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Default contracts in the Swedish retail electricity market: is consumer inertia a matter of concern?

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Abstract

The purpose of this thesis is to examine whether the presence of *default contracts* distorts the market mechanism in the Swedish deregulated retail electricity market. A *default contract* is an inactive form of contract which electricity consumers receive if they do not make an active choice of electricity supplier. Approximately 12% of Swedish electricity consumers today have a default contract. The sources of the *consumer inertia* (a resistance to change behaviour and become an active electricity consumer) behind the default contracts is investigated in order to conclude whether these 12% of consumers on default contracts causes such a problem that regulations might be justifiable. We seek to provide a basis for improved understanding and awareness of the impacts of consumer inertia to be considered when deregulating markets in the future. Our findings support that the inertia concerning the default contracts is primarily caused by information asymmetries amongst different types of consumers, as well as brand awareness. We find is that younger consumers and low-consumption households are most frequently find on default contracts. However, the findings are not robust due to limited data availability of consumers on default contracts.

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All remaining, possible errors and misinterpretations are our own.

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1 Introduction

"Competitive markets only function if consumers are active and take advantage of the opportunities the market mechanism offers" (Konkurrensverket, 2018, p. 274).

The Swedish retail electricity market was opened up for competition in 1996 in order to achieve an efficient allocation of resources and lower prices for consumers. Competition in the retail electricity market functions rather well, there are currently more than 100 electricity suppliers. However, only approximately 35% of all household consumers are active in the market today. This percentage raises some concerns as to whether the prerequisite in the opening phrase holds to be true.

The consumer passiveness (inertia) raises concern of market failure in one particular area of the market – that of *default contracts*. In January 2018, 12.3% of household consumers were still default contracts with their assigned electricity supplier. Consumers pay on average 20–30% more the default contracts which do not offer better service than other contracts, such as a fixed-priced or a variable contract.

A *default contract* is an inactive form of contract which electricity consumers receive if they do not make an active choice and choose supplier. In this case, the electricity distributer assigns a supplier to a consumer within their distribution area. Normally, the distributor assigns a supplier within the own corporate group. For the assigned supplier default contracts can be a means to increase their marginal revenues thus gain a competitive advantage versus those electricity suppliers who do not have default contracts. It could also be the case that suppliers move their costs from active consumers to passive ones on default contracts (Nilsson and Björkström, Appendix A).

The fact that electricity consumers have default contracts is a form of price discrimination, which need not to be a problem on a society level. This is so if the potential loss in consumer surplus is outweighed with a corresponding gain in producer surplus. It is a form of *self-discrimination* since the electricity consumers have the possibility to choose supplier but choose not to make an active choice. However, from a consumer perspective it might be a problem if the inactive behaviour is not due to price insensitiveness, but to *consumer inertia*. The Swedish Energy Markets Inspectorate (Ei) has written several papers concerning the default contracts and it has also been a political question. Price regulation of these default contracts is not deemed optimal in a deregulated market, since one does not take away the inventiveness for consumers to be active as it could distort competition. On the other hand, one wants to protect consumers' interest (Nilsson, Appendix A).

It is a trade-off and therefore the purpose of this thesis is to examine the Swedish deregulated retail electricity market for *default contracts,* with the aim of understanding what is driving the inactive consumer behaviour and if it is a problem. If consumer inertia is more prevalent among specific groups of customers on default contracts, who would benefit from paying less, some regulations might be justified to protect vulnerable consumers, without distorting active consumers' utility gains from a market mechanism.

The inactive behaviour and presence of these default contracts can be understood through the notion of *consumer inertia*. *Inertia* is the resistance against changes of movement. The term originates from Newton's first law of motion stating that "an object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force" (Physics Classroom, 2018). In mechanics inertia signifies the amount of force needed to get an object to move, since it does not move by its own force. The bigger the object is, the bigger the force to get it moving must be. The term also means that if the object is moving then there is instead a resistance (inertia) to stop moving. Inertia is

thus the energy within an object which keeps it doing whatever it is doing, until a force is applied to stop the inertia (Jones, 2008).

Therefore, consumer inertia differs from consumer loyalty. Loyalty implies that the customer continues to buy from the same company, or the same product/service, because the customer prefers it. On the contrary, an inertive customer continues to buy because it costs too much time and/or effort, in combination with the possible gains to be made from being active not being sufficiently large to overcome the inertia. In short, if all the obstacles from being active would disappear an inertive customer would switch product/service or company, whereas a loyal customer would stay (Hyken, 2018 and Anon., 2016).

Concerning the Swedish electricity market, the consumer must first make an active choice (meaning getting the object to move in the first place) in order to avoid a default contract. This is where inertia comes into play. Secondly, once the consumer has made an active choice and received a variable or fixed contracts, he or she normally needs to renegotiate the contract after a few years, in order not to get a default contract again, or to get a better deal (meaning once the object is moving, a force must be applied to stop it from moving). That is, the contract which was best a few years ago, is rarely the best at the moment, since electricity prices fluctuates from year to year, and a consumer needs to be active to save money.

In order to examine the origins of the inertia, this thesis is organized as follows: in part 2, the impact of consumer inertia in competitive markets will be studied through the lenses of the theories of Industrial Organization and Behavioural Economics. This in order to understand why 12.3% of Swedish electricity consumers are still on default contracts, and if it is a problem. We will also examine what previous research have found on the impact of consumer inertia in retail electricity markets and how it can be applicable to the default contracts. Even though this thesis is primarily concerned with the default contracts, we will also devote some sections to other potential, observed market failures. This in order to get a comprehension of the general presence of consumer inertia in the market. If the inertia behind the default contracts is an isolated market failure it could be "treated" separately, but if it is a part of a general problem in the market, it should perhaps be dealt with in other ways than mere regulation aimed at the default contracts.

Part 3 contains a background of the Swedish retail electricity market, in order to provide an understanding under which premises the market operates and which choices electricity consumers have available to them. In part 4 and 5 we will present the method designed try to answer our research question, as well as the data used. In part 6 the results of the research will be presented and analysed jointly. Finally, in part 7, we will present our conclusions and offer a brief summary the work in this thesis.

For simplicity the Swedish retail electricity market will hereafter be referred to as "the market".

2 Literature review

2.1 Theory

As mentioned, competition works rather well in the Swedish retail electricity market, but there are some potential market failures which appear to not align with neo-classical economic theory, such as the default contracts and that the market share and electricity prices (in terms of customers) vary suppliers. In order to understand how consumer inertia can be dealt with, we need to know what type of factors of consumer behaviour that must be taken into account. For this, we will look at *Behavioural Economics,* and examine if this research area can shed light upon the observed consumer behaviour in the market.

Once we have developed an understanding psychology of consumer behaviour, and how this can be extended to the market, we will search for evidence of inertia in the market. In a competitive market with a homogenous product and price competition, the cheapest supplier should capture the entire market and consumers should choose the cheapest contract for a homogenous product, of the same service.

Since this is not the case in the market, we will turn away from neo-classical economic theory of consumer behaviour and turn to a research area within (micro) economics called *Industrial Organization*. It is a research topic concerned with the behaviour of firms in imperfectly competitive markets, e.g. when they have some market power. The theory focuses on how firms make strategic decisions, resulting from certain market conditions, which affect the well-being of different types of market participants. This can used for normative analysis and help governments decide on whether they should intervene and impose regulations in a particular market or not (Belleflamme and Peitz, 2015, pp. 1,3 and 26).

2.1.1 Behavioural economics

In the economic article *2017 års Ekonomispris till Richard Thaler* the authors describe how Economics to a great extent is concerned with the understanding of human behaviour in decision making situations and in different markets, but that humans are complicated beings. In traditional economic theory it is assumed that humans possess full capacity to evaluate all available information and that we always can realize our intentions, the authors state. In order to be able to build useful models economists are therefore forced to make simplified assumptions in order to formulate theories, which have contributed to solutions to important and complicated economics questions, according to authors. However, they continue, sometimes the discrepancies between theory and reality become systematic and large (Gärdenfors et al., 2017, p. 6).

One of these human factors in decision making which Thaler focuses on is the notion of limited rationality in decision making on the part of consumers. The authors describe that it is no longer reasonable to assume that consumers make perfectly rational decisions in line with neo-classical economics, since it is not possible for consumers to evaluate all possible alternatives and their respective consequences when making decisions. Instead, consumers tend to make decisions based on a narrow scope (Gärdenfors et al., 2017, p. 6).

In view of this, it might be the case that the structure of the market, which is built upon consumers being active, is not optimal when taken the human factors in decision making into account. If it is too costly or difficult for consumers to evaluate all available information to choose the optimal contract for them, this might explain why only around 35% of consumers are active in the market.

Since consumers with limited rationality do not always make the best decisions, some assistance from authorities might be justified in certain situations. However, it is not always optimal to impose market regulations in order to protect one group of consumers as it can hurt others. The authors mention the introduction of taxes on alcohol as an example. While taxes can help individuals with limited self-control to decrease their alcohol consumption, other individuals without these problems will be disfavoured by paying a higher price when buying alcohol (Gärdenfors et al., 2017, p. 13).

This is line with the reasons for not wanting to impose price regulation on default contracts which might disturb the market mechanism. However, the question is how much active consumers would be hurt if the default price was regulated. Nor does the passive consumer behaviour have to be due to irrationality, it could be that the gains in expected utility are too low, and that as long as prices are not too high, consumers accept the higher prices.

Nevertheless, behavioural economics has distinguished certain forms of actions which might help individuals with limited self-control without disfavouring other individuals. The notion of libertarian paternalism was created for these types of interventions in different markets. Both Thaler and Sunstein have argued that both public and private institutions should try to "push" individuals in the right directions. This is what the English term nudging refers to (Gärdenfors et al., 2017, p. 13).

An example of the use of nudging in economic policies is the availability of a default alternative. The default alternative will apply in those situations where the consumer is expected to make an active choice, but for one or more reasons do not make that choice. The design of this option in certain markets plays a remarkable importance according to the authors who state that a wisely designed default alternative might help consumers who find it hard to make their own choices, without disfavouring others (Gärdenfors et al., 2017, p. 13).

These opt-out systems can in this way help vulnerable consumers in markets where there are market failures. However, concerning the default contracts, it could be argued to be a case of "nudging" going in the wrong direction. If the policy intention of the default contracts was making sure that vulnerable consumers would have access to electricity, the higher default price might hurt the vulnerable consumers, even though it does not disfavour the already active consumers. On the other hand, if the intention was to make sure that consumers would pay for the electricity and not "free-ride" upon the system, the fact that 61.5% of consumers ended up on default contracts following the deregulation, could be argued to disfavour other groups than the ones who did not plan to pay for the electricity.

Altogether, some libertarian paternalism concerning the default contracts might be justified if it is not possible for consumers to evaluate all possible alternatives and their respective consequences when making decisions regarding optimal electricity contracts. If consumers tend to narrow-bracketing when deciding upon being active and search for better deals, that is, even if consumers would benefit considerably over time from being active in the electricity market, the expected gains today (over the period which they can foresee) from overcoming the inertia might be too low and refer them from making active choices and stay on non-optimal contracts or with the incumbent supplier. Regarding the default contracts, the situation is even more complex as it cannot be assumed that all consumers know that they are on a default contract and could save money by renegotiating or switching supplier. Behavioural economics could thus help explain why not more consumers are active in the market, and how market policies could be formed to nudge consumers to become active. That the supplier centric model could be "nudging" in the right direction forcing passive consumers to be active, without hurting those already active.

2.1.2 Industrial Organization

The policy reform to deregulate the market might have had only good intentions, but as mentioned competitive markets only functions if consumers are active and there are no information asymmetries (Nilsson, Appendix A). This perquisite does however not appear to be altogether fulfilled in the market given the mentioned observed "failures". What forces could be driven the passiveness more specifically and drive potential narrow-bracketing concerning optimal electricity contracts?

According to the theory of Industrial Organization, it is a combination of external market sources (originating from market conditions not originating from the firm's conduct) and internal sources (the firm's own conduct regarding marketing, services, et cetera) which can create imperfectly competitive markets. It is

generally the presence of inertia in the purchasing behaviours of consumers which gives rise to market power for particular firms in market with a homogenous product (Belleflamme and Peitz, 2015. p. 162).

Regarding the default contracts and market share concentration amongst electricity suppliers, our hypothesis is that it is a combination of internal (firms' conduct) and external (regulatory conditions) contributing to the market power. That is, firms are allowed to charge higher prices for default contracts and to vertically integrate supplier, distribution (and sometimes production) facilities. These are external sources, but if different suppliers charge different prices for default contracts (and other contracts as well) and provide different information, there are also internal sources. If firms with production and/or distribution and supplier services marketing this in favourable terms of reliability and security, it is also an internal source. In short, the external, regulatory conditions give firms the opportunity to use internal sources and gain market power due to consumer inertia, in the retail electricity market.

Belleflamme and Peitz describes two types of consumer inertia. One is due to search costs in a setting where firms sell identical products and do not make any advertisements, but nevertheless can be in a position of market power if there are information asymmetries amongst consumers regarding "the existence and prices of available products" (p. 162), resulting in prices above marginal costs. The presence of search and asymmetric information can thus explain why some consumers still are on expensive default contracts.

The second type of inertia is due to switching costs for consumers, leading them to continue to make purchases from the same firm. The behaviour gives rise to market power for incumbent firms (Belleflamme and Peitz, 2015, p. 162). The presence of switching costs in the market could thus explain why there is a market concentration amongst suppliers and why distributors can assign customers to suppliers within the own conglomerate, even though other suppliers can be cheaper. Switching costs can arise due to uncertainty of what one will get if switching supplier, it is safer to stay with what one has.

In any of these two situations described previously prices might not just be above marginal costs, the existence of price dispersion might also be prevalent. Price dispersion signifies a situation when prices vary between different firms in markets for homogenous products. It violates in this way the Bertrand model and the law of one price (Belleflamme and Peitz, 2015, p. 163). The Bertrand model (or the price-competition model) assumes that all customers can acquire information about firms and the homogenous product, without any costs, therefore a firm setting a higher price than competing firms will lose all its customers to the competing firms, and firms will undercut each other until prices equal marginal cost.

A driver of price dispersion could be positive search costs on the part of the consumer. This would imply that informed customers are able to receive better deals than uninformed, locked-in customers (Belleflamme and Peitz, 2015, p. 163). In reality, it is often plausible to assume a sequential search behaviour of consumers, they state. This means that consumers after observing the price at one store can decide whether or not to continue to search or buy according to the elasticity of their demand function. The consumer will continue to search for better deals if the expected search gains outweigh the costs of obtaining the information (Belleflamme and Peitz, 2015, p. 169).

In this situation one can assume that one group of consumers are informed and buy the cheapest product. The other group is at first uniformed regarding the best deals on the market. They only see the price from the first firm after which they can continue to search or buy directly. The firms in this market will set their prices derived from a probability distribution. They know that some consumers search sequentially and that, in Bayesian Nash equilibrium consumers will base their decision on the expected price distribution. Firms take the search behaviour from this distribution as given and set a profit-maximizing price (Belleflamme and Peitz, 2015, p. 170). This can explain why prices in the imperfectly competitive, electricity market can

still be lower than the monopoly price. That is, suppliers with market power can charge higher prices for default contracts or than the competitors, as long as they do not charge too high prices.

Belleflamme and Peitz states that in a setting with a fixed number of firms who all are assumed to have constant marginal costs, the price dispersion will decrease as the number of initially uninformed customers disappear. Eventually, prices will be close to the perfectly competitive price when there are basically informed customers left (2015, p. 170). This implication is important for the default contracts examined in this thesis. If the inertia is merely due to asymmetric information amongst consumers, the share of consumer on default contracts would decline with time, as consumers learn about better alternatives.

Based on these theories, we will search for evidence of search and switching in the Swedish retail electricity market, and different types of consumers on default contracts which could be a sign of asymmetric information amongst consumers resulting in higher prices. Both positive search and switching costs can explain the presence of default contracts and market share concentration amongst suppliers.

Therefore, section 2.2 below will examine what previous research has found on search and switching costs, and consumer inertia in general, in the retail electricity markets in Sweden and in Texas.

2.2 Previous research

2.2.1 Sturluson (2003)

Presence of consumer inertia in the Swedish retail electricity market is examined in a dissertation paper by Sturluson (2003). The paper seeks to explain the prevalence of high price dispersion and reluctance on the part of consumers to switch from the incumbent supplier in the Swedish retail electricity market, despite electricity being a homogenous product. The author seeks to evaluate the importance of search and switching costs, respectively as these can be a reason behind the reluctance to be active. For this purpose, Sturluson uses a two-stage binary probit model on Swedish data to replicate the sequential choices consumers face; a) whether to become an active searcher for better contracts, and b) whether to switch supplier once the decision to become active has been taken. Sturluson find that switching costs are on average larger than search costs. His results indicate that switching costs are approximately 10 times the expected gains from switching. However, search costs are still important and larger than the expected gain from searching information, he writes.

This paper was written in 2003 and since then steps have been taken by authorities to improve information availability to Swedish electricity consumers. Nevertheless, these findings could explain why so few electricity consumers are active – the expected utility gains for overcoming the inertia is simply too low. If Sturluson's findings (the order of the sequential choices) are still valid in todays' market, the higher switching costs compared to search costs would show that more consumers renegotiate with the current ("incumbent") supplier, than switch supplier. The high switching costs could explain the high market share concentration amongst suppliers. Concerning the default contracts, these findings could indicate that asymmetric information and positive search costs amongst some consumers still exist, meaning that some consumers are still uninformed, and locked-in. As mentioned we cannot assume that consumers even know that they could get better deals by being active.

However, later reports contradict our hypothesis that the higher switching costs compared to search costs would show up in data that more consumers renegotiate with the current ("incumbent") supplier, than switch supplier.

2.2.2 Ek and Söderholm (2008, 2009)

In the paper "Households' switching behaviour between electricity suppliers in Sweden", Ek and Söderholm (2008) analyses search and switching costs in the Swedish retail electricity market. To do this the authors use a survey of 536 responding household consumers to analyse factors affecting the consumers decision behaviour "to: (a) switch to a new electricity supplier; and (b) actively renegotiate the electricity contract with the prevailing supplier" (p. 254). The survey was sent out in 2005 to 1 200 randomly drawn households. Households were questioned on their view of the possibility for them to change supplier. 18% reported that they did not know if they could (p. 256). Households were also asked if they had switch supplier or renegotiated their current contract within the 5 most recent years. The vast majority was not active. About 30% had switch supplier in the past 5 years and only about 25% had renegotiated their contract (p. 257).

This paper supports that the prevalence of high switching costs and asymmetric information deter consumers from being active. Ek and Söderholm use binary profit models allowing for both economic and psychological aspects to affect consumers decision making. They run two binary profit regressions: one for the determinants of the choice to actively switch supplier, and the other one for the determinants of the choice to actively renegotiate their contract with the current supplier. For the first one, the results show that a higher income level and use of electric heating, the belief that low competition causes the high prices and the perception that other consumers are active, increases the probability of switching supplier. The perception that it is "difficult to know how offers from different suppliers would affect the size of the electricity bill", along with that of "cannot affect the size of my electricity bill by switching supplier" decreases the probability of switching supplier (Ek and Söderholm, 2008, p. 258).

For the second one, the results indicate that the probability of being active and renegotiating increases with the electricity consumption-level, impact and knowledge of electricity costs, and the belief that being active can save money. The probability also increases with age (Ek and Söderholm, 2008, p. 259).

Ek and Söderholm (2008) find that the degree of inertia is higher amongst electricity consumers with "relatively high search and information costs who are less likely to choose to change electricity supplier" (p. 258). In rather many cases they found that the opportunity cost of time allocated to search for alternatives may outweigh the potential reduced cost in processing the information obtained via search.

The percentage distributions for questions, which the authors consider might explain the various levels of activity amongst household customers, highlight the potential lack of information being a constraint on active decision making. The answers show that 33% of households are uncertain whether they can change their electricity costs by changing supplier. 26% answered "partly agree" that they cannot change electricity costs by switching supplier. This is more than the number of household who "partly disagree" with the same statement (Ek and Söderholm, 2008, p. 258).

These findings are of interest in our thesis because if the rational perception that consumers who have more to gain from being active on the market, this would perhaps show up in data as high-consumption households are more active than low-consumption ones. The finding that consumer switching behaviour is affected by the perception of other consumers' activity level, is a sign of narrow-bracketing and that consumers might have difficulties evaluating all information on their own. This could possibly justify some level of libertarian paternalism and market intervention.

Concerning the default contracts, the finding that the opportunity cost of time allocated to search for alternatives may outweigh the potential reduced cost in processing the information obtained via search, could explain the inertia and passiveness. Their findings also indicate that asymmetric is still prevalent amongst consumers who find it difficult to compare electricity contracts, but individual-level data would be needed to find out if these 33% and 26% of consumers are also more likely to be on default contracts.

In a second paper from 2009 Ek and Söderholm analyses Swedish households' willingness to increase their efforts to save electricity, using an ordered probit model. Specifically, they seek to understand the role of information on consumer behaviour. They test if more specific, targeted information increases households' willingness to save energy. The results indicate that this is the case, but the response rate was only 47% (from 1 200 households who were asked to participate), furthermore they state that consumers with a lack of interest in electricity consumption issues (and/or limited or non-existent experience of these issues) are underrepresented among the respondents (p. 1580).

This paper is of interest in this thesis because it highlights the potential impact of targeted information on consumer behaviour, even though it is concerned with the willingness to save electricity and not primarily of switching and/or renegotiation activities. The findings are connected to their paper from 2008, in that sense that more available information can help overcome the consumer inertia, and also increase the consumer activity and not only the willingness to save electricity.

Furthermore, the authors find that the larger part of the household budget the electricity constitutes, the larger the willingness to save electricity appears to be. The results from the logit regression show "that it is about 6% more likely that an individual living in a house with electric heating would report that she is very willing to increase her effort to save electricity within laundry and hot water use than an individual in a house with another source of heating" (Ek and Söderholm, 2009, p. 1584).

These findings also would indicate that our data analysis would show that higher-consumption level households would be more active, than consumers who use less electricity, whether it is due to environmental concerns or other factors. Ek and Söderholm findings "also suggest that respondents that perceive transaction costs as high were also more reluctant to undertake further measures to reduce their own use of electricity". They also find statistical significance for these results in all but one of their regression models (Ek and Söderholm, 2009, p. 1584).

However, they note that even though information programs may play an important policy role, "the impact of such policies will differ depending on the perception of future cost savings as well as the nature of the information provided" (Ek and Söderholm, 2009, p. 1585). This on the other hand, potentially highlights that merely a disappearance of asymmetric information would not induce all consumers to become active, if they do not have confidence in the market-mechanism. This could therefore mean, that the presence of the default contracts is only one part of a larger function problem of the market.

In short, their results indicate that costs, environmental attitudes and social interactions are all important determinants of for electricity saving activities within Swedish households, together with a strong presence of inertia (Ek and Söderholm, 2009, p 1578, 1585).

As a concluding remark, the authors do state that significant obstacles for action can also be a result of norm-activating information campaigns and/or price increases (Ek and Söderholm, 2009, p. 1585). However, in this paper we argue that occurrence of price increases, for example, might increase the inertia, as the purpose of this thesis is to find out if the inactive consumer behaviour and the presence of the default contracts is a problem or not, we will leave this ambiguity here.

2.2.3 Hedman (2014)

A study from 2014 analyses switching costs between the fifteenth largest suppliers based on market shares in the Swedish electricity market (Hedman). The results indicate that the larger the market share of a company, the higher are the charged prices and the switching costs for a customer associated with leaving that company for a company with a lower market share. These findings of higher switching costs associated with leaving larger electricity suppliers than small ones, could be a possible reason for why the three largest suppliers still have such large market shares, even though a larger share of consumers is unsatisfied with larger suppliers than small ones. But the results must be interpreted cautiously. We will examine our available data to see if it might be brand-awareness for these three largest ones which might cause these switching costs and market concentration, and not because of some other factors these three suppliers might possess. Hedman uses aggregate market data on the electricity companies' market shares and electricity prices to calculate switching costs using Shy's model (2002 in Hedman, 2014). The study is however limited to apartment households with an average annual consumption of 2 000 kWh and for the following electricity supplier contracts: one- and two-year fixed contracts, variable contracts and default contracts (Hedman, 2014).

Finally, we examine if their might be evidence in previous research that more vulnerable (poorer) consumer groups are less active in electricity market. Even though we do not have access to individual-level data of consumers on default contracts, this might be an indication that libertarian paternalism and some regulation of these contracts might be justified, even in a deregulated market.

2.2.4 Hortaçsu, Madanizadeh and Puller (2015)

In a study examining the level of inertia in electricity retail market in Texas, the authors find that the degree of consumer inertia in the electricity markets varies across different types of consumers. They found that consumer inertia is more prevalent in poorer areas, whereas consumers in wealthier areas tend to make active choices. They investigate and test two sources of consumer inertia in a two-stages discrete choice model; lack of information vs brand awareness in favour of incumbents (Hortaçsu, Madanizadeh and Puller, 2015). The former would be associated with search costs, and the latter with switching costs.

They found that most households do not actively search for alternative retailers, "and when they do search, they tend to attach a brand advantage to the incumbent. Counterfactual experiments show that low-cost information interventions can notably increase consumer surplus (Hortaçsu, Madanizadeh and Puller, 2015). These findings also support that brand-awareness could explain the supplier market concentration as electricity is a homogenous product. The fact that they find information availability can increase consumer inertia, might depends at what levels of information availability the Swedish and Texas markets did operate at the time of the surveys.

However, choice frictions can diminish the benefits of retail choice, they state. Households may not actively acquire information about other energy retailers, even if that information would indicate that better options exist. Furthermore, household consumers may value the brand name of the incumbent so much that it defers them from switching to new entrant electricity suppliers (Hortaçsu, Madanizadeh and Puller, 2015). These findings are linked to the narrow-bracketing behaviour in consumer decision making as discussed in the theory of behavioural economics in section 2.1.1 above.

Based on this previous research, the impact of asymmetric information on consumer activity is ambiguous, we will therefore try to scrutinize the available consumer surveys in the Swedish retail electricity market, to be able to determine the more precis role of information concerning the default contracts and supplier market share concentration. However, it appears that high switching costs and search costs are prevalent and driving the passiveness of consumers. In line with these papers above, we will examine if consumer activity varies across different types of consumers, in general and specifically concerning the default contracts. This will help us determine if consumer inertia and lack of information is more prevalent amongst consumer groups which might be more vulnerable than others (low-consumption households for example), and therefore poses a problem. At least it can help us understand how to better target information to consumers in order to increase consumer activity in the market.

3 Specification of detailed research focus

Based on this discussion we will focus on the following research area a: as mentioned previously, the electricity market in Sweden is rather complex as it is not merely a part of an integrated Nordic market, but also integrated and dependent on the electricity market in the EU. It is also integrated with the oil and gas markets in Europe and in other countries. When there is electricity shortage in Sweden, electricity can be imported. Therefore, prices affecting electricity production will, to various degrees, affect prices for end consumers, but this do not infer with the analysis of the prices we will examine.

