Retail pricing, vertical control and competition in the Swedish gasoline market

KONKURRENSVERKET
Swedish Competition Authority

Förord

I Konkurrensverkets uppdrag ingår att främja forskning på konkurrens- och upphandlingsområdet.

Konkurrensverket har gett professorerna Øystein Foros och Frode Steen vid Norges Handelshøyskole i Bergen i uppdrag att, inom ramen för Konkurrensverkets uppdragsforskning, genomföra en generell konkurrensanalys av den svenska detaljhandelsmarknaden för drivmedel med särskilt fokus på prissättning och eventuella priscykler.

Av rapporten framgår att den svenska detaljistmarknaden för drivmedelsförsäljning kännetecknas av en hög grad av vertikal integration där moderbolagen centralt kontrollerar prissättningen utifrån lokala förhållanden för olika försäljningsställen. I den mån det förekommer priscykler, är prisskillnaderna på kort sikt små och betydligt mindre än vad som observerats i jämförbara internationella studier. De geografiska skillnaderna är desto tydligare, med en generellt högre prisnivå och ett mindre tydligt veckomönster i glesbygd samt i Stockholmsområdet. Avslutningsvis noteras att de rekommenderade priser som bolagen offentliggör inte uppvisar någon egentlig variation sinsemellan. De rekommenderade priserna tycks sakna relevans för konsumenter med avseende på var och när det är billigast att tanka, men kan ha betydelse för företagskunder vars rabattavtal är kopplade till de rekommenderade priserna.

Till projektet har knutits en referensgrupp bestående av Richard Friberg (Handelshögskolan i Stockholm), Jon Stenbeck (Motormännens Riksförbund) samt Mattias Ganslandt och Gunilla Rönnholm (Center for European Law & Economics). Från Konkurrensverket har Johannes Erlandsson, Arvid Fredenberg, Lena Fredriksson och Joakim Wallenklint deltagit.

Författarna ansvarar själva för slutsatser och bedömningar i rapporten.

Stockholm, november 2013

Dan Sjöblom
Generaldirektör

Content

Sammanfattning

Bakgrund

Denna rapport är skriven på uppdrag av Konkurrensverket. Rapportens huvudsakliga syfte är att analysera den svenska marknaden för försäljning av drivmedel, framför allt med avseende på huruvida de kortsiktiga priscykler som tidigare studier observerat i flera andra länder också finns på den svenska marknaden.

Disposition

Rapporten inleds med en litteraturöversikt av den akademiska litteraturen inom området. Därefter följer en analys av den svenska marknaden för drivmedelsförsäljning. Analysen utgörs av en deskriptiv analys av mönster för drivmedelsförsäljning i Sverige, en översikt av marknadsstrukturen, samt en beskrivning av hur priserna bestäms på marknaden.

Data

Följande data ligger till grund för analysen:

- Kvalitativ data från intervjuer med stationsföreståndare som Konkurrensverket genomfört under våren 2013.

- Data över pumppriser vid två tidpunkter dagligen, kl 08.00 och kl 16.00, från 190 drivmedelsstationer under år perioden 1 januari till och med 31 december 2012 (totalt antal observationer n=137 676).

- Dagsdata över försäljningsvolymer från samma drivmedelsstationer under samma tidsperiod (n=68 139).

- Data över stationernas närmaste konkurrenter: avstånd (km) samt ägarbolag.

- Data över bolagens rekommenderade priser och kostnader för de viktigaste insatsvarorna.

Litteraturöversikt

Tidigare akademisk litteratur inom området som analyserar långsiktiga förändringar av drivmedelspriser identifierar råoljepriser som den huvudsakliga

drivkraften bakom prissättningen. Över längre tid har det observerats att försäljningspriser på drivmedel justeras snabbare när råoljepriset höjs jämfört med när det sänks. Detta mönster har tidigare observerats också på den svenska marknaden (Asplund *et al.* 2000).

Därutöver diskuteras i den akademiska litteraturen också mer kortsiktiga förändringar av drivmedelspriser som inte relateras till förändringar av råoljepriset. Edgeworthcykler innebär kraftiga prishöjningar som följs av successiva, mer långsamma sänkningar av drivmedelspriserna. Den teoretiska utgångspunkten för Edgeworthcykler presenterades av Maskin och Tirole (1987). Liknande cykler har därefter observerats på flera olika marknader, exempelvis i Norge, Australien, Kanada och USA. Prisförändringarna i Edgeworthcykler ger kunderna möjlighet att segmentera sig själva (enligt en prisdiskriminering baserat på tidpunkt för inköp).

Avslutningsvis finns också litteratur som behandlar marknadsstrukturer och prissättning på drivmedelsmarknader. Generellt observeras i litteraturen olika vertikala ägarförhållanden där kontraktsförhållanden mellan bolagens huvudkontor och enskilda stationer kan variera mellan fullständig vertikal integration och fullständig vertikal separation. Om en betydande andel av stationerna är vertikalt separerade från huvudkontoren innebär detta att marknadskoncentrationen är betydligt högre på huvudkontorens nivå jämfört med på enskild stationsnivå. Vid en vertikal separation sker den slutgiltiga prissättningen på stationsnivå. På flera marknader, exempelvis i Norge, Danmark, Australien och Irland, har huvudkontoren därför använt sig av vertikala kontrakt, även kallade "prisstöd" (eng. "price support"), för att omfördela kontrollen över prissättningen från stationsnivå till den mer koncentrerade huvudkontorsnivån. Prisstöd i kombination med rekommenderade priser används för att skapa vertikal prisstyrning (eng. "Resale Price Maintenance" (RPM*))*, (se exempelvis Wang (2009) samt Foros och Steen (2013)). I flera länder, exempelvis Danmark och Irland, har konkurrensmyndigheter ingripit mot sådana vertikala kontrakt. I Australien (år 2001) och Österrike (år 2009) har myndigheter infört regleringar som begränsar hur ofta bolagen kan ändra sina drivmedelspriser.

Den svenska detaljistmarknaden för drivmedelsförsäljning

Den svenska detaljistmarknaden för drivmedelsförsäljning kännetecknas av en oligopolstruktur med hög grad av horisontell koncentration. År 2011 kontrollerade de fyra bolagen Statoil, Shell, Preem och OKQ8 tillsammans mer än 99 procent av marknaden. Marknaden kännetecknas samtidigt av en hög grad av vertikal integration och en övervägande majoritet av stationerna i Sverige är vertikalt integrerade. I den aspekten skiljer sig den svenska marknaden från många andra nationella marknader där flera internationella studier istället visar på att vertikal separation mellan huvudkontoren och försäljningsställen är vanligt förekommande.

För en övervägande majoritet av stationerna på den svenska marknaden ligger alltså kontrollen över prissättningen hos huvudkontoren. När prissättningen kontrolleras av huvudkontoren finns inget behov av prisstöd och kontrakt om prisstöd är därför ovanliga på den svenska marknaden. Bolagens huvudkontor publicerar rekommenderade priser offentligt på sina hemsidor, men som ett resultat av den höga graden av vertikal integration så spelar de rekommenderade priserna en mindre roll i de vertikala relationerna mellan huvudkontoren och stationerna. Detta skiljer alltså den svenska marknaden från de många marknader där rekommenderade priser kan betraktas som ett verktyg för huvudkontoren att påtvinga vertikal prisstyrning hos vertikalt åtskilda stationer.

De mönster i prissättningen på den svenska marknaden som rapporten identifierar visar att stationernas pumppriser på lång sikt följer rekommenderade priser och priser på insatsvaror (se Figur S1 nedan).

Figur S1   *Prisutvecklingen hos en representativ bensinstation i Malmö. Aktuellt rekommenderat pris samt spotpris för bensin (Platts) under 2012*
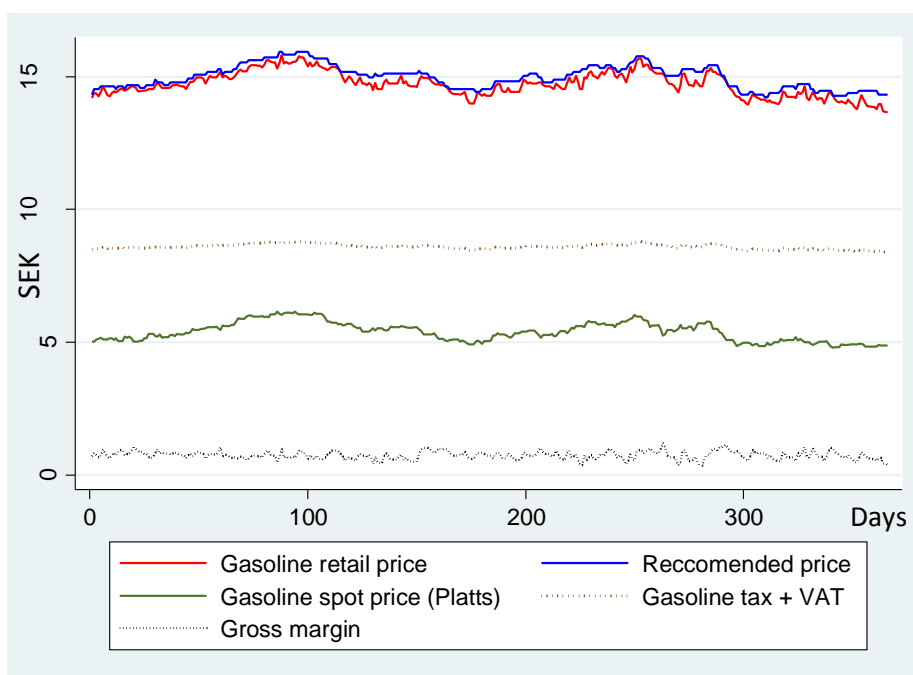
På kort sikt visar de aggregerade observationerna på ett tydligt veckomönster. Prisvariationerna i veckomönstret är emellertid låga jämfört med de mönster som har identifierats på andra marknader, exempelvis i Norge. Vinsten för konsumenter från att försöka anpassa sig till *när* de tankar utifrån veckomönstret, är därför begränsad.

Prissättningsmönstren uppvisar även geografiska skillnader. I rapporten jämförs pumppriser i sex olika geografiska områden: Stockholm, Göteborg, Malmö, längs motorväg E6 mellan Göteborg och Malmö, mindre städer, samt glesbygd. Kategorin "glesbygd" kan antas representera det förhållande som närmast liknar en

monopolmarknad eftersom stationer i denna kategori möter svag konkurrens. Vad gäller geografiska skillnader i prisnivå och prissättningsmönster, är att Stockholm uppvisar ett i det närmaste identiskt mönster med kategorin glesbygd, vilket framgår av Figur S2 nedan. Med andra ord innebär detta att Stockholm, med sin höga stationstäthet, tillsammans med stationer i glesbygd, har de högsta drivmedelspriserna i Sverige.

Figur S2   *Regionala genomsnittliga priser samt genomsnitt av rekommenderade priser.*
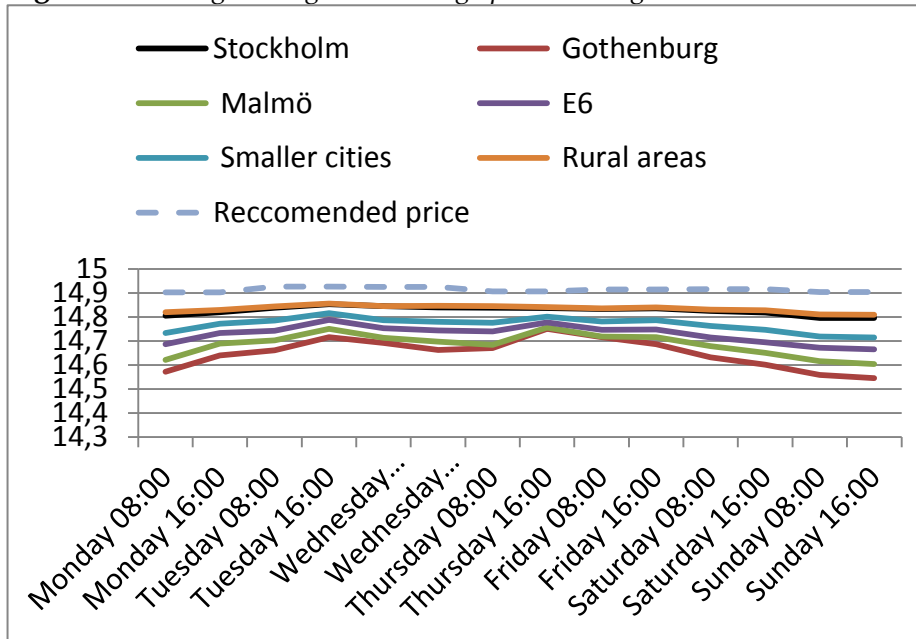
Lägst drivmedelspriser och även störst veckovisa variationer observeras i Göteborg, där det genomsnittliga priset sett över en vecka är 26 öre lägre än det rekommenderade priset och 18 öre lägre än det genomsnittliga priset hos stationerna i Stockholm. Priser ändras generellt mer sällan i områdena med högre priser, alltså Stockholm och glesbygd, jämfört med Göteborg och Malmö. I ett internationellt perspektiv är de genomsnittliga prisförändringarna på den svenska marknaden generellt sett låga.

