606848	.5768811
no3_spot_past_week	.3617806	.0803757	4.50	0.000	.2036776	.5198835
_cons	.0947451	.0191891	4.94	0.000	.0569991	.132491

Year	Summary of markup_spot_zone3 Mean	Std. dev.	Freq.
2015	.54909073	.36220062	26
2016	.24662035	.13313803	52
2017	.16214495	.05414145	52
2018	.07611661	.07542404	52
2019	.10153067	.06875122	52
2020	2.4156764	2.743434	53
2021	-.08813282	.10903962	52
Total	.49621757	1.3720194	339

Appendix 17: Zone 3 Fixed Contracts Markup

Linear regression			
	Number of obs	=	339
	F(2, 336)	=	1403.41
	Prob > F	=	0.0000
	R-squared	=	0.9277
	Root MSE	=	.06021

no3_fixed	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no3_nordpool	.0436505	.0121007	3.61	0.000	.0198479	.0674531
no3_fixed_past_week	.9366179	.0458767	20.42	0.000	.8463762	1.02686
_cons	.0107824	.0127351	0.85	0.398	-.0142682	.0358331

Year	Summary of markup_fixed_zone3 Mean	Std. dev.	Freq.
2015	.88738063	.86708728	26
2016	.04834998	.17000078	52
2017	-.00173115	.14142573	52
2018	-.15894627	.15131722	52
2019	.45884516	.6204674	52
2020	6.001449	7.1514311	53
2021	-.32981935	.1512318	52
Total	1.0088997	3.5688772	339

Appendix 18: Zone 3 Variable Contracts Markup

Linear regression

Number of obs	=	339
F(2, 336)	=	594.72
Prob > F	=	0.0000
R-squared	=	0.9008
Root MSE	=	.06761

no3_variable	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no3_nordpool	.0994201	.0437313	2.27	0.024	.0133985	.1854417
no3_variable_past_week	.8432172	.0783265	10.77	0.000	.6891452	.9972893
_cons	.0317025	.0178511	1.78	0.077	-.0034115	.0668166

Year	Summary of markup_variable_zone3 Mean	Std. dev.	Freq.
2015	.91572391	.84049924	26
2016	.06352686	.16310652	52
2017	.09925426	.20533832	52
2018	-.02007232	.1770993	52
2019	.12338117	.15404843	52
2020	4.5956258	5.2215564	53
2021	-.08684788	.30831701	52
Total	.81621705	2.6445321	339

Appendix 19: Zone 4 Spot Contracts Markup

```
Linear regression                               Number of obs     =        339
                                                F(2, 336)         =     356.00
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9088
                                                Root MSE          =     .07613
```

no4_spot	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no4_nordpool	.4564603	.0920451	4.96	0.000	.2754031	.6375175
no4_spot_past_week	.6715715	.089613	7.49	0.000	.4952984	.8478447
_cons	-.0168183	.0159353	-1.06	0.292	-.0481639	.0145274

Year	Summary of markup_spot_zone4 Mean	Std. dev.	Freq.
2015	.13552452	.1765836	26
2016	.10753646	.16115965	52
2017	.14907182	.06987487	52
2018	.18314962	.08002858	52
2019	.23360451	.08171812	52
2020	.66622204	.61045895	53
2021	.61451597	.67047798	52
Total	.31210349	.42925921	339

Appendix 20: Zone 4 Fixed Contracts Markup

```
Linear regression                               Number of obs     =        339
                                                F(2, 336)         =     705.68
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9495
                                                Root MSE          =     .03497
```

no4_fixed	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no4_nordpool	.0520022	.0115546	4.50	0.000	.0292737	.0747306
no4_fixed_past_week	.9483738	.0326514	29.05	0.000	.8841469	1.012601
_cons	.0033724	.0102841	0.33	0.743	-.0168569	.0236016

Year	Summary of markup_fixed_zone4 Mean	Std. dev.	Freq.
2015	.60311149	.83565818	26
2016	-.10277882	.12006834	52
2017	-.03280801	.11615447	52
2018	-.15719924	.12901185	52
2019	.29838018	.35391274	52
2020	3.5811497	3.5787702	53
2021	.26014435	.73481935	52
Total	.64690333	1.9437253	339

Appendix 21: Zone 4 Variable Contracts Markup

Linear regression

Number of obs	=	339
F(2, 336)	=	5477.31
Prob > F	=	0.0000
R-squared	=	0.9866
Root MSE	=	.02169

no4_variable	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no4_nordpool	.0286947	.0138805	2.07	0.039	.001391	.0559983
no4_variable_past_week	1.012162	.0231762	43.67	0.000	.966573	1.05775
_cons	-.0125784	.0048811	-2.58	0.010	-.0221798	-.0029769