Therefore, this study will be limited to the Swedish retail, electricity market for household consumers, and the years after the deregulation in 1996, as the default contracts were imposed following it. More specifically, this thesis examines if brand awareness for incumbents, e.g. electricity suppliers who also have electricity distribution, negatively affecting the competition situation amongst suppliers on the Swedish deregulated retail electricity market.

The research question is as follow: what is driving the consumer inertia on the Swedish retail electricity market for default contracts? Is the consumer inertia limited to the default contracts, or is the prevalence of these a part of a greater problem of the deregulated market? Does this pose a political problem, and if so, what could be done as far as regulations are concerned?

4 Background

In this section we will provide the reader with background information to the deregulation in 1996, the policy intentions with the default contracts, as well as the structure of the market today and different actors.

4.1 The deregulation of the Swedish electricity market in 1996

The electricity market was drawn up in the 1990s when Sweden, Norway, Finland and Denmark deregulated their respective electricity markets. The purpose of creating a deregulated electricity market was to make electricity a competitive good, and thereby cheaper. The actors whom today make up the Nordic electricity market are mainly electricity producers, distributors, suppliers and end-consumers.

The Swedish electricity market was opened up for competition on 1 January 1996 when the state owned Vattenfallsverket (VV) was unbundled into Vattenfall AB. Apart from increasing competition and lowering

prices, the purpose of the deregulation was to achieve an efficient allocation of resources and flexible delivery of electricity. However, due to the need of installing expensive hour mileage equipment if a consumer wished to switch to another electricity supplier, consumers were not able to actively switch supplier until 1999 when this constraint were removed (Statskontoret, 2012:10, pp. 35–36).

More precisely, the reform meant that competition was introduced in the sale of electricity, whilst the distribution system remained state controlled and are still local monopolies in the areas, which the government has assigned them to. This meant that the changing conditions as the previous electricity generators (amongst them VV) saw their operations being separated into electricity grid-/distributor companies and electricity supplier companies (KkV, 2004, p. 11).

Konsumenternas energimarknadsbyrå was founded in 2002 by Energimyndigheten, Konsumentverket and Svensk Energi (the latter is now Energiföretagen Sverige), to help consumers to choose supplier, as well as help regarding problems with the current supplier (Konsumenternas energimarknadsbyrå, 2018, p. 31).

An independent website for price and contract comparison Elpriskollen was introduced in January 2008 by Ei upon request from the Swedish Government and is also run by Ei. All electricity supplier must report their variable and fixed contracts prices on a regular basis. This site was introduced as a step to make information easily available, to help consumers become more active. There are also private web pages for price- and contract comparison of electricity suppliers to help the consumer.

However, ten years after the deregulation it was still difficult for consumers to compare electricity supplier prices. Even though electricity suppliers are obligated by law to provide comparation prices to potential consumers since some years, the compliance with the regulations was low. Moreover, since some suppliers fail to report all components of the consumer bill, they appear less expensive than other suppliers (Konkurrensverket, 2009, p. 22).

4.2 Default contracts

The system with default contracts was imposed following this proposition from 1998/99. An electricity consumer can be assigned to a default contract in two situations. The first one occurs in case the electricity supplier loses the right to act as a grid operator and deliver electricity to the consumer. The second situation which is more common occurs if the consumer for some reason do not has a contract with an electricity supplier (Prop. 2016/17:13, p.11).

The purpose of the default contract is not primarily to ensure that the consumer has access to electricity, but to force the electricity consumer to pay for the consumption. This since even without an electricity supplier the consumer can access electricity through the distribution pipes, and the bill will then end up with SVK instead (Prop. 1998/99:137, p. 52). However, according to Regeringskansliet default contracts also exist to assure that consumers have access to electricity when they move to a new home or if the consumer for another reason cannot be active (2018).

However, the Parliament announced at the end of 2011 its intention to remove the current form of the default contract, and that the current work regarding the establishment of a new supplier centric model should not be considered an obstacle for such a reform (Prop. 2016/17:13, pp. 11–12). The prices for default contracts were deemed to be unreasonably high. For consumers living in apartments with low consumption, the default price was at most 40% in 2015, for consumers living in houses the difference could be even higher. The electricity suppliers motivated the high default prices by stating that default

customers imposed a higher business risk since default contracts generally have a shorter period of notice and that the administration costs where higher for default contracts. However, since it is possible to assign default contracts with the same prices as for other customers, Ei found that the above-mentioned price differences could not be due to higher costs to that extent (Ei, R2014:19, in Prop. 2016/17:13, p. 13).

In order to make sure that consumers have reasonable terms of contract, and to decrease the number of consumers on default contracts and to increase switching activity, the proposition proposed that information from electricity suppliers to customers with default contracts should be increased, the period of notice to 14 days instead of 30 days, and to limit the price charged to consumer after a certain time has passed after the default contract started to apply. These reforms started to apply in 2017 (Prop. 2016/17:13, p. 1). However, in January 2018, 12.3 % were still on default contracts, as mentioned in the introduction.

The argument against price regulations for default prices is, as mentioned, that one would not wish to intervene on a market where competition functions rather well and limit the incentives for customers to be active. This could hurt the market competition (Nilsson, Appendix A). Consumer activity is low in countries with price regulations. However, it is stated that default contracts themselves are already a step away from a free market model. The Government states that one reason for default prices to be unreasonably high, is that there is not any competition in reality amongst electricity suppliers when the distribution operators assigns the electricity supplier. The distributor operator is not obligated by the current law to assign the consumer to the cheapest supplier. Instead it normally assigns a supplier in the own conglomerate, as mentioned. The Government states further that the high default prices are used by actors to take advantage of passive consumers in order to gain competitive advantages (Prop. 2016/17:13, pp. 13, 24–25).

The supplier centric model would mean that consumers need to contact the supplier whether access to the distribution system or the supply of electricity is concerned. Such a model forces the consumer to enter into a supply contract when moving. Several authorities mean that the problem with default contracts would therefore disappear since consumers tend to end up on default contracts when moving (Prop. 2016/17:13, p. 14). However, according to Nilsson at Ei (Appendix A) it is not yet certain that the model will be implemented, it is still a suggestion as of today. Therefore, it could be worthwhile to examine the system with default contracts, he suggests.

4.3 Current structure of the Swedish electricity market

The electricity market in Sweden today is made up of four major categories with varying numbers of actors within; electricity producers, distributors, suppliers and consumers. The first three are companies and can be involved in different categories whereas others only act within one field. The fourth category is made up by enterprises and household consumers. Only household consumers will be examined in this paper. Smaller enterprises normally buy also their electricity from electricity suppliers, but some large industrial users buy their electricity directly from Nord Pool, making it more complex to study cause and effect (Ei, 2017).

Producers

The Swedish producers are generating electricity within Sweden until demand is met. When there is not enough supply by Swedish producers to meet demand, electricity is bought on the Nordic market Nord Pool. This is the same market where Swedish producers are selling electricity once the local supply is saturated. Roughly 85% of all electricity that is consumed in the Nordic region is traded on Nord Pool. Countries can, and regularly do, trade on other markets similar to Nord Pool, including Sweden, but no distinction between markets will be made for the rest of the paper. Nord Pool will be referred to as the sole

market of electricity for simplifying purposes. The following countries are part of the Nord Pool Group and can thus trade on the market: Sweden, Norway, Finland, Denmark, Estonia, Lithuania and Latvia.

Distributors
The distributor owns the distribution lines and charge a fee to suppliers for the use of distribution networks (Konsumenternas energimarknadsbyrå, 2018). There is one company in Sweden in charge of providing the local distributors with electricity: Svenska Kraftnät (SvK). SvK enjoys a monopoly status on the electricity networks backbone and is owned by the Swedish state.

The roughly 170 local actors on the distribution market connects to the backbone provided by SvK. These actors also enjoy monopoly status within their region and nearby consumers of electricity are automatically assigned to the closest distributor. This is for the sake of efficiency as it would be very expensive to have competitors installing and maintaining separate electricity grids; much like a road network. An electricity distributor must be licensed to construct and charge for wiring. Ei grants the permits and assesses the fairness of the total revenue that the electricity company may charge to its customers (Ei, 2015b).

Suppliers
The suppliers buy electricity from the producers at market price and sell the electricity to end-customers[1]. This market is unregulated and there are more than 100 competing companies, competing mainly on special deals, such as environmentally friendly choice, as the electricity is bought all the same from Nord Pool.[2]

5 Method

We will use a mix of a qualitative/quantitative reports of secondary data from Ei, previous consumer surveys from Energiföretagen Sverige and other Swedish electricity authorities and SCB. In order to draw robust conclusions regarding default contracts and consumer inertia, information on a consumer individual level would be needed. Ideally, individual consumer information would be gathered from an electricity supplier providing default contracts, to examine which types of consumers who switch from, and who stays on a default contract. An econometric approach, for example cluster analysis, could then be applied in order to distinguish certain characteristics common in specific groups of customers. An econometric approach, with a binary logit regression model could be run to examine the likelihood that a customer belonging to a specific group, would stay on/switch from a default contract.

However, in the absence of individual information of consumer behaviour, this thesis takes the form of a more qualitative paper using quantitative, secondary data. A qualitative approach using an inductive approach has its shortcomings. The secondary, quantitative data collected from different surveys, constitutes a sample from the entire population of electricity, household consumers, and conclusions drawn because of analysis of the sample, could appear to be logic. However, what we observe is only valid (or true) for the sample, and not for the entire population. In other words, it is difficult to draw any generalized conclusions

[1]In November 2011 Sweden was divided into four retail electricity price areas, by SvK following a demand from the European Commission that SvK needed to deal with limited transmission capacities in the Swedish power-grid. Allowing for price differences to reflect relative supply and demand was an allowed solution. One of the consequences of the price differences is that more revenues generated from transferring electricity from the north to the south, since there is already exists excess demand in the north (Ei, 2017). Electricity consumers in the four areas thus face different electricity prices, even though they might have the same electricity supplier.
[2] For information regarding the components of the electricity price and other types of contracts for household consumers we refer the reader to Appendix B.

from the sample which would be valid for a population, so we must be aware of the induction problem, when analysing our results.

This is a drawback we will try to address by scrutinizing the data and test the quality of the fitted models in section 5.2 below. We will also use various sources of conducted surveys on consumer behaviour for as many years as possible. Looking at merely one year will not be that valuable since patterns observed could be dependent on seasonal variations, and not the result of a more long-term pattern.

5.1 Qualitative research

The data of consumer behaviour and attitudes will be gathered and summarized in diagrams and tables in Excel. The aim is to discover trends and groups of consumers on default contracts, and if some groups of consumers are more inactive and others and the possible causes of it.

5.2 Empirical tests

5.2.1 Linear regression of default contracts and asymmetric information

In order to try to draw any further conclusions regarding the question if it is lack of information that could be driving the inertia for default contracts, we use a survey from 2014 (Ei) questioning electricity suppliers who uses default contracts. It shows some signs that the share of consumers on default contract for each supplier, seems to correlate with whether the electricity bill contains information that the consumer has a default contract.

In order to test whether this relationship is statistically significant, an OLS regression model will be used, with the share of consumers as the dependent variable. A dummy variable equal to 1 in case there was information on the bill and 0 otherwise, is the independent variable.

Four companies had no consumers on default contracts, therefore these were removed. The data was then sorted after share of consumers on default contracts, and it was then observed that a high share of consumers on default contracts seemed to correlate with lack information on the electricity bill. Two suppliers who had very high share of consumers on default contract, caused suspicions and after closer research it turned out the company with a share of 100%, was a membership-owned company who only had default contracts. For the other company, with a corresponding share of 73%, research showed that the default price was in fact the cheapest contract, since it was a local price which is discounted. Both companies operate in the north of Sweden. A scrutiny of the company with a corresponding share of 84% (a local company outside Stockholm named Sollentuna Elhandel AB) showed that the default price equalled the variable price. Therefore, these three companies were removed from the model. The model is seen below:

$$share_default_i = \beta_0 + \beta_1 * info_bill_i + \varepsilon_i, \quad (1)$$

where the dependent variable $share_default_i$ corresponds to the share of consumers on default contracts for a specific supplier, *i*. The independent variable $info_bill_i$ is a dummy variable equal to 1 if the specific supplier provides information on the customers' bills that they are assigned to a default contract and can switch to another, more optimal contract, and equal to 0 otherwise.

The constant β_0 measures the relative impact of how information on the customers' bills that they are assigned to a default contract, on the share of consumers on default contracts (when $info_bill_i$ equals 1). The coefficient β_0 measures the marginal effect of no information on the customers' bills that they are assigned to a default contract, on the share of consumers on default contracts (when $info_bill_i$ equals 0). The error term, ε_i, contains unobserved factors which influence the share of consumers on default contracts, but are not incorporated in the model. As Ei has no information on types of consumers on default contracts, we expect the error term to be relatively large compared to the estimated coefficients.

Since we only have 64 observations and are unsure of the true relationship between the independent and dependent variables, we will run some quality tests of the models. We will use skewness test for normally distributed shape of the standard errors, the Breusch-Pagan (BP) test and some other diagnoses test for heteroscedasticity. These results of these tests will be briefly mentioned in the section 6 – Results and analysis, and more detailed descriptions will be provided in Appendix C. The BP test takes the residuals of the fitted linear regression and re-fits a linear regression model to these residuals. If too much of the variance is explained by these additional residuals the test will be rejected. The null-hypothesis of the BP test is that of constant variance of the errors terms (Mathematics, Furman University, 2014).

The skewness test if the error terms in the data set are normally distributed. Under the null-hypothesis the skewness equals 0, and the data is perfectly normally distributed. A skewness value greater than -1 or +1 is a sign of high skewness (BrownMath, 2016). If both of these tests, as well as the diagnosis plots of residuals against fitted values, and scale locations indicate heteroscedasticity (Understanding Diagnostic Plots for Regression Analysis, 2015), we will run the model with robust standard errors and do a Box-Cox transformation of the dependent variable.

Heteroscedasticity does not cause bias or inconsistency in the OLS estimates of the coefficient, β_i, nor of the goodness-of-fit measurements, R^2 or $\bar{R}^2$. The reason for our model estimates probably being biased is due to the omittance of important explanatory variables, and unavailability of proper instruments to run an IV-regression instead. However, in the presence of heteroscedasticity the estimators of the coefficients are no longer valid, resulting in invalid the standard errors for constructing confident intervals and the OLS *t* statistics. Moreover, the *F* statistics are no longer *F* distributed. This means that the assumption of normally (asymptotic) distributed OLS estimates no longer holds, which render hypothesis testing difficult. The problem cannot be resolved by increasing the sample size. Running the linear regression with robust standard errors can solve the problem if the sample size is large enough (Wooldridge, 2009).

However, due to our small sample the question arises whether such a method can improve our model. Therefore, apart from running the linear regression model with robust standard errors, we will also use a *Box-Cox transformation* of the dependent variable to see it can solve the problem of heteroscedasticity.

A Box-Cox transformation transforms the dependent variable into a normal distributed form with a constant error variance. The Box-Cox technique estimates different values of an exponent, lambda (λ), for the dependent variable, y. By using a log transformation, the skewness of the OLS estimators in the presence of heteroscedasticity, is even out to a normal distribution by imposing a penalty for large variances in the residuals (the logarithmic function is steep and negative for larger standard deviations and flatter for small standard deviations) (The Minitab Blog, 2018). The optimal lambda is the one corresponding to the best approximation of a normal distributed form of the dependent variable. Since our dependent variable is always positive, $\log(y)$ is defined for all observations and we do not need to make any altercations to the Box-Cox algorithm below:

$$y(\lambda) = \begin{cases} \frac{y^{\lambda}-1}{\lambda}, & \lambda \neq 0; \\ \log(y), & \lambda = 0. \end{cases} \quad (2)$$

The lambda varies from -5 to 5 (Statistics How To, 2015). The optimal lambda is there associated with the highest log-likelihood, as the likelihood is inversely proportional to the standard deviation of the $y(\lambda)$'s. In the presence of outliers in the data, the transformation might not work optimally (NCSS, 2018). It is therefore important to remove outliers (those 3 removed above) in our data. The transformed regression model with the optimal lambda will have the following form:

$$(share_default_i)^{\lambda} = \beta_0 + \beta_1 info_bill_i + \varepsilon_i, \quad (3)$$

where *share_default* is the y-variable and *info_bill* the x-variable.

In order to estimate the accuracy of the linear regression model given the small data sample, we will also *bootstrap* the data with 64 observations, where *share_default* is the y-variable and *info_bill* the x-variable, using the boot-package in R. 1000 bootstraps will be generated, from which the average estimated intercept and coefficient will be will be used to measure the new standard errors. The reason we do this is to examine how our linear regression model responds to variation in the sample data.

The $share_default_i$ and $info_bill_i$ for all 64 observations will randomly be bootstrapped into 1000 new samples, and the estimates of the intercept and the coefficient will be the averages values when of these 1000 bootstrapped samples, each randomly drawn sample contains 64 observations. Since we draw with replacement, each observation can occur more than once in each bootstrap sample. Bootstrapping the sample data in this way allows us to repeatedly draw sampling observations from the collected data, instead of obtaining independent data sets from the population (which we have no data for).

More specific information regarding the results from the robustness check, Box-Cox transformation and the bootstrapping will be provided in the appendices, we will briefly present the results of them in section 7. Results and Analysis, and refer them to sections in Appendix C for simplicity of following the arguments and results we lay forward.

5.2.2 Cluster analysis of consumers on default contracts

However, the linear model can only be improved to a certain degree, and the linear assumption is an approximation and the model fit might be poor (meaning that the linear regression estimates are not robust). Since the data sample used in the linear regression model (model 1 in section 5.2.1) is small and we are not sure how the true relationship between *share_default* and *info_bill* is, we will also do a cluster analysis. Clustering is an unsupervised learning technique, which allows us to relax the linearity assumption (Introduction to statistical learning, 2009). This in order to try to differentiate certain groups of consumer groups, based the share of consumers on default contracts. The method clusters observations into specific groups based on the components of the data set, into different groups which exhibits specific traits, specific to the observations in that cluster group. We will thus not predict the share of consumers on default contracts based on the information on the bill, but rather try do finds subgroups of consumers in order to obtain a better understanding of the consumers on default contracts.

That is, the survey from 2014 (Ei) questioning electricity suppliers who uses default contracts, also allows for clustering of consumers based on two characteristics: the contract lengths for which default contracts are more (and/or less) prevalent, and the different consumption levels for default contracts are more (and/or less) prevalent. Following the argumentation in section 2.2 Previous research, we should see a higher concentration of consumers on default contracts for low-consumption households, as they have less money to save from being active on the electricity market. The analysis of average time on default contracts is of interest because if most consumers are on default contract for only a short period of time, these contracts might not pose such a problem. However, if consumers have been on default contracts for a longer period, it is a possible sign that stronger inertia is present in the market.

More specifically, the unsupervised learning algorithms we will use is principal components analysis (PCA) and K-means clustering. PCA can help us to summarize broad patterns in the data set by creating a smaller number of collectively, representative variables which explain most of the variance in the data. We will use the PCA in order to visualize the clustering results. The K-means is a simple method to partitioning the data into *K* non-overlapping clusters (if the clusters would overlap each other, the cluster analysis would be no use) (Introduction to statistical learning, 2009).

It has the disadvantage that one needs to specify the numbers of clusters, *K,* before running the clustering algorithm. However, since the data set is rather small with not too many features, we will use the K-means method instead of a hierarchical clustering method which helps us divide the data into clusters (Introduction to statistical learning, 2009). As there is no standard rule of how to select the optimal number of clusters, we will use some different techniques and choice the optimal numbers based on their joint results.

More specifically, we will use the elbow and silhouette methods, the gap statistic and the within-cluster variation to find a suitable *K.* As we want the observations within one cluster group to be as similar as possible (have low pairwise squared distances between the observation), while also be distinctly different from observations in other clusters. We want to find the number *K,* that minimalizes the total within-cluster variation for all K clusters. More intuitively explained, "the within-cluster variation for the K^{th} cluster is the sum of all of the pairwise squared Euclidean distances (the Euclidean distance equals the square root of, the squared distance between two observations in a cluster), between the observations in the K^{th} cluster, divided by the total number of observations in the K^{th} cluster" (Introduction to statistical learning, 2009, p. 387). We will use the mclust-library in RStudio to perform the K-means clustering with Euclidean distances between.

The elbow method looks for the number of clusters (on the x-axis) which yields the highest percentage of explained variance (on the y-axis). In the graphics this optimal number often can be find at the point where the curve looks like an elbow, as the first numbers of clusters usually explains most of the total within-cluster sum of squares (WWS) in the data set (R-bloggers, 2017). The silhouette method plots the optimal numbers of clusters on the x-axis against the average silhouetted length for observations on the y-axis. The optimal numbers of clusters correspond to the maximal silhouette length for all observations. Lastly, the gap statistic compares the WWS for different numbers of clusters with their expected values under a null reference distribution of the data observations. The optimal numbers of clusters correspond to the highest gap statistic (Statistical tools for high-throughput data analysis, 2017).

Unsupervised learning can be challenging since it is generally not good at inference. It is more difficult to evaluate the results of it, than supervised learning where we have the dependent variables and can divide the data into a sample set and a validation set to evaluate the model accuracy. However, unsupervised learning can be good at finding patterns in data sample which can be used for prediction. Therefore, we

find it appropriate to use in these setting as we would like to understand if some consumers are more prevalent (or likely) to end up on default contracts.

5.2.3 Linear regression of supplier market share concentration and price competition

In order to try to find indices of any general level of consumer inertia in the market, we will be testing the following correlations using OLS linear regressions:

Correlation between distribution and supply
It is quite common for electricity suppliers to also be part of a corporate group which also handles electricity distribution. In some cases, the same company that handles supply also handles distribution. If the electricity market is not affected largely by consumer inertia but is instead is a perfect market, the only factor for suppliers to compete on would be price. Therefore, there should be no causal relationship between market share in distribution and market share in supply. Consumers should have no reason to select a supplier simply on the fact that it is the same company as their distributor. The following variables are used for a multiple-variable regression to answer whether or not there exists a correlation, and furthermore causation, between market share in distribution and in supplying.

Correlation between price and supply
If the electricity market is a perfect market, the only factor for suppliers on which to compete would be price. Therefore, if the market is perfect and consumer inertia is non-existent, there should be an inverse correlation between electricity price and market share within the supplying sector. Simply put: cheaper prices lead to larger market shares. Even though there are multiple X-variables available, all variables are run separately as simple-linear regressions. This is because of the similarity of comparative prices in between deals which causes Stata to assume co-linearity.

The dependent variable we will use in the two regression models is:
Smarket: Data on market share of the top 30 electricity suppliers in Sweden.

The independent variables we will use are:
Dmarket2: The market share of the corresponding distributor company if any.

Price variables: different contracts and therefore different prices offer by suppliers.

The two linear models we will be running have the following form:

OLS model for correlation between distribution and supply:
$$smarket_i = \beta_0 + \beta_1 * dmarket2_i + \varepsilon_i \quad (4)$$

OLS model for correlation between market share and prices:
$$smarket_i = \beta_0 + \beta_1 * price_variables_i + \varepsilon_i \quad (5)$$

6 Data

6.1 Qualitative survey data on consumer inertia

For the econometric analysis concerning default contracts, a consumer survey, Ei (2014) was used to examine a possible relationship between the share of consumers on default contracts for a specific electricity supplier and information about default contract to the consumer. The survey contained responses from 71 electricity suppliers from this survey, was gathered and questions, relevant for this thesis, regarding the share of consumers on default contracts, whether the electricity bill contained information that the consumer has a default contract, for have long the consumers have been on default contracts and the share of consumers per default contract for different consumption levels.

Moreover, surveys from SBC were used for the years 2006 to 2014, and for 2016, regarding switching and renegotiation activity amongst consumers on the retail electricity market in Sweden. The survey is send out to around 4 000 electricity households randomly. Participation is voluntary and answers from approximately 1 700 households could be used. SCB estimates the total number of households in 2016 equals to 3 860 122. Due to the low total share of households who participated, the data must be interpreted with caution, with the induction problem in mind when drawing any conclusions.

Furthermore, consumer surveys regarding consumer switching activity and behaviour from 2004 to 2005, on behalf of Svensk Energi is used for the qualitative analysis. These surveys were also send out to a randomly number of household consumers each year. The average number of respondents in the annual surveys mounted to approximately 1 000 households, so also these results must be interpreted with caution.

Lastly, price-data from SCB, Ei and Skatteverket for different types of contract types and for the price-components of the electricity bill and the development of the electricity price have been used. A well as data from SCB and Ei regarding share of consumers on default contracts for the four price areas and for Sweden as whole. In all data above consumers are divided into different groups after their annual electricity consumption. A typical consumer with a consumption of 2 000 kWh/year corresponds to is a single-household in a small apartment. A consumption of 20 000 kWh/year corresponds to a family household living in a house of "normal size" or a terrace house, with electric heating.

6.2 Regression on non-information regarding default contracts

In order to try to draw any further conclusions regarding the question if it is lack of information that could be driving the inertia for default contracts, we have as mentioned adopted a more qualitative approach to investigate what is driving the consumer behaviour. A survey from 2014 (Ei) questioning electricity suppliers who uses default contracts, show some signs that the share of consumers on default contract for each supplier, seems to correlate with whether the electricity bill contains information that the consumer has a default contract. In order to test whether this relationship is statistically significant a regression model was developed with the share of consumers as the dependent variable. A dummy variable equal to 1 in case there was information on the bill and 0 otherwise, is the independent variable. A plot of the relationship for the 64 remaining suppliers is shown below (Figure 1), where the share of consumers on default contract for each supplier is called "share_default", and billing information called "info_bill".

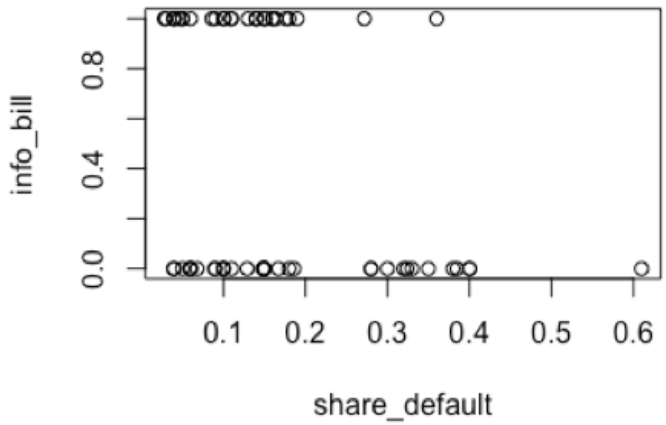


Figure 1. Data source: Ei, 2014. Diagram by the authors.

