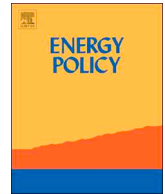




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The Dutch retail electricity market

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ABSTRACT

This paper examines market structure, regulation, and market performance of the Dutch electricity retail market for households since its opening in 2004. Using data containing monthly prices for all products offered in the Dutch retail electricity markets over the period 2008–2014, we provide quantitative results on the intensity of retail competition and the benefits to consumers. Regulation of the retail electricity market is relatively intensive and encompasses structural measures, contractual restrictions, rules on information provision, price surveillance and market monitoring. In contrast to most other countries, the Dutch regulation includes a kind of price regulation which is that the regulator surveys all new retail prices before market introduction in order to prevent too high retail prices. The Dutch retail electricity market has remained relatively concentrated, with retailers offering an increasing variety of retail products, often using multiple brands. Competition is characterized by product innovation, especially for green energy, rather than price competition on homogenous products. Gross retail margins remain relatively high, as is price dispersion across retailers. The market matured, as evidenced by fewer consumer complaints and higher switching rates.

1. Introduction

In their cross-country monitoring report, European regulators (ACER/CEER, 2015) conclude that many retail markets remain very concentrated with aggregate market share for the three largest electricity retailers of 70% or more.¹ Across the board, strong product innovation is observed especially regarding contract duration, additional services and sustainability. Overall, it is said that the transition towards a competitive and efficient retail market depends on the ability and the willingness of individual well-informed households to actively search for and select contracts that best fit their needs (see also Ofgem, 2011a). Although aggregate market developments are similar across many markets, idiosyncratic differences in regulation and (initial) market structure affect market outcomes.

This paper provides an in-depth analysis of the evolution of competition in the Dutch retail energy market for household consumers since its full opening in 2004, and documents the evolution of both market structure, regulation and market outcomes. During this period, the regulation of the retail energy market became gradually more intensive. This increased intensity aimed at improving competition by eliminating market failures. These market failures in particular refer to the lack of transparency and negative spill-overs of bad experiences

with one retailer (bankruptcy, fraudulent billing, and bad customer support) on consumers' faith in the market.

Because of the large number of regulatory changes in the Dutch market it is unfortunately not possible to empirically test the impact of those change on market outcomes. Our analysis therefore consists of two parts. First, we describe the changes in the regulation in the Dutch retail energy markets, and give a qualitative assessment of the importance of those regulations (Section 3). In the second part of the paper, (Sections 4 and 5), we provide quantitative results on the intensity of retail competition and the benefits to consumers. We analyse market structure, product innovation, pricing strategies, gross retail margins as well as consumer behaviour. The analysis relies mainly on a dataset collected by the Authority for Consumers & Markets (ACM), containing monthly prices for all products offered in the Dutch retail electricity markets over the period 2008–2014.

We find that the Dutch retail market remains concentrated, despite numerous entrants, as entrants remain small and entry has been offset by (horizontal) mergers. The number of products has increased strongly, while the gross retail margin decreased slightly. However, price differences between retailers remain high, and a large fraction of consumers has never switched. These inactive consumers are the primary users of variable price products which are the default products of

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retailers. We find that variable price products are significantly more expensive than other products, which are chosen by active consumers. These price differences exist in spite of price supervision by the regulator. This price supervision aims at ensuring reasonable prices for all products, without distorting the price formation process between competitive retailers. We analyse the pass-through rate of wholesale to retail prices with an error-correction model. We find no evidence for asymmetric price pass-through, however, the pass-through rate is slow. In general the functioning of the retail market appears to have improved given the strong decline in the number of consumers' complaints.

In the remainder of the paper, Section 2 reviews the theoretical and empirical literature on retail markets, including an overview of experiences with energy retail markets in the UK, US, Norway, New Zealand and Australia. Section 3 describes the regulation of the Dutch retail energy market. Data and methodology for the evaluation of the Dutch experiences are described in Section 4. The results of our analysis are discussed in Section 5, while Section 6 concludes.

2. Literature review

Since the start of liberalization of energy markets, the need for retail competition and its potential benefits for consumers have been subject to debate. Joskow (2000) sees a rather limited role for retail markets in the energy sector, as many of the traditional roles of retail markets are irrelevant for energy (after-sales service and convenient delivery regarding location and time). He states therefore that competition in retail energy markets is useful mainly for the provision of additional services (insurance, energy services), but that regulated distribution-network operators should provide a basic retail product for the delivery of energy with a price indexed on the wholesale price. In contrast, Littlechild (2000) argues that the retail market is all about price competition and that downstream competition is a necessary component for creating competition in the wholesale market.

One of the predominant features of retail market competition is the large fraction of so-called dormant or passive consumers, i.e. consumers that have not switched supplier or contract. The prevalence of passive consumers may be more pronounced in the electricity sector as the market evolved from a fully regulated market, and many customers have never consciously chosen for a particular contract, but simply continued with their incumbent retailer on a default contract. So this behaviour could be a habit. However, the decision not to switch may be rational, if they believe the costs for making a choice (search and transaction costs) exceed the expected benefits of switching. It is important, however, to recognize that consumers are heterogeneous and make different assessments of expected costs and benefits of becoming an active consumer in the retail market. Although some consumers may have missed some financial benefits by not switching, the non-financial costs for them might exceed these benefits, making their behaviour fully rational.

Armstrong (2014) shows that it might be perfectly rational for informed consumers not to invest in becoming informed and remain non-savvy. He models the strategic decisions of retailers in several search models when there are two types of consumers: savvy and non-savvy consumers and analyses the externalities between both groups. Savvy consumers shop for the best deal in the market, which induces retailers to lower prices and increase product quality. Non-savvy consumers do not make the effort to compare offers and search for more information, which may be a fully rational decision based on their expectations regarding costs and benefits of making such efforts. If retailers cannot distinguish between consumer groups, non-savvy consumers will also benefit from lower prices and increased product quality. Hence, there may be positive externalities.²

Many empirical studies raise concerns about the competitive nature of retail markets, and identify problems that are associated with a lack of active consumer participation and high retail market concentration. Wilson and Waddams Price (2010) show that even in a mature and transparent retail market as Great Britain's, consumers often make suboptimal choices and switch to more expensive contracts. In an empirical study of or the Norwegian retail market, Von der Fehr and Hansen (2009) argue that active consumers have benefited from larger product variety caused by the liberalization, but passive consumers did not experience real benefits from liberalization. Von der Fehr and Hansen (2009) show the coexistence of a very competitive market segment with low mark-ups and active consumers, and a monopolistic market segment where suppliers may exploit the consumers' passivity.

The fraction of savvy and non-savvy consumers affect price dispersion in a non-monotonic way (Armstrong, 2014). If all consumers are savvy, all retailers charge the same low price and price dispersion is non-existent. With a mixture of consumer types, price dispersion exists as retailers use mixed pricing strategies. In that case, savvy consumers pay less than non-savvy consumers. At the other extreme, if all consumers are non-savvy, retailers charge the same monopoly price, and price dispersion disappears again. The impact of the share of savvy consumers on price dispersion is, therefore, inversely U-shaped. Such a curve is also found by Stahl (1988) for the relationship between price dispersion and transparency of the market. In an oligopoly with symmetric firms with full transparency, prices are equal because of Bertrand competition, while in case of a complete lack transparency, an oligopoly with symmetric firms turns into monopolies where each firm charges the same monopoly price. In between these two extremes there is an inverted U-curve, which is called the Diamond paradox (Diamond, 1971).

In some empirical studies, the decision to become active in energy retail markets appears to depend on a consumer's trust that there are no adverse effects of switching retailer. This appeared to be an issue in New Zealand, where switching was not centrally coordinated (APEC, 2017). To facilitate switching, a centralized independent complaint authority was created, and education programs for public awareness were organized. In addition, a "save protection scheme" was introduced to increase switching rates, which limits the ability of retailers to offer a lower retention price to a customer that already started the switching process, until the switch is completed. Another factor that affects switching rates is the design of default contracts. In several US states, switching rates are low due to the existence of default service contracts which incumbent companies have to offer (Littlechild, 2018). Across states with retail competition, a median of 20% of residential consumers has switched to competitive retailers since the opening of the market. A significant fraction of those switchers did not switch individually, but participated in collective bargaining organized by their municipality. The advantage of the default service obligation is that it protects non-active consumers, as they basically have to pay a regulated tariff. A potential drawback is that potential entrants find it hard to enter the market, especially if the regulated tariff is very low, if there is no separation of the retail and distribution activities, and when they have to rely on the incumbent utilities for billing customers, collecting bills and assuming debt.

The switching rate of customers is also related to the transparency of the retail market. In Australia, retailers compete by offering percentage discount on their own standard tariff, which makes comparisons across retailers hard (ACCC, 2018). Some of those (large) discounts are conditional on paying bills on times.