Year	Summary of markup_variable_zone4 Mean	Std. dev.	Freq.
2015	.27467292	.57001323	26
2016	-.1161093	.15849891	52
2017	.04601551	.14446186	52
2018	-.04106478	.17194733	52
2019	.17514644	.20850484	52
2020	2.7292684	2.5658144	53
2021	.69746551	1.3800326	52
Total	.56456724	1.509488	339

Appendix 22: Zone 5 Spot Contracts Markup

Linear regression			
	Number of obs	=	339
	F(2, 336)	=	280.13
	Prob > F	=	0.0000
	R-squared	=	0.8972
	Root MSE	=	.07999

no5_spot	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no5_nordpool	.4196581	.0952314	4.41	0.000	.2323332	.606983
no5_spot_past_week	.6975503	.0901549	7.74	0.000	.5202111	.8748894
_cons	-.0033198	.0176956	-0.19	0.851	-.0381279	.0314882

Year	Summary of markup_spot_zone5 Mean	Std. dev.	Freq.
2015	.27186833	.20418956	26
2016	.23898903	.16757931	52
2017	.29879071	.104792	52
2018	.20558996	.06708081	52
2019	.26060068	.08573926	52
2020	.93521931	.89742557	53
2021	.83365367	.6637278	52
Total	.44894292	.53686102	339

Appendix 23: Zone 5 Fixed Contracts Markup

Linear regression			
	Number of obs	=	339
	F(2, 336)	=	421.70
	Prob > F	=	0.0000
	R-squared	=	0.9371
	Root MSE	=	.0559

no5_fixed	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no5_nordpool	.0667677	.0172472	3.87	0.000	.0328416	.1006938
no5_fixed_past_week	.9532863	.0363063	26.26	0.000	.88187	1.024703
_cons	-.00052	.0123486	-0.04	0.966	-.0248103	.0237702

Year	Summary of markup_fixed_zone5 Mean	Std. dev.	Freq.
2015	.77236853	.86683625	26
2016	.02397659	.10713467	52
2017	.08988475	.16799807	52
2018	-.15918128	.11276552	52
2019	.48070787	.6071004	52
2020	3.7232725	3.5384069	53
2021	.62262394	1.0018578	52
Total	.80363316	1.9669951	339

Appendix 24: Zone 5 Variable Contracts Markup

Linear regression

Number of obs	=	339
F(2, 336)	=	1710.66
Prob > F	=	0.0000
R-squared	=	0.9614
Root MSE	=	.04518

no5_variable	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
no5_nordpool	.0145542	.0154646	0.94	0.347	-.0158655	.044974
no5_variable_past_week	1.013487	.0288413	35.14	0.000	.9567549	1.07022
_cons	-.0069221	.0074518	-0.93	0.354	-.0215801	.0077359

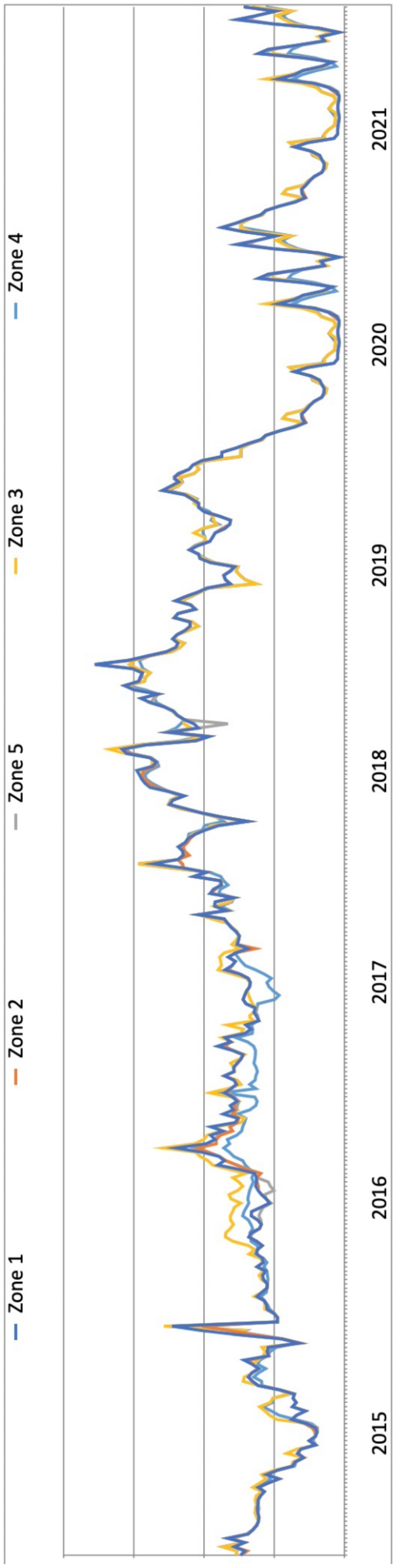
Year	Summary of markup_variable_zone5 Mean	Std. dev.	Freq.
2015	.33355527	.64967717	26
2016	.00793696	.14107649	52
2017	.37422138	.42919261	52
2018	.09181229	.39497296	52
2019	.17818619	.20733783	52
2020	2.8754082	2.5692656	53
2021	1.0624069	1.5773869	52
Total	.73813092	1.5630037	339