6.3 Cluster and principal component analyses

For the cluster and principal component analyses (PCA), data from the survey from 2014 (Ei) questioning electricity suppliers who uses default contracts, will be used as mentioned. The two groups contain the following sub-groups:

1. Share of consumers on default contracts for 4 contracts lengths. These contracts lengths are:

   - 0–3 months
   - 3–6 months
   - 6–12 months
   - >12 months

2. Share of consumers on for 8 annual, consumption levels. These levels are:

   - 0–1000 kWh
   - 1001–2000 kWh
   - 2001–3000 kWh
   - 3001–4000 kWh
   - 4001–5000 kWh
   - 5 001–10 000 kWh
   - 10 001–20 000
   - >20 000 kWh.

In order to run the K-means clustering in RStudio, observations containing missing values must be removed. Since not all suppliers participating in the survey, all fields were not filled in. 7 observations (suppliers) contains missing values for either both or one of the two groups above. This means we are left with 55 observations on which the K-means algorithm is performed. Since all variables are expressed in percentage, we do not need to scale the variables before preforming the cluster analysis or the PCA.

Given the many consumption-levels, different groups might be hard to distinguish. Therefore, we will re-group them into the following four groups (in addition to the four contract length groups):

- 0–3000 kWh
- 3001–5000kWh
- 5001–10 000kWh
- >10 001 kWh.

This division was made on the basis that, after having put together all data into excel and scrutinized it, the shares of consumers on default contracts appeared to be quite similar between low-consumption levels, average levels, and for high consumption levels.

6.4 Regression between distribution and supply market shares

To be able to run regression on the chosen variables, the corresponding data must be collected. The corresponding data to each variable is presented later in the text. Time data can certainly be useful and provide stronger results but is however not immediately necessary. To perform such time analysis, more advanced econometric models, outside the scope of this paper, would have to be used. Luckily though, no major time variation has been identified when simply surveying the price data from various years. All the data used is captured in mid 2016.

The Swedish Energy Markets Inspectorate (Energimarknadsinspektionen; Ei) has proven willing to provide most of the necessary data. The only area in which Ei has been unable to produce data is whether the electricity supplier is also handling distribution or is part of a corporate group that handles distribution as well as the year the company brand was established. This void can be filled by using the service www.allabolag.se to look up company relationships and the database Retriever to pinpoint the year of company brand establishment.

Correlation between distribution and supply:

Dependent variable
Smarket: The market share of a top 30 (market share) electricity supplier. The reason only the top 30 companies are analysed is because of simplifying the analysis. These companies together make up more than 90% of the market share whereas roughly 150 companies make up the rest. (STEM, 2013) Analysing the top 30 companies should then provide enough insight to make a judgement of the market as a whole.

Independent variable
Dmarket2 - The market share of the corresponding distributor company. If a distributor company is not part, the variable still applies but counts as 0.00% market-share.

Correlation between price and supply

Dependent variable
The dependent variable is same as before: Smarket - The market share of a top 30 (market share) electricity supplier.

Independent variable
The independent variables are various deals offered by the suppliers and their corresponding prices. Not all deals are offered by all suppliers. These measures are treated as missing values.

Variable name	Description
Anvisatpris	Default option.
fastpris1år	Fixed price for 1 year.
fastpris2år	Fixed price for 2 years.
fastpris3år	Fixed price for 3 years
fastpris4år	Fixed price for 4 years.
fastpris5år:	Fixed price for 5 years.
fastpris6månader	Fixed price for 6 months.
mixavtal1år	Mixed deal between fixed and moving price for 1 year.
mixavtal2år	Mixed deal between fixed and moving price for 2 years.
mixavtal3år	Mixed deal between fixed and moving price for 3 years.
mixavtal5år	Mixed deal between fixed and moving price for 5 years.
mixavtal6mån	Mixed deal between fixed and moving price for 6 months.
rörligt1år	Moving price for 1 year.
rörligtprislöpande	Moving price indefinitely.

7 Results and analysis

In this section we will presents the results in terms of evidence of consumer inertia we have found and what potentially could be driving it. Evidence A to D concerns consumer inertia behind the default contracts, whereas Evidence E and F concerns the general prevalence of inertia in the market.

7.1 Evidence A: Asymmetric information and default contracts

The results from the quantitative surveys show that since the deregulation when 65.1% of consumers had default contracts, the share has substantially decreased (see Figure 2 and 3 below). Most consumers on default contracts appear to have opted for variable contracts instead. Variable contracts are normally recommended for low-consumption households.

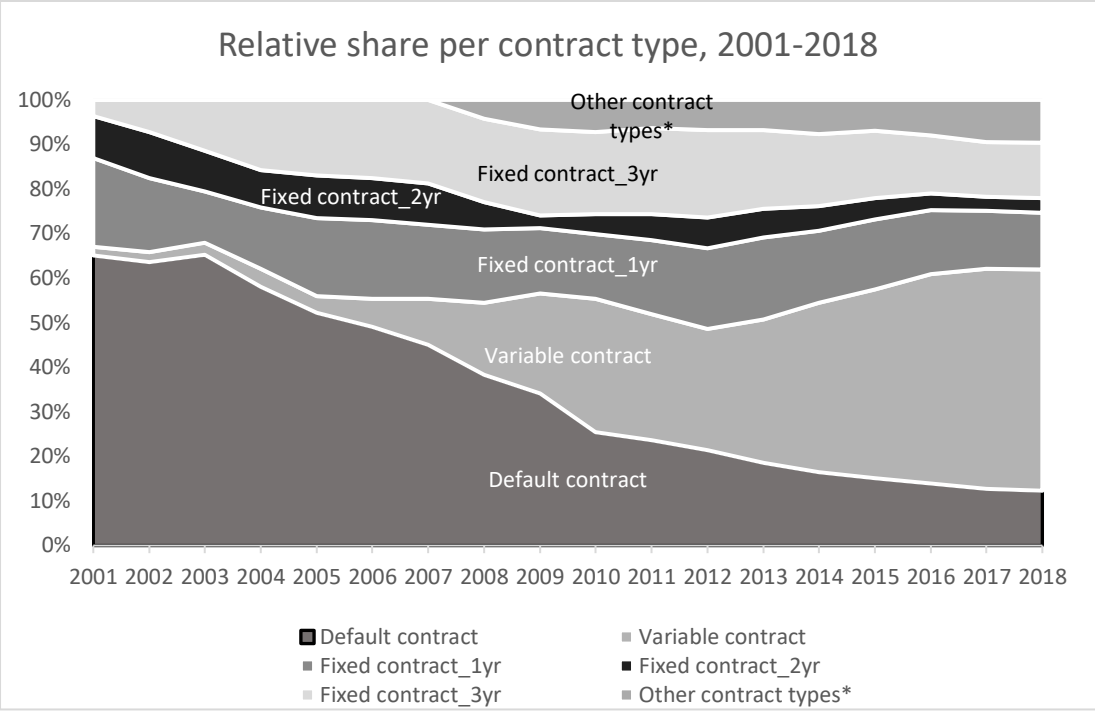


Figure 2. Data source: SCB, 2006–2014. Diagram by: the authors.

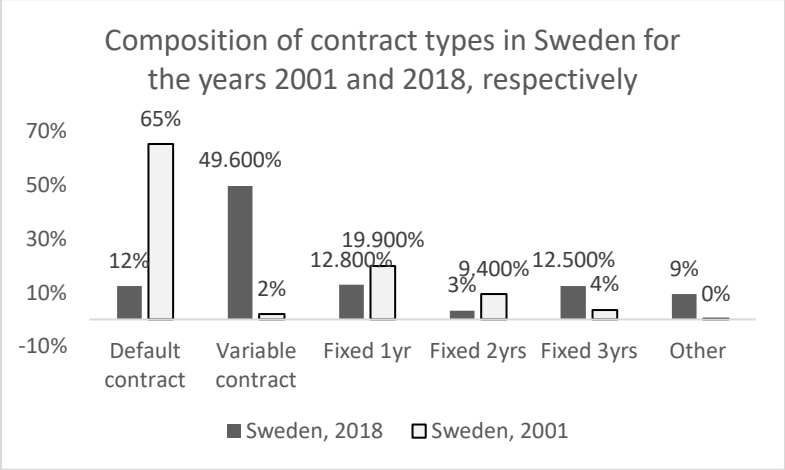


Figure 3. Data source: SCB, 2006–2014. Diagram by: the authors.

The estimated models of regression of share of consumers on default contract for each supplier on billing information, can be seen below and in Table 1.

Estimated OLS model:

$$share_default_i = 0.198 - 0.077 info_bill_i + \varepsilon_i \quad (6)$$

Estimated Robust model:

$$share_default_i = 0.166 - 0.051 info_bill_i + \varepsilon_i \quad (7)$$

Estimated Box-Cox model:

$$(share_default_i)^{0.09} = 0.845 - 0.033 info_bill_i + \varepsilon_i \quad (8)$$

Estimated Bootstrapped model:

$$share_default_i = 0.197658 - 0.07593269 info_bill_i + \varepsilon_i \quad (9)$$

Comparasion of regression models

	Dependent variable:		
	share_default	share_default	share_default
	OLS	*MM-type linear*	*OLS*
	OLS	Robust	Boxcox
Info(=1)	-0.077***	-0.051	-0.033**
	(0.028)	(0.032)	(0.013)
Constant	0.198***	0.166***	0.845***
	(0.019)	(0.031)	(0.009)
Observations	64	64	64
R^2	0.105	0.067	0.088
Adjusted R^2	0.091	0.052	0.073
Residual Std. Error (df = 62)	0.113	0.083	0.053
F Statistic (df = 1; 62)	7.274***		5.959**
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 1. Standard errors are shown in parentheses. Data source: Ei, 2014. Diagram by: the authors.

The OLS regression output can be seen in the first column in Table 1. The results show that information of default contracts on the bill decreases the share of consumers on default contract with approximately 7.7%. If there is no information on the bill, the number of consumers on default contracts increases with 19.8%. The actual impact of no information on the bill is equal to 12.1% (19.8–7.7). The results are statistically significant at the 1%-level. However, the standard error is rather high at 0.113. Furthermore, given the few observations the F-statistic would need to be far from zero in order to for us to be able to reject the null hypothesis that there is no relationship between the independent and dependent variable. However, the F-statistic is only 7.274 which is not satisfactory.

Moreover, skewness test of the residuals from the OLS regression above comes back positive, at 1.072835. Since it is above zero it is an indication of heteroscedasticity and that the standard residuals are not normally distributed. This is also supported by the Breusch-Pagan test. The Breusch-Pagan statistic is 5.4636 with a p-value of 0.01942. Since the p-value is lower than the significance level of 5%, the null hypothesis of homoscedasticity can be rejected (Appendix C).

In order to examine if the results are robust some diagnoses of the variation of the residuals are performed (see Appendix C for further details). These results also indicate that the standard errors do not have constant variance across all observations and the presence of outliers.

When we run the model with robust standard errors, (in the second column in Table 1). Since the single explanatory variable loses its significance and the constant term decreases (implying that no information on the bill loses some impact of share of consumers on default contracts), when using robust standard errors (which also differs from the standard errors in the OLS regression) it is sign that model being wrongly specified and sensitive to outliers in the data set. This is expected due to the limited data available. Even though the line relationship between the residuals and the fitted values improves in the diagnosis test (Appendix D), the Box-Cox transformation of the fitted values was preformed to see if the specified model become could be improved as we cannot add other satisfactory, explanatory variables.

The Box-Cox transformation of the dependent variable yields an optimal lambda of 0.09090909, which corresponds to the highest log-likelihood of -110.1613. The estimates are shown in the third column in Table 1. The BP-test statistic is now 0.5841, with the corresponding p-value of 0.2082. This p-value is much better and mean that we now can reject the significance level of 5%, the null hypothesis of homoscedasticity at the significance level of 5%. The diagnoses tests of the variation of the residuals do also show better results. The residuals and scale locations are now horizontal and almost horizontal lines which as sign of homoscedasticity. Therefore, these model estimates are likely more accurate than the OLS estimates of the coefficient and the intercept.

The explanatory variable regains some significance, compared to the robust model. It is now significant at the 5%–level. The more reasonable impact of information of default contracts on the bill now decreases the share of consumers on default contract with approximately 3.3%. If there is no information on the bill, the number of consumers on default contracts increases with 84.5%. The actual impact of no information on the bill is now, however, equal to 81.2% (84.5–3.3). The standard errors are lower compared to the OLS regression, but at the same time the adjusted, explanatory value of the model is now only 7.3% and the F-statistic decreases to 5.6% and loses significance.

When we also bootstrap the OLS regression, the standard errors increase and the OLS estimates decreases slightly, which is also an indication that the model should be interpreted with caution, as there are probably other factors than information on the bill which affects the share of consumers on default contracts. However, the confidence intervals for the bootstrapped coefficients compared to the OLS ones, are different, but not to a high degree. None of the intervals contains the value zero, indicating that the fitted model has some explanatory power.

OLS confidence intervals:

	2.5 %	97.5 %
(Intercept)	0.1591183	0.2369228
info_bill	-0.1334810	-0.0198402

Bootstrap confidence intervals:

	2.5%	97.5%
matr(Intercept)	0.1622206	0.23662737
matrinfo_bill	-0.1329016	-0.02282818

ORDINARY NONPARAMETRIC BOOTSTRAP

Call:

Bootstrap Statistics :

	original	bias	std. error
t1*	0.19802059	-0.001024396	0.0236136
t2*	-0.07666059	0.001819897	0.0270923

Table 2. Bootstraps estimates of the OLS model, where t1 is the intercept and t2* the coefficient.*

That is, the three largest suppliers (Vattenfall, Fortum and Eon), all provides information on the bill, but do nevertheless have between 11 to 18% of consumers on default contracts in 2014 (Table 3 below). In order to make an approximation of how many consumers are on default contracts we retrieved data from Ei for the year 2014. The results show that approximately 100 000 consumers were on default contracts, which could be argued to be a substantial number. 10.4% of Vattenfall's household consumers had an average, annual consumption-level of more than 10 001 kWh. This is a possible sign that brand-awareness is relatively strong, especially since relatively many consumers have been on the default contracts for more than 12 months and that the presence of inertia is rather strong in general in the market.

Supplier	Number of customers	Market share	Share of customers on default contracts	Number of customers on default contracts	Share of customers on default contract for >12 months	Information about default contract on the bill	Share of customers on default contracts for >10001kWh/ year	Number of customers on default contract for >12months
Vattenfall	960000	18.0%	10.9%	104640	70.2%	1	10.4%	10883
Eon	689000	12.9%	16.4%	88789	34.0%	1	9.9%	8790
Fortum	636000	11.9%	17.6%	75654	82.0%	1	8.0%	6052
Bixia	300000	5.6%	15.0%	45000	42.0%	1	5.0%	2250
Telge Energi	172000	3.2%	6.8%	5533	-	0	16.0%	885
Mälarenergi	161000	3.0%	3.9%	4848	23.9%	1	7.0%	339
Kraftringen	150770	2.8%	38.5%	58046	70.5%	0	8.0%	4644

Table 3. Overview of large electricity suppliers and shares of consumers on default contracts. Data source: Ei, 2014 and Energimarknaden, 2014 via Ei. Table by: the authors in Excel.

Despite the low explanatory value being low, the results indicate that search costs can be high and driving consumer inertia. It is interesting that amongst the suppliers with a share of consumers on default contracts of 30% or more only 1 of 11 suppliers provided information on the bill. Amongst the suppliers with a share of consumers on default contracts of 5% or less, 8 of 11 provided information about default contracts on the bill (Table 1). It is a possible sign that lack of information increases the number of consumers on default contacts, but it must first be examined by interviews consumers on default contracts.

These results are a possible indication that asymmetric information is driving the consumer passiveness regarding default contracts, and that it is a consumer learning process. It takes time for consumer to find their way to the market, to put it straight. As the number of informed consumers increases the number of default contracts declines. Thus, the 12.3% of consumers still on default contracts might not be a serious cause for concern.

Some qualitative tests were executed to see whether it could be other reasons than inertia for why these high-consumption households have default contracts. No apparent explanation as to why these consumers are on default contracts with their current supplier could be found. See Table 3 and 4 below. The default price (Default price =1) was more expensive than both variable and fixed contracts offered by that supplier and offered no other advantages over other contracts. This was indeed the case for all 6 suppliers. All 6 suppliers also had distribution operations, which is in line with observations that distributors often assign a consumer to a default contract with a supplier within the same conglomerate.

Supplier	share_default	info_bill	distributor	default_price	>12 months	10 001-20 000 kWh	>20 000 kWh
Vattenfall AB (556036-2138	10.9%	1	1	No info	70.2%	7.3%	3.1%
Fortum AB	17.6%	1	1	1	82.0%	5.0%	3.0%
Eon	16.4%	1	1	1	34.0%	4.6%	5.3%

Table 3. Data source: Elpriskollen, via Ei and websites for the suppliers. Table by: the authors. Numbers in red are possibly not exact due to a probable calculating error in the survey, but they are deemed to be close.

Supplier	share_default	info_bill	distributor	default_price	>12 months	10 001-20 000 kWh	>20 000 kWh
Lerum Elhandel AB	40.0%	0	1	1	0.0%	17.0%	7.0%
Eskilstuna Energi & Miljö AB	36.0%	1	1	1	91.4%	2.4%	0.7%
Kvänum Energi AB	5.0%	0	1	1	52.0%	16.0%	1.0%

Table 4. Data source: Elpriskollen, via Ei, and websites for the suppliers. Table by: the authors

Furthermore, the results raised some questions concerning the impact of brand awareness for consumer activity. That is, the 3 largest suppliers by market share all provide information on both the bills and on the website that default contracts are not optimal. A large share of the default consumers had also been on them

for more than 12 months. The annual savings consumers with a consumption of 20 000 kwh/year can be seen in Table 5 below. The question is what is causing this inertia, lack of information can be a drive for inertia. This is mentioned by Konsumenternas elmarknadsbyrå (cited in KkV, 2006, p. 20). The largest obstacle preventing consumers to be more active, appears to be due to lack of information of how the electricity market is structured and functions. This in combination with difficulties in comparing different contracts in the market (KkV, 2006, p. 20).

Consumption:	**20 000**	**kWh/year**
Year: 2014	**Fixed contract**	**Variable contract**
Area 1	5486	7006
Area 2	5010	6557
Area 3	5399	7078
Area 4	-1133	506

Table 5. Annual savings (in Swedish kronor) from switching from a default contract to a variable or fixed contract. Data source: Elpriskollen, via Ei, 2018. Table by: the authors.

7.2 Evidence B: Price dispersion and default contracts

In a survey initiated by Vattenfall (2004, cited in KV, 2010), they stated that default contracts implied a greater risk and where therefore more expensive. However, an additional observation from the trends mentioned above is that since the share of consumers has decreased to 12.3% in 2018, it could be argued that the accumulated risk has decreased. However, at the same time the default prices have increased relative to other contract types (Figures 4 and 5 below). We found no real explanation for this price increase of default contract, that could be justifiable. On the other hand, it could be argued that these 12% of consumers, still on default contracts are high-risk customers, since they have not switched despite the improvement and increased accessibility of information, according to Björkström (Ei, 2018) Without information regarding individual consumers on default contracts, it is however impossible to draw any such conclusions.

What we also can see from the same figures is that prices for low-consumption households are more expensive today than for large-consumption households but there were no such differences in the years 2000 to 2003. A reason could be administrative costs since these are the same for all consumption levels, according to Vattenfall (2004, cited in KV, 2010).

However, it is interesting (Figures 4 and 5 below), that default prices started to become much more expensive relative to other contracts around 2010 (Figures 4 and 5 below). This since the decrease of the share of consumers on default contracts started to slow down around the same time (see Figure 2). This even though, the analysed data show that households could save up to 7 000 kWh in 2014 by just switching from a default contract to a variable or fixed contract with the same supplier (Figure 6 below). For a consumption level of 2 000 kWh/year the corresponding annual savings are about 650 Swedish kroner/year (Figure 7 below). These saving patterns are approximately the same across the four price areas. Since 2011 the savings have been quite stable for both types.

These findings could indicate that suppliers have been able to move costs to passive consumers on default contracts, from active consumers who receive better deals on other contracts, as Björkström from Ei expressed in an interview (2018). But these are merely speculations given the available data on consumer behaviour.

However, it could also be the case that electricity consumers have become less active following the increased activity on the Swedish housing market which started around 2009–2010. Meaning that if consumers accepted to live in an apartment/house for a short period of time, they might not deem it being worth the effort to search for better electricity deals. The low activity after 2010 (see Figure 1) could be a result of this, but as with the theories about, it cannot be proved without interview with consumer on default contracts.

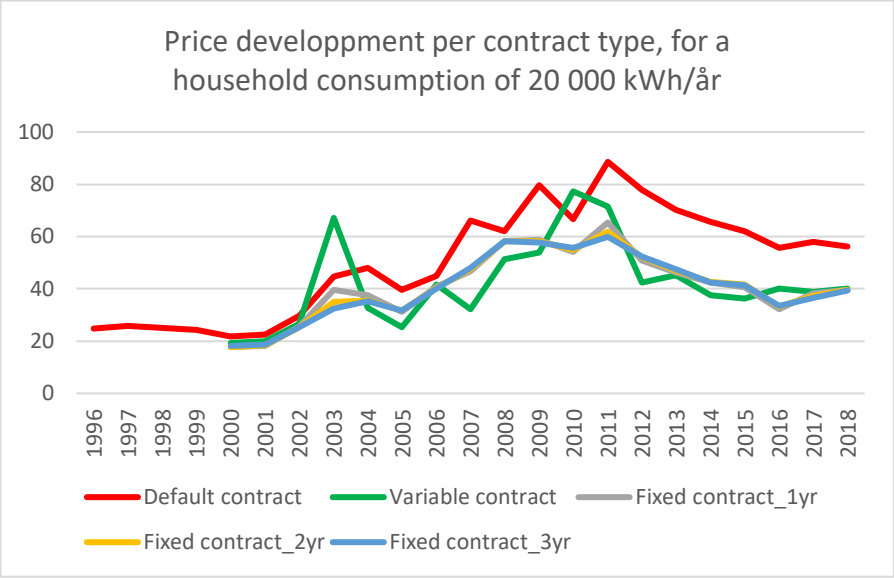


Figure 4. Data source: SCB in Ei, 2018. Diagrams by: the authors.

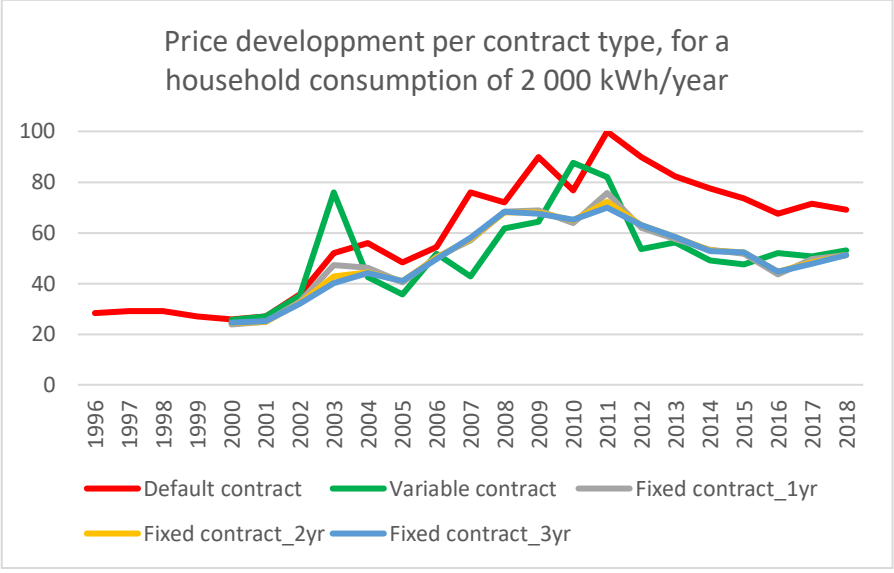


Figure 5. Data source: SCB in Ei 2018. Diagrams by: the authors.

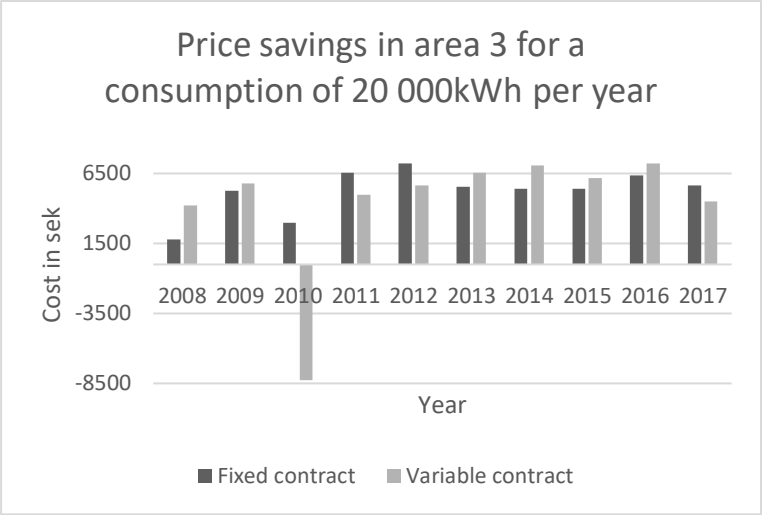


Figure 6. Annual price savings for a consumer with a consumption of 20 000 kWh/year, in area 3 as an example. See Appendix C for the remaining areas.

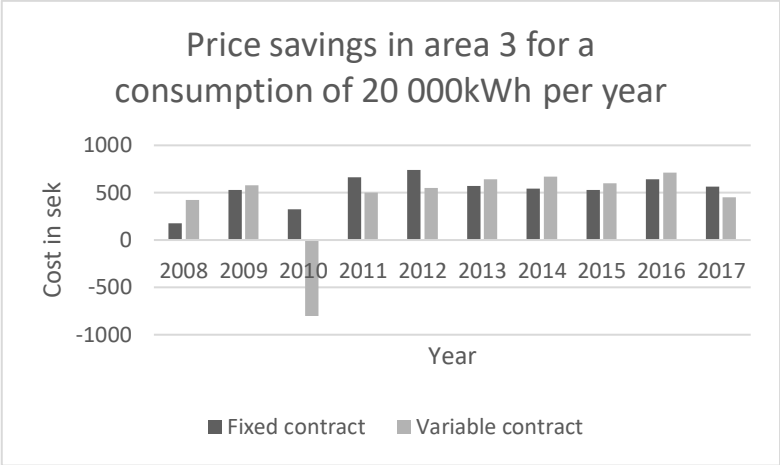


Figure 7. Annual price savings for a consumer with a consumption of 2 000 kWh/year, in area 3 as an example. See Appendix C for the remaining areas.

Altogether, these findings of increase price dispersion for default contracts combined with the decline in the decrease of default contracts in the market, raises some concern for the 12.3% of consumers who are left at them. It would therefore be valuable, to try to investigate deeper into which these consumers are. Then it, is easier to value the extent of the problem with the default contracts.