I rapporten diskuteras avslutningsvis betydelsen av rekommenderade priser på den svenska marknaden. Trots att i stort sett samtliga stationers drivmedelspriser bestäms centralt av bolagens huvudkontor, publicerar bolagen rekommenderade priser på sina hemsidor. De rekommenderade priserna ger således ingen *direkt* information till privatkunder, som ju betalar stationernas pumppriser, om *var* och *när* drivmedelspriser är som lägst. Vad gäller företagskunder, så betalar dessa numera det rekommenderade priset minus en rabatt. Här har det skett en förändring från tidigare då rabatter kopplade till pumppriset var vanligast på marknaden. Nuvarande utformning av rabattavtalen ger därför huvudkontoren möjlighet att segmentera kunderna i två grupper: privatkunder och företagskunder. Pumppriser bestämmer prisnivån för privatkunder medan nivån på de rekommenderade priserna tillsammans med rabattavtalen bestämmer slutpriset för

företagskunder. Detta gäller så länge pumppriset inte är lägre än det rekommenderade priset med rabatten, i vilket fall pumppriset gäller också för företagskunder. Om istället företagskundernas rabatter drogs av från pumppriserna så skulle huvudkontoren behöva ta i beaktande att även pumppriserna påverkar företagskunderna.

Mot bakgrund av segmenteringen av privat- och företagskunder är ett intressant ämne för fortsatt analys en jämförelse av de två möjliga utformningarna av prissättningen mot företagskunder, samt hur utformningen av rabattavtalen påverkar konkurrensen mellan bolagen på central nivå. En annan fråga som kan belysas ytterligare i framtida studier är i vilken utsträckning publicering av rekommenderade priser ökar transparensen mellan marknadens aktörer och därmed underlättar priskoordinering.

Summary

Background and structure of the report

- The report was commissioned by the Swedish Competition Authority.

- The overall objective of the report is to analyse the Swedish retail market for road fuel with special emphasis on the short run retail price cycles that have previously been observed in other countries.

- The outline of the report is as follows:

  - A survey of the international literature.

  - An analysis of the Swedish retail gasoline market:

    - A descriptive analysis of the patterns of retail gasoline prices in Sweden.

    - An overview of market structure.

    - A description of how retail prices are determined.

- The analysis is based on the following data from the Swedish market:

  - Interviews of outlet-managers undertaken by the Swedish Competition Authority, spring 2013.

  - Pump prices collected twice a day (at 08:00 and 16:00) across 190 gasoline stations for 2012 (n=137 676). Daily volumes across the same gasoline stations in 2012 (n= 68 139) and data on the closest competitors (distance and ownership).

  - Recommended prices and major input costs.

International literature

- Long run movements in retail gasoline prices:

  - The primary driver for long run movements in retail gasoline prices are crude oil prices.

  - Observe a faster response in retail prices to upward than to downward changes in wholesale/crude oil prices (a pattern found earlier also in the Swedish market; see Asplund *et al.*, 2000).

- Short run movements not related to changes in wholesale prices

  - Edgeworth cycles: Sharp increases followed by gradual reductions in retail prices.

- - - Theoretical foundation; Maskin and Tirole (1987).

      - Observed in several markets: Norway, Australia, Canada and the United States, among others.

      - Price movements in an Edgeworth cycle fashion allow customers to segment themselves (inter-temporal price discrimination).

- Market structure and determination of retail prices

  o Typically to observe a mixed vertical ownership structure; contractual arrangements between headquarters and outlets are varying between complete vertical integration and complete vertical separation.

  o Vertical separation for a significant fraction of outlets implies that the level of concentration is significantly higher at the headquarters-level than at the retail outlet-level.

  o Under vertical separation, retail pricing is at the outset in the hands of the outlets. In several markets (Norway, Denmark, Australia and Ireland, among others) vertical contractual arrangements (often labelled as price support systems) are used to transfer control from the retail level to the more concentrated headquarters level.

  o The price support systems in combination with recommended prices are used to *de facto* impose Resale Price Maintenance (RPM); see e.g. Wang (2009) and Foros and Steen (2013).

    - In several countries, e.g. Denmark and Ireland, competition authorities have intervened towards these vertical contractual arrangements transferring control of retail pricing from vertically separated outlets to headquarters.

  o In Australia (2001) and Austria (2009) authorities have imposed regulations that restrict how often the firms change retail prices.

The Swedish retail gasoline market

- High degree of horizontal concentration:

  o In 2011 the "big four" (Statoil, Shell, Preem and OKQ8) controlled more than 99% of the market.

  o The gasoline market shares for 2011 imply a Herfindahl index of 2 713.

  o The concentration has increased significantly: Compared 1999 (when the companies were found guilty of having a cartel) the market has changed from an oligopoly of six to an oligopoly of four, and the Herfindahl index has increased from 1 874 to 2 713.

- High degree of vertical integration

  o Previous studies of other markets have revealed a mixed ownership structure; where vertical separation between headquarters and retail outlets is common. In contrast, the degree of vertical integration is high in Sweden. The vast majority of retail outlets are vertically integrated.

  o The control of retail pricing is therefore in the hands of the headquarters for the vast majority of retail outlets.

  o When retail pricing is in the hands of headquarters no price support schemes are needed, and price support systems are not used in Sweden on regular basis.

  o The headquarters make recommended prices available on their web-sites, but due to the high degree of vertical integration, recommended prices have a minor role in the vertical interplay between headquarters and retail outlets. This is in contrast to other markets, where the recommended prices have been considered as a device used by head-quarters to impose an RPM element on vertically separated outlets.

- Price patterns in the Swedish market

  o Aggregate observations for the overall Swedish market

    ▪ The long run movements of pump prices follow the recommended prices and the input prices (see Figure S1 below).

    ▪ There is a significant short-term cyclic weekly pattern, but amplitudes are low compared to what is found elsewhere; e.g. in Norway. Therefore, the benefit to customers from adapting to _when_ they fill gasoline is limited.

Figure S1 *A representative gasoline station's price development in Malmo, the relevant recommended price and the spot price for gasoline (Platts) during 2012.*
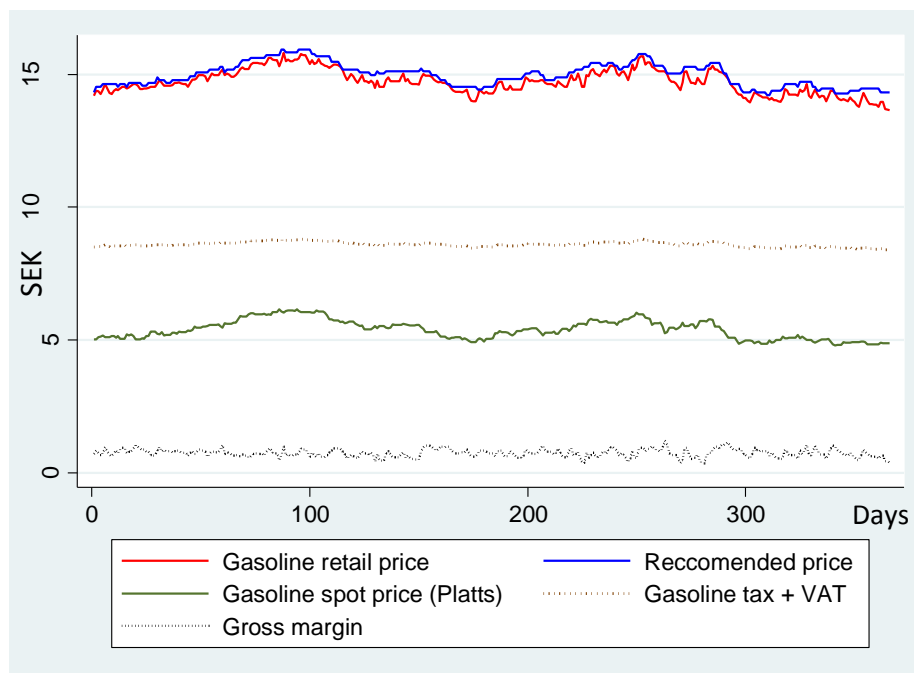
- o Geographical differences in the Swedish market: Does it matter *where* you fill gasoline?

    - ▪ We compare pump prices in six different geographical areas (Stockholm, Gothenburg, Malmo, E6 high-way Gothenburg-Malmo, Smaller cities, and Rural areas.).

    - ▪ The category "Rural areas" constitutes a monopoly benchmark; the outlets face a low degree of competition. Consequently, the conjecture is that the retail prices are close to the monopoly level.

    - ▪ The most striking feature revealed (see Figure S2) is that both the price level and pattern (no cycles) in Stockholm resemble the monopoly benchmark (rural areas). Stockholm - with its high density of gasoline stations - has in common with rural areas the highest gasoline prices in Sweden.

Figure S2: *Regional average prices and average recommended price*
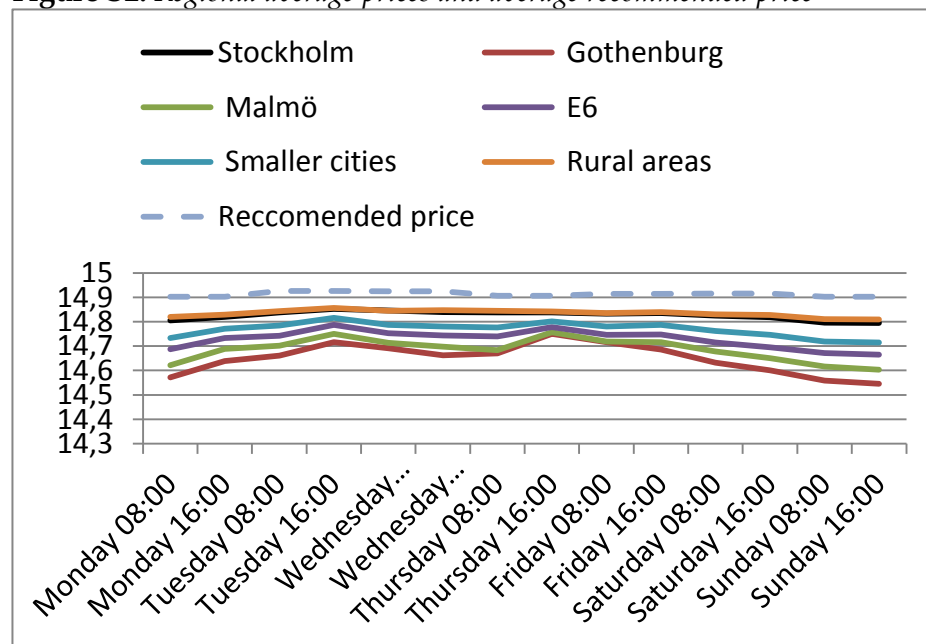
- The lowest prices and the largest cycles are found in Gothenburg; the weekly price average is SEK 0.26 lower than the recommended price and SEK 0.18 lower than the Stockholm average.

- Prices change generally a lot less frequently in the high price markets Stockholm and the rural areas than in Gothenburg and Malmö.

- Average price changes are generally low compared to other retail markets.

- The role of the recommended prices in Sweden

  o Despite that retail prices are determined by the headquarters for almost all outlets, the headquarters post recommended prices on their websites.

  o The recommended prices provide no *direct* information to private customers (that pay the pump price) on *where* and *when* gasoline prices are lowest.

  o In contrast to previously, a large share of the corporate customers now pay the recommended price minus a rebate (previously the most common model was that rebates were linked to the pump price).

  o Consequently, the current arrangements to a large extent allow the headquarters to segment the two customer groups (private and business customers). The pump prices determine the prices faced by private customers, while the rebate level and the level of the recommended

prices determine the net prices for business customers with rebate agreements (except if the pump price is lower than the net rebated price).

o In contrast, if the rebates towards business customers were deducted from the pump prices, the headquarters need to take into account that the pump prices also affect the business customers.

o An interesting topic for further research would be to compare these two different business models, and, in particular, how these models affect the competition among the headquarters.

o If headquarters are not allowed to use recommended prices, a potential detrimental effect is that it forces the headquarters to use vertical integration in cases where vertical separation is a more efficient ownership structure. In Sweden, where vertical integration is so frequently used, such a concern is not present.

o To what extend the recommended prices increase transparency among the market players and, thereby facilitate price coordination, is a question that should be further investigated by the competition authorities.

About the authors

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1   Introduction

This report was commissioned by the Swedish Competition Authority, in which we are asked to undertake an analysis of retail pricing in the Swedish gasoline market with particular focus on short run retail price cycles. We first provide a survey of the international literature on price determination, retail competition and price cycles in different retail gasoline markets. Then we provide an analysis of the Swedish retail gasoline market, which consists of the following parts: (i) A descriptive analysis of the patterns of retail gasoline prices in Sweden, (ii) an overview of market structure, and (iii) a description of how retail prices are determined.[1]

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[1] Our contact persons within the Swedish Competition Authority have been Johannes Erlandsson, Arvid Fredenberg, Lena Fredriksson and Joakim Wallenklint. We have also receved comments from Rickard Friberg and Gunilla Rönnholm.

2   Backdrop: A survey of theoretical and empirical literature

In our literature survey the focus is towards asymmetric price cycles; in particular short run asymmetric cycles in retail gasoline prices not related to changes in wholesale prices. However, first we discuss asymmetric pass-through of crude oil and wholesale prices into retail prices. Thus, we do not go into the literature on developments of the long run margins.

2.1   Rockets and feathers: Asymmetric pass-through of crude oil and wholesale prices into retail prices

The primary driver for long run movements in retail gasoline prices are crude oil prices (see Eckert, 2010 for a comprehensive survey of the literature). In this strand of the literature, several studies show asymmetric price responses. Typically, we observe a faster response in retail prices to upward than to downward changes in wholesale/crude oil prices. Hence, the often used informal term of '*rockets and feathers*'; first documented by Bacon (1991) in an analysis of the UK gasoline market. Explanations put forward for incomplete pass through from reduction in crude oil prices to gasoline wholesale prices are for instance related to adjustment costs and storage capacity at the refinery level (see e.g. Borenstein and Shepard, 2002).