Besides the switching rate of customers, a key measure to assess the

(footnote continued)

consumers may also create a negative (rip-off) externality for non-savvy consumers if higher prices for non-savvy consumers are used to subsidize savvy consumers.

² However, Armstrong shows this depends crucially on the set-up: savvy

efficiency of retail markets, is the pass-through of upstream costs to downstream prices. In many retail markets, wholesale price increases are passed on faster to final end-users than decreases, a phenomenon called rockets and feathers (Peltzman, 2000).³ The literature proposes several explanations for those effects. If price adjustments are costly and on average prices increase with inflation, it might be optimal not to adjust price downwardly. Another explanation refers to adjustment costs in technology. If capacity constraints exist in the downstream market, firms in this market do not face competitive pressure to pass on upstream cost reductions (Borenstein and Shepard, 2002). A third explanation is related to competition and search effects. The search intensity by consumers declines when prices decrease, and as a result firms face less competitive pressure to pass on cost reductions (Lewis and Marvel, 2011).⁴ Empirical evidence for the rockets and feathers effects was found for the UK and Norwegian retail electricity market by Ofgem (2011b), von der Fehr and Hansen (2009) and Mirza and Bergland (2012). Ofgem (2011b) found some evidence that the competitive process is less intense when prices are falling. This conclusion was to some extent confirmed by CMA (2016), which pointed at the large share of inactive consumers as explanation for the presence of the rockets and feather mechanism.⁵ Mirza and Bergland (2012) show that faster downward adjustments of prices would have resulted in considerable consumer savings.

In the remainder of this paper we analyse how the competition in the Dutch retail electricity market has evolved by looking at the price dispersion, the profits of retailers, the switching rates and the pass-through rate of retail costs. Before presenting the method and results, we first describe the evolution of the Dutch retail electricity market

3. Regulation of the Dutch retail electricity market

Before the liberalization of the Dutch retail market, energy consumers were supplied by a regulated, vertically integrated incumbent with a regional monopoly for electricity distribution and retail. After a gradual liberalization of the Dutch retail market, which started for large industrial users in the nineties, followed by a partial opening for green electricity products in 2001, all consumers were free to choose supplier in 2004 (Van Damme, 2005). Since 2004, a number of regulatory measures has been implemented (Table 1).

The Authority for Consumers & Markets (ACM) regulates the energy market. It was created in 2013 by the merger of the Competition Authority NMa (which was responsible for energy regulation and competition policy until then), the Consumer Authority and the Telecom and Post regulator (OPTA). Since the merger, the regulation of energy retail markets is increasingly based on general consumer protection rules and less on sector-specific legislation. Regulation consists of four components: 1) structural measures, 2) contract restrictions, 3) information provision and transparency and 4) monitoring.

The *structural measures* include licensing requirements for retailers, full unbundling of distribution services, and the reallocation of tasks within the energy value chain. A retail licence is a prerequisite for becoming active in the market, and is granted to firms that are sufficiently solvent and have satisfactory organizational capabilities.⁶ In

³ The Rockets and Feathers literature is vast. One of its main applications is the study of gasoline retail prices, a market where products are also rather homogenous (Borenstein, 1991). Meyer and von Cramon-Taubadel (2004) and Eckert (2013) provide surveys.

⁴ Recent papers endogenize both search intensity and the strategic price setting by firms. See Yang and Ye (2008), Tappata (2009), and Cabral and Fishman (2012).

⁵ CMA (2016) believes “that the results are indicative of the presence of a certain degree of asymmetric price response in the domestic retail energy markets, in that cost reductions have not been fully passed through to prices” but overall they “attach limited weight” to this conclusion (p. 411).

⁶ Once a retailer obtains a licence, only light-handed financial monitoring

2008, energy-distribution companies were forced by the government to unbundle ownership of commercial activities, such as generation, trading and retailing, from network operation. Network operation and ownership, however, could not be privatized and remained in hands of local and national governments. Both measures were meant to guarantee the independence of infrastructure operators, improve competition and in particular facilitate decentralized (renewable) energy production (Mulder and Shestalova, 2006).

A significant change in the responsibilities of network operators was the introduction of the so-called “new market model” in 2013, which made retailers the sole responsible for managing the switching processes on behalf of consumers. Retailers also became the single point of contact for households, who receive a single bill consisting of both retail and distribution charges.⁷ As a first step towards the introduction of the new market model, a capacity-based transport tariff was introduced in 2009. Since a number of years, the metering infrastructure became the exclusive responsibility of the network operators, while retailers are responsible for collecting metering data.⁸ Since 2012, network operators are obliged to gradually roll-out smart meters, although consumers can opt-out.

We do not believe that the introduction of smart meters will have an immediate impact on competition in the Dutch retail market. A few retailers offer additional services where consumers receive information about their demand, but no new contract forms have been introduced yet.⁹

The second group of regulatory measures consists of *restrictions on contracts* offered by the retailers. These restrictions include a maximum on (1) the penalty that consumers pay in case of early contract breach as well as (2) the prohibition of automatic renewal of contracts. The first restriction follows from sector-specific regulation imposed by the regulator, while the second restriction is based on general consumer legislation and is also valid for subscriptions to newspapers, insurance contracts and telecom contracts.

In order to improve market transparency the legislator¹⁰¹¹ decided that each energy retailer should offer a standardized product that is identical across retailers on all aspects except price. In cooperation with the industry and consumer organizations, the regulator therefore issued a model contract (NMa, 2012a). This model contract prescribes the contract in all its details (product type, general conditions, etc.). However, this standardized product is hardly sold. Retailers typically offer the standard product for the same price as the other products they sell, but those other products have more generous contracting terms in other dimensions than price. This might be a rational strategy of retailers to avoid price competition, but might also reflect that retailers are not allowed to use this product for special temporary offers.

A particular element of the Dutch retail market is the “safety net” regulation, which is laid down in the Dutch Energy Law.¹² This regulation was initially adopted by the Parliament as a transitional

(footnote continued)

takes place as the regulator has limited legal power to intervene if a retailer does not meet financial criteria. If a retailer goes bankrupt, its retail licence is revoked. Supply to its customers is then guaranteed by the network operator, until customers are transferred to another retailer.

⁷ Retailers become the single point of contact for customers, do not need to understand the different roles of the retailer and the distribution company.

⁸ Before this change, the market for metering was open for competition. Only one retailer offered a product that included a smart meter. In first 4 years, about 1% of Dutch households installed a smart meter.

⁹ For the UK market the market segment of pre-paid contracts, might disappear with the introduction of smart meters. In the Netherlands, pre-paid contracts have been available on the market only in some years.

¹⁰ Amendment to the 1998 Electricity Act (Stb, 2011, 203).

¹¹ The introduction of a standardized retail product led in Norway to strong price competition with homogenous goods and low mark-ups.

¹² Articles 95b of the Elektriciteitswet and Article 44 of the Gaswet.

Table 1
Regulatory events in the Dutch retail energy markets since 2004.

Category	04	05	06	07	08	09	10	11	12	13	14	15	16
Structural Regulation (ex ante)	Opening of the retail market				Licensing of retailers								
					Full unbundling of retailers								
					Capacity tariff for distribution								
					New market model: retailers single point of contact								
									Roll-out of smart meters				
Contracting Restrictions (ex-ante)	Tariff surveillance (Safety Net)												
						Maximum penalty for early contract breach							
						Prohibition for automatic renewal of contracts (based on general consumer legislation)							
									Obligation to offer a model contract				
Information Requirements (ex-ante)													
						Guidelines on information provision (based on energy legislation)							
						Guidelines information provision (based on general consumer legislation)							
						Voluntary guidelines on composition of energy bill							
					Code of conduct retailers I								
						Code of conduct retailers II							
											Code of conduct retailers III		
									Code of conduct for smart meters				
Monitoring (Ex-post)	Assessment of price comparison websites												
	Sampling experience customer experience												
						Responses to complaints by retailers							

measure to protect consumers, until the market is sufficiently competitive (NMa, 2012b), but the regulation is still in place. Four weeks before offering a new contract to consumers or four weeks before a price change, retailers are required to submit the contract to the regulator, which will check whether the contracting conditions and in particular the price, are not unreasonable.¹³ In theory, the safety net could have adverse effects on competition. If a price cap would be announced publically, it could become a focal point for retailers. The regulator therefore does not disclose its assessment methodology. Moreover, with a too strict safety net, the role of the retail competition is hollowed out: price differences are reduced and consumers will no longer search actively for new products.

This price surveillance process in the Netherlands should not be confused with a full blown price cap regime, where maximum prices are set according to strict rules. In its evaluation whether a contract is reasonable, the regulator will not only take into account price levels but also other contracting provisions, and innovative components that are bundled with the energy product (for instance a tablet or an appliance). It allows also for prices that are indexed on a price indicator according some pre-defined formula. Note also that the safety net regulation does not prohibit firms to provide freebies or signing bonuses, or to undercut their own price. So firms can still compete on a day by day basis.