7.3 Evidence C: Low-consumption consumers on default contracts

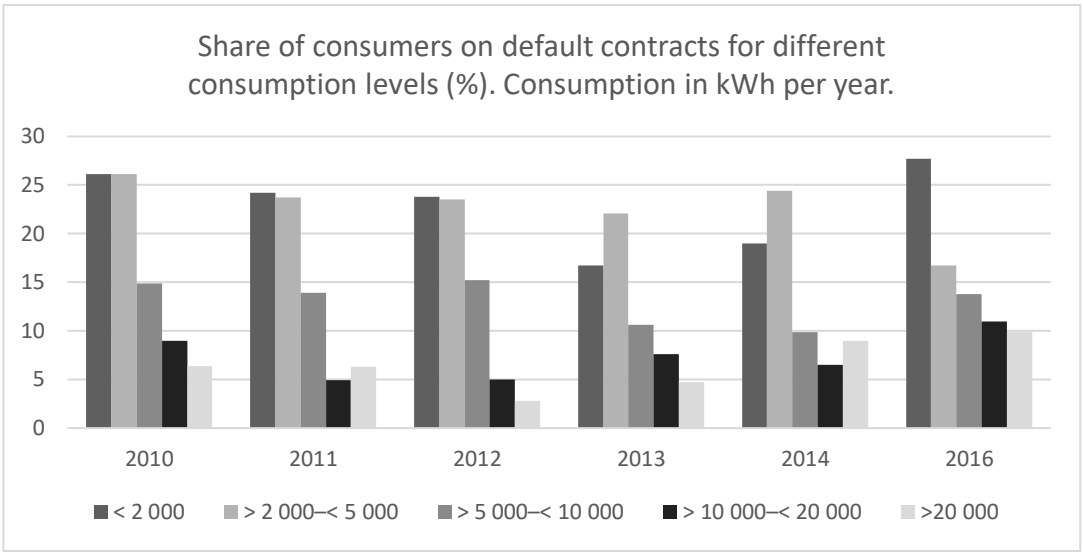


Figure 8. Data source: SCB, 2010–2016. Diagram by: the authors.

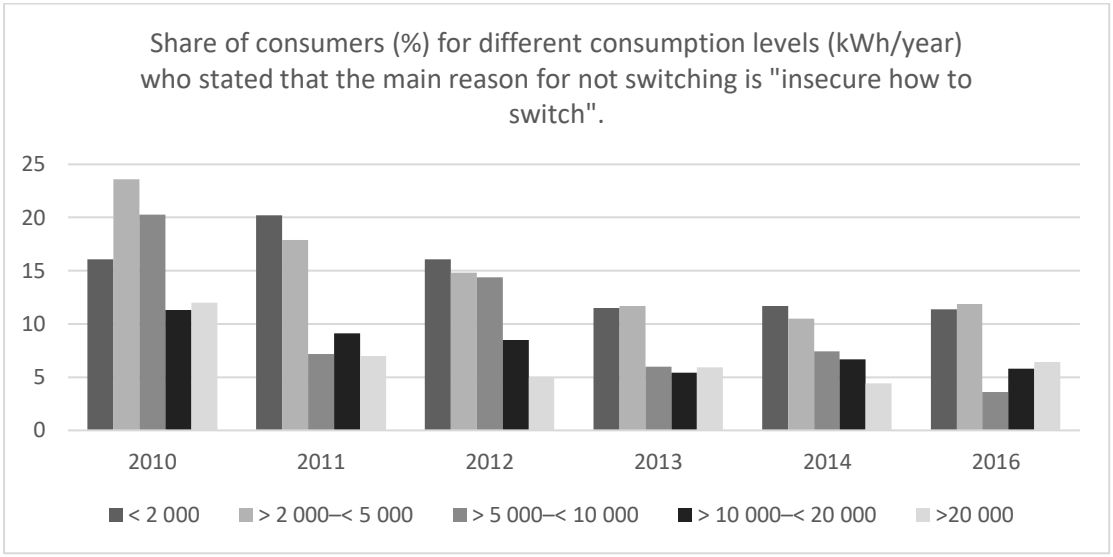
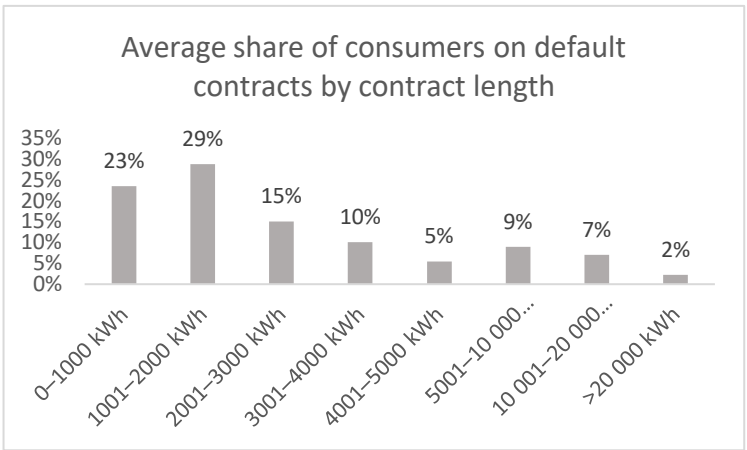


Figure 9. Data source: SCB. 2010–2016. Diagram by: the authors.



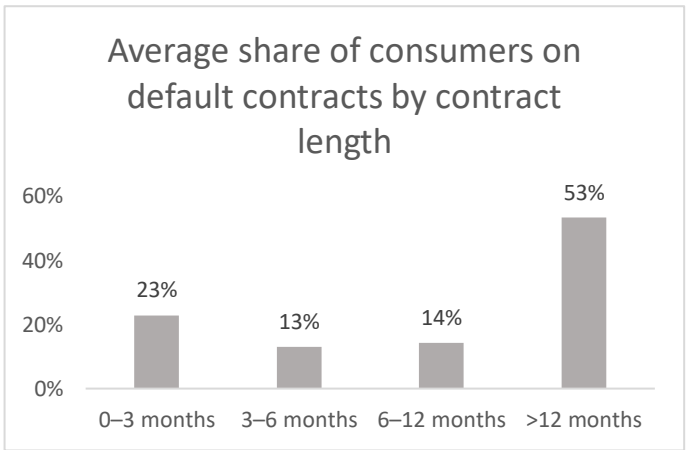


Figure 10 and 11. Data source: Ei, 2014. 58 observations. Diagram by: the authors.

The WWS, elbow, silhouette methods and the gap statistic all indicated that the optimal numbers of cluster, *K*, was 2. The results of the k-means clustering algorithm is seen in the cluster plot below (Figure 13), where the two identified cluster plots are plotted against the two principal components which where find by the PCA. As seen these two components explain 66.72% of the variability in the data set. It is not the optimal percentage, it would have been better if it where even higher, but the data availability is limited, and we have length of contract and consumption-levels for these default contracts to perform the cluster analysis on.

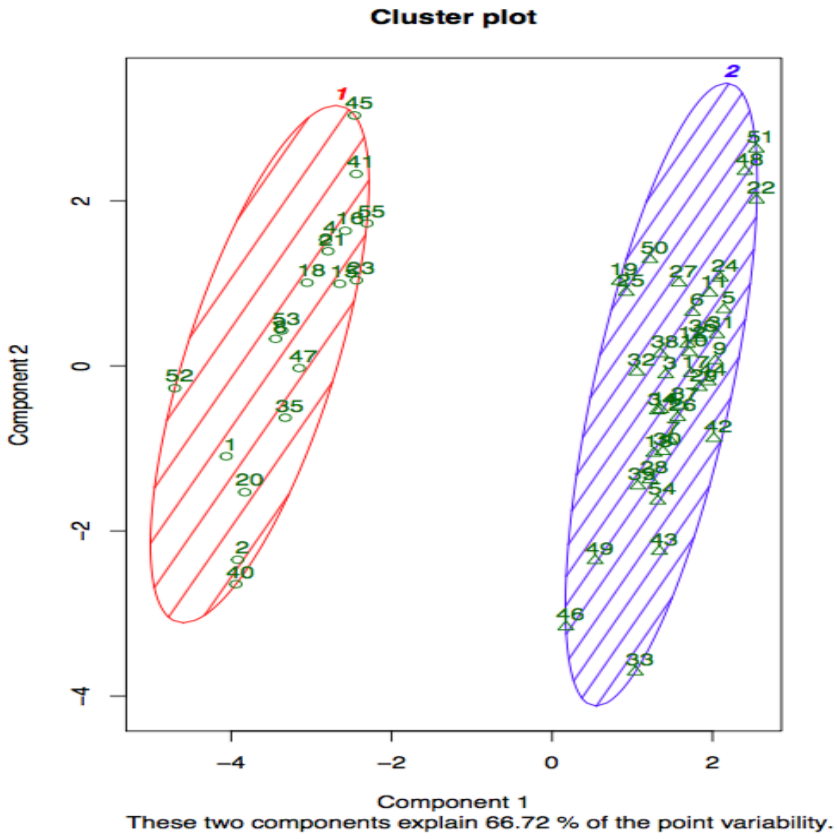


Figure 13. The 2 identified clusters plotted against the two identified principal components. Data source: Ei, 2014. Cluster plot by: the authors in RStudio.

From the results of the K-means clustering, we can see that the two cluster groups differ the most in relation to component 1. Observations in cluster 2 (in blue in Figure 13), are negatively correlated with component 1, whereas observations in cluster 1 are positively correlated with component 1.

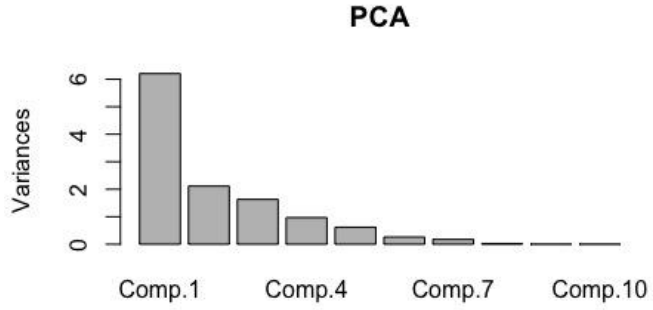


Figure 14. Principal component analysis. Data source: Ei, 2014. Plot by: the authors in RStudio.

From the printing of the loading vectors in R-output (Appendix D), we can see that the contract length >12 months and a consumption-level of 0–3000kWh per year are positively correlated with component 1, whereas contract lengths 0–3 months and 3–6 months are negatively correlated with the first component. Annual consumption-levels 5000–10 001kWh and >10 001kWh, are most positively correlated with component 2, whereas contract length 6–12 months, and consumption levels of 0–3000kW and 3000–5000kWh are negatively correlated with component 2.

It appears that the cluster group are most different in terms of length of time on default contracts, which can also be seen in the plots of the two clusters against other parameters (Appendix D).

When we add the group the assigned cluster group to each of the 55 observations in the data set, we can also see these tendencies in the data. Observations in cluster 1 tend to have high default share values for the contract length of >12 months, as well as for a consumption-level of 0–3000kWh. Observations in cluster 2, on the other hand, tend to have default share values for consumption-levels of 5001–10 000kWh and above 10 00kWh, but lower values for shorter contracts lengths. This indicate that consumers on default contracts could potentially be segmented into at least two groups based on these features; one where consumers on default contracts tend to have been on these contracts for more than 12 months and have low-consumption levels (up to 3000kWh per year). The other distinct group of consumers on default contracts are those who have the higher consumption levels and tend to be more on shorter contract lengths of 0–6 months.

These are potential findings of interest, when comparing these groups to, the groups for which the previous research have found various degrees of consumer inertia. That is, that high-consumption levels are associated with lower share of consumers on default contracts, combined with shorter times on default contracts, could be a sign that search and switching costs are lower for high-consumption consumers, who are more active and therefore, switches from default contracts more readily. At the same time, the indication by the cluster analysis that low-consumption households are more often find on default contracts, and that they can have been on default contracts for over a year, might be a sign that the search and/or switching costs are higher for low-consumption households how are still uninformed, or "locked-in". These are merely hypothesis though, as we do not have access to individual level data for consumer on default contracts.

In Figure 9 lower-consumption households are also found to lack information of how to switch to better deals. This might be a group to examine further, since these consumers might be low-income consumers on average. (To give a hint of the relatively consumption levels, one person living in a small apartment of 40 square metres, without electric heating, can consume around 2 500 kWh per year).

From the plot of the importance of the components in Figure 14 below, it is clear that component 1 explains most of the variance in the data. When examining the component, important output, we see that both components 1, 2 and 3 have values over 1, so they can be used. However, as we want as few components as possible and the explained variance do not differ much when going from 2 to 3 components, we will use PCA 1 and 2.

7.4 Evidence D: Younger consumers on default contracts

Another characteristics on types of consumers on default contracts are found in the qualitative survey from SCB for the years 2010 to 2016 in Figure 15 and 16 below. The youngest age-group appear to be more commonly found on default contracts in the past few years, and they are also more insecure of how to switch to a better deal. This is a potential sign that asymmetric information and search and/or switching

costs being higher for younger groups. It might be that they have not yet found their way to the market, but get informed the longer time they have been responsible. But the results across age-groups are non-conclusive.

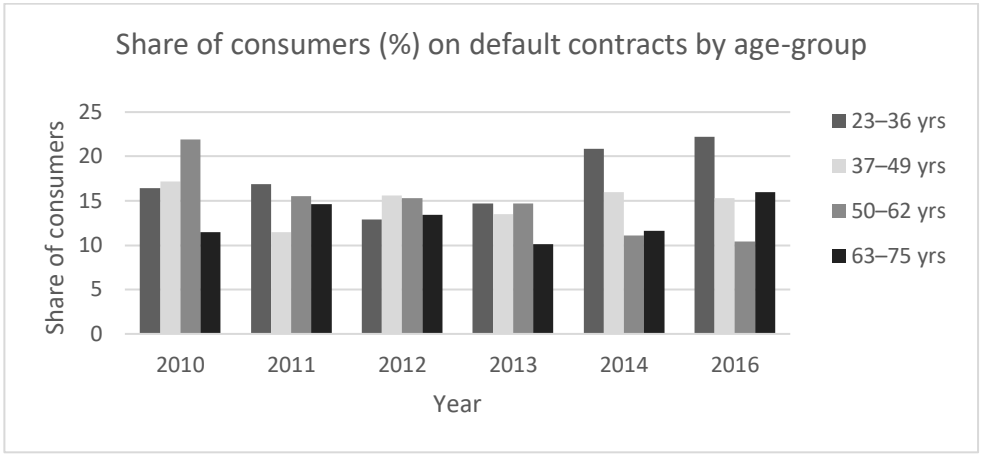


Figure 15. Data source: SCB, 2010–2016. Diagram by: the authors.

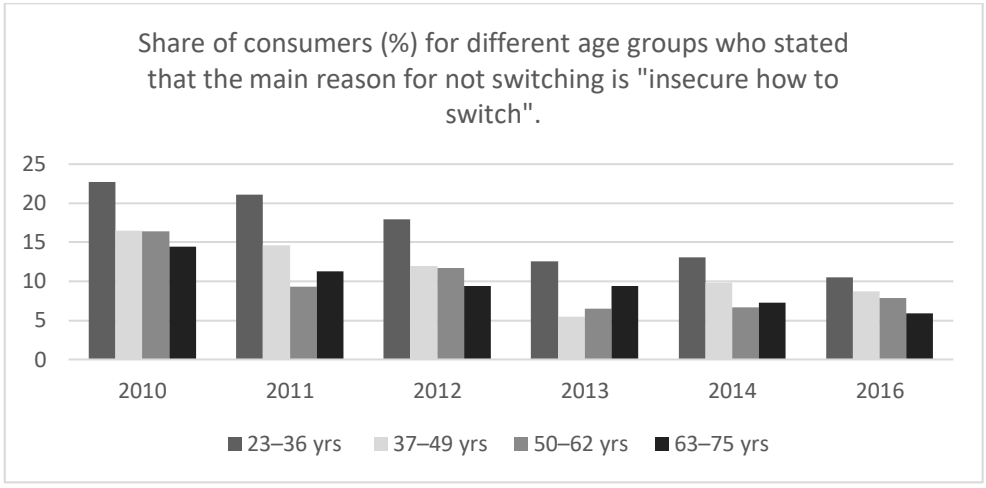


Figure 16. Data source: SCB. 2010–2016. Diagram by: the authors.

7.5 Evidence E: Market share concentration and price competition

The output from R, shown below in Table 6, indicates that there is a strong correlation between the independent variable dmarket2 and the dependent variable smarket. The adjusted R-squared is 0,88 which is fairly high, signifying that much of smarket, or the market share for electricity suppliers, is explained by the market share for the corresponding electricity distributor. It seems as if 1% market share in electricity distribution corresponds with 0.743% market share in electricity supply. The p-value of the independent variable is also sufficiently low to represent a correlation.

OLS model for correlation between distribution and supply:

$$smarket_i = 0.011 + \beta_1 * 0.743_i + \varepsilon_i \quad (10)$$

Robust model for correlation between market share and prices:

$$smarket_i = 0.010 + \beta_1 * 0.646_i + \varepsilon_i \quad (11)$$

Comparasion of regression models

	Dependent variable:	
	Smarket	Smarket
	OLS	*MM-type linear*
	OLS	Robust
Dmarket2	0.743^{***}	0.646^{***}
	(0.052)	(0.015)
Constant	0.011^{***}	0.010^{***}
	(0.003)	(0.003)
Observations	28	28
R^2	0.887	0.912
Adjusted R^2	0.883	0.908
Residual Std. Error (df = 26)	0.014	0.010
F Statistic	204.735^{***} (df = 1; 26)	
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 6. OLS and Robust regressions of correlation between supplier and distribution market shares.

Even though some outliers have been removed before running the OLS regression of correlation between supply and them, the impacts of the estimates decrease when using robust standard errors. The intercept decreases slightly from 0.011 to 0.010, and the coefficient for supplier-market share decreases from 0.743 to 0.646, even though it is still significant. The standard error for the coefficient decreases from 0.052 to 0.015, and the R-square value increases to over 90%, indicating that there likely are other outliers and that the fitted model should benefit from more observations.

OLS confidence intervals:

```
      2.5%      97.5%
0.005031721 0.016760862
  0.6438325 0.8432287
```

Bootstrap confidence intervals:

```
                2.5 %     97.5 %
(Intercept) 0.004680072 0.01702896
Dmarket2    0.636418746 0.84994576
```

The confidence intervals for the bootstrapped model, hardly changes though (and neither interval contains the zero value, so the null hypothesis that the model estimates would be equal to zero can thus be rejected), indicating that the model estimates are quite robust. (The intercept is in the first row and the Dmarke2-variable in below, also for the OLS confidence intervals.)

Since there is a clear correlation between the market share in distribution and market share in supply, it seems as if consumers prefer to have the same supplier as the distributor, unless there is some unseen market factor causing this correlation. The correlation does not necessarily prove a causal relationship, but it is unlikely that there would be some unknown variables or chance causing the correlation in this situation. A likely variable which could influence the result is of course price which is investigated in later chapters.

Consumer inertia is likely driving this behaviour, even though we are unable to determine to what extent it impacts the supplier market concentration. Because most consumers actively switch from the default option to a more favourable contract, it is reasonable to assume consumers are aware of the possibility of switching. Consumers are however seemingly convinced that the brand of choice should correspond with their distr-

ibutor. As mentioned earlier, there are no clear benefits of having the same supplier and distributor such as increase in quality or stability as these attributes are not dependent on the consumers choice of supplier. However, there is the notion of not having to write a contract with to separate companies. Even though the companies are most likely different from an accounting standpoint it is moreover likely consumers prefer to be in touch with a single brand instead of having their electricity split up with two different brands. It is reasonable to assume the shared experience simplifies the contact with the supplier and distributor and therefore instils a feeling of better customer service.

Correlation between market share and price:

The output from Stata, shown below, clearly states that there is essentially no correlation between the independent variable fastpris3år, rörligtprislöpande and the dependent variable smarket. The adjusted R-squared is negative or very low, implying that none of smarket, or the market share for electricity suppliers, can be explained by the price of a 3-year fixed contract or moving price. The p-value of the independent variables is too high to represent a correlation.

OLS model for correlation between distribution and supply:

$$smarket_i = 10.658 - 0.093 * fastpris3år_i + \varepsilon_i \quad (12)$$

Source	SS	df	MS	Number of obs	=	24
				F(1, 22)	=	0.03
Model	.555896226	1	.555896226	Prob > F	=	0.8711
Residual	453.795084	22	20.6270493	R-squared	=	0.0012
				Adj R-squared	=	-0.0442
Total	454.350981	23	19.7543905	Root MSE	=	4.5417

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris3år	-.092508	.5635093	-0.16	0.871	-1.261155	1.076139
_cons	10.65762	45.0668	0.24	0.815	-82.80521	104.1205

Source	SS	df	MS	Number of obs	=	24
				F(1, 22)	=	1.57
Model	29.8614093	1	29.8614093	Prob > F	=	0.2235
Residual	418.717684	22	19.032622	R-squared	=	0.0666
				Adj R-squared	=	0.0241
Total	448.579093	23	19.5034388	Root MSE	=	4.3626

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rörligtprislöpande	-.3222121	.2572385	-1.25	0.224	-.8556921	.2112679
_cons	30.18735	21.46574	1.41	0.174	-14.32987	74.70457

The results are conclusive for other contract price options: there is essentially no to very little correlation between prices and market share. This leads to assume that customers are not choosing supplier based on best price offer but rather other factors. See Appendix F for full list of regression results.

7.6 Evidence F: Why are not more consumers active in the market?

As the regression results showed in 7.5 Evidence F, suppliers do not appear to compete on prices in today's market and their market share can vary substantially. One reason for the inertia in the market is that the expected gains from being active, is simple to low, the price gains for switching supplier might be too low, as these suppliers do not appear not compete on prices to a great extent. However, from Figures 17 and 16, we can see that the share of active consumers has increase up until today, and consumers have become less reluctant to switch supplier. These might depend on the steps taken to facilitate the switching process and lower search costs with more accessible information to consumers.

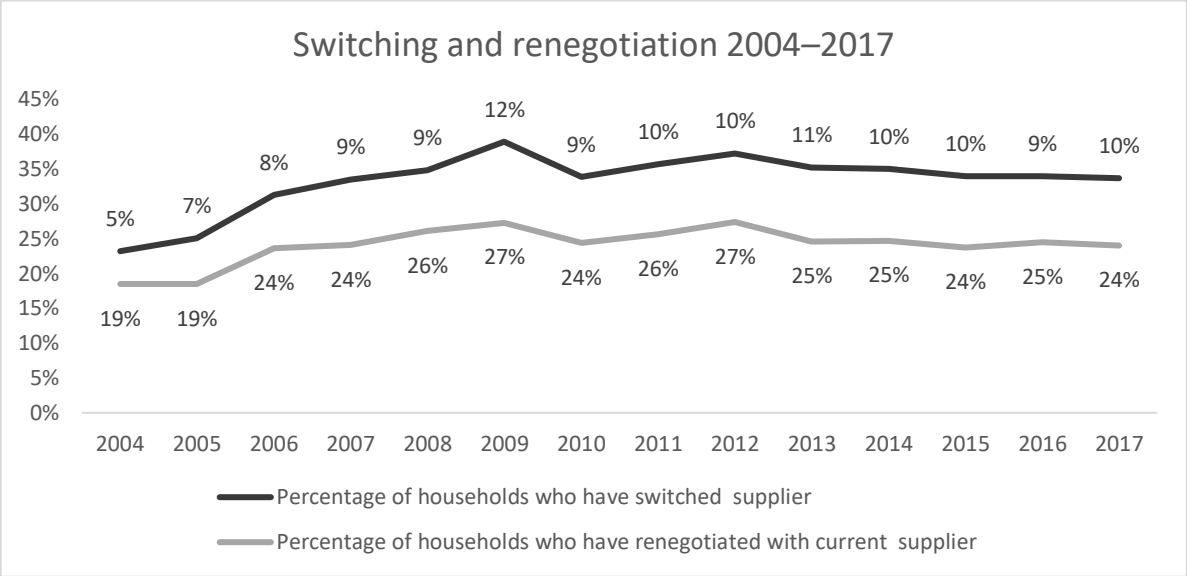


Figure 17. Data source: SCB, 2006–2014, 2016. Diagram by: the authors. For the year 2004 the same value as for 2015 was used for negotiation activity since there was no information available by the authors to this thesis.

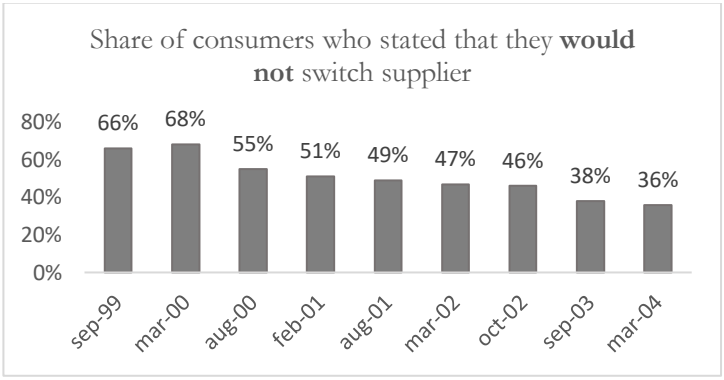


Figure 18. Data source: Svensk Energi, 2004–2014. Diagrams by: the authors.

In Figure 18 below the inertia appears to have to do with a low interest and that the expected gains from making an effort to search for information of other contracts or suppliers might be too low, as mentioned. However, some consumers find it difficult to be an active consumer and choose between all the contracts on the market. This is a sign of a more general presence of consumer inertia in the market. It might be the case that consumers do not even know that they have default contracts, if they never bother to search or cannot search for better deals.