At the retail level, Borenstein *et al.* (1997) suggest that the explanations for such asymmetric pricing identified in the United States may be tacit collusion and consumer search costs. When wholesale prices are reduced, Borenstein *et al.* suggest that previous retail prices could be used as focal point in a collusive strategy. Their alternative explanation is consumer search, where only a fraction of consumers undertakes a search for the lowest price. Thus, we have incomplete pass through from a reduction in the wholesale price since consumers that do not search accept that prices are high.

Asplund *et al.* (2000) use daily data from 1980 to 1996 from the Swedish gasoline market. Similar to the papers mentioned above, they found that prices respond faster to upward changes than downward changes in wholesale prices, indicating that, at least during that period in time, the Swedish market followed a rockets and feathers price adjustment pattern.

2.2   Edgeworth cycles: Sharp increases followed by gradual reductions in retail prices

Contrary to the rockets and feathers cycles described above, Edgeworth cycles are not related to changes in wholesale prices. Edgeworth cycles are observed in

several retail gasoline markets. Prices are gradually reduced, followed by sharp increases in prices.

Figure 1 provides an example from Norway (Foros and Steen, 2008); daily prices from 2005 from an outlet in Norway (Bergen, the second largest city in Norway).

Figure 1: *Weekly price and cost patterns based on the local time series of average daily prices over seven stations in Bergen (Norway) collected between January 4, 2005 and March 15, 2006 (n = 1,067 (price), n = 1,062 (Rotterdam + tax), illustrated for four weeks). Source: Foros and Steen (2008).*
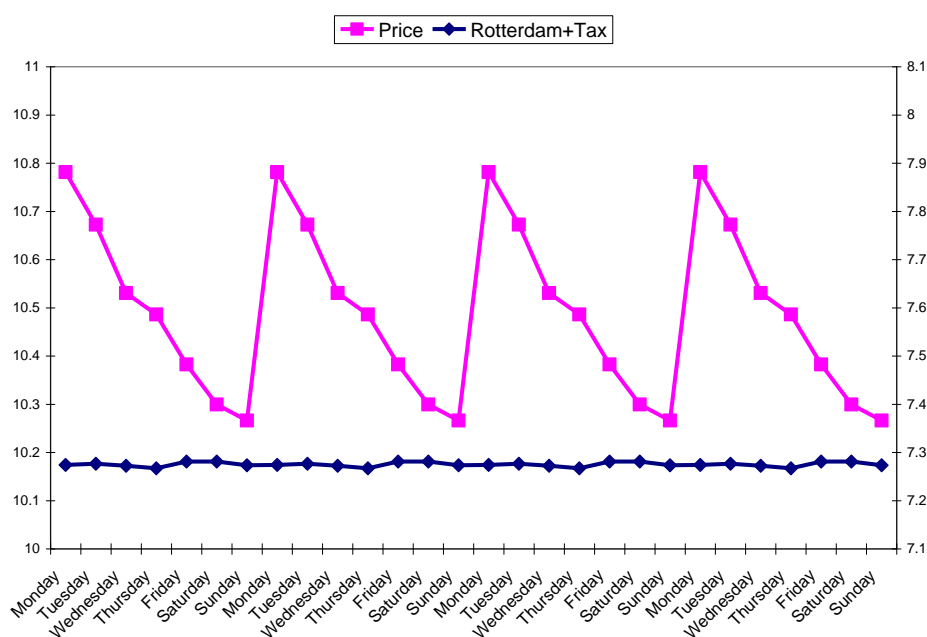
As seen from Figure 1, these cycles are not driven by wholesale prices.[2] A vast literature has documented similar patterns in other countries:

- United States (Castanias and Johnson, 1993, Lewis and Doyle, 2011, Doyle *et.al.* 2010, Lewis, 2011, and Zimmerman *et al.,* 2010)
- Canada (Atkinson, 2009, Eckert, 2002, 2003, Eckert and West, 2004, and Noel, 2007a, 2007b, 2009)
- Australia (ACCC, 2007 and Wang, 2008, 2009)
- Norway (Foros and Steen, 2013)

Maskin and Tirole (1988) provide the formalized theory describing how firms successively undercut each other in a price war phase. This process continues until

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[2] Both Noel (2007a) and Foros and Steen (2013) clearly dismiss wholesale prices and gasoline inventories as explanations for these cycles in retail prices.

further undercutting becomes too costly. Then we have a war of attrition phase until one firm takes the burden and raises its prices. The other firms will then follow and increase their prices, but not to the same level as the firm that initiated the price increase. A new cycle will then start.[3] Hence, there is no stable equilibrium in the model of Maskin and Tirole. Firms sequentially undercut each other until the marginal costs are reached. Then each firm randomizes between continuing with low prices or initiation of a new cycle by increasing its price significantly. Because of the multiple equilibriums in the price cycle outcome in Maskin and Tirole (1988), the theory makes no clear predictions on the average level of prices and profits compared to the outcome without cycles.[4]

The vast majority of the empirical studies find support for that the observed price cycles are the outcome of a competition process à la Maskin and Tirole's (1988). In Maskin and Tirole (1988) firms play a mixed strategy game on who should be the first to increase the price. Firms have incentives to end the war of attrition game as soon as possible (Wang, 2009), and the empirical literature show that several practices have emerged in order to end the war of attrition phase. One example is that one firm takes the role as the price leader (Wang, 2009, and Lewis, 2011). Noel (2007a) uses data from the Toronto area in Canada, and shows that while small outlets lead price undercutting, larger firm initiate price restorations. Based on US data, Lewis (2011) shows that restorations are led by a company with a high degree of vertical integration. In Norway, Foros and Steen (2013) show how all firms increase prices at Mondays about noon. The headquarters of Norwegian companies *de facto* simultaneously decide to increase pump prices to a given level (the recommended price) on Mondays. In the next section, we show how the Norwegian headquarters use vertical restraints (the price support system) to transfer the control of retail prices from the retail outlets to headquarters. Thus, the pricing decisions are taken by headquarters also under ownership with vertical separation (see further discussion below). The price support system is used in several markets and de facto implements a resale price maintenance (RPM) aspect (see e.g. Wang, 2010, Foros and Steen, 2013, The Irish Competition Authority, 2003, and The Danish Competition Authority, 2009). Instead of hundreds of price setters, there are in Norway, for instance, four big companies (and a few small companies) that decide pump prices. While it may be difficult to see how hundreds of independent retailers set prices according to the Edgeworth cycle theory, the Edgeworth cycle explanation becomes more appealing when four quite symmetric players decide on the pump prices.[5]

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[3] Eckert (2003) and Noel (2007b, 2008), provide extensions of Maskin and Tirole. These extensions show that Edgeworth cycles are not restricted to a symmetric duopoly with homogenous goods

[4] Without cycles, the equilibrium in Maskin and Tirole implies that firms matching each other at the monopoly level forever.

[5] Similar weekly based price cycles have recently also been observed in Australia where Thursday is the high-price day (ACCC, 2007). In contrast to Norway, there is no industry wide adoption of the pattern in Australia.

Wang (2008) shows how phone activity by the market leader resets Edgeworth cycles in the Australian retail gasoline cartel. Clark and Houde (2011) analyse how retailers in Quebec used phone conversations to initiate price increases after periods of repeated price reductions. Wang (2009) uses data from Perth, Australia, and analyses Edgeworth cycles *ex ante* and *ex post* the authorities imposed a regulation that restricted the retailers to change retail prices no more than once per day. Furthermore, the stations were obligated to inform the authorities the day before about the price they set the next day. Consequently, this implies simultaneously price setting in contrast to what assumed in Maskin and Tirole's theory. Wang (2009) thus show that an Edgeworth cycle pattern could also arise even if firms are required to determine retail prices simultaneously, and, furthermore, he shows that typically a larger company leads the price restorations.

In a study on data from the United States Doyle *et al.* (2010) show that cycles may depend on ancillary revenue sources. They find that cycles are more common in markets with more non-integrated outlets (see discussion on below on ownership structures) that operate convenience stores. When other types of goods provide an important part of the revenues, the outlets would have higher incentives to undercut the rivals' gasoline prices. In Scandinavian markets this may be important since a large part of gasoline stations offers a wide range of additional services like grocery and convenience store items, car washes, automobile services etc. Restrictions on opening hours for conventional grocery stores during weekends may also be important.

Finally, we now discuss some potential alternative explanations for the observed cycles.

2.2.1 Demand fluctuations

Both Noel (2007a) and Foros and Steen (2013) emphasize that it seems unlikely in general that one has a sudden large increase in demand on one day, followed by a number of days with small reductions in demand. However, the demand condition may affect the time of price restorations. Noel (2007a) suggests that fluctuations in weekly demand may have an impact on when firms relent in the Edgeworth cycle model. Firms are more likely to relent on a given day (period) with low demand, when the loss from being the initiator of a new cycle is lower than when demand is higher.

2.2.2 Inter-temporal price discrimination

Eckert and West (2004) suggest inter-temporal price discrimination as an alternative explanation for Edgeworth cycles. Under the existence of heterogeneous consumers; e.g. different degrees of patience, firms may have incentives to step by

step reduce the price since such a strategy introduces inter-temporal price discrimination between consumers that differ in their willingness or ability to wait.

Conlisk *et al.* (1984) show how a monopoly provider of durable goods may use periodic price reductions in order to discriminate between low- and high-value consumers. Sobel (1984) extends the analysis to competition). Consumers differ in their reservation price, as well as in their willingness/ability to wait. Low-value consumers will be more willing to wait for price reductions than high-value consumers. In the gasoline market, willingness to wait may be interpreted as the costs of inventorying (which depends on how much people drive).

However, several factors indicate that inter-temporal price discrimination is not the main driver behind price movements that moves in an Edgeworth cycle fashion. For instance, cycles are less frequently observed in markets with high concentration. Eckert and West (2004) and the Norwegian Competition Authority (2010) find that in markets with high concentration (typically rural districts), such cycles are rarely observed. In Norway, the headquarters force the outlets that have no close competitors to charge retail prices equal the recommended price throughout the week (see further discussion below). A manager of a retail outlet in Norway explains the following to her local newspaper:[6] "*The companies (headquarters) say that we have no competition, and we get no price support to reduce the prices. I am forced to charge the recommended price every day.*" In contrast, theories on inter-temporal price discrimination theories (e.g. Conlisk et al, 1984) predict that also a monopolist will use price discrimination.[7]

As emphasized by Noel (2012), even if inter-temporal price discrimination is unlikely as the main explanation for price patterns that appear like Edgeworth cycles, the fact that competition creates such price cycles allow the consumers to adapt to the pattern. In particular, this will be the case under calendar-based strategies as in Norway (Noel, 2012). As shown above (Figure 1, panel B), almost all retail prices increase about noon on Mondays (Foros and Steen, 2013). Foros and Steen (2008, the discussion paper version of Foros and Steen, 2013) undertake a survey among consumers while filling gasoline (see also the discussion of this Norwegian survey in Noel, 2012).[8] The survey findings indicate that consumers differ according to their information about prices and price patterns. The pattern with price increases on Mondays was established in April 2004 (Foros and Steen, 2013). However, in 2006, more than two-thirds of consumers were not aware of any weekly pattern. There are, however, strong indications that a large group of consumers adapt to the pattern. The Norwegian Competition Authority (2010)

[6] Anne-Lise Nordsæther (retail outlet manager) to *Sør Trøndelag* (newspaper), 23.09.2005.

[7] The theory mentioned above on inter-temporal price discrimination assume that consumers have perfect foresight, while few consumers in gasoline markets seem to follow timing strategies and mostly they are non-informed about the actual price pattern. We have focused on consumers being heterogeneous in their willingness to wait. Salop (1977) shows that a monopolist may practice price discrimination between informed and uninformed consumers by offering a distribution of prices.

[8] The survey was conducted by asking 474 gasoline customers on two stations in Bergen in 2005 and 2006.

shows that volumes on Sunday and on Monday morning have increased by around 50% from 2005 to 2008. In Figure 2 we show a facsimile from the Norwegian Competition Authority (2010). [9]

Figure 2 *Volume in % of weekly consumption over the week in 2005 and 2008, respectively. Source: The Norwegian Competition Authority (2010, page 16).*

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
00:00	00:00	00:00	00:00	00:00	00:00	00:00
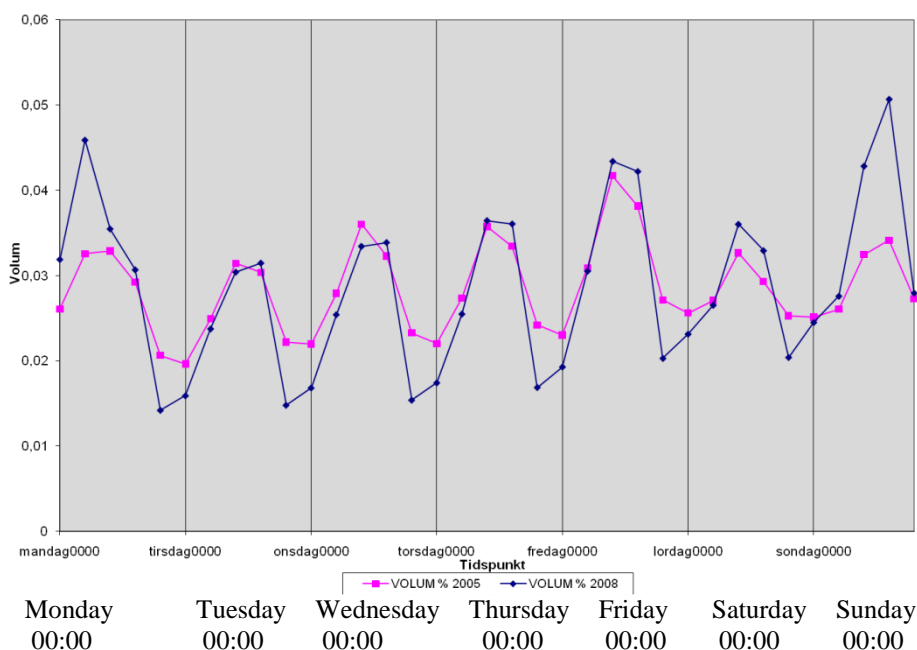
Two important observations can be made with regard to the graphs above. First, as the new pattern with low prices Sunday and Monday morning has been known by more and more customers, volumes in the periods 09:36-19:12 on Sunday and 04:48-09:36 on Mondays have increased by around 50% from approximately 3% to 4-5% of weekly consumption from 2005 to 2008. Second, while the volume is reduced in off-peak periods during the weekdays, the volume has not been reduced in peak-periods during weekdays. This suggests that it is not as easy for the utility drivers to change their consumption pattern during weekdays as it is for the more price sensitive private customers that indeed can adapt to the changes in the weekly cycle by filling gasoline during the weekend. Based on this information, Foros and Steen (2013) note that even if price discrimination is not the driving force behind the cycles, price discrimination may explain why the firms coordinate on the relenting process with Monday as the high price day.