It is our understanding (from discussions with relevant parties) that the threat of intervention is often sufficient to affect the price-setting behaviour of retailers. According to the regulator, this safety net regulation results in lower prices for consumers. Over both 2016 and 2017, the regulator reports that it has intervened in the tariff proposals twice as the initial tariffs were assessed as unreasonable (ACM, 2016, 2017). As a result of these two interventions, consumers' aggregate bills dropped with € 1 million in 2016 and € 5 million in 2017.

The third group of measures are *information requirements*. They often have the form of voluntary codes of conducts (self-regulation) which sometimes evolve into binding regulation upon ACM's endorsement of a

¹³ This rather vague requirement that “contracts have to be reasonable” is also what the law prescribes. Specific conditions for “being reasonable” are, on purpose, not spelled out, as to provide sufficient discretion to the regulator. In general the energy law says that a retail tariff is reasonable if the tariff is closely related to the costs in the wholesale market plus a normal profit margin for the retailer. It is up to discretion of the regulator to precisely determine the relevant costs and profit margin as benchmark for assessing reasonability. The regulator has not communicated publicly on how it evaluates prices.

text agreed upon by stakeholders. Codes of conduct are meant to improve market transparency (by making information more comparable), but also to prevent abuses (telemarketing, door-to-door selling). The third version of the Code of Conduct includes the provision that consumers need to be precisely informed about the total annual costs of a specific offer. This rule is based on general consumer legislation.

Finally, the regulator closely *monitors* the energy retail market and publishes information to make the market more transparent. The regulator assesses on an ad-hoc basis the quality, in particular the independence and transparency, of the existing price-comparison websites. In addition, the regulator provides information on the retail energy market on a government website directed towards consumers. At this site consumers can also submit complaints to the regulator.

Many countries have specific provisions for households with specific needs (low income, less literate households). Those consumers might be less savvy on average and therefore not benefit from competition as much as other groups and they typically spend a larger fraction of their income on energy services. This issue has received little public attention in the Netherlands (compared to for instance in the UK). This is likely due to the specific setting in the Netherlands. Social security provides direct support to the most needy and poorer households receive rent subsidies. Moreover, there were no large shocks in energy prices for residential users, the safety net limited excessively priced contracts, while the insulation standards for houses are relatively high.

4. Method and data

4.1. Method

We use several indicators to assess the development of Dutch retail market. A first set of indicators are measures for industry structure. Although the relationship between industry structure and competition is not unambiguous, changes in the structure are informative about the dynamics on the supply side. New firms can enter and lower market concentration. At the same time, less efficient retailers are likely to lose market share or to be taken over by competitors. We measure the **horizontal market structure** by the HHI and the market shares of the major players.

As indicator for dynamic efficiency, we use **product and service innovation**, measured by the number of products offered to consumers. Note that product variety is not necessarily a good measure of market efficiency. Even in a market without entry barriers, variety might be too

large or too small (Dixit and Stiglitz, 1977). Moreover, an increase in the number of products may also hinder competition if it reduces market transparency and increases switching costs.

To analyse the pricing strategies of firms, we focus on a subset of contracts – contracts with fixed and variable retail prices with a limited duration of one year for both green and grey electricity. The **variance in retail prices** across retailers also offers information about the degree of competition (see Section 3). Large price differences may be a sign of lack of transparency and difficulties for consumers to compare prices, but it can also be related to consumer inertia (ACER/CEER, 2015). In the case of homogeneous markets with search costs, the price spanned by the lowest and the highest prices can be used as an indicator for the intensity of competition. There is typically an inverse u-shaped relationship between competition and price span. A lower price span could indicate very intense competition but also tacit collusion. We look, therefore, also at the evolution of the variance in retail prices over time. Models with search cost and homogenous goods find that in equilibrium, firms randomize prices, and that there is no clear price leader that is always the cheapest (hence, there is some leap-frogging). If a single firm is always the price leader, then this simple search model does not hold, and there are (perceived) quality differences between firms.

As indicator for the intensity of price competition we look at **gross retail margins**. In a perfectly competitive market with homogenous products, gross retail margins are equal to the marginal costs of retailing, leaving no room for surplus profits. This is, however, no longer the case if retailers have some market power, for instance because products are (perceived as being) differentiated. We estimate the gross margins in the Dutch retail energy market by comparing the retail prices for a subset of product types with the relevant wholesale price. We find the corresponding wholesale price by matching the duration of the retail contract with the wholesale contract.¹⁴ Following Von der Fehr and Hansen (2009), we estimate the following equation:

$$p_t^r = \beta_0 + \beta_1 p_t^w + \beta_2 p_{t-1}^r + \varepsilon_t \tag{1}$$

where p_t^r and p_t^w are the retail and wholesale price at month t , and p_{t-1}^r the retail price in the previous month and ε_t the error term. We assume that marginal retail costs have not changed significantly. In a steady-state situation $p_t^r = p_{t-1}^r = p^r$, and ignoring the error term, we are able to write the retail price as a function of the wholesale price:

$$p^r = \frac{\beta_0}{1-\beta_2} + \frac{\beta_1}{1-\beta_2} p^w, \tag{2}$$

which means that in the long run the retail price consists of a constant plus fraction of the wholesale price. The relative mark-up can now be determined as follows:

$$\frac{p^r}{p^w} = \frac{\beta_0}{1-\beta_2} \frac{1}{p^w} + \frac{\beta_1}{1-\beta_2}. \tag{3}$$

In addition, we analyse the symmetry in the pass-through of changes in wholesale costs to the retail prices, as was done by others for some other retail markets (see Section 3). Using the error-terms of the long-term cointegration equation between the retail price and the wholesale price,

$$p_t^r = \beta_0 + \beta_1 p_t^w + \varepsilon_{LTt}, \tag{4}$$

we estimate an error-correction model in order to determine how changes in the wholesale price affect changes in the retail price. We estimate the following relationship:

¹⁴ For 1-year fixed price contracts, the relevant wholesale price is the 1-year forward price at the time the retail product is sold. As retailers generally update the prices in their variable-price contracts every quarter, we assume that the relevant wholesale price for these contracts is the 1-quarter forward price.

$$\Delta p_t^r = \beta_0 + \beta_1 \Delta p_t^w + \beta_2 \varepsilon_{LT,t-1}^+ + \beta_3 \varepsilon_{LT,t-1}^- + \varepsilon_t^r, \tag{5}$$

where Δp_t^r is the first difference of the retail price, Δp_t^w is the first difference of the wholesale price, $\varepsilon_{LT,t-1}^+$ is the error term of the cointegration equation if it has a positive value and $\varepsilon_{LT,t-1}^-$ error term of the cointegration equation if it has a negative value. The hypothesis is that the coefficients β_2 and β_3 are both negative. If $\varepsilon_{LT,t-1}$ is positive, the actual retail price is above the long-term estimation and one may expect that the price will go down. Otherwise, if $\varepsilon_{LT,t-1}$ is negative, the actual retail is below the prediction based on the long-term estimation, and as a result one may expect that the price will go up.¹⁵ If the upward and downward effects of the wholesale price on the retail price are symmetric, then coefficients β_2 and β_3 should be equal.

Finally, we look at **consumers' behaviour**. A first indicator is the number of complaints filed by consumers at the Dutch Court of Arbitration regarding energy retailers. As consumers become more satisfied with the functioning of the retail market, we expect this number to decline. The second indicator is the switching rate, the yearly number of consumers choosing a different retailer. There is no monotonic relationship between switching rates and competition intensity as in both a market with perfect competition (and hence equal prices) and a market without any competition (i.e. a monopolistic market), consumers will never switch. In combination with information about price differences, it may give some insight into the search intensity of consumers.

4.2. Data

The analysis relies mainly on a dataset on the retail energy market collected by the Authority for Consumers & Markets (ACM), which contains monthly prices for all products offered in the Dutch retail electricity markets over the period 2008–2014. In addition we use data from other Dutch agencies (Dutch Court of Arbitration, CertiQ and Vectis), Bloomberg (for wholesale electricity prices), and other policy reports (Market Response, 2014; Mulder, 2015; several monitoring reports by the ACM).

The main retail data set contains 11.000 observations of new price-product combinations offered by the 32 retailers that operated in the Dutch market over the sample period (Jan 2008-Dec 2014). For this study, we limit ourselves to electricity contracts offered to households. Hence, we do not look at interaction with the retail gas market¹⁶ and neglect contracts for smaller industrial or commercial consumers.

This data set does not contain information when specific contracts are withdrawn from the retail market. We therefore assume that each price-contract combination will remain available on the retail market for six months, unless it is being replaced at an earlier moment by an identical product offered by the same retailer at a different price level. Across time, products are assumed to be identical, if they are sold under the same (commercial) name or, if almost all contract specifications are identical and for a window of ca. 3 months before and after the newer contract, no closer match exists.¹⁷ Contracts are mainly classified by

¹⁵ Because in that case, ε_{LTt} is negative, a negative coefficient is required to obtain a positive effect on the retail price.