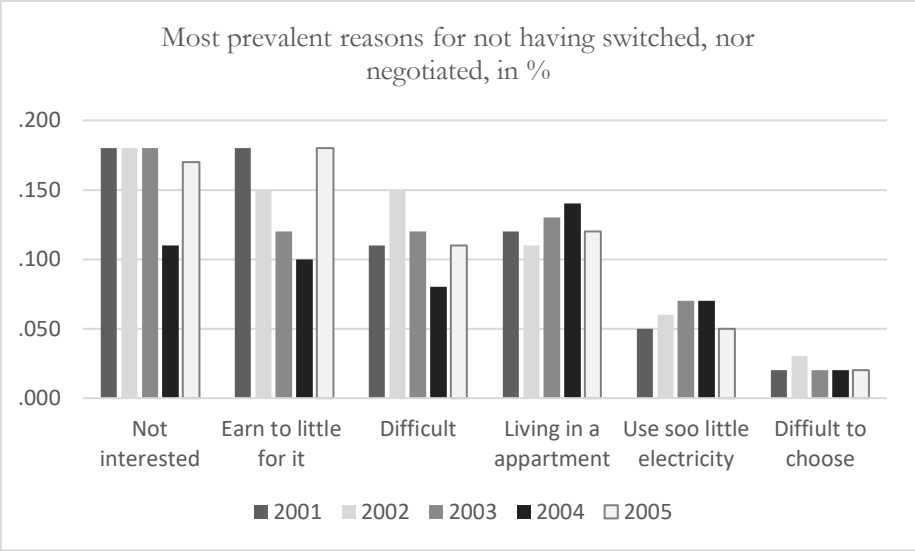
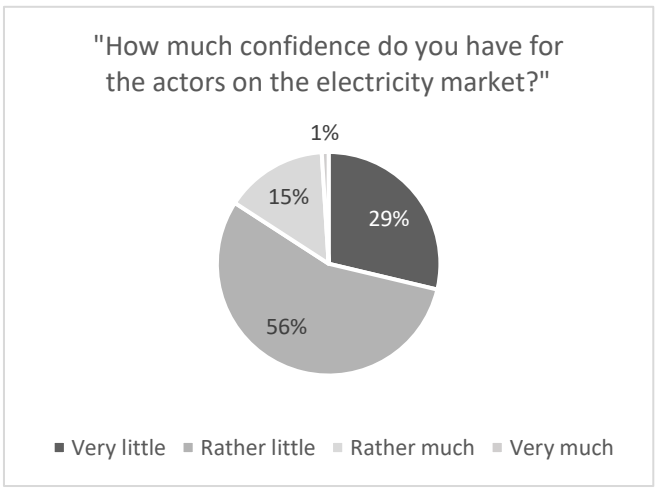
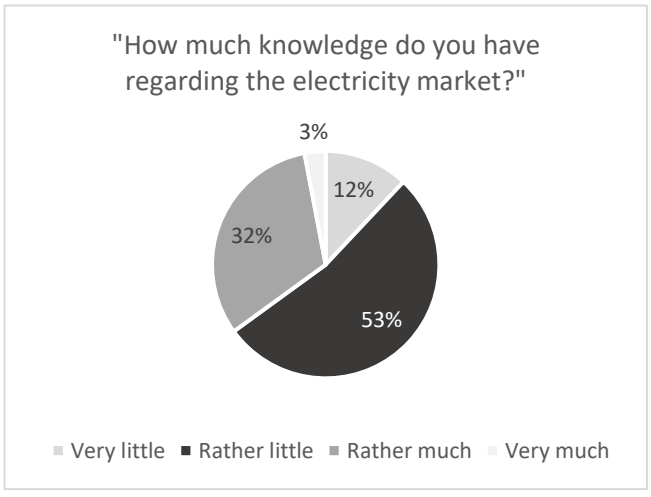


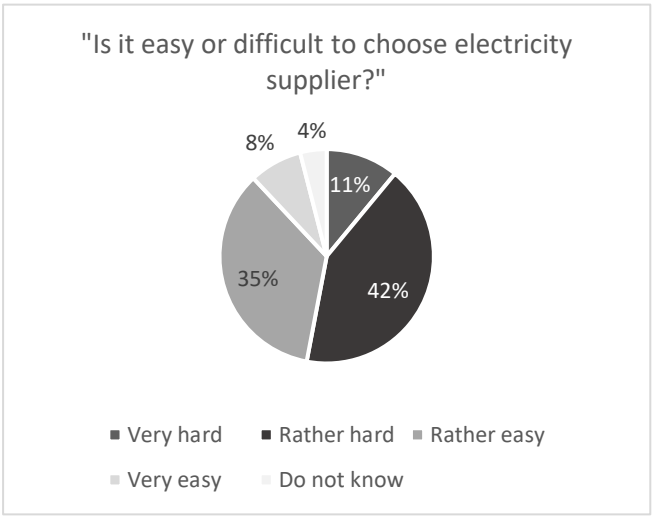
Figure 18. Data source: Svensk Energi, 2004–2014. Diagrams by: the authors.

In the diagrams below of consumer attitudes to the market, the confidence for the market is low, and consumers lack information of how the market works and find it difficult to choose supplier. Based on these findings, the general consumer inertia appears to still be a problem, and it is important to work to reduce the asymmetric information amongst consumers, in general. That might decrease the share of consumers on default contracts from 12.3% to lower level.





Data source: Ei, 2012b. Diagram by: the authors.



7 Conclusion and summary

In this thesis, we have evaluated the Swedish retail electricity market concerning the default contracts, in order to evaluate whether the 12% of electricity consumers still on default contract poses a problem that might justify some degree of regulation. Consumer activity in the market is low in general. However, since these default contracts are generally 20–30% more expensive than other contracts, with no better service, they have been a political question. Therefore, we have tried to understand why these consumers do not switch from the expensive default contracts. For this, we have been evaluating quantitative surveys of consumer attitudes in the retail electricity market and tested the role of information empirically.

We have also examined the general role of consumer inertia in the market and have found a high correlation between supplier and distributor market shares, for a business conglomerate who own both. This even though, electricity is a homogenous product and the quality of electricity delivery does not depend on the level of vertical integration between production, distribution and supply of electricity. By regressing different contract prices offered by a specific electricity supplier, on that supplier's market share, and found that suppliers do not seem to compete on prices, but rather on additional services or assurances.

Our conclusion is that it primarily seems to be asymmetric information among younger and low-consumption households of electricity, which causes them to be more prevalent on default contracts compared to other groups with higher consumption. The results are however non-conclusive, and we are unable to determine to what extent the consumer inertia originates from search and/or switching costs. However, since our findings indicate that some consumers have been on default contracts for more than a year and that especially younger consumers find it difficult to switch supplier or find optimal deals, is an indication that consumer inertia is a problem. Since the decrease of the share of default contracts have slowed down in recent years at the same time as default contracts have become more expensive, relatively to other contracts, these 12% of consumers still on default contracts might be a cause for concern, worth examining further by consumer surveys on an individual level.

The electricity market is special in the sense that the product is identical, which consumers do not want to be without, but they cannot get a better quality or service by searching around, the internal motivation to overcome the inertia, is probably not enough (Davenport, 2018). The analysed data in this thesis is not enough to prove where the inertia originates from or the cost of it and which consumers who bear it, but the analysed data is of potential value to try to understand the consumer behaviour more deeply. Upon questioning Ei about availability of consumer behaviour surveys, given all the price data they have for all, they said that such surveys were missing, but that a large electricity consumer survey would be done later this year together with the neighbouring Nordic countries.

Given that default contracts are more prevalent amongst younger consumers, inertia could be driven by information asymmetries and that there are search costs preventing all consumer to participate. Since the number of consumers on default contracts have decreased so much since 1999, it is a potential sign of a consumer learning process, which then perhaps could be eliminated with more direct information targeted towards younger consumers and consumers with lower consumption.

The presence of the default contracts and market concentration amongst suppliers might have been unintentional policy outcomes of the 1996 deregulation policy. However, by examining the consumer inertia from a behavioural perspective, the optimal solution to the presence of expensive default contracts, could be the introduction of a supplier-centric model could have the possibility to eliminate consumer paying more for a default contract and reduce issues with opt-out default contracts; possibly be combined with

more direct information. This model could have the potential to "nudge" consumers in the right direction, without hurting already active consumers in the market which a price regulation might do.

To conclude, it appears that the market power is rather concentrated amongst the largest, electricity suppliers which is not to the benefit of consumers. If consumers deem it not to be worth it taken the trouble to try to overcome the inertia and switch and/or renegotiate electricity contracts because the expected costs outweigh expected utility gains, it is a sign of market failure, which we find concerning.

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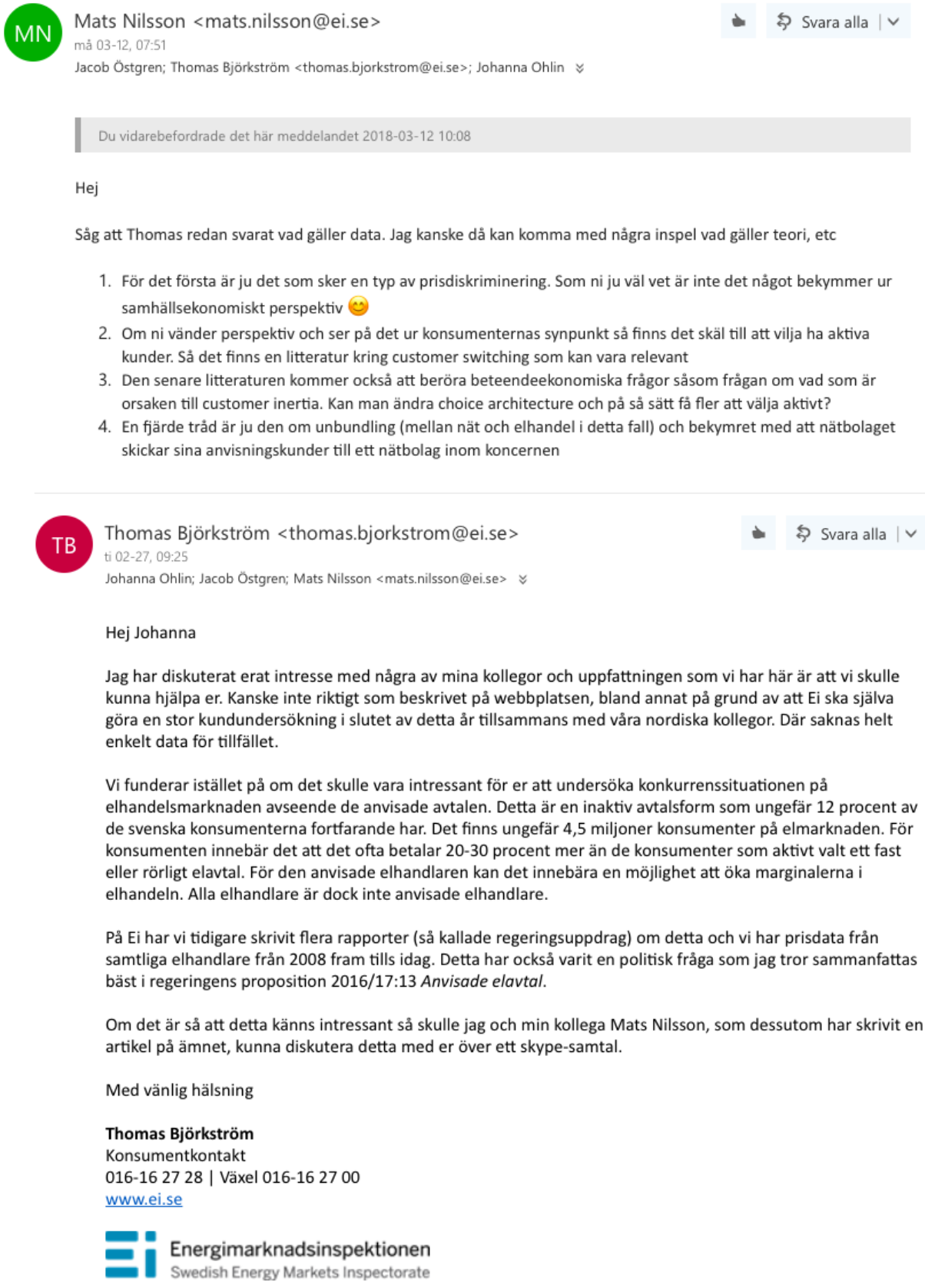
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Appendix A. Interview with Nilsson and Björkström at Ei, 2018

Nilsson, M., and Björkström at Ei, 2018 [email] (In Swedish only)



MN

Mats Nilsson <mats.nilsson@ei.se>

må 03-12, 07:51

Jacob Östgren; Thomas Björkström <thomas.bjorkstrom@ei.se>; Johanna Ohlin

Svara alla

> Du vidarebefordrade det här meddelandet 2018-03-12 10:08

Hej

Såg att Thomas redan svarat vad gäller data. Jag kanske då kan komma med några inspel vad gäller teori, etc

1. För det första är ju det som sker en typ av prisdiskriminering. Som ni ju väl vet är inte det något bekymmer ur samhällsekonomiskt perspektiv 😊
2. Om ni vänder perspektiv och ser på det ur konsumenternas synpunkt så finns det skäl till att vilja ha aktiva kunder. Så det finns en litteratur kring customer switching som kan vara relevant
3. Den senare litteraturen kommer också att beröra beteendeekonomiska frågor såsom frågan om vad som är orsaken till customer inertia. Kan man ändra choice architecture och på så sätt få fler att välja aktivt?
4. En fjärde tråd är ju den om unbundling (mellan nät och elhandel i detta fall) och bekymret med att nätbolaget skickar sina anvisningskunder till ett nätbolag inom koncernen

TB

Thomas Björkström <thomas.bjorkstrom@ei.se>

ti 02-27, 09:25

Johanna Ohlin; Jacob Östgren; Mats Nilsson <mats.nilsson@ei.se>

Svara alla

Hej Johanna

Jag har diskuterat erat intresse med några av mina kollegor och uppfattningen som vi har här är att vi skulle kunna hjälpa er. Kanske inte riktigt som beskrivet på webbplatsen, bland annat på grund av att Ei ska själva göra en stor kundundersökning i slutet av detta år tillsammans med våra nordiska kollegor. Där saknas helt enkelt data för tillfället.

Vi funderar istället på om det skulle vara intressant för er att undersöka konkurrenssituationen på elhandelsmarknaden avseende de anvisade avtalen. Detta är en inaktiv avtalsform som ungefär 12 procent av de svenska konsumenterna fortfarande har. Det finns ungefär 4,5 miljoner konsumenter på elmarknaden. För konsumenten innebär det att det ofta betalar 20-30 procent mer än de konsumenter som aktivt valt ett fast eller rörligt elavtal. För den anvisade elhandlaren kan det innebära en möjlighet att öka marginalerna i elhandeln. Alla elhandlare är dock inte anvisade elhandlare.

På Ei har vi tidigare skrivit flera rapporter (så kallade regeringsuppdrag) om detta och vi har prisdata från samtliga elhandlare från 2008 fram tills idag. Detta har också varit en politisk fråga som jag tror sammanfattas bäst i regeringens proposition 2016/17:13 *Anvisade elavtal*.

Om det är så att detta känns intressant så skulle jag och min kollega Mats Nilsson, som dessutom har skrivit en artikel på ämnet, kunna diskutera detta med er över ett skype-samtal.

Med vänlig hälsning

Thomas Björkström
Konsumentkontakt
016-16 27 28 | Växel 016-16 27 00
www.ei.se

Energimarknadsinspektionen
Swedish Energy Markets Inspectorate

Nilsson, M., and Björkström, T., Ei, 5 Mars 2018. [skype-meeting] Personal summary. In Swedish.

"Man vill inte reglera en avreglerad marknad, reglerar man för mycket riskerar man att också ta bort drivkraften att välja elhandlare. Paradox: regleringen ska skydda konsumenterna, men ej vara så bra (välskyddat) att folk inte gör ett aktivt val.

Man skulle kunna räkna på hur stora marginalerna för anvisade avtal är. Problemet är att vi har priser från elhandlare från 2008, men vi har ej tillgång till elhandlarnas kostnader. Man kan räkna på en överprissättning, på hur stora marginalerna är. Tobias på Ei har räknat på detta i en gammal studie, som han skulle kunna rekonstruera för oss. Vi behöver göra antaganden och uppskattningar av elhandlarnas kostnader. (Se även rapport från 2009 kallad "Default contract"). Vi vet att om en elkonsument flyttar in i kommun x, så har ofta nätägare i kommun x även elhandlare som de ger de anvisade avtalen till. Man måste titta balanserat på situationen, de kunder som ej göra aktiva val kan vara kunder som har högre kreditrisk och innebär därför kanske högre kostnader för elhandlaren (om de är kunder som riskerar att ej kunna betala elräkningarna), därför skulle ett högre pris för anvisade avtal vara motiverat. Undersök anvisade avtal och det samhällsekonomiska värdet av den, även vilket det historiska värdet av dem är ekonomiskt".

Appendix B. Components of the electricity price and types of contracts

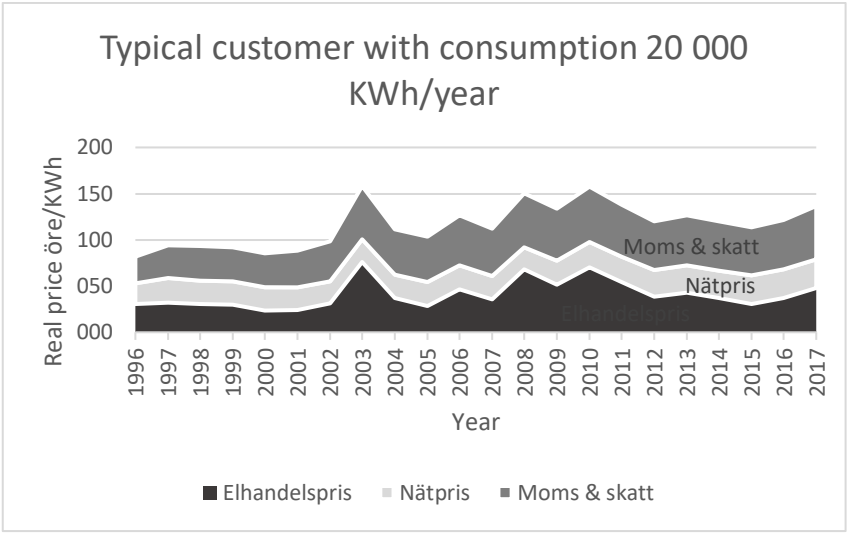
The components of the electricity price

The components of the electricity price for household consumers can be divided into three categories:

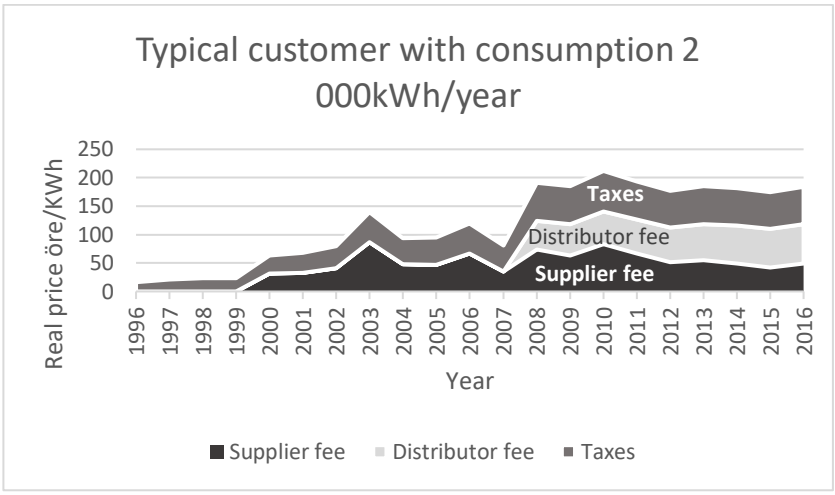
- price charged by the electricity supplier,
- fees to the distributor operator,
- taxes, electricity certificate and fees for emission trading to government authorities (Svensk Energi, 2013, pp. 13–15, and 2015, p. 21).

With a variable contract, the seller has to carry a volume risk (not knowing the exact amount of electricity the consumer will buy), and a price risk (not knowing what it will cost to buy the electricity in the future). The electricity supplier will enter into various financial contracts to hedge against the risk. The terms of these contracts determine the prices to end-consumers. For less risk-averse consumers there are variable contracts, which means that the price risk is born by the consumer (KkV, 2013:4, p. 23).

Since the deregulation the energy tax has increased, and costs for electricity certificate and emission trading have been added. Even without taking these factors into account, the electricity price has increased more than the consumer price index since 1996 (KvK, 2013:4, p. 34). See the 2 figures below.



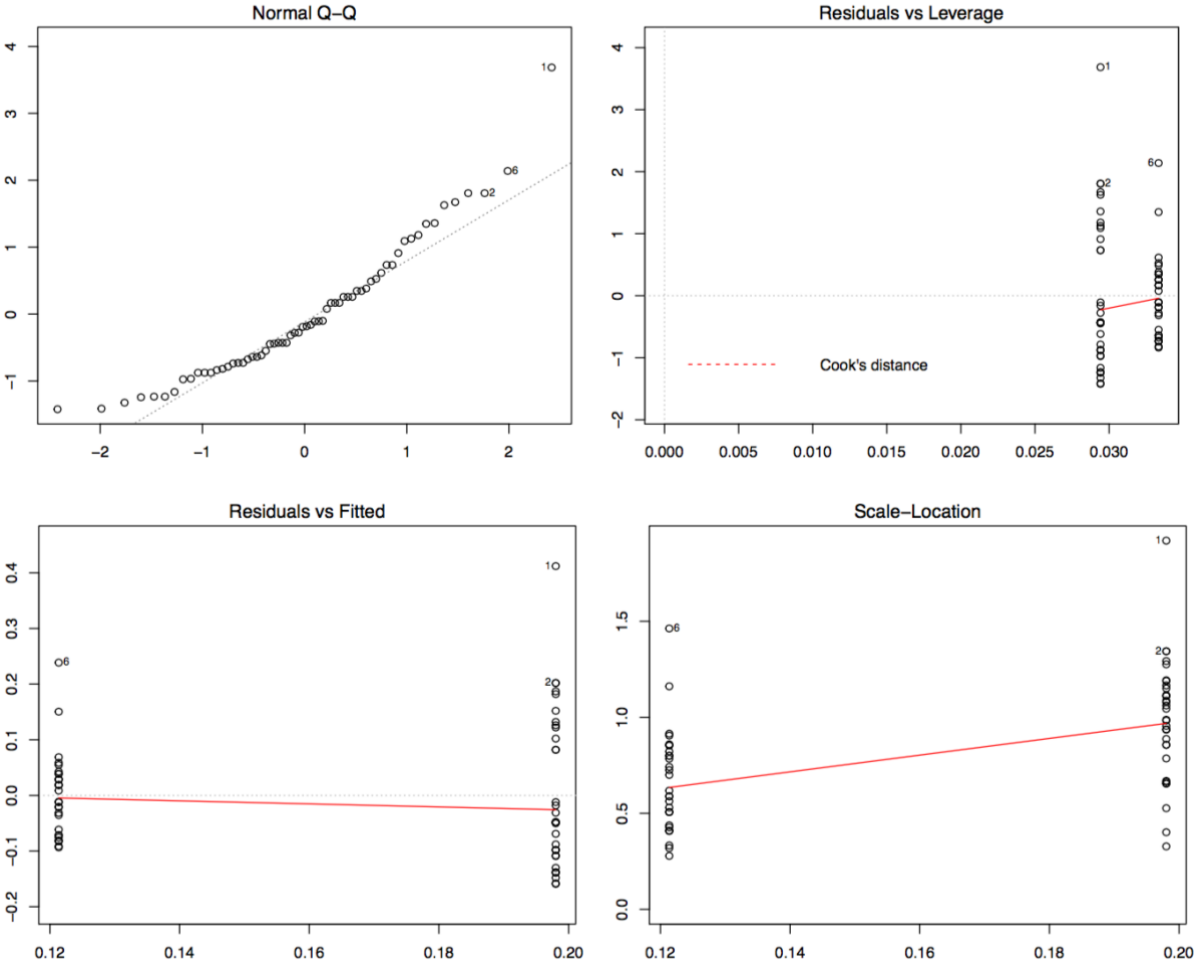
Price components in real terms of the electricity bill with annual consumptions of 20 000 kWh/year above, and of 2000 kWh/year below. Data source: Ei, SCB, Skatteverket and via Ei, 2018). Diagram by: the authors.



Appendix C. Diagnosis tests for the OLS regression of default contracts

In order to examine if the results are robust some diagnoses of the variation of the residuals are performed.

Diagnosis test for the OLS model:



OLS diagnosis. Data source: Ei, 2014. Diagram by: the authors.

The diagram in the upper left corner shows the standardized residuals on the vertical axis and theoretical quantiles on the horizontal axis. If the residuals are normally distributed the fitted line would be horizontal, which is almost is. This is positive. However, in the diagram in the upper right corner, showing the standardized residuals on the vertical axis and the leverage on the horizontal axis, the Cock's distance (the red line) is slightly noticeable. This indicates that the three identified outliers (case 1, 2 and 6) are influential in our model, and could distort the regression results.

The last two diagrams indicate whether the model suffers from heteroscedasticity (which would imply that the standard errors and the OLS t-statistics are no longer valid, and that the F-statistic is no longer F distributed), some diagnoses of the variation of the residuals are performed. The lower left plot shows the residuals on the vertical axis and the fitted values on the horizontal axis. If there would be no heteroscedasticity the red line would horizontal, which it almost is, indicating that constant variance of the residuals across the fitted values. However, the right plot shows if the standardized residuals on the vertical axis are equally distributed over the ranges of the fitted values on the horizontal axis. If there would be no

heteroscedasticity, the red line here would also be horizontal, which it is not and thus indicating that heteroscedasticity is present in our model.

The skewness test of the residuals from the OLS regression above comes back positive, at 1.072835. Since it is above zero it is an indication of heteroscedasticity. This is also confirmed by the Breusch-Pagan test. The Breusch-Pagan statistic is 5.4636 with a p-value of 0.01942. Since the p-value is lower than the significance level of 5%, the null hypothesis of homoscedasticity can be rejected.

Results BP test for heteroscedasticity:
studentized Breusch-Pagan test
BP = 5.4636, df = 1, p-value = 0.01942
Since the p-value is lower than the significance level of 5%, the null hypothesis of homoscedasticity can be rejected.

Skewness results:
r = residuals(reg_model)
skewness(r) = 1.072835

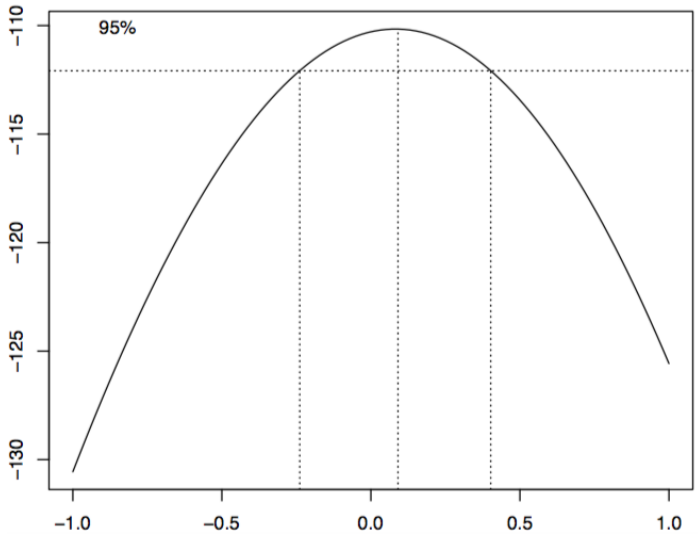


Figure 6. Box-Cox transformation to find the optimal lambda. Values for lambda are shown on the x-axis and log-likelihoods on the y-axis. The optimal lambda (0.09) corresponds to the highest log-likelihood (the highest point on the curve). Data source: Ei, 2014. Diagram by: the authors.