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[9] The Norwegian Competition Authority has collected all prices, price changes and corresponding volumes for the total Norwegian market from the oil companies. The data allows them to aggregate the prices and price changes into different time intervals. They have chosen to divide the 24 hour period into five intervals, each of 4 hours and 48 minutes; 00:00-04:48, 04:48-09:36, 09:36-14:24, 14:24-19:12 and 19:12-24:00, providing 35 intervals per week. The Norwegian Competition Authority (2010) report confirms the price pattern we find in our data.

2.3   Who sets retail pump prices: Headquarters or retail outlets?

In this section we discuss the vertical contractual arrangements between the headquarters/suppliers and the retail stations. In retail gasoline markets we typically observe a mixed ownership structure (dual distribution); contractual arrangements varying between complete vertical integration and complete vertical separation:

1. Complete vertical integration where the headquarters own and operate stations.

2. Commissioned agent stations where the headquarters take all risk.

3. Franchising

4. Complete vertical separation (dealer owned stations)

The structure in the Swedish market is discussed below. A crucial feature of the retail gasoline market in most countries is that the level of concentration is significantly higher at the headquarters-level than at the retail outlet-level as illustrated in Figure 3:

Figure 3 *Market structure with higher concentration among headquarters than retail outlets.*
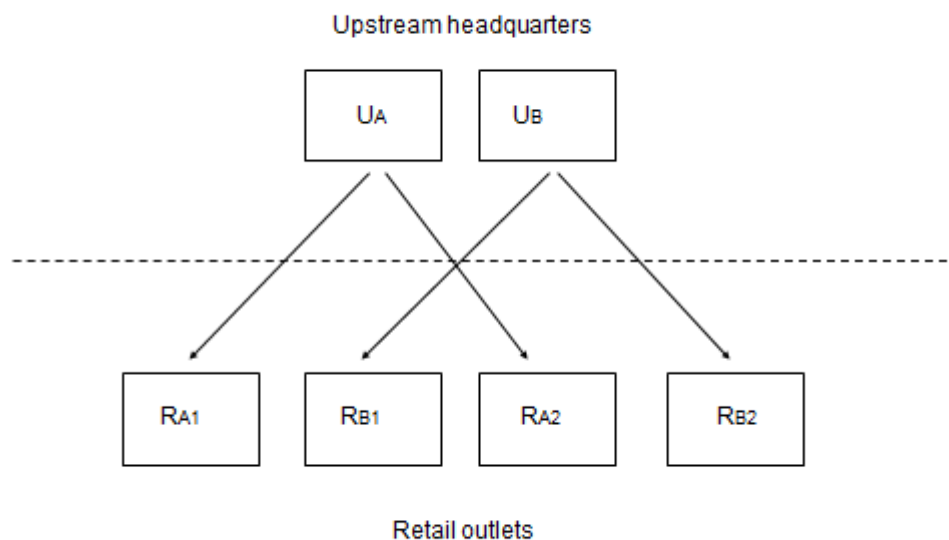
In this section we show how headquarters in several countries use vertical arrangements labelled price support in order to transfer the control of pump prices from the outlets to the headquarters.

First, let us, however, mention the studies that analyse the headquarters' choice of ownership structure. Agency theory has been applied to answer how firms choose between different forms of ownership structure in gasoline retailing. Shepard (1993) finds empirical support in the US-market for that upstream headquarters are choosing contracts with strong incentives and less direct control when retail outlets' unobservable effort is important. Dahlstrom and Nygaard (1994) find similar results for the Norwegian gasoline market. From the Canadian gasoline market Slade (1998) finds empirical support for vertical separation being used to soften retail competition (strategic delegation).

Shepard (1993) and Slade (1998) assume that under vertical separation (franchising and dealer owned stations) the retailers decide the pump prices since resale price maintenance (RPM) has been banned, or at least been considered as a hard-core restraint. The definition of what constitutes RPM has subsequently narrowed in both the US and in Europe. The European Commission provides a safe harbour (block exemption) for maximum RPM for firms with market shares below 30%. Minimum RPM is still a hard-core restraint that takes the agreement outside the safe harbour. In the United States the US Supreme Court overruled the nearly one-hundred-year-old per se ban on RPM in June 2007 (Leegin Creative Leather Products, Inc. v. PSKS, 2007). Like other vertical restraints, resale price maintenance in the US is therefore now judged under the rule of reason.

However, several recent studies and investigations into retail gasoline markets have showed that the price support system used by headquarters transfer the control of retail prices from retail outlets to headquarters. Let us first focus on the price support system used to restart cycles. Foros and Steen (2013) and Wang (2009) show how the price support system restart and synchronize pump prices when price cycles are restarted, in Norway and Australia, respectively. Let us briefly describe the ingredients in the price support system (see Foros and Steen, 2013, for more details). Consider c as the input price of gasoline where the major components within Europe are the Rotterdam price and tax. The pump price is p, and the total margin to the retail outlet and the headquarters is thus $p-c$. We scrutinize on two features of the sophisticated profit-sharing scheme towards the retail outlets:

- First, a maximum RPM that equals is the recommended price p^{rp}. As long as p=p^{rp}, the retail outlet is charged the wholesale price w^{rp} (note that w^{rp} typically is higher than c). The retailer then achieves the margin $p^{rp} - w^{rp}$ as long as the pump price equals the maximum RPM.

- Second, a profit–sharing scheme (*price support)* which specifies a margin M^{ps} to the retailer if p< p^{rp}; where $M^{ps}< p^{rp} - w^{rp}$. A crucial feature of this price support component is that it is not always in force. The headquarters may choose to withdraw the price support scheme for a period of time. When the price support is withdrawn, the retailer will have the margin $p-w^{rp}$.

Foros and Steen (2013) and Wang (2009) show that when price support is withdrawn the interval p^{rp} -w^{rp} is set such that the outlets are induced to set the pump price at the level suggested by the headquarters (i.e. p^{rp}).

In total this scheme is leading to the synchronization of the retail prices when price support is withdrawn. In Norway Foros and Steen (2013) show that there is an industry-wide adoption of a system where all the four major companies withdraw the price support at the same time about noon on Mondays. Figure 4, from Foros and Steen (2013) illustrate this:

Figure 4 *Retail and recommended prices at 8 am and 2 pm for all gasoline stations in Oslo Monday April 7, 2008. Source: Foros and Steen (2013).*
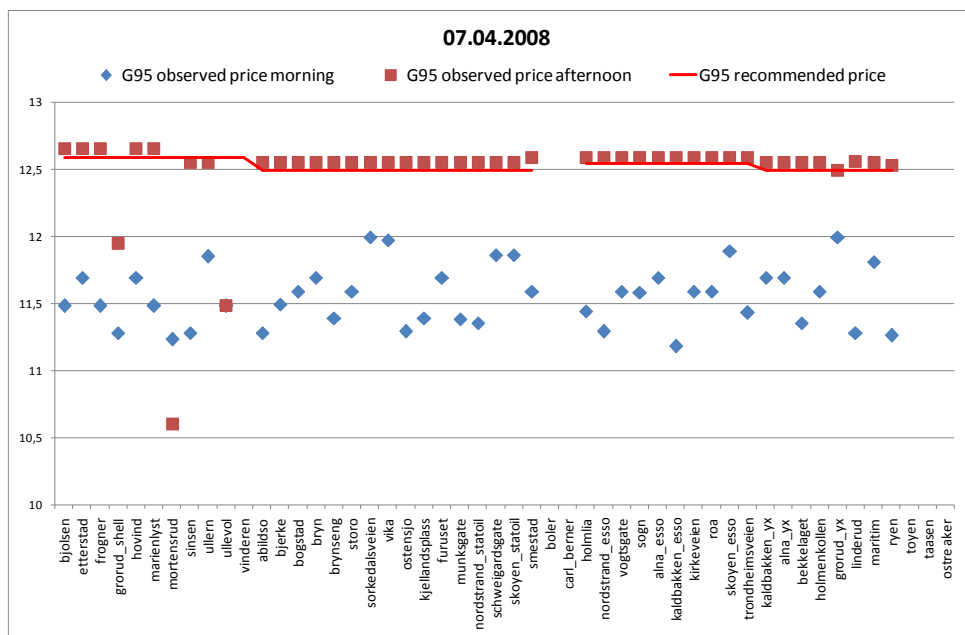
In Figure 4 we have all the pump prices in Oslo at 8 am and 2 pm on a given Monday. While we observe a significant degree of price dispersion at 8 am, at 2 pm (almost) all stations have raised their price to the recommended prices. We now focus on when the price support is in force. Foros and Steen (2013) show how the price support system are used towards retail outlets (not all) to transfer the control of retail prices to the headquarters also in these periods.

Independent retail outlets are typically obligated by the headquarters to collect price information from a given number of rivals. Price information is then reported to the headquarters. These now suggest new local prices with an implied price support for the local retailers. Towards a number of independent retailers (and

franchisees) Foros and Steen (2013) thus show how the headquarters impose a pure RPM also when the price support scheme is in force.[10]

Price support systems are widely used. In addition to Norway and Australia, Faber and Janssen (2011) argue that 'suggested' (recommended) prices in the Netherlands are used to coordinate retail gasoline prices across Dutch gasoline stations. The Irish Competition Authority (2003) and The Danish Competition Authority (2009) show how price support arrangements may limit the independent retailers' control of price decisions (see discussion below). The Danish Competition Authority intervened towards headquarters using the combination of recommended prices and a price support system that de facto allow the headquarters to determine retail prices; i.e. the headquarters use RPM (The Danish Competition Authority, 2009).

The consequence of the system is that what matter for price competition is the degree of concentration at the headquarter level, not at the retail outlet level. As noted above, the degree of concentration is typically higher at the headquarter level than at the retailer level. This follows from the mixed ownership structure; as long as a significant fraction of the outlets is vertically separated from headquarters (or organized as franchisees), the concentration at the headquarters-level is higher than at the outlet-level.[11]

2.4   Competition policy and regulation

There have been several investigations on price cycles and the adoption of price support schemes. After the findings in Foros and Steen (2008, the discussion paper version of Foros and Steen, 2013) the Norwegian Competition Authority initiated an inquiry (reported in the Norwegian Competition Authority, 2010). The inquiry confirms the findings that retail pump prices for almost all retail outlets in Norway are adjusted to the recommended prices on Mondays. The Norwegian Competition Authority (2010) did not find hard evidence for overt collusion between the major oil companies. The Norwegian Competition Authority (2010) proposes inter-temporal price discrimination as the main motivation behind the arrangement. In the inquiry, the Norwegian Competition Authority did not make any comment on the price support system as a device to transfer control over retail prices from outlets to headquarters.

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[10] This is confirmed in a newspaper interview where a previous independent outlet manager states the following (Dagens Næringsliv, 26th February, 2013): *Pump prices are no longer determined by the retail outlets, prices are decided from the headquarters.*

[11] An interesting anecdotal example is given by The Norwegian Competition Authority (2010). Os, a local community close to Bergen, has been known for low gasoline prices. Compared to Bergen prices were lower in 2006, but not in 2008. The suggested reason from The Norwegian Competition Authority (2010) was that the degree of concentration at the upstream level was increased. In 2006 all the big four companies had outlets in Os, while in 2008 Shell's outlet had been replaced by the small independent entrant Best. Best had a vertical agreement with Statoil, and Statoil already had their own retail outlet in Os. The conjecture from The Norwegian Competition Authority is that this had caused the reduction in the competitive pressure in Os. Hence, it is the degree of competition at the upstream headquarter level that matters, not the degree of competition among retail outlets.

In Ireland the competition authorities stopped a practice used by Statoil (The Irish Competition Authority, 2003), and in Denmark the authorities forced the headquarters not to use price support arrangements that limit the independent retailers' control of price decisions (The Danish Competition Authority, 2009).

Both in Australia and Austria authorities have imposed regulations that restrict the firms to change retail prices no more than once per day. In 2001 Australian authorities restricted price changes to once a day, including reductions. They also created a web-site where prices were posted (see Wang, 2009, and ACCC, 2007). Wang (2009) show how the regulation in Australia changed firms' price setting behaviour. After the restriction was imposed average prices fell, but after a while they returned to the previous levels.