Appendix 25: Descriptive statistics of 3 contracts in 5 zones

Variable	Obs	Mean	Std. dev.	Min	Max
no1_spot	340	.4625018	.2501274	.0931503	1.990407
no2_spot	340	.460849	.2497056	.0910867	1.988099
no3_spot	340	.4614804	.249725	.0918681	1.990615
no4_spot	340	.4620186	.2513851	.0907083	1.99303
no5_spot	340	.4609926	.2488314	.0917339	1.985673
no1_fixed	340	.4321816	.177206	.2466404	1.221337
no2_fixed	340	.4405312	.227557	.2355366	1.56789
no3_fixed	340	.4377088	.2230955	.2359446	1.683443
no4_fixed	340	.4156795	.1551378	.2227002	1.180527
no5_fixed	340	.4364847	.2220829	.2371402	1.582863
no1_variable	340	.4593733	.2404592	.2023004	1.6521
no2_variable	340	.4474823	.2314857	.1976958	1.627212
no3_variable	340	.4547373	.214095	.2053467	1.445957
no4_variable	340	.4287638	.1870014	.1865151	1.354955
no5_variable	340	.4521493	.2293258	.2026259	1.635681

(Mean stands for the average prices.)

Appendix 26: Wholesale price fluctuation in the different zones



Appendix 27: Average market share for top five leading firms in Zone1

Variable	Obs	Mean	Std. dev.	Min	Max
Firm1	37	54.42635	2.459916	49.67866	57.7184
Firm2	37	11.70339	.404326	10.86076	12.44429
Firm3	37	9.487493	.3392449	8.719543	10.01162
Firm4	37	5.321141	.7787665	4.491794	7.568867
Firm5	37	3.434633	.5352568	2.870543	4.54459

Appendix 28: Average market share for top five leading firms in Zone 2

Variable	Obs	Mean	Std. dev.	Min	Max
Firm1	37	69.8651	2.212737	65.90087	72.74871
Firm2	37	10.74158	.228179	9.957753	11.1195
Firm3	37	6.668551	.1398179	6.380561	6.934114
Firm4	37	2.792148	.9795688	1.857218	4.833974
Firm5	37	1.637468	.4349788	1.06574	2.381934

Appendix 29: Average market share for top five leading firms in Zone 3

Variable	Obs	Mean	Std. dev.	Min	Max
Firm1	37	69.74461	1.806626	67.19637	72.61435
Firm2	37	8.962819	.4583132	7.734415	9.74013
Firm3	37	5.030106	.4667275	4.329031	5.931301
Firm4	37	3.436476	.6568725	2.419398	4.477029
Firm5	37	2.204833	.3840884	1.676643	2.831276

Appendix 30: Average market share for top five leading firms in Zone 4

Variable	Obs	Mean	Std. dev.	Min	Max
Firm1	37	77.14912	1.310478	75.17079	79.26308
Firm2	37	7.675151	.3717459	6.964143	8.064511
Firm3	37	3.918445	.2999037	3.521464	4.411643
Firm4	37	2.273331	.6079896	1.650208	3.378709
Firm5	37	1.441597	.3167856	1.090052	2.080823

Appendix 31: Average market share for top five leading firms in Zone 5

Variable	Obs	Mean	Std. dev.	Min	Max
Firm1	37	68.47651	1.911626	65.00734	71.38774
Firm2	37	10.05164	.5167598	8.908984	11.03911
Firm3	37	6.138671	.528021	4.825541	7.020177
Firm4	37	3.395636	.7537422	2.418033	4.911955
Firm5	37	1.814304	.1288618	1.502297	2.086048