After the log likelihoods were calculated for different lambdas, these results were ordered in order to find the lambda with the highest likelihood. This is the lambda in the first row below:

```
> lambda=box_reg$x
> lik=box_reg$y
> bc=cbind(lambda,lik)
> bc[order(-lik),]
           lambda       lik
 [1,]  0.09090909 -110.1613
 [2,]  0.07070707 -110.1627
 [3,]  0.11111111 -110.1752
 [4,]  0.05050505 -110.1794
 [5,]  0.13131313 -110.2046
 [6,]  0.03030303 -110.2115
 [7,]  0.15151515 -110.2493
 [8,]  0.01010101 -110.2589
 [9,]  0.17171717 -110.3094
[10,] -0.01010101 -110.3215
```

The Box-Cox transformed model with optimal lambda 0.09 is shown below together with the BP test for heteroscedasticity:

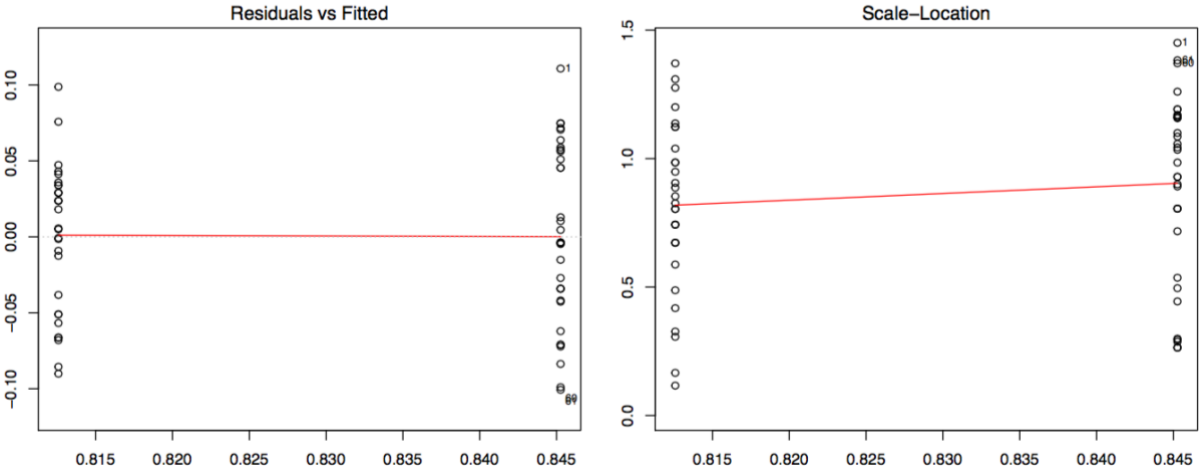
$$(share_default_i)^{\lambda} = \beta_0 + \beta_1 * Info_bill_i + \varepsilon_i,$$

```
        studentized Breusch-Pagan test

data:  reg_2
BP = 1.5841, df = 1, p-value = 0.2082
```

The p-value rises to 0.2082, which is much better, but not optimal.

From the diagnosis of the Box-Cox regression below (Figure 7), the transformation reduces the heteroscedasticity problem (see the almost straight red lines in the first two diagrams) and decreases the problem of influential outliers.



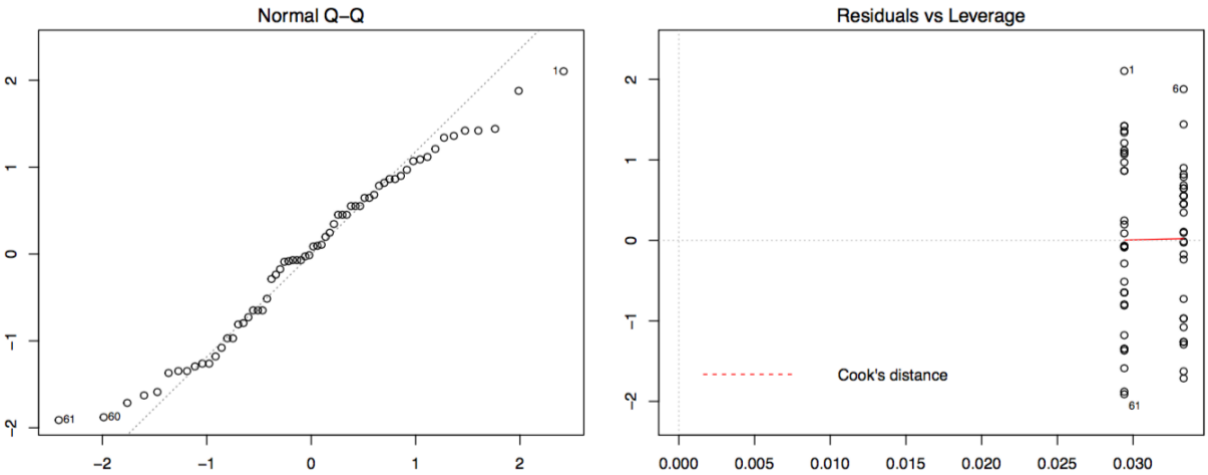
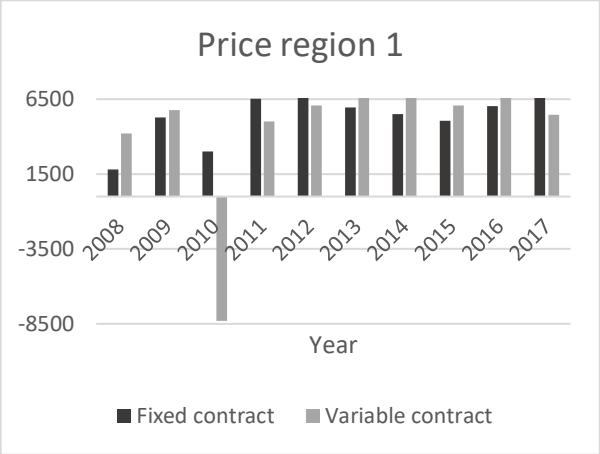
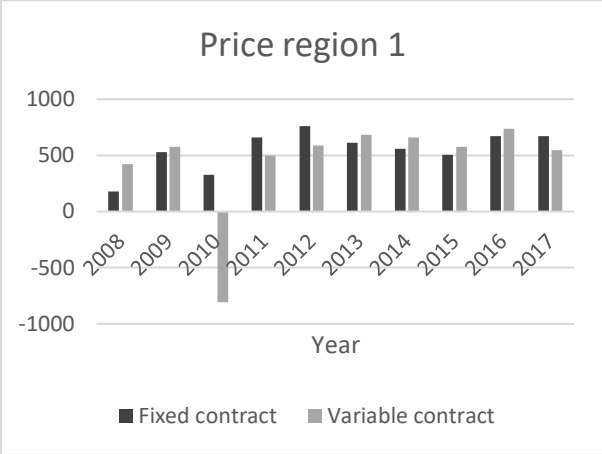


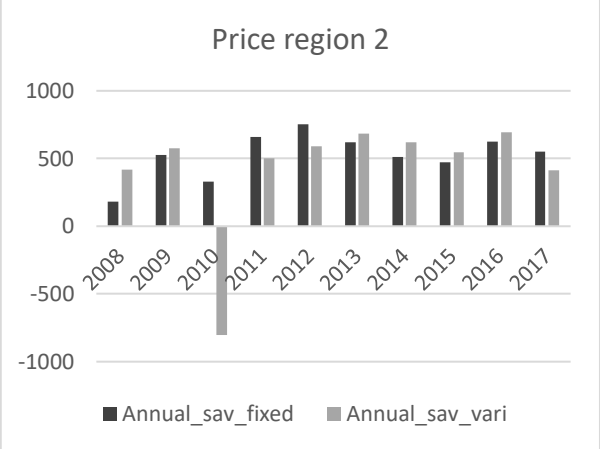
Figure 7. Diagnosis tests of the Box-Cox regression. Data source: Ei, 2014. Diagram by: the authors.

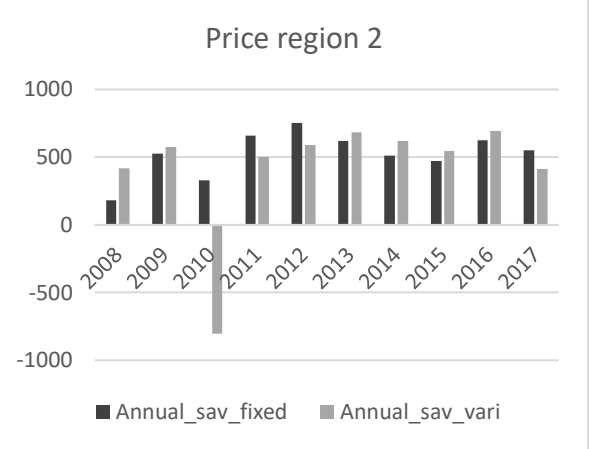
This can also be seen in the Box-Cox regression in the third column in Figure 4. The explanatory variable regains some significance, now it is significant at the 5%-level. The more reasonable impact of information of default contracts on the bill now decreases the share of consumers on default contract with approximately 3.3%. If there is no information on the bill, the number of consumers on default contracts increases with 84.5%. The actual impact of no information on the bill is now, however, equal to 81.2% (84.5–3.3). The standard errors are lower compared to the OLS regression, but at the same time the adjusted, explanatory value of the model is now only 7.3% and the F-statistic decreases to 5.6% and loses significance.

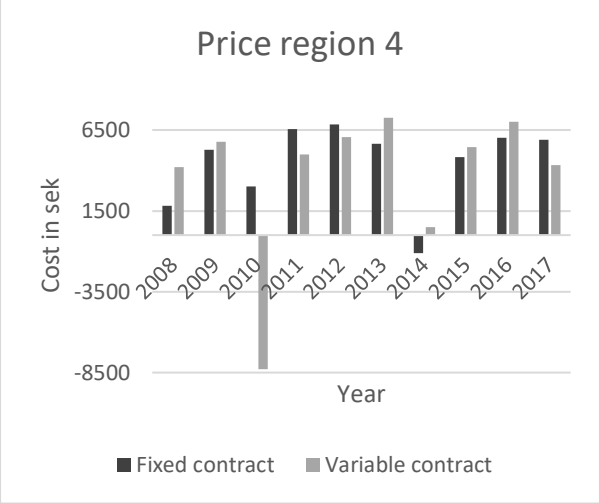
Annual price savings (in Swedish SEK) of switching from a default contact to a fixed, or variable contract, for consumption-levels of 20 000kWh/year (left column below) and 2000kWh/year (right column below).

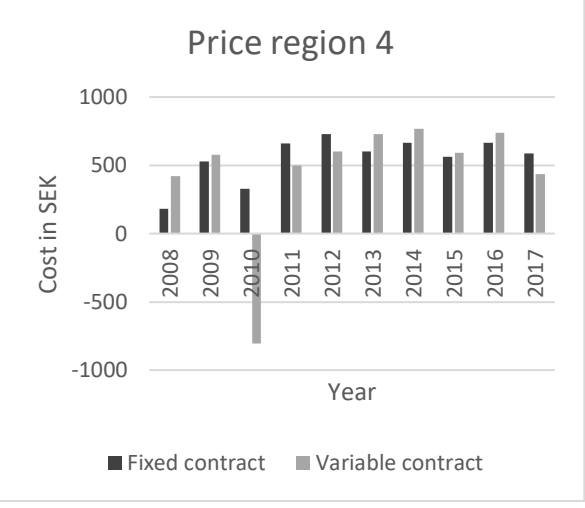












Appendix D. Cluster analysis of consumer groups on default contracts

Below the data set of all 64 observations used to regress share of consumers on default contract on the provided information on the consumer's bill. In order to run the cluster analysis missing values had to be removed in R.

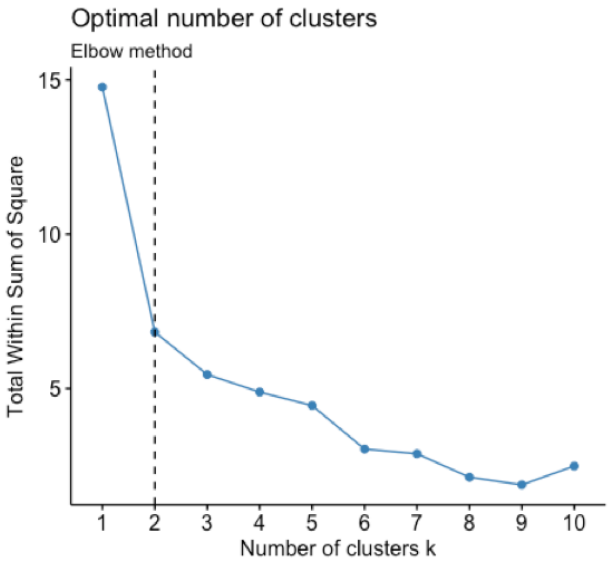
Supplier	share_default	info_bill	0–3 months	3–6 months	6–12 months	>12 months	0–1000kWh	001–2000kWh	2001–3000kWh	3001–4000kWh	5001–10000 kWh	10001–20000kWh
Osterfärnebo Kraft AB	100%	0										
Jämtkraft AB	73%	1	2%	1%	3%	94%	18%	7%	11%	7%	17%	12%
Sollentuna Energi Handel AB	84%	0										
Höganäs Energi Handel AB	61%	0	20%	80%	0%	0%	13%	34%	11%	5%	12%	20%
Falu Energi & Vatten	40%	0	40%	40%	20%	0%						
Lerum Elhandel AB	40%	0	90%	10%	0%	0%	19%	18%	13%	5%	16%	17%
Kraftringen Energi AB (publ)	39%	0	11%	6%	12%	71%	15%	35%	19%	10%	9%	6%
Karlstads Energi AB	38%	0	45%	30%	15%	10%	15%	41%	20%	8%	6%	4%
Eskilstuna Energi och Miljö Försäljning AB	36%	1	3%	2%	4%	91%	20%	36%	21%	10%	5%	2%
Oskarshamn Energi AB	35%	0	8%	6%	10%	76%	18%	39%	20%	8%	6%	4%
SundsvallEnergi AB	33%	0	6%	6%	7%	81%	11%	31%	20%	10%	10%	8%
Billinge Energi AB	32%	0	40%	30%	20%	10%	5%	20%	20%	20%	10%	4%
Trollhättan Energi AB	32%	0	40%	20%	40%	0%						
Falkenberg Energihandel AB	30%	0	2%	3%	5%	90%	30%	29%	16%	7%	8%	5%
Ovik Energi AB	28%	0	7%	7%	6%	80%	14%	36%	22%	10%	8%	4%
Jönköping Energi AB	28%	0	6%	4%	9%	81%	18%	43%	19%	8%	5%	3%
Värnamo Energi	27%	1	7%	4%	11%	78%	15%	37%	19%	10%	6%	5%
Varberg Energimarknad AB	19%	1	11%	9%	7%	74%	10%	31%	20%	10%	14%	6%
AB Helsinge Elhandel	19%	0	8%	14%	6%	72%	20%	36%	15%	5%	9%	9%
VänerEl AB	18%	1	40%	30%	10%	20%	24%	40%	11%	6%	8%	8%
Västerbergslagens Elförsäljning AB	18%	0	35%	30%	20%	15%	33%	34%	12%	5%	7%	5%
Fortum AB	18%	1	7%	4%	7%	82%	23%	32%	16%	9%	8%	5%
Fyrfasen Energi AB	17%	0	45%	30%	15%	10%	27%	22%	19%	10%	5%	5%
Eon (556014-5889)	16%	1	9%	1%	55%	34%	37%	25%	20%	16%	9%	5%
Hjo Energi Elhandel AB	16%	1	53%	40%	5%	2%	14%	23%	16%	8%	16%	14%
Karlskoga Energi & Miljö AB	16%	1	66%	14%	12%	8%	26%	35%	17%	7%	6%	5%
Norrtälje Energi AB	15%	0	3%	5%	0%	92%	45%	45%	5%	5%	0%	0%
Sjogerstads Energi AB	15%	1	50%	10%	10%	30%	20%	30%	15%	15%	8%	2%
Göteborg Energi DinEl AB	15%	0	5%	3%	6%	86%	19%	43%	19%	8%	3%	2%
Skyllbergs Bruks AB	15%	0										
Borås Elhandel AB	15%	1					16%	46%	21%	8%	3%	2%
Bixia AB	15%	1	10%	16%	32%	42%	17%	38%	19%	9%	8%	4%
Jukkasjärvi Energi AB	15%	0	8%	1%	11%	79%	47%	14%	8%	5%	6%	8%
SEVAB Strängnäs Energi AB	15%	0	10%	5%	21%	64%	21%	37%	19%	10%	8%	0%
Skånska Energi Marknad AB	14%	1	8%	6%	11%	75%	13%	30%	15%	8%	12%	13%
Vaggeryds Energi AB	14%	1	9%	2%	3%	86%	26%	28%	16%	9%	11%	4%
PiteEnergi Handel AB	14%	1	14%	2%	3%	81%	25%	24%	10%	10%	10%	7%
Trelleborgs Energiförsäljning AB	13%	1	6%	2%	2%	90%	19%	38%	20%	8%	5%	6%
Gislaved Energiring AB	13%	0					25%	22%	14%	9%	12%	8%
Näckåns Energi AB	11%	1	13%	10%	23%	54%	33%	24%	11%	9%	12%	4%
Varbergsortens Elförsäljning AB	11%	0	7%	4%	6%	83%	16%	16%	11%	7%	26%	14%
Vattenfall AB (556036-2138)	11%	1	11%	7%	11%	70%	21%	29%	17%	8%	10%	7%
Habo Energi AB	10%	1	70%	15%	10%	5%	15%	33%	15%	7%	14%	13%
Halmstads Energi och Miljö AB	10%	0	5%	5%	5%	85%	40%	20%	10%	10%	7%	3%
Osterlens Kraft Försäljnings AB	10%	0	7%	5%	9%	79%	20%	34%	15%	7%	10%	8%
Enkla elbolaget	10%	0	11%	8%	18%	63%	22%	34%	16%	8%	10%	5%
Boo Energi Försäljnings AB	10%	1	8%	5%	14%	73%	21%	21%	13%	9%	9%	14%
Upplands Energi	9%	1	100%	0%	0%	0%	24%	18%	7%	5%	15%	23%
Göta Energi	9%	0	10%	35%	30%	25%						
Dalakraft AB	9%	0	8%	4%	87%	0%	29%	29%	13%	6%	10%	7%
Grästorp Energi AB	9%	1	4%	1%	1%	94%	41%	20%	9%	5%	15%	5%
Telge Energi	7%	0					11%	28%	19%	10%	10%	12%
Sala-Heby Energi AB	6%	0	0%	0%	0%	100%	5%	15%	15%	15%	13%	10%
Ljusdal Energi Försäljning AB	6%	0	4%	2%	3%	91%	22%	33%	16%	10%	8%	6%
Tibro Energi Försäljning AB	6%	1	10%	20%	50%	20%	10%	25%	25%	25%	0%	0%
BestKraft AB (BestEl)	6%	0	15%	15%	20%	50%	16%	17%	11%	7%	20%	19%
Mölndal Energi AB	5%	1	50%	20%	20%	10%	11%	33%	17%	9%	10%	11%
Bodens Energi AB	5%	1	6%	6%	8%	80%	95%	3%	2%	0%	0%	0%
Kvänum Energi AB	5%	0	27%	12%	9%	52%	29%	25%	9%	6%	20%	16%
Eksjö Energi ELIT AB	5%	1	20%	13%	18%	50%	23%	43%	16%	7%	5%	2%
Rödeby Energi AB	4%	1	0%	0%	20%	80%	90%	10%	0%	0%	0%	0%
Gävle Energisystem AB	4%	1	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%
Vimmerby Energiförsäljning AB	4%	0	30%	50%	15%	5%	20%	29%	16%	8%	9%	9%
Nossebro Energi Försäljnings AB	4%	0	9%	5%	4%	82%	23%	17%	18%	5%	11%	15%
Mälarenergi AB	4%	1	34%	17%	26%	24%	22%	35%	18%	8%	5%	4%
Skellefteå Kraft AB	3%	1										
Hallstaviks Elverk	3%	1										

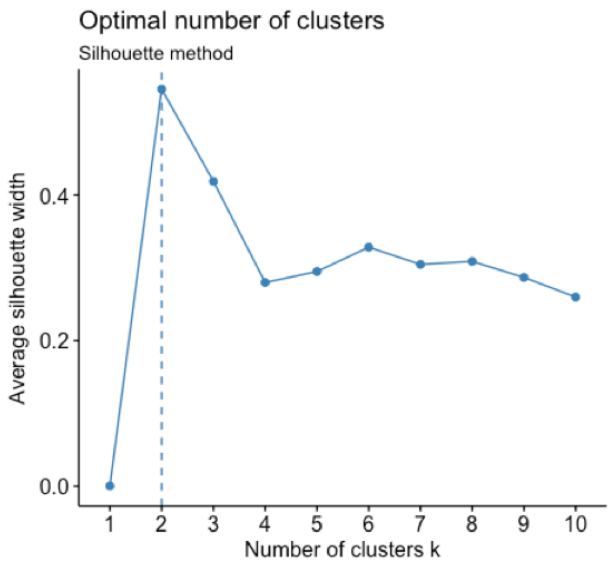
Data source: Ei, 2014. Table: by the authors. Numbers in red are possibly not exact due to a probable calculating error in the survey, but they are deemed to be close.

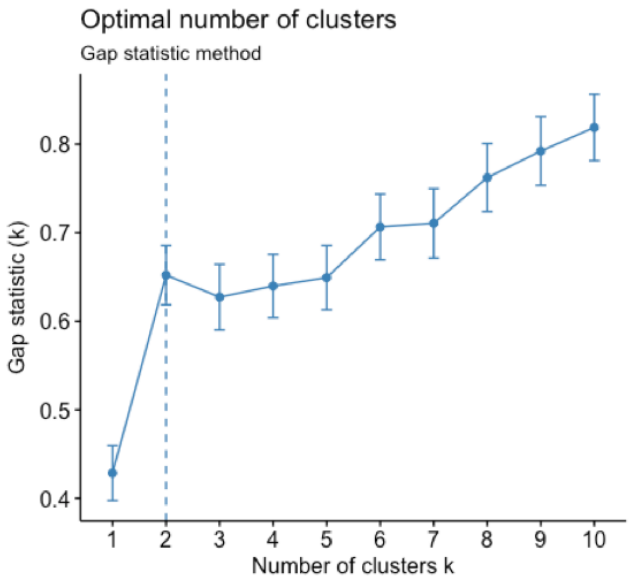
The following 7 suppliers were removed, leaving 55 observations for the cluster analysis:
Skyllbergs Bruks AB,
Borås Elhandel AB,
Gislaved Energiring AB,
Telge Energi,
Skellefteå Kraft AB,
Hallstaviks Elverk and Göta Energi.

Finding the optimal numbers of clusters, *K:*

Below the results of the elbow silhouette methods and the gap statistic are shown. All tests suggested *K=2,* which was the number used to perform the K-means clustering in RStudio.








```
*******************************************************************
* Among all indices:
* 7 proposed 2 as the best number of clusters
* 2 proposed 3 as the best number of clusters
* 4 proposed 4 as the best number of clusters
* 1 proposed 5 as the best number of clusters
* 6 proposed 7 as the best number of clusters
* 2 proposed 9 as the best number of clusters
* 1 proposed 10 as the best number of clusters
```

```
                    ***** Conclusion *****

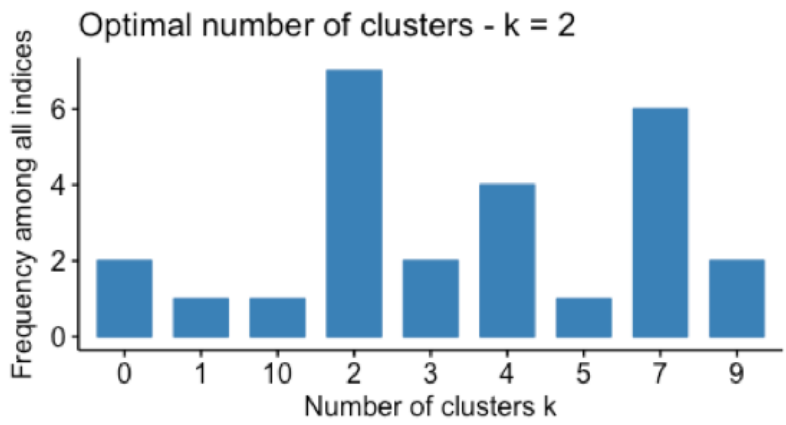
* According to the majority rule, the best number of clusters is  2


*******************************************************************
  Group.1  0-3months  3-6months 6-12months  >12months
1       1 0.08246849 0.05589483  0.1074508 0.75421291
2       2 0.49212166 0.23903679  0.1749927 0.09384889
  0-3000kWh 3001-5000kWh 5001-10000kWh  >10001kWh
1 0.7010545    0.1340401    0.09112866 0.08453079
2 0.6060316    0.1971442    0.08707985 0.10918881
K-means clustering with 2 clusters of sizes 37, 18

Cluster means:
   0-3months  3-6months 6-12months  >12months 0-3000kWh
1 0.08246849 0.05589483  0.1074508 0.75421291 0.7010545
2 0.49212166 0.23903679  0.1749927 0.09384889 0.6060316
  3001-5000kWh 5001-10000kWh  >10001kWh
1    0.1340401    0.09112866 0.08453079
2    0.1971442    0.08707985 0.10918881

Clustering vector:
 [1] 2 2 1 2 1 1 1 2 1 1 1 1 1 1 2 2 1 2 1 2 2 1 2 1 1 1 1 1
[29] 1 1 1 1 1 1 2 1 1 1 1 2 2 1 1 1 2 1 2 1 1 1 1 2 2 1 2

Within cluster sum of squares by cluster:
[1] 2.429417 4.399751
 (between_SS / total_SS =  53.8 %)
```



The "clustering vector" show into which cluster each of the 55 observations were assigned to. The first observation was assigned to cluster 2, so also obs. 2, while obs. 3 was assigned to cluster 1.