In 2009 authorities in Austria imposed a regulation that restricted the firms to increase prices just one time a day (while there were no restrictions in the number of reductions). Authorities also introduced a web-site where firms where obligated to post their prices. The motivation was to increase transparency for consumers and thereby reduce transaction costs. Dewenter and Heimeshoff (2012) undertake an empirical analysis of the restrictions on pricing in Austria and Australia. They find support for a decrease in retail prices in Austria after the regulation was imposed, but they could not find significant effects of the regulation in Australia. Haucap and Müller (2012) undertake a lab experiment of the regulation, and show how the regulation may facilitate coordination. Therefore, in contrast to Dewenter and Heimeshoff, the expected effect from the regulation in Haucap and Müller (2012) is that the price levels are increased. Obradovits (2012) provide a theoretical model that shows detrimental effects from the regulation.

3 The Swedish retail gasoline market

As most national retail gasoline markets, the Swedish market is highly concentrated. Four major firms are controlling the market; Statoil Fuel & Retail AB marketing the two brands Statoil and Jet, St1 Energy AB operating the brands St1 and Shell, OKQ8 AB and Preem AB. Through the Swedish Competition Authority we have gathered data on prices and quantities for all the major players across a number of gasoline stations in 2012, and several interviews have been undertaken with outlet-managers following instructions from the authors of this report. We start by describing the data and provide some descriptive statistics before we look more closely into the functioning of the market.

3.1 Data description

The analysis is based on the following data from the Swedish market:

- Interviews with outlet-managers at 8 outlets undertaken by the Swedish Competition Authority during spring 2013 covering Preem (2), OKQ8 (3), Statoil (1) and Shell (2). The brands Jet and St1 only operate automated stations and where naturally excluded from the interview sample. Out of the outlets covered, one is vertically integrated, five are franchisees, and two outlets are vertically separated (note that some outlets operate different types of vertical agreements for gasoline and additional services).

- Pump prices collected twice a day (at 08:00 and 16:00) across a selection of 190 gasoline stations from 1 January to 31 December 2012 (n=137 676).[12]

- Daily volumes across the same gasoline stations in 2012 (n= 68 139)

- Data on the closest competitors (distance and ownership) for a significant fraction of the analysed gasoline stations. For the closest competitor we have information on most of the stations (181), whereas we have information for somewhat fewer stations for the second closest (153) and third and fourth closest (129).

- Recommended prices for the four chains and major input cost (the gasoline spot price (Platts) in SEK, gasoline tax and VAT).

The 190 stations are collected from six distinct geographical areas: (i) Stockholm, (ii) Gothenburg, (iii) Malmo, (iv) the E6 high-way between Gothenburg and Malmo, (v) smaller cities, and (vi) rural areas. The sample distribution across regions and chains is shown in Table 1.

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[12] We are thus missing some information from some days/stations since a full dataset would have amounted to 139 080 bi-daily observations (366 days * 190 stations * 2).

Table 1 Sample *distribution of gasoline stations across regions and chains*

	Stockholm	Gothenburg	Malmo	E6	Smaller cities	Rural areas	Sweden
Statoil	5	5	5	5	6	12	38
Preem	5	5	5	5	6	12	38
OKQ8	5	2	5	4	4	4	24
Shell	3	5	4	5	4	2	23
Jet	5	5	4	5	6	4	29
St1	5	5	5	5	6	12	38
Total	*28*	*27*	*28*	*29*	*32*	*46*	*190*

Note: 'Smaller cities' include Umeå, Falun, Gävle, Karlstad, Skövde and Växjö, whereas 'Rural areas' include even smaller places like Jokkmokk, Pajala, Arjeplog, Rättvik and Malung etc. The average population in the smaller cities region is around 57 000, varying between 33 000 and 80 000. The Rural areas are significant smaller, here the population numbers even when including the whole municipalities are well below 10 000 inhabitants.

Jet and St1 are both running only automated stations. Jet is owned by Statoil, and Shell and the St1 stations are run jointly.

Prices and volumes are collected both for diesel and gasoline sales. The analysis is performed primarily for gasoline. We have also analysed prices for diesel, and we find the same pattern as for gasoline. Thus, the analysis and discussion in our report focus on the gasoline market, though the conclusions are representative also for the diesel market.

Since it has been collected data from a symmetrical number of stations across the areas, market shares are likely to be more symmetric in our dataset than what we observe in the market. At the same time 190 stations is a significant number of stations relative to the total market, and we believe that the results should be representative when it comes to price levels and price patterns.

3.2   Market shares

The four major companies in Sweden are Statoil, Shell, Preem and OKQ8. In 2012 they controlled more than 99% of the market; Statoil/Jet was controlling 34.86% of volumes, OKQ8 27.93%, St1/Shell 22.62% and Preem 14.22%, leaving only 0.36% of

the volumes to others.[13] Thus, the Swedish market is highly concentrated. The gasoline market shares for 2011 imply a Herfindahl index of 2 713.

As a comparison, in 1999, when the oil companies were found guilty of having had a cartel during the coordinated rebate reduction at the time, the concentration was significantly lower. Then 6 companies were controlling the market; OKQ8 (26.20%), Statoil (24%), Shell (16.70%), Hydro (11.9%), Preem (10.90%) and Jet (8.3%). These numbers translate into a Herfindahl index of 1 874. Comparing this to the 2012 figure, this means that the market has changed from an oligopoly of six to an oligopoly of four, and the Herfindahl index has increased from 1 874 to 2 710. For more on the effects from increased concentration in the Swedish gasoline market; see the companion report by Ganslandt and Rönnholm (2013).

Statoil and OKQ8 have significantly higher market shares compared to their rivals. Therefore, in comparison to the competition, for Statoil and OKQ8 the neighbouring outlets may more often belong to the same chain. In the sample we find this effect most pronounced for OKQ8. They have their own stations as neighbours most often.[14]

To the extent that the next-door outlet is a not a competitor, all other things equal, this implies that one should have higher incentives to transfer retail pricing to the headquarter level. Furthermore, a conjecture would be that they also have less incentive to reduce the pump price at a given outlet than rivalling headquarters.

Another structural change is that ever more outlets are transformed into automated stations. In 1999 automated stations had a 32% market share; in 2013 it was up to 62%. Figure 5 displays the development in the share of automated stations back to 1991.

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[13] Source: http://spbi.se/statistik/volymer/marknadsandelar/

[14] OKQ8 has their own stations as neighbors most often in the sample, for 10 cases (out of 24; see Table 1). Statoil has only one out of 38 of their own stations as their nearest neighbor, but if we include their subsidiary Jet also, they have 3 Jet outlets as their close neighbors, and in as much as 24 out of 29 cases Statoil as one of Jet's close neighbors. We do not observe any cases of own outlets as neighbors for Preem, St1 and Shell, and not even any when we look at Shell vs St1 or St1 vs Shell.

Figure 5 *Development in automat- and service stations for the period 1991 to 2013 (Source: http://spbi.se/statistik/forsaljningsstallen/)*
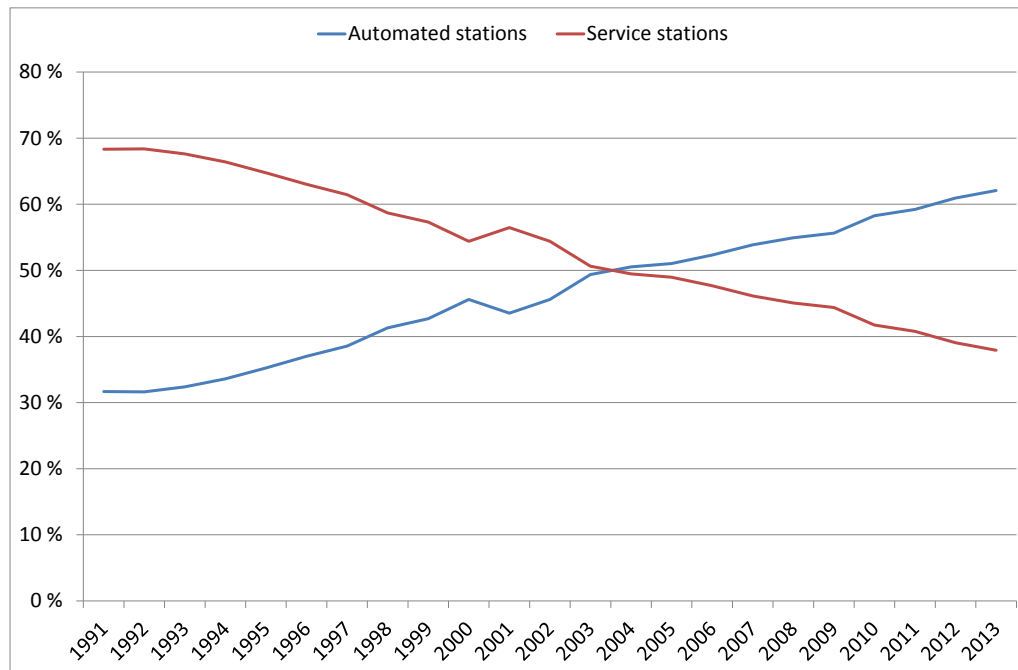

3.3 How do retail (pump) prices depend on when and where consumers fill gasoline?

We will start by looking at the price pattern across weekdays and regions, and compare this to both recommended prices and input prices. Figure 6 displays a representative gasoline station's price development in Malmö during 2012 together with the relevant recommended price, the spot price for gasoline (Platts), taxes and the gross margin.[15]

We have several observations: (i) The station price is following the recommended price (but is always below), (ii) there is a short-term cyclic pattern, (iii) the spot price movement determines the long-run cycle in the retail prices (iv) and the gross margin is quite stable; but shows greater variation in the short term.

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[15] The gross margin is equal to the price minus the spot price and taxes.

Figure 6 *A representative gasoline station's price development in Malmo, the relevant recommended price and the spot price for gasoline (Platts) during 2012.*
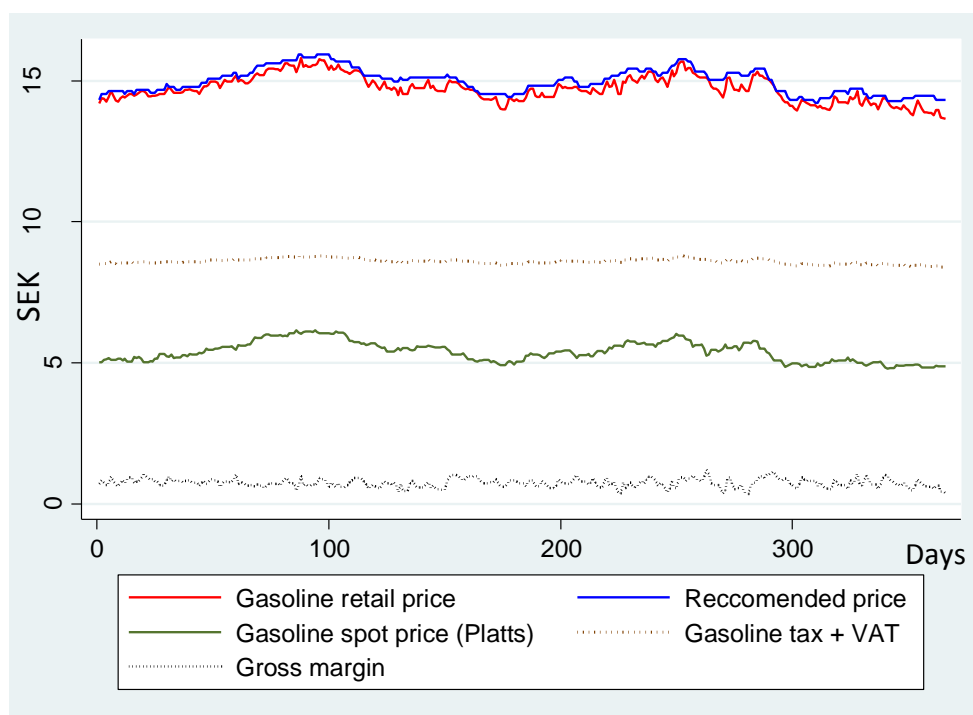
The average recommended price for this station in 2012 was SEK 14.91 and the average retail price SEK 14.76, suggesting a difference of SEK 0.15. The difference between the input price and the retail price is more or less fixed over the year. It constitutes gasoline tax of SEK 5.65 per litre[16], the 25% VAT (average 2.95) and a gross margin (average=0.77). Table 2 shows the descriptive statistics of variables relevant to price across the 190 stations included in the survey sample.

Table 2 *Descriptive statistics prices, input prices and gross margin across all 190 stations over 366 days*

Prices in SEK	n	Mean	Std. Dev.	Min	Max
Gasoline average daily retail price	68 838	14.76	0.475	13.30	15.95
Recommended price	68 838	14.91	0.450	13.98	15.93
Gasoline spot price (Platts)	68 838	5.39	0.359	4.80	6.15
Gasoline tax	68 866	5.65	0.000	5.65	5.65
VAT (25%)	68 838	2.95	0.095	2.66	3.19
Gross margin	68 838	0.77	0.181	-0.13	1.44

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[16] Source: http://spbi.se/statistik/skatter/

The variance is somewhat higher for the retail prices than the recommended price, mirroring the picture from Figure 6. The highest relative variance we find in the Gross margin where the standard error amounts to 24% of the mean. In Figure 7 we show the distribution of the gross margin across 68 838 days, including also the simulated normal distribution. Clearly, the gross margin is close to the normal, but somewhat skewed to the right. We also observe that it very seldom turns negative.