¹⁶ Most retailers offer dual fuel contracts. However, the conditions (price, type of product) for the electricity product are not fundamentally different from single fuel electricity contracts. In contrast to the UK market, dual fuel contracts already existed before the liberalization, and there is no incumbent gas retailer, that acted as a new entrant in the electricity retail market.

¹⁷ Commercial product names might change every few years for what are essentially identical products. When we build our time series we try to follow products across those name changes. Even if a new commercial product is introduced, old commercial products might be phased out only gradually (e.g. by being available only for existing customers). In that case we use the price of the newly introduced product. Contract prices are often adjusted at regular intervals, which allows us to match different contracts more easily over time.

contract duration, pricing flexibility (fixed or variable), primary fuel, and sales channel. Sometimes those specifications are insufficient to uniquely determine a specific contract and in these cases individual contract specifications are checked on the websites of retailers. This data is codified to construct a multi-dimensional panel data (time, retailer, and contract type). Given the frequency of adjustment, we use a monthly resolution for the time variable. Note that the contract types themselves could be considered as multi-dimensional variables describing contract duration, pricing flexibility, primary fuel etc. Almost all contracts are sold nationwide with a uniform price, so delivery location is not a differentiating factor.

The pricing of retail contracts generally are non-linear and consist of a yearly fixed term f (in EUR / Yr.) and a variable energy component v (in EUR/MWh).¹⁸ In order to make contracts comparable, we calculate the average electricity price (EUR/MWh) for an average household that consumes 3.2 MWh/year by using the following formula:

$$p = \frac{f}{3.2} + v. \quad (5)$$

The importance of the fixed component f in the electricity price has increased over time from ca. 20 EUR/Yr. to ca. 35 EUR/Yr. The fixed component increased for all retailers, and is about 10% of the overall bill.¹⁹

In order to compare prices across retailers, for each retailer four composite benchmark products are created: a fixed 1 year green contract, a fixed 1 year grey contract, a variable green contract and a variable grey contract.²⁰ For the composite benchmark product, we neglect contracts representing short duration offers, and contracts that are not available to all consumers or specific promotions.²¹ If a retailer offers contracts with similar specifications at a given moment in time, but with pricing formulas targeting households with different consumption volume (by offering a menu of contracts with different fixed and variable pricing components), the cheapest contract for a yearly consumption of 3.2 MWh is considered.²² For the variable-price contracts, we combine contracts with an unlimited duration (which can be cancelled at no costs) and contracts of one-year duration (which may require a cancellation fee when contracts were finished before the end

¹⁸ Only a small fraction of consumers opts for “Time-of-Use” pricing (which requires a special meter, and has a different price setting at night and day). We therefore neglect those types of contracts.

¹⁹ If only some retailers would adjust their tariff structure, then this could indicate market segmentation: Some retailers focus on large households, while others focus on the smaller ones. As all retailers are adjusting their tariffs, those adjustments probably reflect a better alignment of the fixed tariff with the per household fixed cost (billing, communication, and average debt collection). Electricity is, until now, almost never used for heating or cooking purposes, so demand across households does not vary as much as in some other countries, and segmentation might therefore be less valuable.

²⁰ In the variable-price contracts, generally the prices are adapted every quarter or half year. As a result, this type of contracts can also be called fixed quarter or half-year contracts.

²¹ We discard for instance contracts offered to consumer collectives, special prices offered to retention consumers, contracts with best-price guarantees, transitional contracts during mergers, contracts with additional services or applications (like smart meters), and any exotic pricing formulas (only decreasing, temperature dependent, wind speed dependent, a mixture of fixed and flexible), or targeting specific users (for charging electric cars). By neglecting some contracts, we might underestimate the level of price competition, so our results are conservative. Sales to consumers’ collectives were observed in some years and for a few retailers, at prices close to the other contracts offered by that retailer.

²² Few firms offer multiple pricing formulas: One incumbent firm offered two additional tariffs for variable price contracts for a duration of 10 years. The additional contracts are optimal for consumption levels below ca. 1.5 MWh/Year and above 6.5 MWh/Year. Another incumbent firm offered in 2010 three additional tariffs for fixed priced green electricity for a duration up to 1.5 years.

of the contract).²³ As the composite price for the green products, we take the *cheapest* available contract for green electricity for each retailer. By selecting the cheapest contract, which is often based on Nordic hydropower, contracts become more comparable.²⁴

From our database, we cannot observe the actual prices that consumers pay, as there are often promotional offers, and many promotions are not fully registered in the database. Those promotions could take the form of an upfront switching bonus, an introductory price for a limited duration, or a loyalty price (where prices decrease over time), and often depend on the sales channel (e.g. door-to-door, comparison website, own website, in a physical shop).

In order to estimate the retail margins, we use two benchmark products for wholesale electricity prices. For the variable-price contracts we take a quarterly forward contract, since retailers usually update these prices every 3 months. For the 1-year fixed-price retail contracts, we take the 1-year forward contract.²⁵ Forward contracts are traded on a daily basis and might fluctuate considerably from day to day given limited liquidity on some days. We therefore use the average closing price during a ten-day window around the first day of the month. Since retail prices have to be submitted to the regulator for assessment one month before the energy is delivered to consumers, they can only be based on market information that is at least one month old. We therefore compare retail price with wholesale prices that are lagged one month.²⁶

5. Results and discussion

5.1. Market structure

The Dutch retail market remains fairly concentrated in spite of a number of entrants. With an HHI concentration index of 2200, it is more concentrated than the Dutch wholesale electricity market (Fig. 1). Several retail companies use multiple-brand strategies. For instance Oxxio, which started as an entrant, is now a one of ENECO's brands,²⁷ while Essent/RWE owns a second brand, EnergieDirect, which sells only through internet. Also GreenChoice belongs to the ENECO group (See Fig. 2). All major brands are active in all regions, and retail competition is national in scale.

The three largest retailers, the incumbents Essent, Nuon, and Eneco with their affiliated brands, serve about 80% of the market. Essent and Nuon were privatized and acquired in 2009 by RWE (Germany) and Vattenfall (Sweden), respectively. Some retailers are vertically integrated: RWE and Vattenfall are major international players in the wholesale market, but Eneco owns only limited production capacity. As it was not yet fully unbundled, it provided retail as well as distribution services through the network company Stedin.²⁸ Although Engie and

²³ One-year contracts with variable price form only a small fraction of this group. Most contracts with variable prices have an unlimited duration. Note that a contract with variable prices and a fixed duration may be attractive to consumers because of a relative low initial price, but after the contract has been signed the retailer has the option to raise the price, making the contract less attractive ex-post.

²⁴ Retailers typically offer a vertically differentiated set of green contracts ranging from Nordic hydro (the cheapest), to European Wind, and Dutch wind energy (the most expensive).

²⁵ For both wholesale prices, we use OTC prices. Differences between the OTC price and the exchange price are negligible for the period under consideration.

²⁶ Although retailers may also make some costs for acquiring Green Certificates of Origin, there is no publicly available information on these prices.

²⁷ Eneco is one of the incumbent energy suppliers, until recently vertically integrated with the network company Stedin. Eneco used to be owned by the municipalities and regions (Provinces), but recently these shareholders have decided to sell their shares.

²⁸ Eneco unbundled in 2017 after a long process in which it (unsuccessfully) appealed the legislation imposing unbundling.

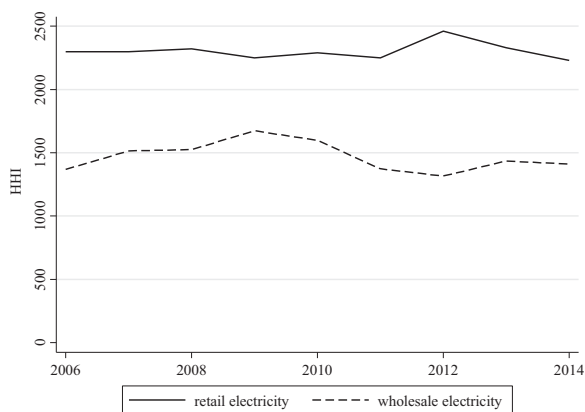


Fig. 1. HHI of Dutch electricity wholesale and retail market, 2006–2014. Source: ACM

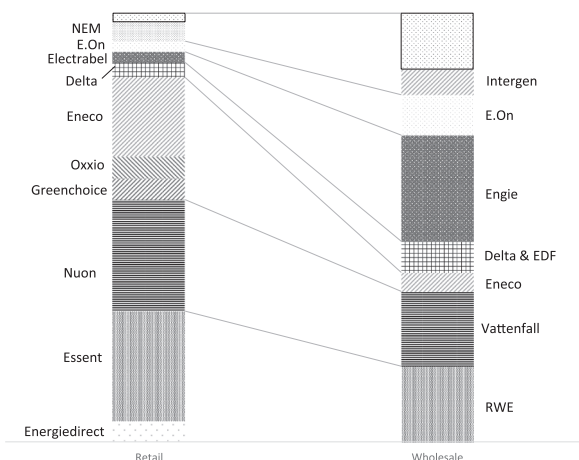


Fig. 2. Market shares in Dutch electricity market: retail and wholesale 2013. Sources: Retail data: Market Response (2014), Wholesale data (Mulder, 2015)

E.ON are large international energy firms, they focus in the Netherlands only on production, and have small retail market shares. One relatively successful entrant, Nederlandse Energiemaatschappij (NEM) still has low market shares, while other entrants have been (partially) acquired by one of the incumbents (Oxxio, Greenchoice).