In order to run a Principal component analysis, each variable should be correlated. As seen below, they are, although the correlation varies. None is higher than 0.80.

```
> cor(default_cgroups)
               X0.3months  X3.6months X6.12months X.12months
X0.3months      1.0000000  0.25273669 -0.12717694 -0.7874515
X3.6months      0.2527367  1.00000000  0.02826454 -0.6210275
X6.12months    -0.1271769  0.02826454  1.00000000 -0.3581781
X.12months     -0.7874515 -0.62102750 -0.35817814  1.0000000
X0.3000kWh     -0.4672219 -0.08001236  0.17515244  0.3004418
X3001.5000kWh   0.3215551 -0.09691636  0.03036897 -0.2096548
X5001.10000kWh  0.1109215  0.08696731 -0.11441797 -0.0678224
X.10001kWh      0.2976259  0.25978013 -0.14768862 -0.2645036

                X0.3000kWh X3001.5000kWh X5001.10000kWh
X0.3months      -0.46722188    0.32155514     0.11092152
X3.6months      -0.08001236   -0.09691636     0.08696731
X6.12months      0.17515244    0.03036897    -0.11441797
X.12months       0.30044184   -0.20965485    -0.06782240
X0.3000kWh       1.00000000   -0.70616085    -0.44788633
X3001.5000kWh   -0.70616085    1.00000000    -0.17161739
X5001.10000kWh  -0.44788633   -0.17161739     1.00000000
X.10001kWh      -0.44925759   -0.21933486     0.70313527

                X.10001kWh
X0.3months       0.2976259
X3.6months       0.2597801
X6.12months     -0.1476886
X.12months      -0.2645036
X0.3000kWh      -0.4492576
X3001.5000kWh   -0.2193349
X5001.10000kWh   0.7031353
X.10001kWh       1.0000000
```

Below the importance of the components are reported, as discussed. The three, first components have standard deviations above 1 (we want the variance to be as high as possible):

```
Importance of components:
                          Comp.1    Comp.2    Comp.3
Standard deviation     2.4907474 1.4535121 1.2770974
Proportion of Variance 0.5169852 0.1760581 0.1359148
Cumulative Proportion  0.5169852 0.6930434 0.8289582
                          Comp.4     Comp.5     Comp.6
Standard deviation     0.9843572 0.78747412 0.51232555
Proportion of Variance 0.0807466 0.05167629 0.02187312
Cumulative Proportion  0.9097048 0.96138106 0.98325419
                           Comp.7      Comp.8       Comp.9
Standard deviation     0.41964657 0.157603924 2.745131e-03
Proportion of Variance 0.01467527 0.002069916 6.279785e-07
Cumulative Proportion  0.99792946 0.999999372 1.000000e+00
                            Comp.10 Comp.11 Comp.12
Standard deviation     4.566012e-09       0       0
Proportion of Variance 1.737372e-18       0       0
Cumulative Proportion  1.000000e+00       1       1
```

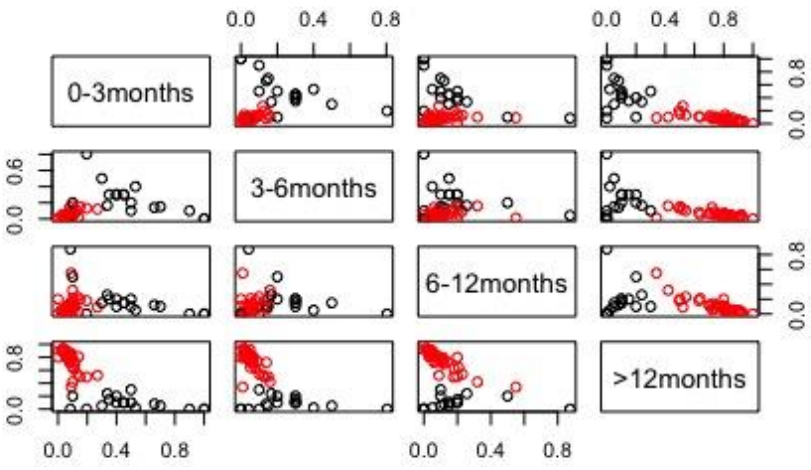
```
> loadings(PCA) #Correlations with the components for each variable

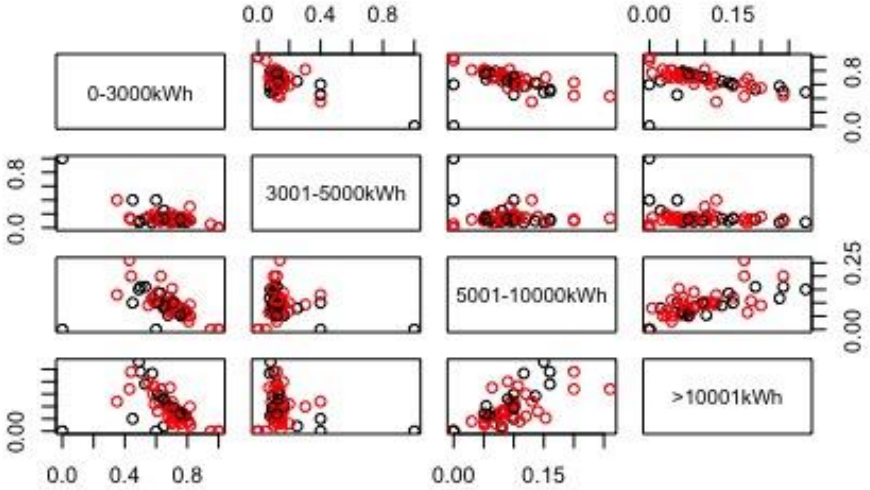
Loadings:
                Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7
X0.3months      -0.448         -0.164  0.278  0.531
X3.6months      -0.339         0.385  0.215 -0.668 -0.327
X6.12months             -0.360  0.257 -0.821  0.102
X.12months       0.510  0.159 -0.159        -0.147
X0.3000kWh       0.302 -0.177 0.468  0.221  0.466 -0.573 -0.207
X3001.5000kWh   -0.166 -0.171 -0.688 -0.156        -0.567 -0.313
X5001.10000kWh  -0.102 0.624         -0.313        -0.436  0.544
X.10001kWh      -0.213 0.591  0.156 -0.125         0.150 -0.719
fit.cluster     -0.493 -0.206  0.116  0.107         0.135  0.169
                Comp.8 Comp.9
X0.3months       0.350  0.530
X3.6months       0.179  0.311
X6.12months             0.320
X.12months      -0.367  0.722
X0.3000kWh      -0.145
X3001.5000kWh   -0.143
X5001.10000kWh
X.10001kWh      -0.134
fit.cluster     -0.799
```

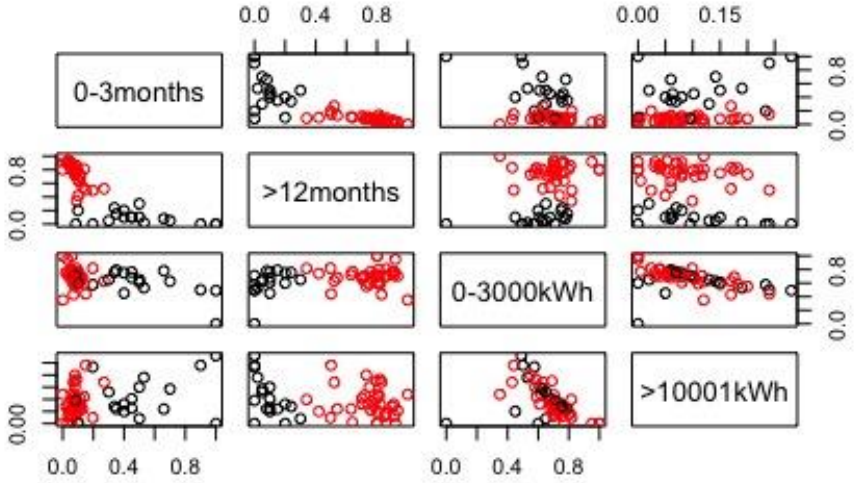
Table with the discussed loading vectors is shown in the R-output table above.

Below some plots showing the two cluster groups position against some of the features:

As discussed in the main part of the thesis, the highest explanatory variance seems to be found on the length of contract. This is shown in the first plot were the two cluster groups are clearly separated. In the second plot showing the different consumption-levels, the two groups cannot be distinguished. However, in the third plot, the cluster groups can be distinguished rather well when comparing, for example 0-3 months with 0–3000 kWh, or 0–3000 kWh with >12 months.




0-3000kWh
3001-5000kWh
5001-10000kWh
>10001kWh
0.0
0.4
0.8
0.00
0.15
0.25


0-3months
>12months
0-3000kWh
>10001kWh
0.0
0.4
0.8
0.00
0.15

Below is a combined output-table of the 55 observations and their assignment to one of the two cluster groups, as discussed in the main part of the thesis:

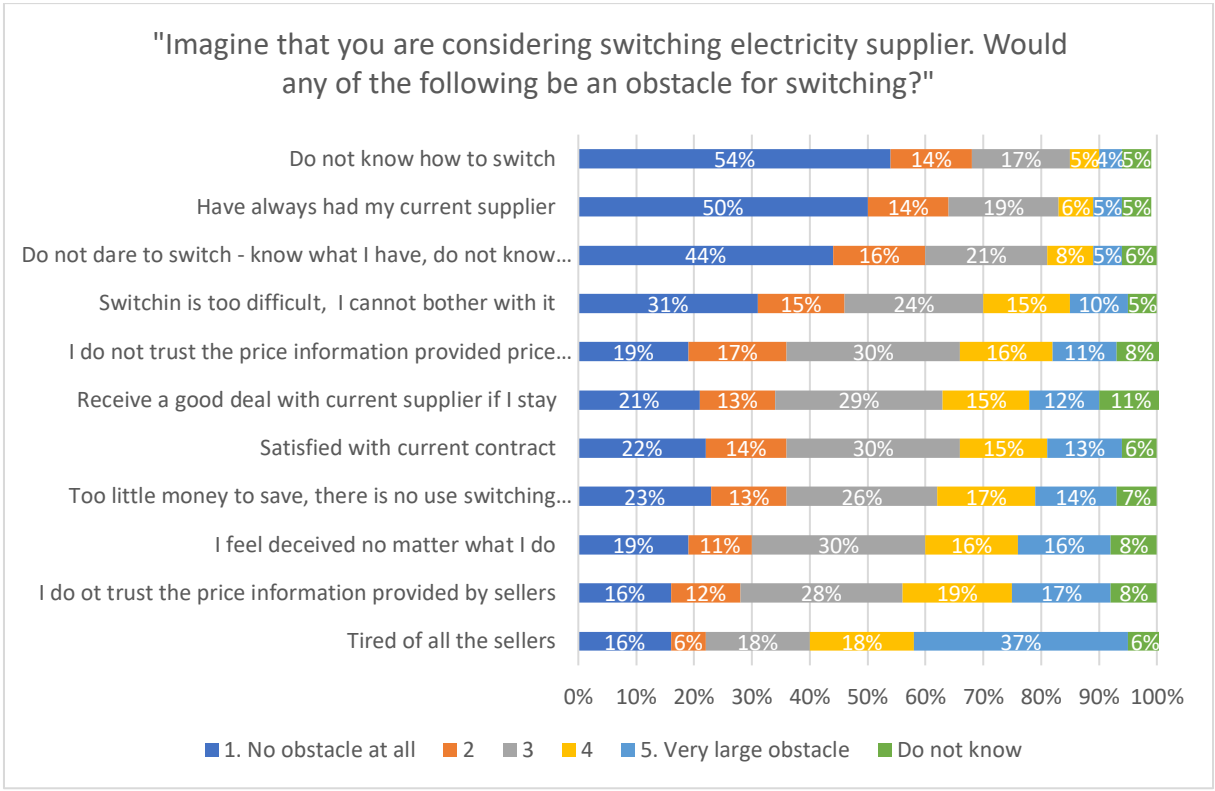
Supplier	cluster_group	share_default	info_bill	0–3months	3–6months	6–12months	>12months	0–3000kWh	3001–5000kWh	5001–10000kWh	>10001kWh
Kraftringen Energi AB (publ)	1	39%	0	11%	6%	12%	71%	69%	14%	9%	8%
Eskilstuna Energi och Miljö Försäljning AB	1	36%	1	3%	2%	4%	91%	76%	15%	5%	3%
Oskarshamn Energi AB	1	35%	0	8%	6%	10%	76%	77%	12%	6%	6%
SundsvallEnergi AB	1	33%	0	6%	6%	7%	81%	62%	16%	10%	12%
Falkenberg Energihandel AB	1	30%	0	2%	3%	5%	90%	75%	10%	8%	7%
Ovik Energi AB	1	28%	0	7%	7%	6%	80%	72%	15%	8%	5%
Jönköping Energi AB	1	28%	0	6%	4%	9%	81%	80%	11%	5%	4%
Värnamo Energi	1	27%	1	7%	4%	11%	78%	72%	15%	6%	7%
Varberg Energimarknad AB	1	19%	1	11%	9%	7%	74%	61%	16%	14%	8%
AB Helsinge Elhandel	1	19%	0	8%	14%	6%	72%	70%	9%	9%	12%
Fortum AB	1	18%	1	7%	4%	7%	82%	71%	13%	8%	8%
Eon (556014-5889)	1	16%	1	9%	1%	55%	34%	82%	30%	9%	10%
Norrtälje Energi AB	1	15%	0	3%	5%	0%	92%	95%	5%	0%	0%
Göteborg Energi DinEl AB	1	15%	0	5%	3%	6%	86%	81%	12%	3%	4%
Bixia AB	1	15%	1	10%	16%	32%	42%	74%	14%	8%	5%
Jukkasjärvi Energi AB	1	15%	0	8%	1%	11%	79%	69%	7%	6%	18%
SEVAB Strängnäs Energi AB	1	15%	0	10%	5%	21%	64%	77%	15%	8%	1%
Skånska Energi Marknad AB	1	14%	1	8%	6%	11%	75%	58%	14%	12%	15%
Vaggeryds Energi AB	1	14%	1	9%	2%	3%	86%	70%	15%	11%	4%
PiteEnergi Handel AB	1	14%	1	14%	2%	3%	81%	59%	20%	10%	11%
Trelleborgs Energiförsäljning AB	1	13%	1	6%	2%	2%	90%	77%	11%	5%	7%
Näckåns Energi AB	1	11%	1	13%	10%	23%	54%	68%	14%	12%	6%
Varbergsortens Elförsäljning AB	1	11%	0	7%	4%	6%	83%	43%	14%	26%	17%
Vattenfall AB (556036-2138)	1	11%	1	11%	7%	11%	70%	66%	13%	10%	10%
Habo Energi AB	1	10%	1	70%	15%	10%	5%	63%	10%	14%	14%
Osterlens Kraft Försäljnings AB	1	10%	0	7%	5%	9%	79%	69%	11%	10%	10%
Enkla elbolaget	1	10%	0	11%	8%	18%	63%	72%	12%	10%	6%
Boo Energi Försäljnings AB	1	10%	1	8%	5%	14%	73%	55%	16%	9%	20%
Upplands Energi	1	9%	1	100%	0%	0%	0%	49%	8%	15%	28%
Sala-Heby Energi AB	1	6%	0	0%	0%	0%	100%	35%	40%	13%	12%
Ljusdal Energi Försäljning AB	1	6%	0	4%	2%	3%	91%	71%	13%	8%	8%
BestKraft AB (BestEl)	1	6%	0	15%	15%	20%	50%	44%	12%	20%	24%
Bodens Energi AB	1	5%	1	6%	6%	8%	80%	100%	0%	0%	0%
Kvänum Energi AB	1	5%	0	27%	12%	9%	52%	63%	10%	20%	17%
Eksjö Energi ELIT AB	1	5%	1	20%	13%	18%	50%	82%	11%	5%	2%
Rödeby Energi AB	1	4%	1	0%	0%	20%	80%	100%	0%	0%	0%
Nossebro Energi Försäljnings AB	1	4%	0	9%	5%	4%	82%	59%	12%	11%	18%

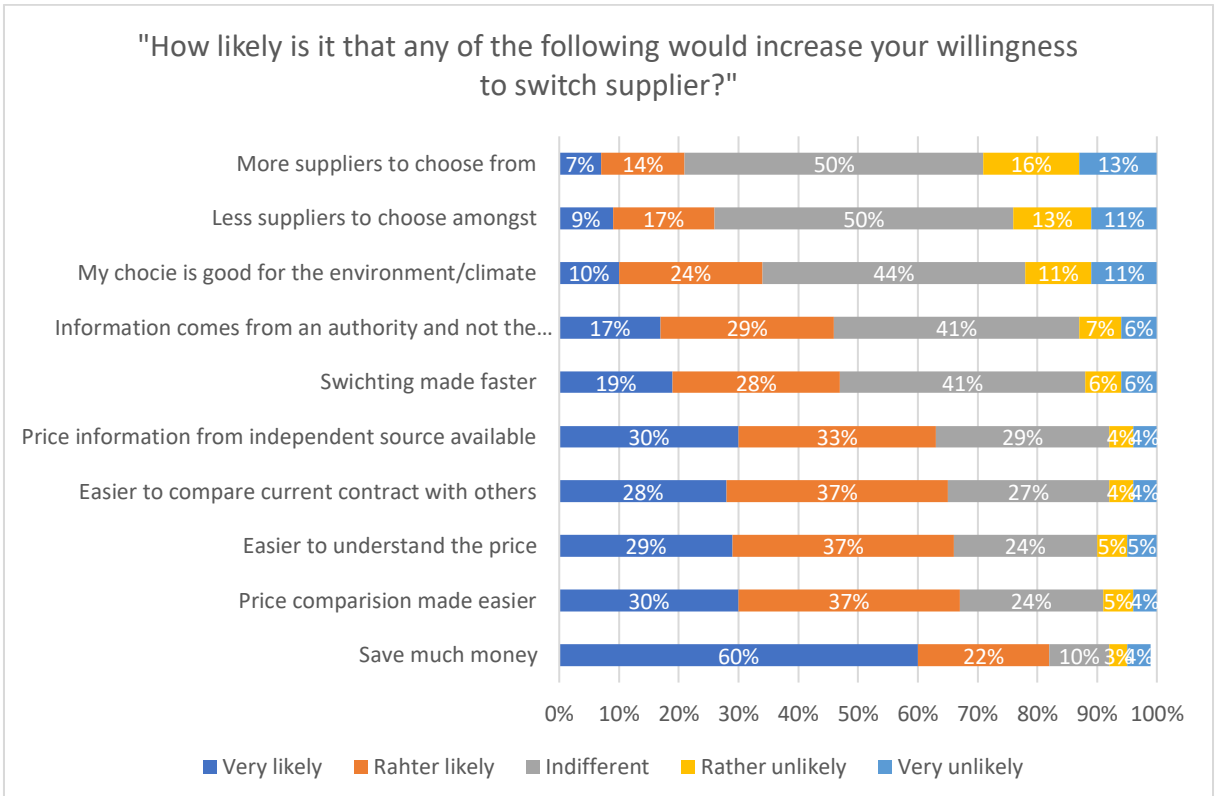
Cluster group 1 with 36 observations. Data source: Ei, 2014. Table by: the authors.

Supplier	cluster_group	share_default	info_bill	0–3months	3–6months	6–12months	>12months	0–3000kWh	3001–5000kWh	5001–10000kWh	>10001kWh
Höganäs Energi Handel AB	2	61%	0	20%	80%	0%	0%	58%	8%	12%	23%
Lerum Elhandel AB	2	40%	0	90%	10%	0%	0%	50%	10%	16%	24%
Karlstads Energi AB	2	38%	0	45%	30%	15%	10%	76%	12%	6%	6%
Billinge Energi AB	2	32%	0	40%	30%	20%	10%	45%	40%	10%	5%
VänerEl AB	2	18%	1	40%	30%	10%	20%	75%	9%	8%	8%
Västerbergslagens Elförsäljning AB	2	18%	0	35%	30%	20%	15%	79%	8%	7%	6%
Fyrfasen Energi AB	2	17%	0	45%	30%	15%	10%	68%	17%	5%	10%
Hjo Energi Elhandel AB	2	16%	1	53%	40%	5%	2%	53%	12%	16%	19%
Karlskoga Energi & Miljö AB	2	16%	1	66%	14%	12%	8%	78%	10%	6%	6%
Sjogerstads Energi AB	2	15%	1	50%	10%	10%	30%	65%	25%	8%	2%
Halmstads Energi och Miljö AB	2	10%	0	5%	5%	5%	85%	70%	20%	7%	3%
Dalakraft AB	2	9%	0	8%	4%	87%	0%	71%	9%	10%	10%
Grästorp Energi AB	2	9%	1	4%	1%	1%	94%	70%	9%	15%	5%
Tibro Energi Försäljning AB	2	6%	1	10%	20%	50%	20%	60%	40%	0%	0%
Mölndal Energi AB	2	5%	1	50%	20%	20%	10%	61%	13%	10%	15%
Gävle Energisystem AB	2	4%	1	100%	0%	0%	0%	0%	100%	0%	0%
Vimmerby Energiförsäljning AB	2	4%	0	30%	50%	15%	5%	65%	13%	9%	13%
Mälarenergi AB	2	4%	1	34%	17%	26%	24%	76%	12%	5%	7%

Cluster group 2 with 18 observations. Data source: Ei, 2014. Table by: the authors.

Appendix E. General presence of consumer inertia in the market





Source: Ei 2012b, Opinionsundersökning. Tables replicated by the authors.

Supporting material for consumer inertia, with all available consumer answers from Svensk Energi's survey (2009) to why they are unsatisfied with the electricity market:

Comments on cartel formation and market concentration:

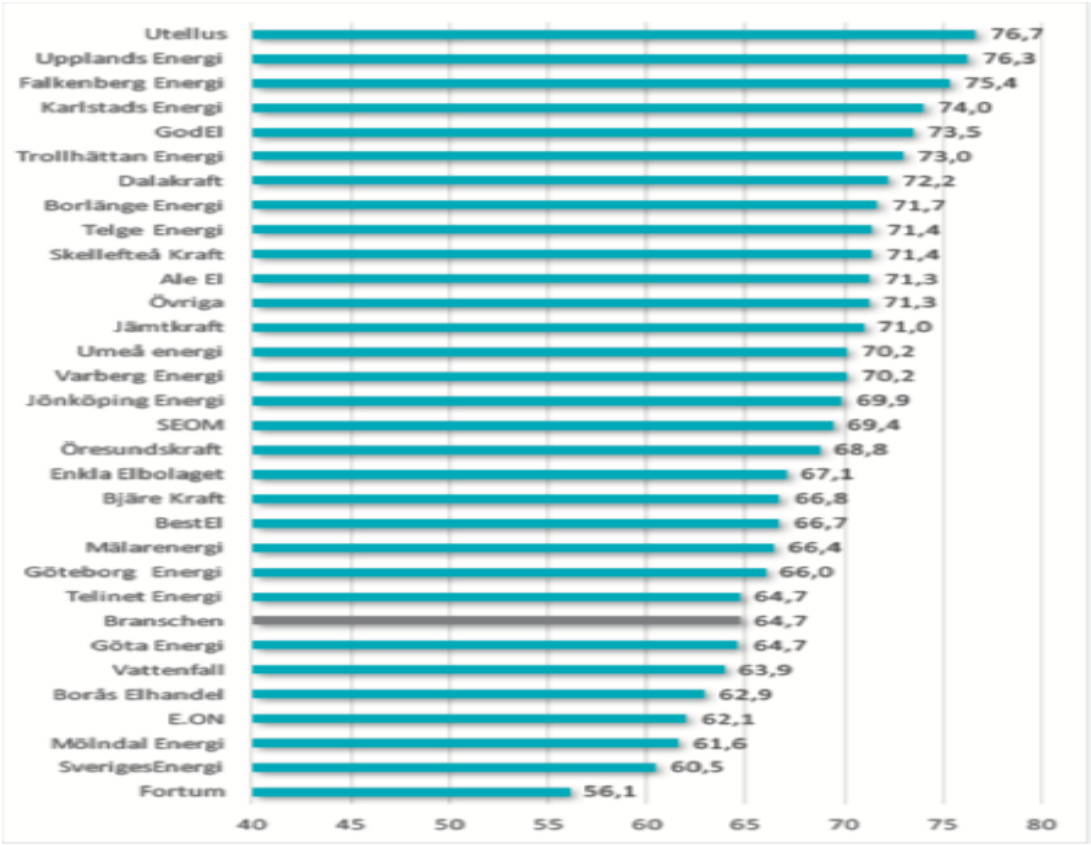
- "Much monopoly and that one really do not have that much of a choice. One cannot choose distribution system operator."
- "Tendencies of monopoly in the area, the marginal revenues are too high."
- "The market has not been working, even if one switch there is too little economic gains to be made. It is the three largest actors who decide (Vattenfall, Fortum and EON)".
- "There is no competition. All actors have the same price."
- "The electricity market is like a cartel, it does not get any cheaper, despite the reductions."
- "We feel a prevalence of cartels. The reason for the deregulation was that it would become cheaper, but instead the prices sky-rocked after the deregulation."

Comments on that it is expensive:

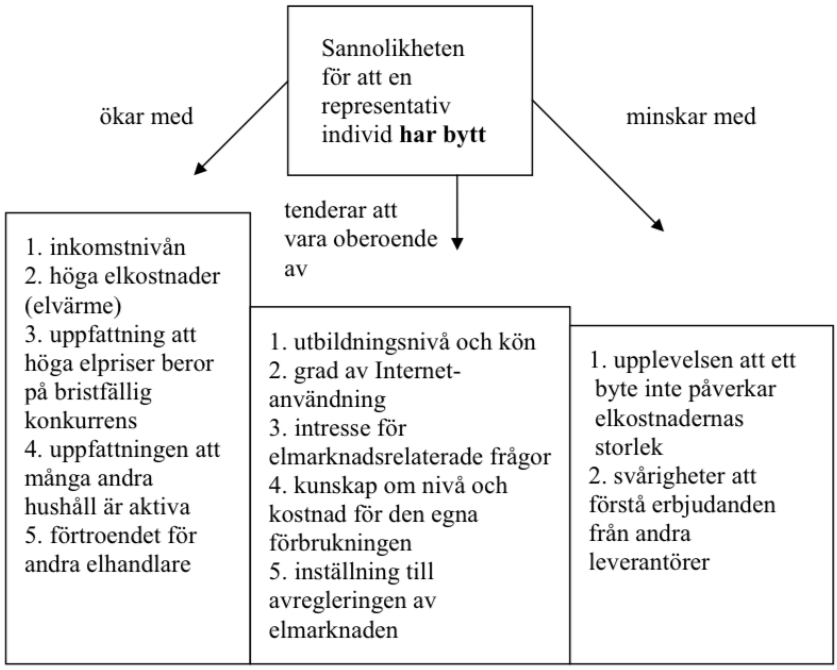
- "It has been difficult to achieve better terms of contract, seems that they charge too much."
- "They say that it will become cheaper, but then that does not happen, and they have high revenues. It is just getting more and more expensive."
- "They are increasing the prices when they wish, and blame it on available amount of water, etc."
- "The deregulation brought about higher prices. Completely the opposite to the original purpose."
- "It is a jungle of different actors and things one cannot affect. When it goes bad, the prices rice."
- "First and foremost, it has become much more expensive since the deregulation in 1996. All the fixed fees and the kilowatt fees have increased and the 'green' environmental friendly electricity is more expensive, which is not good."

Supporting material showing consumer satisfaction with different suppliers:

"SKI Kundnöjdhet Elhandel privatmarknaden 2017." Scale: 1-100. Average score for the industry is 64,7.