Figure 7 *The distribution of the gasoline gross margin across 190 stations and 366 days (n=68 838) and the normal distribution.*
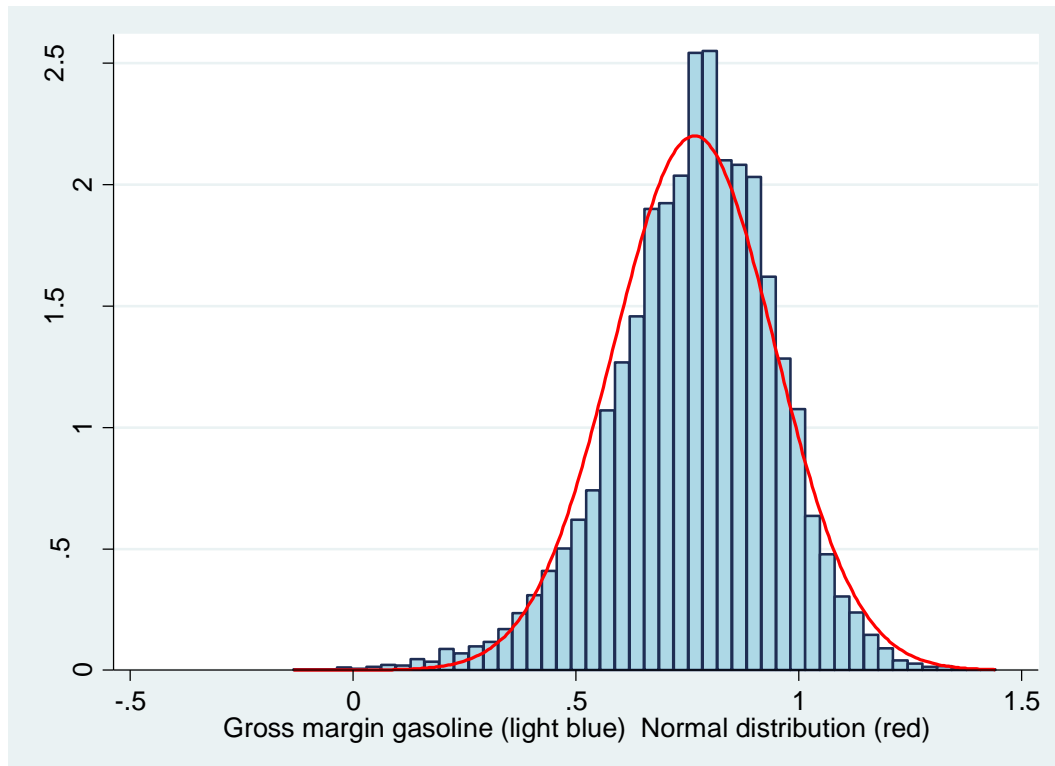
Now we will scrutinize on the prices to see whether we can observe any weekly pattern. In Figure 8 we look at weekday averages in prices for gasoline and diesel. Pump prices are highest on Tuesdays and Thursdays, while prices are lower during the weekends. In contrast to what has been observed in Norway, price differences are small. This is even clearer illustrated in Figure 9 where we measure the deviation in average prices over the week compared to Monday morning 08:00. The magnitude over the week is only around 0.10 SEK. We have run OLS-regressions which typically show that the differences are indeed statistically significant, but very low in amplitude. Thus, the first conclusion is that it is not much benefit for customers if they try to adapt to the weekly cycle with respect to *when* (which day) they fill gasoline.

Figure 8: *Diesel and gasoline average prices Sweden (n=137676)*
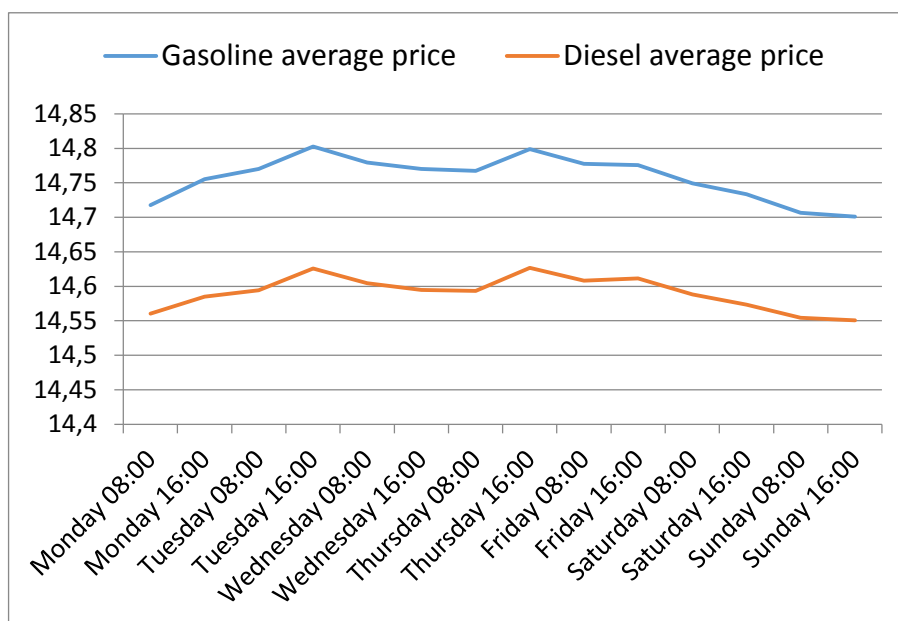
Figure 9: *Weekly price changes gasoline and diesel relative to Monday morning price (08:00) (n=137676)*
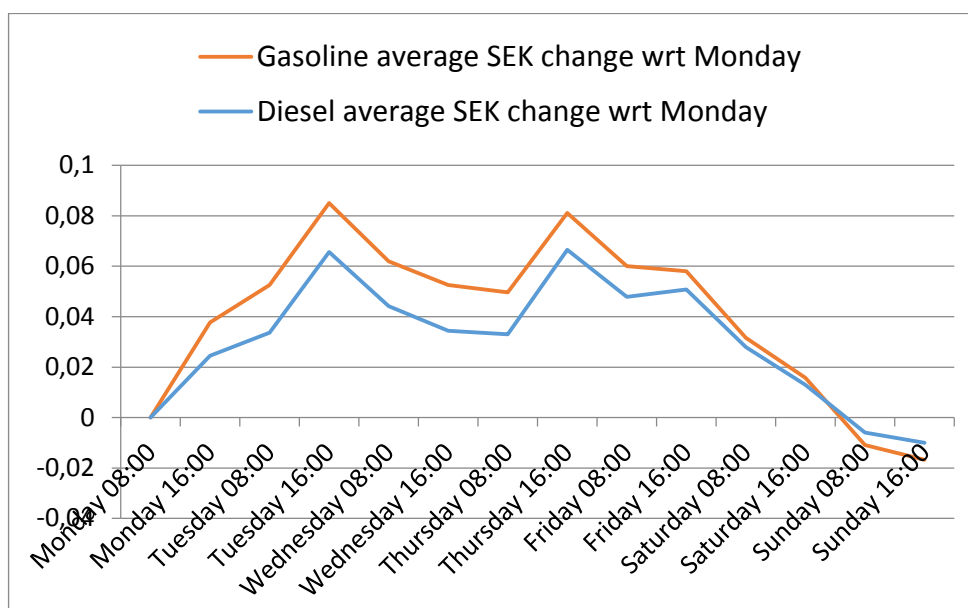
To obtain better insight on how prices change across all stations and weekdays we have calculated the price changes and tabulated them in Table 3. 'Total n' refers to all potential price changes.[17] Thus, if we consider Monday 08:00, we have *n=9962*. In 1066 out of 9962 potential changes, there have been price increases from Sunday 16:00 to Monday 08:00. Similarly, in 858 out of 9962 potential changes, prices are

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[17] Across 190 stations, periods of the day (08:00 ans 16:00) and 366 days we observe 137 451 'price changes', these can be zero (price did not change between now and the previous observation, n=101 780) or positive (price increased, n=14 283) or negative (price decreased, n=21 388).

reduced. Prices are unchanged in 8038 out of 9962 potential prices changes. The percentages in parentheses refer to this number ('Total n').

There are several interesting observations to be made. First, *overall there are very few price changes*, in 74 % of the cases (101 780) there are no price changes. There are less price increases than price reductions (10 % vs. 16%), though the increase are somewhat higher in magnitude (0.19 versus -0.14 on average).

In Foros and Steen (2013, Table 1) a similar decomposition is made for Norwegian price data. Two striking differences appear between Norway and Sweden. First, the number of cases with no price changes is so much lower (46%) in Sweden than in Norway. Second, average price decreases are significantly higher in magnitude (NOK 0.54 and -0.24 respectively).

When we concentrate on the weekday pattern, we observe two distinct periods where most prices are increased, namely Tuesday afternoon and Thursday afternoon. Out of 14 283 price increases, 4772 are made on these two afternoons.

Thus, *to the extent that there are cyclical patterns in retail prices in Sweden the amplitude is low compared to what is found elsewhere*, and the cycle seems to contain two price peaks during the week. Furthermore, the cycles observed do not look like Edgeworth cycles. From above; Edgeworth cycles imply a sharp price increase. Then prices are gradually reduced. The cycles observed in Sweden are more hump-shaped; see Figure 9. Weekend prices tend to be lower than during the rest of the week. Interestingly, the weekly pricing pattern is not mirrored by a corresponding cycle in volumes, as will be discussed further in relation to Figure 12 below. It could still be just briefly mentioned that gasoline volumes instead exhibit a clear pattern with a small peak on Fridays and lower sales throughout the weekend.

Table 3 *Price changes during the week across all 190 gasoline stations (n= 137 451)*

	Total n	Positive price changes n (%)	Average positive price change (SEK)	Negative price changes n (%)	Average negative price change (SEK)	No price change n (%)
Monday 08:00	9962	1066 (11%)	0.25	858 (9%)	-0.12	8038 (81%)
Monday 16:00	9967	2314 (23%)	0.26	1616 (16%)	-0.13	6037 (61%)
Tuesday 08:00	9776	1022 (10%)	0.21	1583 (16%)	-0.13	7171 (73%)
Tuesday 16:00	9783	2316 (24%)	0.23	1586 (16%)	-0.14	5881 (60%)
Wednesday 08:00	9774	518 (5%)	0.17	2021 (21%)	-0.15	7235 (74%)
Wednesday 16:00	9777	887 (9%)	0.22	1923 (20%)	-0.15	6967 (71%)
Thursday 08:00	9775	1048 (11%)	0.21	1761 (18%)	-0.14	6966 (71%)
Thursday 16:00	9784	2456 (25%)	0.23	1872 (19%)	-0.14	5456 (56%)
Friday 08:00	9780	739 (8%)	0.16	2124 (22%)	-0.15	6917 (71%)
Friday 16:00	9785	1466 (15%)	0.18	1765 (18%)	-0.16	6554 (67%)
Saturday 08:00	9774	129 (1%)	0.12	1656 (17%)	-0.17	7989 (82%)
Saturday 16:00	9777	117 (1%)	0.14	1182 (12%)	-0.14	8478 (87%)
Sunday 08:00	9772	103 (1%)	0.13	801 (8%)	-0.15	8868 (91%)
Sunday 16:00	9965	102 (1%)	0.19	640 (6%)	-0.12	9223 (93%)
Total	137 451	14 283 (10%)		21 388 (16%)		101 780 (74%)
Average price change			0.19		-0.14	

We now turn to how weekly retail prices are linked to the major input price: the gasoline spot price (Platts), and to the recommended prices. This is shown in Figure 10 where we compare the average gasoline price to both the spot price and the average price recommended by the headquarters.

Figure 10 *Average price, average recommended price and gasoline spot price (Platts) whole Sweden (n=137676)*
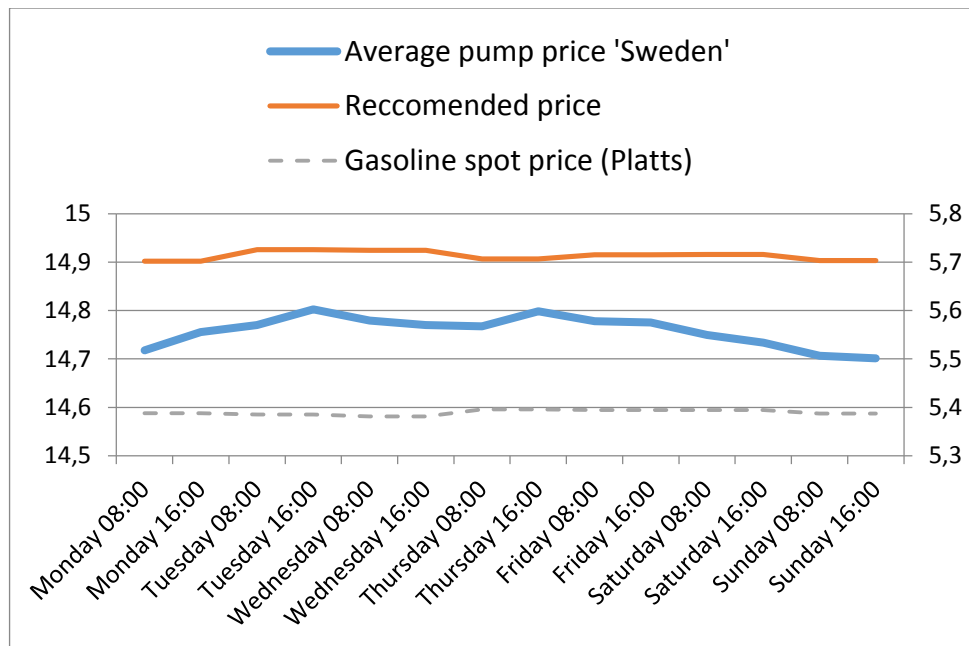
As can be observed from Figure 10 above, recommended prices are always above retail prices. Interestingly, the weekly pattern in retail prices is not found in recommended prices, neither in the spot price. Whereas the weekly magnitude in retail prices is around SEK 0.10, it is only SEK 0.02 for recommended prices and as low as 0.01 for the spot price. Thus, to the extent that we observe a weekly pattern, albeit modest, this is not due to input price and recommended price changes in the aggregate.