5.2. Innovation in products

Since the opening of the Dutch retail energy market both green (100% from renewable energy sources) and grey electricity (from a mixture of energy sources) are offered. The number of product types has strongly increased (Fig. 3). Currently, consumers can choose among ca. 50 green and 20 grey products offered by the 7 main brands. Hence, on average each brand offers 10 different products. Product proliferation is driven by two developments: quality differentiation in green electricity and innovation in contracting forms.

Retailers have to provide a label detailing the origin of their electricity by relying on Certificates of Origins (CoO), which is a European-wide tradeable certification system for electricity production. Retailers can bundle CoOs with wholesale electricity to construct green retail contracts (100% from renewable energy sources) and grey electricity (from a mixture of energy sources). The market share of green electricity has increased significantly. In 2014, about two thirds of electricity supplied to residential households was green, while in 2008 this share was less than one third (ACM, 2014). For green products, Dutch retailers depend strongly on the import of CoOs from for instance

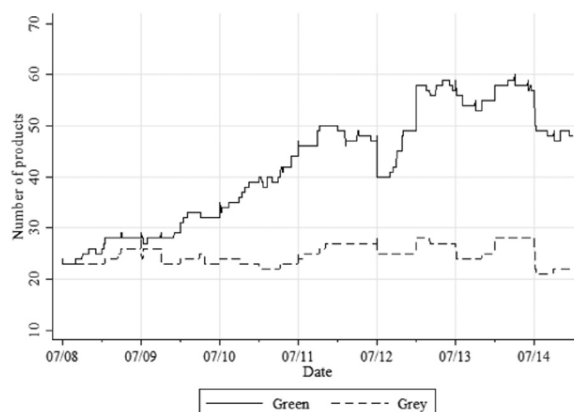


Fig. 3. Number of products offered by the 7 main brands, by type (Green/Grey), 2008–2014. Source: ACM

Norway.²⁹

From around 2011, green electricity becomes a quality-differentiated product with plain green electricity (based mainly on Nordic hydro-electricity), and premium products such as European wind, Dutch wind or Dutch solar. Consumers are prepared to pay a premium for those higher quality products. Several action committees organized information campaigns about differences in green electricity and tried for instance to shame (local) governments into buying ‘more honest (Dutch) green electricity’.³⁰ This increased product differentiation is likely to affect competition, as it is linked to specific the location and technologies of production plants and can therefore not be readily copied by other retailers.³¹ Fig. 4 shows the number of major brands offering different quality levels of green and grey electricity products.

Another dimension of product differentiation is pricing structure. Two pricing structures are offered by all brands: variable price contracts and fixed price contracts. Variable-price contracts are very similar to the pre-liberalization types of contracts where prices are adjusted on a regular 3–6 months schedule. The variable prices are not explicitly indexed on wholesale spot market prices, but are set by the retailer (although still subject to the Safety Net regulation).³² With fixed-price contracts, households pay a fixed electricity price for a specific duration (typically 1 or 3 years). Contracts with an undetermined duration always use variable prices. If consumers do not undertake any action before the end of a contracting period, the contract is automatically transformed into a variable price contract. Other novel types of pricing structures are introduced by a subset of brands (Fig. 5). Those contracts are often part of large marketing campaigns and involve trademarked products.³³

²⁹ About one third of national electricity consumption (industry and retail) is green, while only 10% of national electricity production is green (CertiQ, 2015). The Netherlands belongs to a small group of countries which dominate the demand for guarantees of origin in Europe. Other countries which also consume a lot of renewable energy through these certificates are Belgium, Germany, Sweden, Switzerland and Italy (BEUC, 2016).

³⁰ Since 2013, national newspapers report regularly on the issue of tampered green power, or ‘sjoemelstroom’.

³¹ Product differentiation puts a premium on Dutch green electricity and wind & solar electricity. Producers with a large Dutch fossil fuel park (Essent, Nuon), and with Nordic Hydro power plants (Vattenfall), might find it difficult to offer those products. Note that, unlike some other countries, German regulation restricts the use of Certificates of Origin if companies receive German subsidies. Hence, German wind does not provide competitive pressure in the Netherlands.

³² Contracts which are indexed on the spot market have been more popular in Norway. Norway is however a hydro based system, and in the short to medium run wholesale prices are more stable than in the Netherlands. This could explain why those contracts did become more popular.

³³ One typical contract is an option contract in which prices are variable but cannot increase above their initial price. Hence, those contracts include an

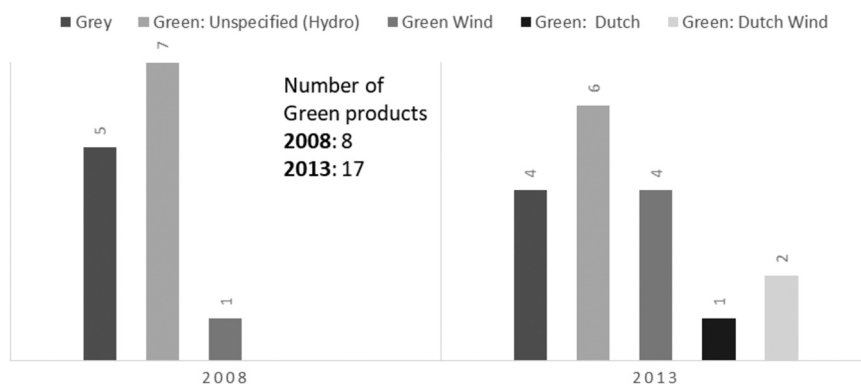


Fig. 4. Number of brands offering green products (Largest 7 Brands), 2008 vs. 2013. Source: ACM

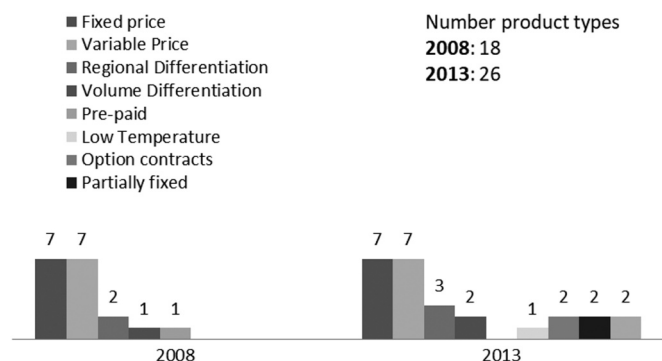


Fig. 5. Number of brands offering different contracting types (Largest 7 Brands), 2008 vs. 2013. Source: ACM

In some countries electricity retailers differentiate prices based on consumer location, consumption volume and payment mechanism, but not in the Netherlands. Regional price discrimination is not very common and if it is used, then it is part of targeted local marketing efforts (e.g. door-to-door campaign) and prices are not posted publicly. A few retailers offer volume differentiated contracts for one or two products. There is almost no price differentiation according to payment system. Direct-debit consumers receive a reduction of 1 or 2 EUR on their monthly bill, and pre-paid contracts are almost non-existent. More recently, retailers start bundling energy contracts with other services or devices (smart thermostats, tablets, energy audits, insulation, etc.).

5.3. Price comparison websites

Since the start of the liberalization comparison websites have played an important role in the retail energy market.³⁴ However, as products have become more numerous and more complex and as door-to-door

(footnote continued)

explicit price cap. Other contracts that affect household's risk are also offered: a linear combination of a fixed and variable price contract (which in effect dampens price fluctuations), prices that drop with outside temperature (and hedge against cold winters) or with higher wind speeds (which hedges the retailer, as it only offers low retail prices when wholesale prices are low). In fact, the last two contracts are the only ones which explicitly link the retail price to the wholesale market conditions. The contract indexed on the outside temperature hedges the volume risks during colder winter months (and thus leads to negative correlation between the wholesale and the retail price).

³⁴ This section is based on monitoring reports frequently published by the energy regulator (DTe/NMa 2004, 2005, 2006, 2007, 2010 and 2011; ACM (2014 and 2015).

selling and tele marketing are no longer as effective, comparison websites have become crucial for consumers to make well-informed decisions, and for retailers' overall strategies.³⁵

Although all comparison websites are commercial entities, different market models are used. A large number of comparison websites are paid by the retailer for every consumer that signs up to a new contract.³⁶ Advertisement driven comparison websites do not have commercial links with the retailers, but generate revenue by the publicity on their websites and collect information of retailers themselves. As they do not have commercial links with retailers, they do not offer special deals.