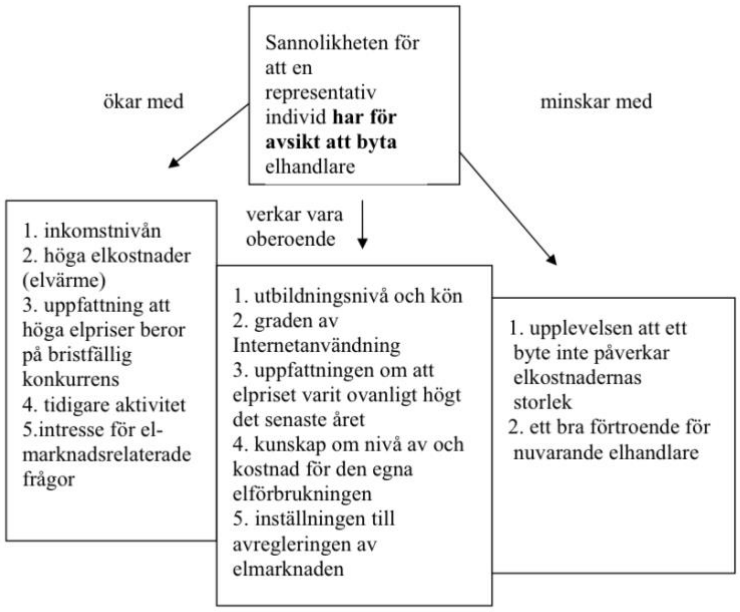


Supporting material showing factors affecting consumer intention and switching activity. (In Swedish only).



Figur 10: Faktorer som förklarar konsumentens val att byta elhandlare

Källa: EMI (2006)



Figur 11: Faktorer som förklarar hushållens intentioner att aktivt påverka sina elkontrakt

Källa: EMI (2006)

Source: Ei, 2006, p.36. Tables borrowed by the authors.

Appendix F. Regression results of price competition

```
Wednesday April 25 15:11:44 2018   Page 1

                                                                    (R)
                                  ___  ____  ____  ____  ____
                                 /__    /   ____/   /   ____/
                                ___/   /   /___/   /   /___/
                                  Statistics/Data Analysis

  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   15.1   Copyright 1985-2017 StataCorp LLC
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Notes:
      1.  Unicode is supported; see help unicode advice.
      2.  Maximum number of variables is set to 5000; see help set maxvar.

1 . doedit "C:\Users\jacob\Desktop\2K\2k.do"

2 . run "C:\Users\jacob\AppData\Local\Temp\STD2448_000000.tmp"
3 . run "C:\Users\jacob\AppData\Local\Temp\STD2448_000000.tmp"
4 . reg smarket anvisatpris

      Source |       SS       df       MS      Number of obs   =        24
-------------+------------------------------   F(1, 22)        =      1.39
       Model |  26.7047559     1  26.7047559   Prob > F        =    0.2514
    Residual |  423.456242    22  19.248011   R-squared       =    0.0593
-------------+------------------------------   Adj R-squared   =    0.0166
       Total |  450.160998    23  19.5722173   Root MSE        =    4.3873

------------------------------------------------------------------------------
    smarket |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+----------------------------------------------------------------
anvisatpris |   .0754052   .0640177     1.18   0.251    -.0573593    .2081698
      _cons |    -5.7292   7.726197    -0.74   0.466    -21.75235    10.29395
------------------------------------------------------------------------------

5 . reg smarket fastpris1år

      Source |       SS       df       MS      Number of obs   =        26
-------------+------------------------------   F(1, 24)        =      0.00
       Model |  .001865378     1  .001865378   Prob > F        =    0.9912
    Residual |  362.448581    24  15.1020242   R-squared       =    0.0000
-------------+------------------------------   Adj R-squared   =   -0.0417
       Total |  362.450446    25  14.4980178   Root MSE        =    3.8861

------------------------------------------------------------------------------
    smarket |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+----------------------------------------------------------------
fastprislår |  -.0011271   .1014153    -0.01   0.991    -.2104379    .2081837
      _cons |   2.791426   9.606223     0.29   0.774    -17.03484    22.61769
------------------------------------------------------------------------------

6 .
7 . reg smarket fastpris2år

      Source |       SS       df       MS      Number of obs   =        18
-------------+------------------------------   F(1, 16)        =      0.54
       Model |  4.92272384     1  4.92272384   Prob > F        =    0.4737
    Residual |  146.307439    16  9.14421493   R-squared       =    0.0326
-------------+------------------------------   Adj R-squared   =   -0.0279
       Total |  151.230163    17  8.89589193   Root MSE        =    3.0239

------------------------------------------------------------------------------
    smarket |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+----------------------------------------------------------------
fastpris2år |    .078958   .1076135     0.73   0.474    -.1491723    .3070883
      _cons |  -5.351855   10.21827    -0.52   0.608    -27.01363    16.30992
------------------------------------------------------------------------------
```

```
. 
. reg smarket fastpris3år
```

Source	SS	df	MS	Number of obs	=	26
				F(1, 24)	=	0.01
Model	.153259941	1	.153259941	Prob > F	=	0.9297
Residual	462.207403	24	19.2586418	R-squared	=	0.0003
				Adj R-squared	=	-0.0413
Total	462.360663	25	18.4944265	Root MSE	=	4.3885

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris3år	.0136022	.1524779	0.09	0.930	-.3010967	.3283011
_cons	1.816795	14.42313	0.13	0.901	-27.95109	31.58468

```
. 
. reg smarket fastpris4år
```

Source	SS	df	MS	Number of obs	=	3
				F(1, 1)	=	0.28
Model	21.0937504	1	21.0937504	Prob > F	=	0.6909
Residual	75.7680508	1	75.7680508	R-squared	=	0.2178
				Adj R-squared	=	-0.5645
Total	96.8618012	2	48.4309006	Root MSE	=	8.7045

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris4år	-.8035714	1.522968	-0.53	0.691	-20.15471	18.54757
_cons	83.90786	149.8428	0.56	0.675	-1820.025	1987.841

```
. 
. reg smarket fastpris5år
```

Source	SS	df	MS	Number of obs	=	10
				F(1, 8)	=	2.42
Model	43.3331295	1	43.3331295	Prob > F	=	0.1586
Residual	143.387967	8	17.9234959	R-squared	=	0.2321
				Adj R-squared	=	0.1361
Total	186.721097	9	20.7467885	Root MSE	=	4.2336

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris5år	.4928476	.3169669	1.55	0.159	-.2380795	1.223775
_cons	-44.2172	31.21826	-1.42	0.194	-116.2066	27.77225

```
. 
. reg smarket fastpris6månader
```

Source	SS	df	MS	Number of obs	=	8
				F(1, 6)	=	0.00
Model	.155200374	1	.155200374	Prob > F	=	0.9523
Residual	239.302195	6	39.8836992	R-squared	=	0.0006
				Adj R-squared	=	-0.1659
Total	239.457395	7	34.2081994	Root MSE	=	6.3154

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris6månader	.0266896	.4278524	0.06	0.952	-1.020228	1.073607
_cons	3.002734	42.25598	0.07	0.946	-100.3939	106.3994

```
16 .
17 . reg smarket mixavtal1år
```

Source	SS	df	MS	Number of obs	=	10
				F(1, 8)	=	0.56
Model	1.92582579	1	1.92582579	Prob > F	=	0.4774
Residual	27.7280153	8	3.46600191	R-squared	=	0.0649
				Adj R-squared	=	-0.0519
Total	29.6538411	9	3.29487123	Root MSE	=	1.8617

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal1år	.09109	.1222016	0.75	0.477	-.1907073	.3728874
_cons	-6.944408	11.83155	-0.59	0.573	-34.22801	20.33919

```
18 .
19 . reg smarket mixavtal2år
```

Source	SS	df	MS	Number of obs	=	2
				F(1, 0)	=	.
Model	11.7612501	1	11.7612501	Prob > F	=	.
Residual	0	0	.	R-squared	=	1.0000
				Adj R-squared	=	.
Total	11.7612501	1	11.7612501	Root MSE	=	0

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal2år	2.425	.	.	.	.	.
_cons	-215.215	.	.	.	.	.

```
20 .
21 . reg smarket mixavtal3år
```

Source	SS	df	MS	Number of obs	=	4
				F(1, 2)	=	2.24
Model	6.53834159	1	6.53834159	Prob > F	=	0.2729
Residual	5.82975928	2	2.91487964	R-squared	=	0.5286
				Adj R-squared	=	0.2930
Total	12.3681009	3	4.12270029	Root MSE	=	1.7073

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal3år	.4943925	.3301022	1.50	0.273	-.9259226	1.914708
_cons	-42.80673	29.63897	-1.44	0.285	-170.3329	84.71946

```
22 .
23 . reg smarket mixavtal5år
```

Source	SS	df	MS	Number of obs	=	3
				F(1, 1)	=	3.28
Model	8.36405062	1	8.36405062	Prob > F	=	0.3211
Residual	2.54801678	1	2.54801678	R-squared	=	0.7665
				Adj R-squared	=	0.5330
Total	10.9120674	2	5.4560337	Root MSE	=	1.5963

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal5år	.6816667	.3762399	1.81	0.321	-4.098915	5.462248
_cons	-59.43667	33.87413	-1.75	0.330	-489.8483	370.975

```
24 .
25 . reg smarket mixavtal6mån
insufficient observations
r(2001);

26 .
27 . reg smarket rörligtlår
```

Source	SS	df	MS	Number of obs	=	5
				F(1, 3)	=	1.29
Model	61.2842943	1	61.2842943	Prob > F	=	0.3385
Residual	142.453576	3	47.4845254	R-squared	=	0.3008
				Adj R-squared	=	0.0677
Total	203.737871	4	50.9344676	Root MSE	=	6.8909

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rörligtlår	-.3415956	.3006863	-1.14	0.338	-1.298514	.6153225
_cons	35.67984	27.65497	1.29	0.287	-52.33062	123.6903

```
28 .
29 . reg smarket rörligtprislöpande
```

Source	SS	df	MS	Number of obs	=	26
				F(1, 24)	=	0.56
Model	10.399814	1	10.399814	Prob > F	=	0.4608
Residual	444.14923	24	18.5062179	R-squared	=	0.0229
				Adj R-squared	=	-0.0178
Total	454.549044	25	18.1819617	Root MSE	=	4.3019

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rörligtprislöpande	-.0817902	.1091057	-0.75	0.461	-.3069733	.1433928
_cons	11.30149	10.85946	1.04	0.308	-11.11134	33.71432

```
30 . reg smarket anvisatpris
```

Source	SS	df	MS	Number of obs	=	24
				F(1, 22)	=	1.39
Model	26.7047559	1	26.7047559	Prob > F	=	0.2514
Residual	423.456242	22	19.248011	R-squared	=	0.0593
				Adj R-squared	=	0.0166
Total	450.160998	23	19.5722173	Root MSE	=	4.3873

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
anvisatpris	.0754052	.0640177	1.18	0.251	-.0573593	.2081698
_cons	-5.7292	7.726197	-0.74	0.466	-21.75235	10.29395

```
31 .
```

(R)
Statistics/Data Analysis

```
1 . run "C:\Users\jacob\AppData\Local\Temp\STD1f94_000000.tmp"
2 . reg smarket dmarket2
```

Source	SS	df	MS	Number of obs	=	21
				F(1, 19)	=	147.68
Model	391.326083	1	391.326083	Prob > F	=	0.0000
Residual	50.3482378	19	2.64990725	R-squared	=	0.8860
				Adj R-squared	=	0.8800
Total	441.674321	20	22.0837161	Root MSE	=	1.6279

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dmarket2	.7532151	.0619819	12.15	0.000	.6234855	.8829447
_cons	.9551794	.4138188	2.31	0.032	.0890467	1.821312

```
3 .
4 . reg smarket anvisatpris
```

Source	SS	df	MS	Number of obs	=	24
				F(1, 22)	=	0.25
Model	5.15167526	1	5.15167526	Prob > F	=	0.6214
Residual	451.578255	22	20.5262843	R-squared	=	0.0113
				Adj R-squared	=	-0.0337
Total	456.729931	23	19.8578231	Root MSE	=	4.5306

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
anvisatpris	.0362089	.0722763	0.50	0.621	-.113683	.1861007
_cons	-.7094668	7.944173	-0.09	0.930	-17.18467	15.76574

```
5 .
6 . reg smarket fastpris1år
```

Source	SS	df	MS	Number of obs	=	22
				F(1, 20)	=	0.54
Model	11.7789294	1	11.7789294	Prob > F	=	0.4712
Residual	436.757818	20	21.8378909	R-squared	=	0.0263
				Adj R-squared	=	-0.0224
Total	448.536747	21	21.3588927	Root MSE	=	4.6731

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris1år	-.1038066	.1413439	-0.73	0.471	-.3986449	.1910317
_cons	12.39223	12.42687	1.00	0.331	-13.52977	38.31423

```
7 .
8 . reg smarket fastpris2år
```

Source	SS	df	MS	Number of obs	=	17
				F(1, 15)	=	0.83
Model	18.9741277	1	18.9741277	Prob > F	=	0.3756
Residual	341.281369	15	22.7520913	R-squared	=	0.0527
				Adj R-squared	=	-0.0105
Total	360.255497	16	22.5159686	Root MSE	=	4.7699

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris2år	.4803434	.5259949	0.91	0.376	-.6407882	1.601475
_cons	-37.97288	44.97198	-0.84	0.412	-133.8284	57.88262

```
 9 .
10 . reg smarket fastpris3år
```

Source	SS	df	MS	Number of obs	=	25
				F(1, 23)	=	0.11
Model	2.09603134	1	2.09603134	Prob > F	=	0.7475
Residual	453.913766	23	19.7353811	R-squared	=	0.0046
				Adj R-squared	=	-0.0387
Total	456.009797	24	19.0004082	Root MSE	=	4.4425

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris3år	.1303502	.3999775	0.33	0.747	-.6970663	.9577667
_cons	-7.900623	34.07367	-0.23	0.819	-78.38738	62.58614

```
11 .
12 . reg smarket fastpris4år
```

Source	SS	df	MS	Number of obs	=	3
				F(1, 1)	=	0.61
Model	.054449994	1	.054449994	Prob > F	=	0.5771
Residual	.088816657	1	.088816657	R-squared	=	0.3801
				Adj R-squared	=	-0.2399
Total	.143266651	2	.071633326	Root MSE	=	.29802

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris4år	.165	.2107328	0.78	0.577	-2.512615	2.842615
_cons	-13.50167	18.33456	-0.74	0.596	-246.4644	219.4611

```
13 .
14 . reg smarket fastpris5år
```

Source	SS	df	MS	Number of obs	=	10
				F(1, 8)	=	11.02
Model	63.4087868	1	63.4087868	Prob > F	=	0.0105
Residual	46.0141794	8	5.75177242	R-squared	=	0.5795
				Adj R-squared	=	0.5269
Total	109.422966	9	12.1581073	Root MSE	=	2.3983

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris5år	1.851351	.55759	3.32	0.011	.5655465	3.137156
_cons	-158.9252	48.79502	-3.26	0.012	-271.4468	-46.40373

```
15 .
16 . reg smarket fastpris6månader
```

Source	SS	df	MS	Number of obs	=	8
				F(1, 6)	=	0.25
Model	10.7332514	1	10.7332514	Prob > F	=	0.6379
Residual	262.393094	6	43.7321824	R-squared	=	0.0393
				Adj R-squared	=	-0.1208
Total	273.126346	7	39.0180494	Root MSE	=	6.613

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris6månader	.2749296	.5549533	0.50	0.638	-1.082992	1.632851
_cons	-17.55623	49.44615	-0.36	0.735	-138.5466	103.4341

```
17 .
18 . reg smarket mixavtal1år
```

Source	SS	df	MS	Number of obs	=	9
				F(1, 7)	=	3.77
Model	47.9173406	1	47.9173406	Prob > F	=	0.0932
Residual	88.8759505	7	12.6965644	R-squared	=	0.3503
				Adj R-squared	=	0.2575
Total	136.793291	8	17.0991614	Root MSE	=	3.5632

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal1år	.7552778	.3887796	1.94	0.093	-.1640399	1.674595
_cons	-62.81204	33.97419	-1.85	0.107	-143.1482	17.52415

```
19 .
20 . reg smarket mixavtal2år
note: mixavtal2år omitted because of collinearity
```

Source	SS	df	MS	Number of obs	=	2
				F(0, 1)	=	0.00
Model	0	0	.	Prob > F	=	.
Residual	11.7612501	1	11.7612501	R-squared	=	0.0000
				Adj R-squared	=	0.0000
Total	11.7612501	1	11.7612501	Root MSE	=	3.4295

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal2år	0	(omitted)				
_cons	3.035	2.425	1.25	0.429	-27.77755	33.84755

```
21 .
22 . reg smarket mixavtal3år
```

Source	SS	df	MS	Number of obs	=	3
				F(1, 1)	=	0.05
Model	.471488156	1	.471488156	Prob > F	=	0.8667
Residual	10.4405792	1	10.4405792	R-squared	=	0.0432
				Adj R-squared	=	-0.9136
Total	10.9120674	2	5.4560337	Root MSE	=	3.2312

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal3år	.3178572	1.49575	0.21	0.867	-18.68744	19.32316
_cons	-24.045	122.1671	-0.20	0.876	-1576.326	1528.236

```
23 .
24 . reg smarket mixavtal5år
```

Source	SS	df	MS	Number of obs	=	3
				F(1, 1)	=	0.03
Model	.315466664	1	.315466664	Prob > F	=	0.8912
Residual	10.5966007	1	10.5966007	R-squared	=	0.0289
				Adj R-squared	=	-0.9422
Total	10.9120674	2	5.4560337	Root MSE	=	3.2552

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal5år	-.26	1.506884	-0.17	0.891	-19.40678	18.88678
_cons	23.32	124.081	0.19	0.882	-1553.279	1599.919

```
25 .
26 . reg smarket mixavtal6mån
insufficient observations
r(2001);

27 .
28 . reg smarket rörligt1år
```

Source	SS	df	MS	Number of obs	=	25
				F(1, 23)	=	0.03
Model	.667856535	1	.667856535	Prob > F	=	0.8558
Residual	455.008341	23	19.7829713	R-squared	=	0.0015
				Adj R-squared	=	-0.0419
Total	455.676197	24	18.9865082	Root MSE	=	4.4478

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rörligt1år	-.0378475	.2059876	-0.18	0.856	-.4639652	.3882703
_cons	6.562258	18.2557	0.36	0.723	-31.20255	44.32706

```
29 .
30 . reg smarket rörligtprislöpande
```

Source	SS	df	MS	Number of obs	=	5
				F(1, 3)	=	0.19
Model	13.7099507	1	13.7099507	Prob > F	=	0.6940
Residual	218.995043	3	72.9983477	R-squared	=	0.0589
				Adj R-squared	=	-0.2548
Total	232.704994	4	58.1762484	Root MSE	=	8.5439

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rörligtprislöpande	-.23646	.5456275	-0.43	0.694	-1.97289	1.49997
_cons	26.83723	46.20921	0.58	0.602	-120.2211	173.8956

```
31 .
```

```
                                                              ___  ____  ____  ____  ____(R)
                                                             /__    /   ____/   /   ____/
                                                            ___/   /   /___/   /   /___/
                                                              Statistics/Data Analysis

      ___  ____  ____  ____  ____ (R)
     /__    /   ____/   /   ____/
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Notes:
      1.  Unicode is supported; see help unicode_advice.
      2.  Maximum number of variables is set to 5000; see help set_maxvar.

1 . doedit "C:\Users\jacob\Desktop\20k\20k.do"

2 . run "C:\Users\jacob\AppData\Local\Temp\STD19bc_000000.tmp"
3 . reg smarket anvisatpris

      Source |       SS           df       MS      Number of obs   =        25
-------------+----------------------------------   F(1, 23)        =      1.99
       Model |  36.3099977         1  36.3099977   Prob > F        =    0.1716
    Residual |  419.334616        23  18.2319398   R-squared       =    0.0797
-------------+----------------------------------   Adj R-squared   =    0.0397
       Total |  455.644614        24  18.9851922   Root MSE        =    4.2699

------------------------------------------------------------------------------
    smarket |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+----------------------------------------------------------------
 anvisatpris |   .0903928   .0640527     1.41   0.172    -.0421102    .2228959
       _cons |  -6.103291   6.657547    -0.92   0.369    -19.87548    7.668894
------------------------------------------------------------------------------

4 .
5 . reg smarket fastpris1år

      Source |       SS           df       MS      Number of obs   =        24
-------------+----------------------------------   F(1, 22)        =      0.15
       Model |  3.08498783         1  3.08498783   Prob > F        =    0.7017
    Residual |  450.530772        22  20.4786714   R-squared       =    0.0068
-------------+----------------------------------   Adj R-squared   =   -0.0383
       Total |   453.61576        23  19.7224243   Root MSE        =    4.5253

------------------------------------------------------------------------------
    smarket |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+----------------------------------------------------------------
 fastpris1år |  -.1939634   .4997398    -0.39   0.702    -1.23036    .8424336
       _cons |    18.7703   40.23966     0.47   0.645    -64.68164    102.2223
------------------------------------------------------------------------------

6 .
7 . reg smarket fastpris2år

      Source |       SS           df       MS      Number of obs   =        16
-------------+----------------------------------   F(1, 14)        =      0.37
       Model |  8.99695965         1  8.99695965   Prob > F        =    0.5537
    Residual |  342.079826        14  24.4342733   R-squared       =    0.0256
-------------+----------------------------------   Adj R-squared   =   -0.0440
       Total |  351.076785        15   23.405119   Root MSE        =    4.9431

------------------------------------------------------------------------------
    smarket |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+----------------------------------------------------------------
 fastpris2år |   .5947174   .9800822     0.61   0.554    -1.50735    2.696785
       _cons |  -44.47887   78.72255    -0.57   0.581    -213.3219    124.3642
------------------------------------------------------------------------------
```

```
. 
. reg smarket fastpris3år
```

Source	SS	df	MS	Number of obs	=	24
				F(1, 22)	=	0.03
Model	.555896226	1	.555896226	Prob > F	=	0.8711
Residual	453.795084	22	20.6270493	R-squared	=	0.0012
				Adj R-squared	=	-0.0442
Total	454.350981	23	19.7543905	Root MSE	=	4.5417

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris3år	-.092508	.5635093	-0.16	0.871	-1.261155	1.076139
_cons	10.65762	45.0668	0.24	0.815	-82.80521	104.1205

```
. 
. reg smarket fastpris4år
```

Source	SS	df	MS	Number of obs	=	3
				F(1, 1)	=	0.00
Model	.140449985	1	.140449985	Prob > F	=	0.9758
Residual	96.7213512	1	96.7213512	R-squared	=	0.0015
				Adj R-squared	=	-0.9971
Total	96.8618012	2	48.4309006	Root MSE	=	9.8347

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris4år	-.265	6.954184	-0.04	0.976	-88.62629	88.09629
_cons	26.355	563.3175	0.05	0.970	-7131.273	7183.983

```
. 
. reg smarket fastpris5år
```

Source	SS	df	MS	Number of obs	=	10
				F(1, 8)	=	0.06
Model	1.38555731	1	1.38555731	Prob > F	=	0.8130
Residual	185.335539	8	23.1669424	R-squared	=	0.0074
				Adj R-squared	=	-0.1167
Total	186.721097	9	20.7467885	Root MSE	=	4.8132

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris5år	.2863313	1.170822	0.24	0.813	-2.41359	2.986253
_cons	-19.17154	95.90243	-0.20	0.847	-240.3229	201.9799

```
. 
. reg smarket fastpris6månader
```

Source	SS	df	MS	Number of obs	=	8
				F(1, 6)	=	0.03
Model	1.09161645	1	1.09161645	Prob > F	=	0.8738
Residual	238.365779	6	39.7276298	R-squared	=	0.0046
				Adj R-squared	=	-0.1613
Total	239.457395	7	34.2081994	Root MSE	=	6.303

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fastpris6månader	.1102086	.6648549	0.17	0.874	-1.516633	1.73705
_cons	-3.470988	54.97882	-0.06	0.952	-137.9993	131.0573

```
16 .
17 . reg smarket mixavtal1år
```

Source	SS	df	MS	Number of obs	=	10
				F(1, 8)	=	0.58
Model	1.99053116	1	1.99053116	Prob > F	=	0.4698
Residual	27.6633099	8	3.45791374	R-squared	=	0.0671
				Adj R-squared	=	-0.0495
Total	29.6538411	9	3.29487123	Root MSE	=	1.8595

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal1år	.1827517	.2408707	0.76	0.470	-.3726971	.7382005
_cons	-13.15819	19.8083	-0.66	0.525	-58.83621	32.51984

```
18 .
19 . reg smarket mixavtal2år
```

Source	SS	df	MS	Number of obs	=	2
				F(1, 0)	=	.
Model	11.7612501	1	11.7612501	Prob > F	=	.
Residual	0	0	.	R-squared	=	1.0000
				Adj R-squared	=	.
Total	11.7612501	1	11.7612501	Root MSE	=	0

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal2år	1.616667	.	.	.	.	.
_cons	-120.64	.	.	.	.	.

```
20 .
21 . reg smarket mixavtal3år
```

Source	SS	df	MS	Number of obs	=	4
				F(1, 2)	=	0.06
Model	.331645464	1	.331645464	Prob > F	=	0.8362
Residual	12.0364554	2	6.0182277	R-squared	=	0.0268
				Adj R-squared	=	-0.4598
Total	12.3681009	3	4.12270029	Root MSE	=	2.4532

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal3år	-.3472727	1.47934	-0.23	0.836	-6.712358	6.017813
_cons	27.69727	111.3271	0.25	0.827	-451.3045	506.699

```
22 .
23 . reg smarket mixavtal5år
```

Source	SS	df	MS	Number of obs	=	3
				F(1, 1)	=	2693.34
Model	10.9080174	1	10.9080174	Prob > F	=	0.0123
Residual	.004050003	1	.004050003	R-squared	=	0.9996
				Adj R-squared	=	0.9993
Total	10.9120674	2	5.4560337	Root MSE	=	.06364

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mixavtal5år	-4.045	.0779423	-51.90	0.012	-5.035351	-3.054649
_cons	312.03	5.97569	52.22	0.012	236.1017	387.9584

```
24 .
25 . reg smarket mixavtal6mån
insufficient observations
r(2001);

26 .
27 . reg smarket rörligtlår
```

Source	SS	df	MS	Number of obs	=	5
				F(1, 3)	=	10.87
Model	159.663083	1	159.663083	Prob > F	=	0.0458
Residual	44.0747872	3	14.6915957	R-squared	=	0.7837
				Adj R-squared	=	0.7116
Total	203.737871	4	50.9344676	Root MSE	=	3.833

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rörligtlår	-1.078761	.3272333	-3.30	0.046	-2.120163	-.0373587
_cons	91.19038	26.36534	3.46	0.041	7.284112	175.0966

```
28 .
29 . reg smarket rörligtprislöpande
```

Source	SS	df	MS	Number of obs	=	24
				F(1, 22)	=	1.57
Model	29.8614093	1	29.8614093	Prob > F	=	0.2235
Residual	418.717684	22	19.032622	R-squared	=	0.0666
				Adj R-squared	=	0.0241
Total	448.579093	23	19.5034388	Root MSE	=	4.3626

smarket	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rörligtprislöpande	-.3222121	.2572385	-1.25	0.224	-.8556921	.2112679
_cons	30.18735	21.46574	1.41	0.174	-14.32987	74.70457

```
30 .
```