Let us now turn to geographic differences; does it matter *where* you fill gasoline? Markets differ with respect to size, concentration and competition characteristics. However, the average prices described above might mask regional differences that would be important to understand when painting the picture of the Swedish gasoline market. To the extent that such differences exist it is, naturally, difficult for most consumers to take advantage of these. (If you are in Stockholm it does not affect you that gasoline prices are lower in Gothenburg). We illustrate average prices in the six different areas described above in Figure 11.

Figure 11 *Regional average prices and average recommended price*
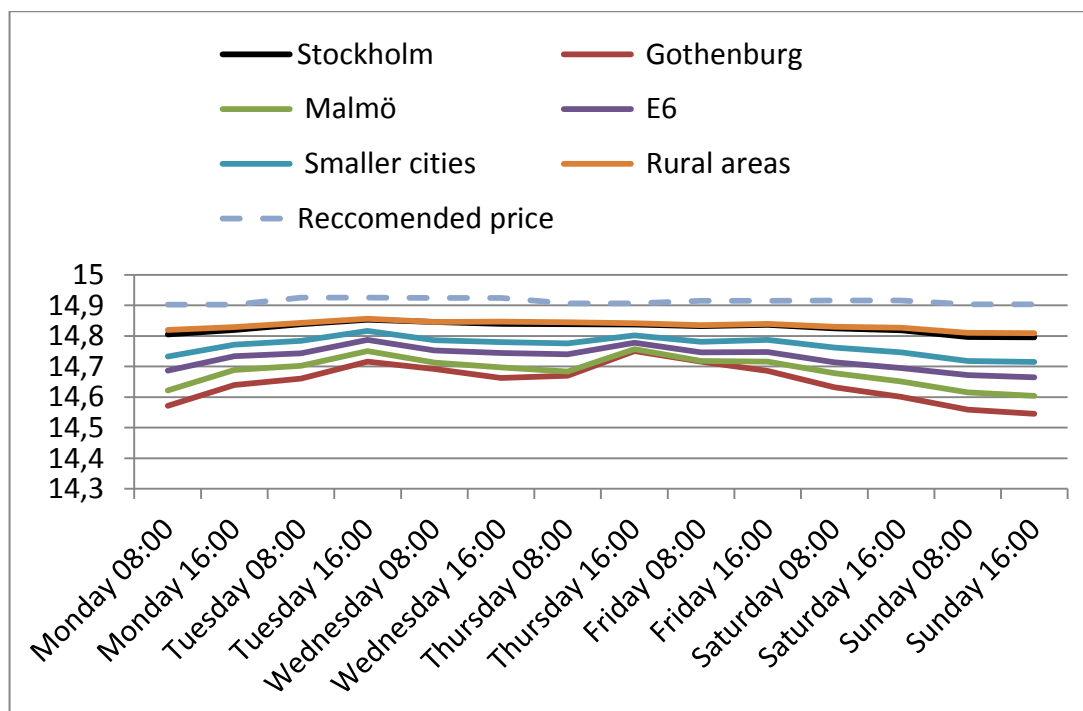
The outlets in the category 'rural areas' were chosen to reflect outlets that do not face direct competition. The category 'rural areas' may then be considered as 'isolated markets' as described in Bresnahan and Reiss (1991) This conjecture is confirmed by the interviews undertaken; where the managers accentuate that they consider that they do not face competition. Therefore, the prices from rural areas constitute a benchmark; the monopoly outcome where the retail prices are close to the monopoly price. This is also reflected in the distances to the closest competitors. For the larger cities Stockholm, Gothenburg and Malmo, there are on average between 2 and 3 other outlets within a range of 2 kilometres, whereas the closest outlet in the rural areas is nearly 4 kilometres away on average, and the second closest outlet more than 16 kilometres away.

Figure 11, displaying regional average prices and average recommended prices, reveals several interesting features. First, the average recommended price for all companies is SEK 0.08 above the monopoly price benchmark: rural areas. *In rural areas we observe an (almost) uniform price during the week*, and this is also confirmed by the station manager interviews. This pattern resembles observations in other countries; even in countries where significant cycles are observed, retail prices seem not to include cycles in rural areas with high concentration. As emphasized above, this has been used to dismiss inter-temporal price discrimination as a major force behind Edgeworth cycles.

Second, *the most striking feature revealed in Figure 11, is that both the price level and lack of cyclical pattern in Stockholm resemble the monopoly benchmark* (rural areas). Thus, retail gasoline prices in Stockholm equal the prices without competition (the

average price in Stockholm is less than SEK 0.01 lower than the rural areas' price average). *Stockholm - with its high density of gasoline stations - has in common with rural areas the highest gasoline prices in Sweden.* Moreover, the transportation costs are probably higher in rural areas than in Stockholm; such that the margin per litre is probably therefore higher in Stockholm than in rural areas.[18]

In Figure 12 gasoline volume per station per day in each region is displayed. Stockholm has the highest average sales per station, more than the double of what we observe for rural areas, and also significantly above the low price areas as Gothenburg and Malmö. Still they resemble rural areas when it comes to pricing.

Figure 12 *Average gasoline volumes per station per day in each region*
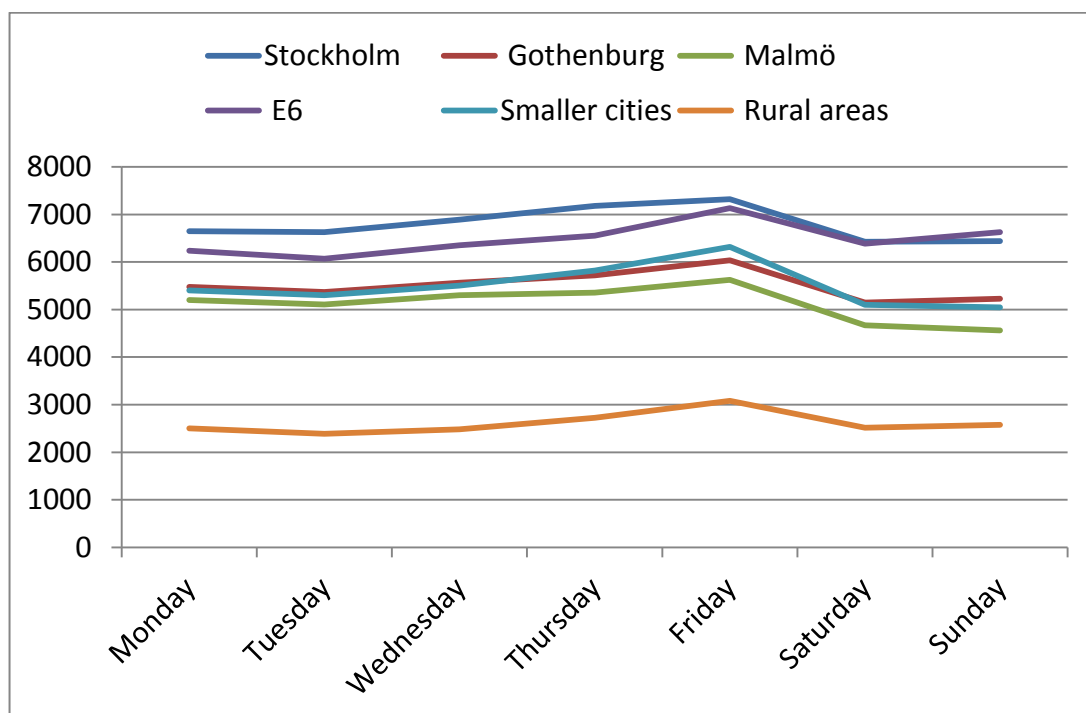
Third, for the other areas (Gothenburg, Malmo, the highway (E6) between Gothenburg and Malmo, and smaller cities), the retail prices are (i) lower and (ii) there are some cycles (even if the amplitudes are small). *The lowest prices and the largest cycles are found in Gothenburg where the weekly price average is SEK 0.26 lower than the recommended price and SEK 0.18 lower than the Stockholm average.* Hence, similar to what has been observed in other countries, the average price levels are often found to be lower in areas where price cycles are observed than in areas where cycles are not present.

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[18] In Foros and Steen (2008) the rural areas have the highest prices across Norway, whereas the major cities all have significantly lower prices, also Oslo (See parameters for regional dummyvariables Table 2 in Foros and Steen (2008)). Thus, the Swedish regional pattern distiguishes itself clearly from what has been found elsewhere.

To further illustrate how the weekly price patterns differ between regions, in Figure 13 we illustrate the price amplitudes measured relative to the lowest price. We observe that the weekly price cycle amplitude is higher for the lowest priced areas. This is the highest for Gothenburg, where the weekly amplitude doubles compared to the entire survey sample average (see Figure 9 above). Still the highest average weekly amplitude is less than half of what we observe for other national markets such as Norway.

Figure 13 *Regional price amplitudes – measured relative to lowest price in SEK*
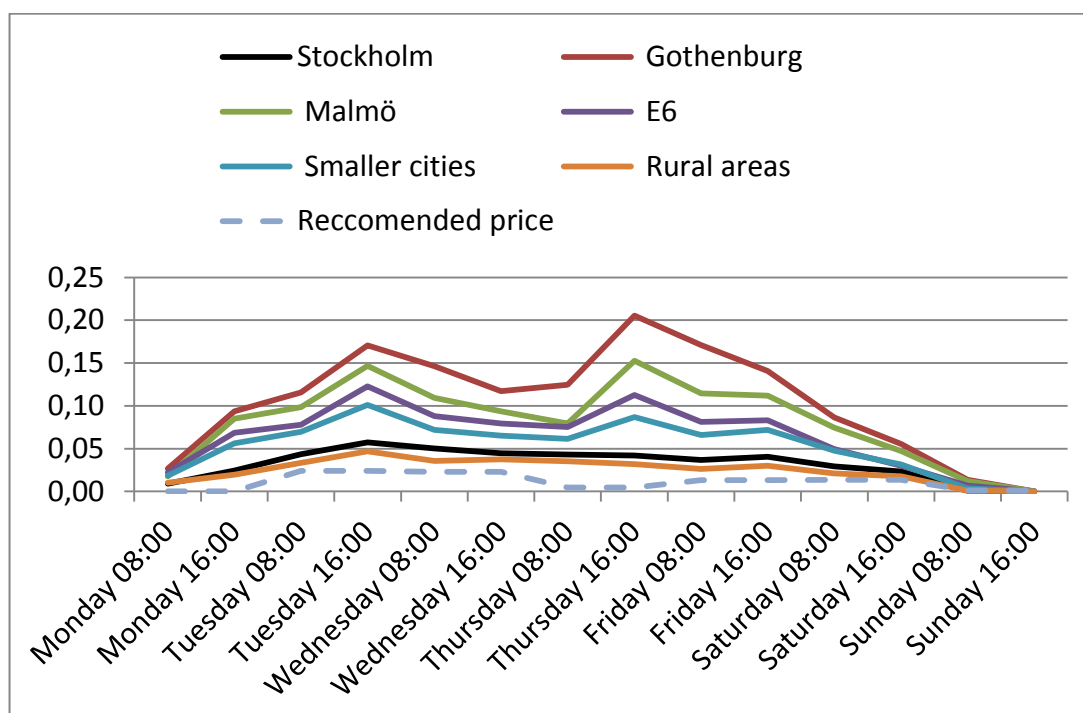
In Table 4 we have looked at the micro pattern of price changes within each regional market. Table 4 resembles Table 3, but to simplify we have aggregated the bi-daily price changes into weekdays and we have not reported the average magnitudes of the price changes. The aggregated pattern from Figure 13 is confirmed in Table 4. First, in the lower priced markets (Gothenburg and Malmö) price increases takes place predominantly during three days, Mondays, Tuesdays and Thursdays (mirroring the price peaks in Figure 13). These days 20-24% of all price observations imply price increases, whereas the other days the prices are increased in less than 12% of the cases. For the higher priced regions the corresponding figures are different, where positive price changes are more evenly distributed throughout the weekdays. Second, *prices changes generally a lot less frequently in the high price markets Stockholm (68-74%) and the rural areas (73-84%) than in Gothenburg and Malmö (51-63%).*

Table 4 *Share of price changes during the week within regions*

		Sweden	Stockholm	Gothenburg	Malmö	E6	Smaller cities	Rural areas
Monday	Price -	12.4	11.9	16.6	18.1	9.4	10.7	9.8
	Price 0	70.6	73.8	61.6	60.4	74.3	71.6	77.4
	Price +	17.0	14.2	21.9	21.6	16.3	17.7	12.8
Tuesday	Price -	16.2	11.9	22.6	26.3	15.8	14.9	9.9
	Price 0	66.7	72.5	57.8	53.0	67.9	67.7	75.5
	Price +	17.1	15.7	19.6	20.7	16.3	17.4	14.5
Wednesday	Price -	20.2	14.2	28.3	34.4	19.6	21.1	9.8
	Price 0	72.6	79.0	63.2	56.2	73.9	71.8	84.4
	Price +	7.2	6.8	8.5	9.4	6.4	7.2	5.8
Thursday	Price -	18.6	17.0	19.7	24.9	17.1	20.6	14.5
	Price 0	63.5	68.3	56.9	51.3	64.8	61.2	72.8
	Price +	18.0	14.7	23.4	23.9	18.1	18.3	12.7
Friday	Price -	19.9	14.3	29.7	32.0	19.9	19.8	10.0
	Price 0	68.8	74.0	58.3	55.4	69.3	68.5	80.3
	Price +	11.3	11.7	12.0	12.6	10.9	11.7	9.8
Saturday	Price -	14.5	8.7	24.5	25.0	14.0	16.2	4.8
	Price 0	84.2	89.9	74.2	72.8	84.9	82.7	94.4
	Price +	1.3	1.4	1.3	2.3	1.0	1.1	0.8
Sunday	Price -	7.2	4.2	13.3	16.1	5.4	6.7	1.5
	Price 0	90.8	93.8	84.6	81.3	92.9	90.8	97.1
	Price +	2.0	2.0	2.0	2.6	1.6	2.5	1.4
Average price in region		14.76	14.83	14.65	14.69	14.73	14.77	14.83

Note: Price decrease: Price -, No price change: Price 0, Price increase: Price +. All numbers refer to percentage share of price observations within each region.