In order to facilitate the retail market, comparison sites should not treat some of retailers preferentially and offer a sufficiently wide variety of products. A retailer could receive preferential treatment if certain contracts of competing retailers are not offered. Early on ACM would monitor whether all official products were offered on the comparison site, while neglecting the special deal contracts. However, as the total number of contracts has increased, and the number of special deals in particular, this was no longer feasible. ACM therefore (irregularly) monitors the contractual relations between retailers and comparison sites and looks at overall product variety.

The focus of comparison websites has shifted from providing price information on standardized products, to providing additional information on product types, the quality of retailers, and special contracting conditions. Most comparison sites provide correct information on the different pricing components and the yearly bill for customers. On some of the other dimensions, such as the specific conditions for special deals, transparency is lacking.³⁷ Responsibility for providing this information is often shared between the retailer and the comparison site.

5.4. Pricing strategies and price dispersion

Our data shows that retailers use different pricing strategies. The frequency of price adjustments differs across firms. Some retailers

³⁵ In the press door-to-door sales of energy products received bad publicity. In October 2009 a strict telemarketing law with an opt-out rule was introduced in the Netherlands, Stb. 2009, 129.

³⁶ Typically those websites provide a direct link to the product on the website of the retailer, or they allow consumers to contract directly through their own website interface. The sites have a contractual relationship with one or several retailers, and are therefore able to provide special deals that are not present on the retailers' website. The most prominent special deals are cash-back offers (e.g. lump-sum payments up to 200 EUR) or reduced rates for an introductory period.

³⁷ Sometimes cash backs will only be paid out if the consumer would stay longer than the contract duration. Once the promotion is finished, consumers might end up with a higher priced "sleepers' contract".

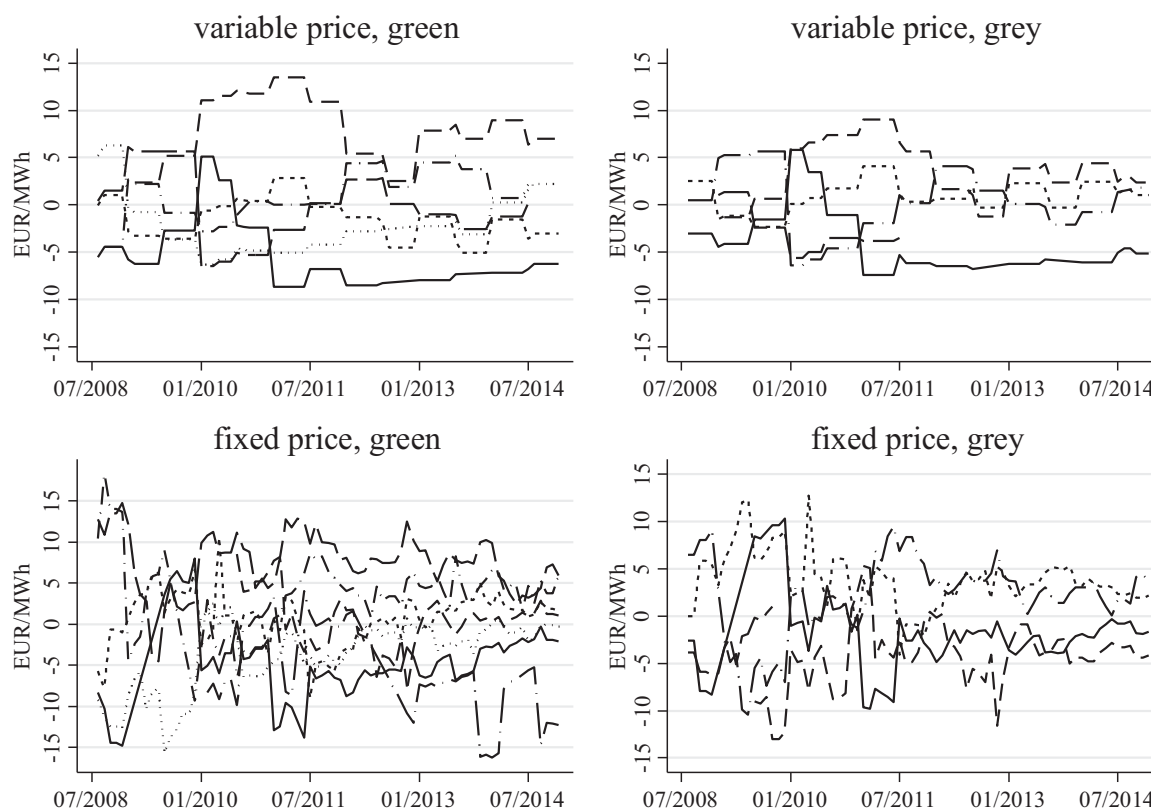


Fig. 6. Price deviations from average price, by product type and month, 2008–2014. Source: ACM; own calculations

frequently introduce new prices, while others maintain their prices for a longer period of time (Fig. 6). This holds for variable and fixed price contracts and for green and grey products. We also see that firms often undercut each other, and that there is no clear first mover. For the fixed price contracts, several firms have the cheapest offer for short periods, so there is also no consistent price leader.

Overall price dispersion appears rather constant over time, although there is a slight decline for grey fixed price contracts. The difference between the lowest and highest priced contract for green electricity was about 15 euro/MWh in 2014. For grey electricity this difference is much smaller. Measuring price dispersion by the standard deviation and the difference between the highest and lowest price, we find that price dispersion has declined strongly for fixed-price products, both green and grey (Fig. 7). For variable-price products, however, the price dispersion did not structurally change.³⁸ The initial level of the standard deviation for fixed-price contracts was relatively high, in particular for grey products. In 2014, the price dispersion for both types of products was fairly similar.

5.5. Retail margins

Retail prices have declined over the past years, but this also holds to some extent for the wholesale prices (Fig. 8). In order to determine how the retail margins have developed, we conduct a time-series regression analysis as described in Section 4.³⁹ Both the 1-year fixed average retail

³⁸ When we regress the price dispersion on a trend variable, then the trend coefficient is negative and significant at a 1% level for the fixed retail prices, but highly insignificant for the variable retail prices.

³⁹ Besides the wholesale costs of the electricity, retailers also need to make some costs for acquiring green certificates. The price of these certificates appear to be only a few eurocents/MWh, except for specific types of green certificates, such as Dutch wind, which prices may be a few euro/MWh.

price as well as the yearly forward wholesale price are cointegrated non-stationary series (see Appendix A).⁴⁰ This allows us to include the levels of these prices in the regression equation. We conduct this analysis for the group of all 1-year fixed products over the period 2009–2014 as well as for the subgroups of green and grey products, and all products in two different sub-periods (Table 2).

We find that the ratio between the retail price and the wholesale price is about 1.5, which means that the gross mark-up for retailers is on average around 50% (Table 3). The mark-up is higher for green than for grey products and has decreased over time. Given an average annual consumption of 3.5 MWh, the yearly gross margin is about 90 EUR per household over the full sample.⁴¹ It is less for grey than for green products (Columns 2 and 3), and has decreased over time (Columns 4 and 5). Extrapolating the time trend of Table 3, we find that the savings for the average household are about 3 EUR per year on a total electricity bill of about 260 EUR. Of course, on individual level these benefits may be much larger.

5.6. Pass-through of wholesale costs

The previous analysis shows a significant long-term relation between the 1-year fixed retail price and 1-year forward wholesale price. We now look at short term dynamics. Monthly changes in the retail price are positively related with changes in the wholesale price, but this effect is not significant (Table 4). Deviations from the long-term price relationship affect the retail price. Both coefficients of the error term from the long-term relation have the expected, negative size, while the

⁴⁰ The series for the variable retail prices and the quarterly forward prices, however, are not cointegrated.

⁴¹ The gross margin is used to cover the costs of administration, marketing, and price and credit risks. The remainder is the net margin, i.e. the retailer's profits.

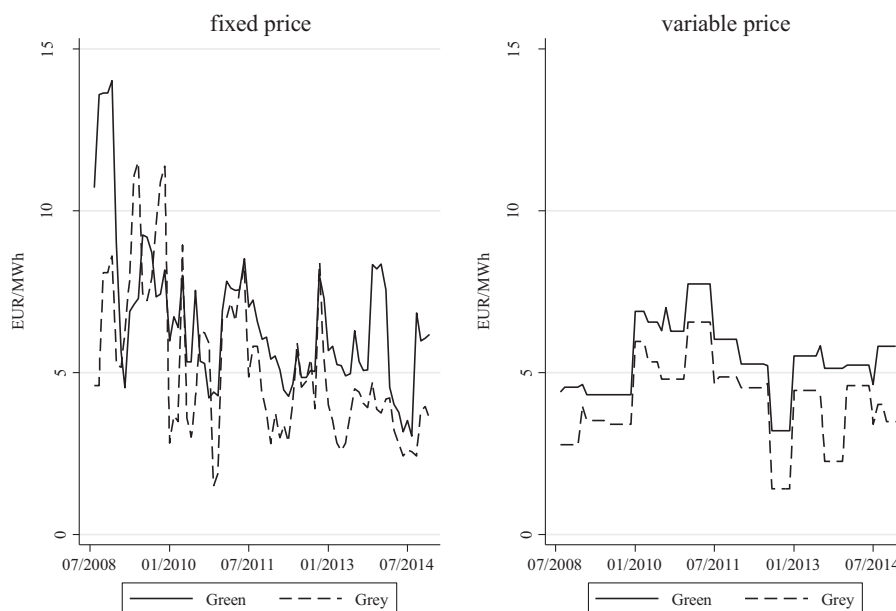


Fig. 7. Price dispersion: standard deviation of prices across firms, by product type, 2008–2014. Source: ACM; own calculations

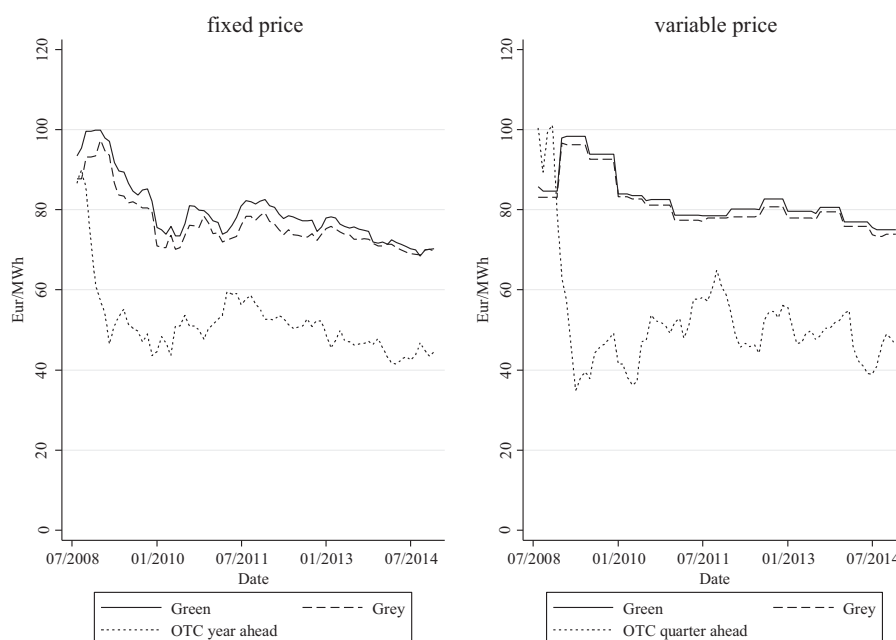


Fig. 8. Average retail price versus relevant wholesale price, by product type, 2008–2014. Source: retail prices: ACM; wholesale prices: Bloomberg

joint effect is statistically significant as well. However, we do not find evidence of asymmetric pass-through of wholesale costs, as we reject the hypothesis that the coefficients for the positive and negative residuals are different.

5.7. Consumers

Consumers have become more satisfied with the energy retail market at least as reflected in the strong decline in the number of complaints at the Dutch Court of Arbitration (Fig. 9). Immediately after the full opening of the retail market in 2004, the number of complaints rose sharply to more than 3000 in 2005. These complaints were mostly related to problems with the switching process (NMa, 2008). Triggered by these complaints new measures on information provision were

introduced (guidelines, code of conduct as shown in Table 1).

Annual switching rate increased gradually from about 5% per year to almost 14% in 2014 (see Fig. 10). Compared to Dutch health-care insurance market (which was liberalized in 2006), energy consumers are fairly active. The degree of switching in the Dutch retail energy market is higher than in several other European countries, but lower than in the UK, Australia and New Zealand (VAASA/ETT, 2012; ACER/CEER, 2015). Although the annual switching rate has increased, a significant amount of households (40%) has never switched supplier (ACM, 2015).

6. Conclusions and policy implications

More than a decade since its liberalization, the Dutch electricity

Table 2
Retail price-regression for fixed-price contracts.

	(1)	(2)	(3)	(4)	(5)
Time Period	09–14	09–14	09–14	09–11	12–14
Green/Grey	Both	Green	Grey	Both	Both
Lag Retail Price	0.853*** (0.0139)	0.799*** (0.0215)	0.754*** (0.0292)	0.784*** (0.0260)	0.732*** (0.0301)
Wholesale Price	0.179*** (0.0240)	0.216*** (0.0303)	0.198*** (0.0387)	0.230*** (0.0440)	0.170*** (0.0303)
Constant	2.069 (1.335)	4.605*** (1.748)	8.307*** (2.489)	4.878 (3.029)	11.45*** (1.832)
# Observations	725	444	281	338	387
R-squared		0.818	0.752	0.746	0.758
# Products	12	7	5	12	11

Standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1; with fixed effects.

Table 3
Retail margins by contract type for different periods (Fixed price contracts).

	(1)	(2)	(3)	(4)	(5)
Time Period	09–14	09–14	09–14	09–11	12–14
Green / Grey	Both	Green	Grey	Both	Both
Fixed mark-up (€)	14	21	34	23	42
Pass-through ratio	1.22	1.07	0.80	1.07	0.64
Retail-wholesale price ratio	1.49	1.51	1.45	1.50	1.46
Gross margin (€/household/year)	89	94	82	91	83

Table 4
Error-correction regression to test asymmetric pass-through of 1-year forward wholesale prices to 1-year fixed retail prices.

Diff. retail price	Coefficient
Diff. wholesale price	0.0496 (0.0445)
residual + (t-1)	-0.142*** (0.0503)
residual - (t-1)	-0.279*** (0.0936)
Constant	-0.381 (0.267)
Observations	82
R-squared	0.284
Wald test on residuals of long-term relation (p-value)	
- joint significance	0.00
- different in size	0.26

Standard errors in parentheses; ***p < 0.01, ** p < 0.05, * p < 0.1.

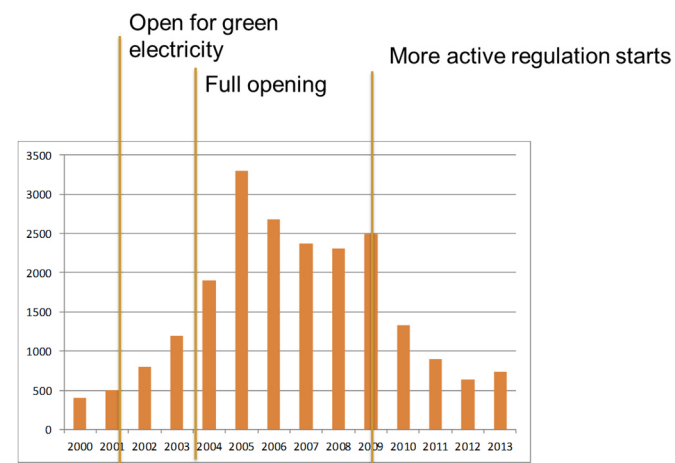


Fig. 9. Number of complaints of consumers regarding retail energy market. Source: Dutch Court of Arbitration (annual reports)

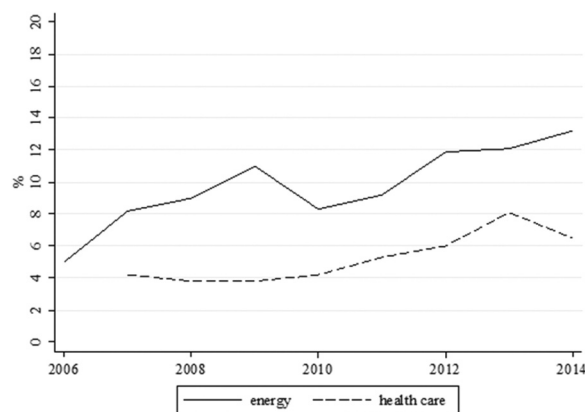


Fig. 10. Annual percentage of switching consumers in energy and health care. Source: ACM, Vectis

retail market has matured: the market has become transparent while consumers can switch more easily from supplier and product. Switching rates are among the highest in Europe and continue to increase. The number of complaints is back to pre-liberalization levels, from which we conclude that consumer confidence has increased. Product innovation is strong, in particular for green energy. As retailers spend much efforts in explaining the essential product characteristics, comparison websites have improved information provision, and consumers are willing to pay a premium for green electricity, new products are likely to correspond to the tastes of marginal consumers. Innovation is therefore likely to have positive welfare effects, for a substantial fraction of active (and thus marginal) households, although we cannot rule out that it harmed inactive consumer who did not fully experience the benefits of competition. Gross retail margins have decreased slightly, although this monetary benefit is estimated at only a few euros per household per year.

Market concentration remains fairly high with the three largest retailers having 80% market share and one surviving entrant with a market share above 5%. A large fraction of consumers never switched supplier and remained “dormant”, as in many other European markets. Dormant consumers remain on default offers, which are variable price contracts. Those contracts are more expensive than other contracts in the market, in spite of price supervision. The Dutch regulator surveys all new retail prices before market introduction in order to prevent too high retail prices. Although there has been a debate to phase out this regulation (IEA, 2014), it is still in place and operational: the regulator still intervenes a few times each year.

Many active consumers switched to green energy products. Gross retail margins are higher for green electricity, although the additional production costs are small, and price dispersion has increased for green products.⁴² This indicates that the green retail market is less competitive and retailers are able to capture the higher willingness-to-pay of consumers for green products (as in OECD, 2014).

Experiences in the Dutch retail market differ from those in other countries. As there is no incumbent gas retailer in the Netherlands, dual fuel contracts were not a driver of competition as in the UK. Although incumbent retailers started as regional monopolies, regional price discrimination was never an issue and retail competition is national. This might be due to the relatively homogenous Dutch marketing landscape. In the Netherlands, competition seems to be based on product innovation (as suggested by Joskow, 2000) and not on prices as in Norway. This may be caused by differences in technology and market concentration. Almost all Norwegian electricity is based on green Norwegian hydro, there is thus less room for product differentiation.

⁴² Given the subsidies for green electricity, the price of Certificates of Origins is relatively small.

The Norwegian electricity market is much less concentrated, which could make national marketing campaigns for new products less effective. The gross retail margin is considerably higher in the Netherlands than in Norway. This might indicate softer (price) competition in the Dutch retail market, but could also be related to differences in non-energy related retail costs.

Hence, although there are many parallel developments across retail markets, the effectiveness of behavioural and structural regulatory measure depends also on regional and cultural differences and are path

Appendix A

See Tables A.1 and A.2

Table A.1

Augmented Dickey-Fuller test on unit root^{*}.

	Retail prices		Wholesale prices	
	Variable	Fixed	Quarterly forward	Yearly forward
Level	−2.5	−1.9	−2.2	−2.2
1st difference	−9.2	−7.0	−7.0	−8.2

^{*} critical values: 1%: −4.08; 5%: −3.47; 10%: −3.2.

Table A.2

Results of Johansen cointegration test between retail and wholesale prices.

Maximum rank	Trace statistic	5% critical value
<i>Variable retail price and quarterly-forward wholesale price</i>		
0	42.0	15.4
1	3.9	3.8
<i>Fixed retail price and yearly forward wholesale price</i>		
0	19.4	15.4
1	2.7 [*]	3.8

References

- ACCC, 2018. Retail Electricity Pricing Inquiry—Final Report June 2018. Australian Competition and Consumer Commission.
- ACER/CEER, 2015. Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2014, Ljubljana/Brussels.
- ACM, 2014. Trendrapportage marktwerking en consumentenvertrouwen in de energiemarkt - tweede halfjaar 2013. The Hague, April.
- ACM, 2015. Trendrapportage marktwerking en consumentenvertrouwen in de energiemarkt - tweede halfjaar 2014. The Hague, April.
- ACM, 2016,2017. Jaarverslag.
- APEC, 2017. New Zealand: Electricity Retail Services Market Reform (No. APEC#217-SE-01. 11). Asia-Pacific Economic Cooperation, Policy Support Unit. Retrieved from <<https://www.apec.org/Publications/2017/06/New-Zealand-Electricity-Retail-Services-Market-Reform>>.
- Armstrong, 2014. Search and rip-off externalities. University of Oxford. ISSN 1471-0498.
- BEUC, 2016. Current practices in consumer driven green electricity markets. The European Consumer Organisation, January 2016.
- Borenstein, S., Shepard, A., 2002. Sticky prices, inventories, and market power in wholesale gasoline markets. *RAND J. Econ.* 116–139.
- Borenstein, S., 1991. Selling costs and switching costs: explaining retail gasoline margins. *RAND J. Econ.* 22 (3), 354–369. <https://doi.org/10.2307/2601052>.
- Cabral, L., Fishman, A., 2012. Business as usual: a consumer search theory of sticky prices and asymmetric price adjustment. *Int. J. Ind. Organ.* 30 (4), 371–376.
- CertiQ, 2015. Annual reports CertiQ.
- CMA, 2016. Energy market investigation Summary of final report. Competition & Markets Authority, 24 June 2016.
- Diamond, P.A., 1971. A model of price adjustment. *J. Econ. Theory* 3 (2), 158–168.
- Dixit, A.K., Stiglitz, J.E., 1977. Monopolistic competition and optimum product diversity. *Am. Econ. Rev.* 67 (3), 297–308.
- DTe/NMa, 2004, 2005, 2006, 2007, 2010, 2011. Energieprijzvergelijkers: Onderzoek naar transparantie van internetvergelijkers voor elektriciteit en gas. Multiple years. The Hague.
- Eckert, A., 2013. Empirical studies of gasoline retailing: a guide to the literature. *J. Econ. Surv.* 27, 140–166.
- IEA, 2014. Energy Policies of IEA countries: the Netherlands; 2014 Review. Paris.
- Joskow, PAUL., 2000. Why do we need electricity retailers? Or, can you get it cheaper wholesale? Working Paper. MIT Center for Energy and Environmental Policy Research. <<http://dspace.mit.edu/handle/1721.1/44965>>.
- Lewis, M.S., Marvel, H.P., 2011. When do consumers search? *J. Ind. Econ.* 59 (3), 457–483. <https://doi.org/10.1111/j.1467-6451.2011.00459.x>.
- Littlechild, S.C., 2000. Why We Need Electricity Retailers: A Reply to Joskow on Wholesale Price Pass-Through. Cambridge Working Papers in Economics. Nr.008 Faculty of Economics, University of Cambridge.
- Littlechild, S.C., 2018. The regulation of retail competition in US residential electricity markets. EPRG, Cambridge. Retrieved from <https://www.eprg.group.cam.ac.uk/wp-content/uploads/2018/03/S.-Littlechild_28-Feb-2018.pdf>.
- Market Response, 2014. Stand van zaken op de energiemarkt - Onderzoek energiemarkt consumenten - Rapportage kerncijfers - Tweede halfjaar 2013.
- Meyer, J., von Cramon-Taubadel, S., 2004. Asymmetric price transmission: a survey. *J. Agric. Econ.* 55 (3), 581–611. <https://doi.org/10.1111/j.1477-9552.2004.tb00116.x>.
- Mirza, F.M., Bergland, O., 2012. Pass-through of wholesale price to the end user retail price in the Norwegian electricity market. *Energy Econ.* 34 (6), 2003–2012.
- Mulder, M., Shestalova, V., 2006. Costs and benefits of vertical separation of the energy distribution industry: the Dutch case. *Compét. Regul. Netw. Ind.* 197–231.
- Mulder, M., 2015. Competition in the Dutch electricity market: an empirical analysis over 2006–2011. *Energy J.* 36 (2), 1–28.
- NMa, 2008. Rapportage naar aanleiding van het onderzoek naar onterechte switches. The Hague, April.
- NMa, 2012a. NMa geeft groen licht voor modelcontract energie, Press release, 6 April.
- NMa, 2012b. Evaluatie Elektriciteitswet 1998 en Gaswet Eindverslag, Den Haag, April.
- Ofgem, 2011a. What can behavioural economics say about GB energy consumers? London.
- Ofgem, 2011b. Do energy bills respond faster to rising costs than falling costs? London, 21 March.
- OECD, 2014. Greening Household Behaviour: Overview from the 2011 Survey - Revised, edition. OECD Publishing: OECD Studies on Environmental Policy and Household Behaviour.
- Peltzman, S., 2000. Prices rise faster than they fall. *J. Political Econ.* 108, 466–502.
- Stahl II, D.O., 1988. Oligopolistic pricing with sequential consumer search. *Am. Econ. Rev.* 79 (4), 700–712.
- Tappata, M., 2009. Rockets and feathers: understanding asymmetric pricing. *RAND J. Econ.* 40 (4), 673–687. <https://doi.org/10.1111/j.1756-2171.2009.00084.x>.
- VAASA/ETT, 2012. World Energy Retail Market Rankings 2012.
- Van Damme, E., 2005. Liberalizing the Dutch electricity market: 1998–2004. *Energy J.* 155–179.
- Von der Fehr, Nils-Henrik M., Hansen, Petter Vegard, 2009. Electricity Retailing in Norway. Department of Economics, University of Oslo (Memorandum 02/2009).
- Wilson, C., Waddams Price, C., 2010. Do Consumers Switch to the Best Supplier? Oxford Economic Papers 62.
- Yang, H., Ye, L., 2008. Search with learning: understanding asymmetric price adjustments. *RAND J. Econ.* 39 (2), 547–564. <https://doi.org/10.1111/j.0741-6261.2008.00027.x>.