3.4   Market structure and determination of retail prices

3.4.1 Ownership structure

Above we describe how retail gasoline markets typically consist of a mixed ownership structure (dual distribution). The contractual arrangements vary from complete vertical integration to complete vertical separation. Four ownership structures can be distinguished:

1. Complete vertical integration where the headquarters own and operate stations

2. Commissioned agent stations where the headquarters take all risk,

3. Franchisees

4. Complete vertical separation (dealer owned stations).

Note that there may not be a clear distinction between these arrangements, and our interviews reveal that vertical contract restrictions may differ between gasoline and additional services. To our knowledge, commissioned agent stations where the headquarters that take all risks are not present in the Swedish market. As described above, the degree of vertical separation between headquarters and retail outlets is critical with respect to who determines retail prices. As shown by Foros and Steen (2013) and Wang (2009), among others, the vertical contractual arrangements (price support systems) are used to transfer the control of retail prices from the retail outlets to the headquarters.

Historically, a similar structure with mixed ownership structure has been present in the Swedish market. However, the current trend seems to move towards complete vertical integration. The majority of the outlets are now vertically integrated. Furthermore, retail gasoline prices are determined directly by the headquarters also when outlets are organized as franchisees (according to interviews among outlet managers undertaken by the Swedish Competition Authority).[19] To our knowledge, the outlets that still are dealer owned are located in regions with low competition, that is, those labelled "rural areas" in the survey sample. See also Ganslandt and Rönnholm (2013) for more details.

Consequently, *for the majority of Swedish outlets (in particular outlets that face competition), retail prices are determined directly from the headquarters*. The role of the outlets, with regard to pricing, is simply to collect prices from rivals, and send information about rivals' prices to the headquarters.[20] *This is different from what has been observed in most previous analyses of retail gasoline prices in other markets; where the ownership structures have been more mixed.*

It is interesting to note that the headquarters now seem to have more direct control over retail pricing than what was assumed by the European Commission when they analysed Statoil's acquisition of JET in 2008: "*In general, the retail suppliers of motor fuels in Sweden determine retail prices charged by company-operated full-service stations and automated stations while franchisees and independent dealers are free to set their own retail prices...(…).. At the local level, each station manager is responsible for the prices charged at his station ("pump prices"). Pump prices are changed frequently – often several times per day – to reflect local competition. For each station, a set of*

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[19] Outlets organized as franchisees for additional services like grocery and convenience store items have often organized the sale of gasoline as a commission agent agreement.

[20] The degree of collection of price data obviously differs, as well as the methods across Sweden. For instance, the interviews showed that not all stations collect data. Retailers with no competition naturally doesn't collect data. Also, companies seem to have some selected retailers for collecting data in areas where there are many closely situated stations.

neighbouring stations ("clusters") is determined whose prices are frequently monitored." European Commission (2008).

Thus is suggesting that even within the last five years, the headquarters have been able to increase their control over local gasoline pricing in Sweden.

Interviews undertaken with outlet managers reveal that a large fraction of revenues is captured from the sales of additional services like grocery and convenience store items, car washes, automobile services etc. In a situation where outlets are vertically separated and are offered only a small margin on gasoline, this would provide an incentive to use retail gasoline prices to attract sale of complementary products. Dealer owned stations may then choose a lower price on gasoline than what maximize channel profit. However, since the majority of outlets in Sweden are controlled by the headquarters, the headquarters may internalize these effects. If retail gasoline prices are used to increase the sale of complementary products, headquarters do so in order to maximize channel profit.

3.4.2 Price support systems

Under complete vertical separation or franchising the price support systems described above are used by the headquarters to achieve at least partly control over retail pricing. As we saw in the previous section, the vast majority of outlets in Sweden are vertically integrated or they have franchising contracts where retail pricing is in the hands of the headquarters. Thus, there is limited need for a price support system to transfer control from independent outlets to headquarters. Interviews undertaken by the Swedish Competition Authority among managers of retail outlets confirm that price support schemes are not used on regular basis.[21] This is in contrast to e.g. the Norwegian market where we observe a more mixed ownership structure (Foros and Steen, 2013). Also in other countries the price support system is considered as a way to de facto ensure resale price maintenance (RPM); see e.g. Wang (2009) and the Danish Competition Authority (2009).

There exist a few dealer owned outlets in Sweden. These are most typically located in regions with low degree of competition, and they report that they simply set a uniform price that resembles the recommended prices offered from the headquarters.[22]

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[21] European Commission (2008) reports that price support arrangements have previously been used in Sweden during "price wars": *"The prices charged by individual stations (…) reflect both general pricing policies - such as a strategy to maintain a given price differential to competitors in the same cluster - and local pricing policies – for example offering dealers wholesale discounts to support them if local price wars erupt ("price support")."* See also Ganslandt and Rönnholm (2013).

[22] These dealers report in the interviews with the Swedish Competition Authority that they receive a fixed margin per liter, and that there exist no price support systems. The question is then, what happens if they reduce the price below the recommended price? If they have a fixed margin per liter from the headquarters regardless which pump price they choose, they should have the incentives to lower the price in order to increase the volume. We do not

As accentuated above, the use of recommended prices and price support systems are considered as devices used by the headquarters to transfer the control of retail pricing from the outlets to the headquarters. One reason for this is, as emphasized in the previous section, that the degree of concentration is higher at the headquarters-level than at the outlet-level (see Figure 3). In contrast, in the Swedish market this seems not to be the case anymore, since headquarters decide retail prices for the majority of retail outlets directly, even when the retailers are franchisees or independent dealers.

Above in Section 3.2 we accentuate that there has been a significant increase in concentration in the Swedish market, suggesting *that the Swedish market has grown into very tightly integrated oligopoly where prices generally are determined centrally by only four firms.*

3.4.3 Recommended prices

Despite that retail prices are determined by the headquarters for almost all outlets, the headquarters post recommended prices in a way that resemble the description from other markets above.[23] Figure 14 illustrates Statoil's web-site on recommended prices (from July 12, 2013). In addition to the current recommended price, Statoil provide information about daily recommended prices from 2001-2013. The other big chains (Preem, Shell and OKQ8) reveal their recommended prices in a similar way.[24]

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have information about which elements in the contractual arrangements between the headquarters and the dealer owned stations that prevent such behaviour in absent of price support systems.

[23] Two out of the major companies offer one recommended price for the business segment and one for the private segment. However, these two prices follow each other, and are almost identical. All major firms have recommended prices on their web site for business customers. Moreover, the companies offer a separate recommended price for automated stations.

[24] Note that Shell only has recommended prices on the web site intended for business customers.

Figure 14 *Recommended posted on Statoil's web—site July 12, 2013*
(*http://www.statoil.se/sv_SE/pg1334072467111/privat/Drivmedel/Priser/Priser-privatkund.html*)

What begs a question, since the recommended prices have no (or a minor) role as a device for vertical control of retail pricing, why do headquarters post recommended prices? In the literature reviewed above; the alternative incentives for the headquarters are:

- Information exchange among the competing headquarters; i.e. coordination of retail gasoline prices across competing headquarters' gasoline stations.
- Inform customers about prices.

With respect to information towards customers, it is interesting to note that all brands offer two different pricing schemes towards customers in the Swedish market:

- Pay according to the pump price; this is the conventional business model where the consumers simply pay the pump price per litre. To our knowledge, this pricing scheme is the most frequently used by *private consumers*. As described above, the pump prices are decided by the head-quarters for the majority of outlets, and the price may vary with local competition.
- The customer has made a rebate agreement; then the customer pays the recommended price minus a rebate (corporate customers) or the pump price minus a rebate (private customers). The size of the rebate varies a lot between different customer groups, and is typically higher for *the corporate customers*. Also the way these rebate agreements are arranged differ (e.g.

Preem seems to base the rebate agreements also towards the business customers on the pump price), and lacking knowledge on the exact content of these contracts we do not have detailed information about that.

We do not have detailed information about the levels of the rebates, but our impression is that private customers may have a rebate at approximately SEK 0.30 or higher.[25] We do not have exact knowledge on the corporate customers' rebate levels, but according to the interviews these seem to be higher. From Figure 13 above, we see that the recommended prices are higher than average pump prices. Therefore, the net gain for corporate customers is lower than their granted rebate level from using such rebate cards instead of paying the pump price. For areas like Gothenburg and Malmö the average pump price is indeed generally more than SEK 0.15 below the recommended price.

An interesting observation is that in 1999 when the companies were found guilty of having formed a cartel to coordinate rebate reductions, the rebate contracts had a different structure: All rebates offered were deducted from the pump price rather than from the recommended price, in which case local competition matters for all customers. Now the majority of rebate agreements towards business segments seem to be based on the recommended prices. Then, with the current system, local competition does not matter for business customers with a rebate agreement who face a uniform price across Sweden (for a given brand). Consequently, the current arrangements, where rebates linked to pump prices, allow the headquarters to segment the two customer groups: private and business customers, respectively.

The pump prices determine the prices faced by private customers, while the rebate level and the level of the recommended prices determine the net prices for most business customers with rebate agreements. In contrast, if the rebates towards business customers were deducted from the pump prices, the headquarters would have to take into account that pump prices would also affect the business custo-mers. An interesting topic for further research would be to compare these two different business models, and, in particular, how these models affect the competition among the headquarters.

If we now scrutinize on the headquarters' recommended prices, these are almost identical, which emerges clearly in Figure 15 below where we illustrate the recommended prices for the four major companies, including their automated station brands.

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[25] See e.g. http://www.visma.se/Inkop-Inkasso/Inkopsrabatter/Foretagsresor/Drivmedel/.

Figure 15 *Recommended prices, weekly company averages in the period (For Statoil, Preem, OKQ8 and Shell service station recommended prices are used, for Jet and St1* automated station *recommended prices are used).*
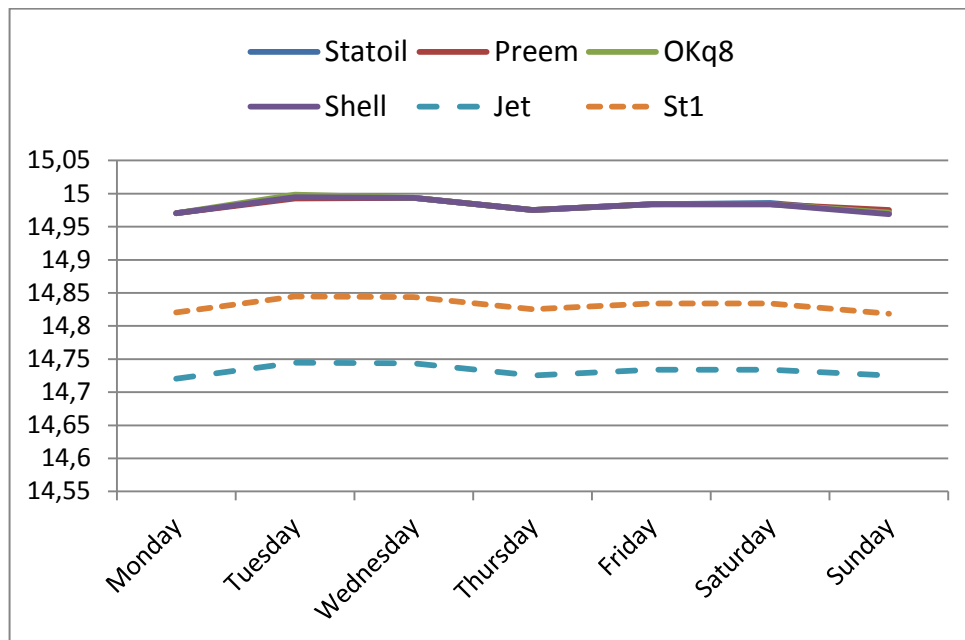

Literally speaking the service station prices are indistinguishable with respect to the level of recommended prices. Actually, an OLS-regression where we test for price differences across the companies shows no significant differences across the Statoil, Preem, OKQ8 and Shell service station prices at all (the insignificant difference in averages implied by the estimated coefficients are ranging between SEK 0.001 and 0.002). However, the automated stations' recommended prices are significantly lower, suggesting SEK 0.15 and SEK 0.25 lower recommended prices for St1 and Jet, respectively. The weekly pattern for the automated stations resembles the weekly pattern for the service stations' recommended prices.

In Figure 16 we compare the pump prices with the recommended prices for the different regions. For people living in Stockholm and rural areas where the pump prices are the highest, we see that the difference to the recommended price is below SEK 0.15. Therefore, there will be some benefits for corporate customers located in these areas even with a modest rebate level in their contracts. If we consider Gothenburg and Malmö, the pump price is actually always more than SEK 0.15 below the recommended price. In these areas there is no gain from having a corporate rebate agreement unless the contract offers a rebate that exceeds SEK 0.15.

In sum, the price paid for corporate customers, where the rebate is linked to the recommended prices, is now independent on which of the firm's outlets the customer uses, and the rebate price is not affected by local competition for this group.

Figure 16 *Price differences between recommended and regional pump prices (Pr-Pp)*
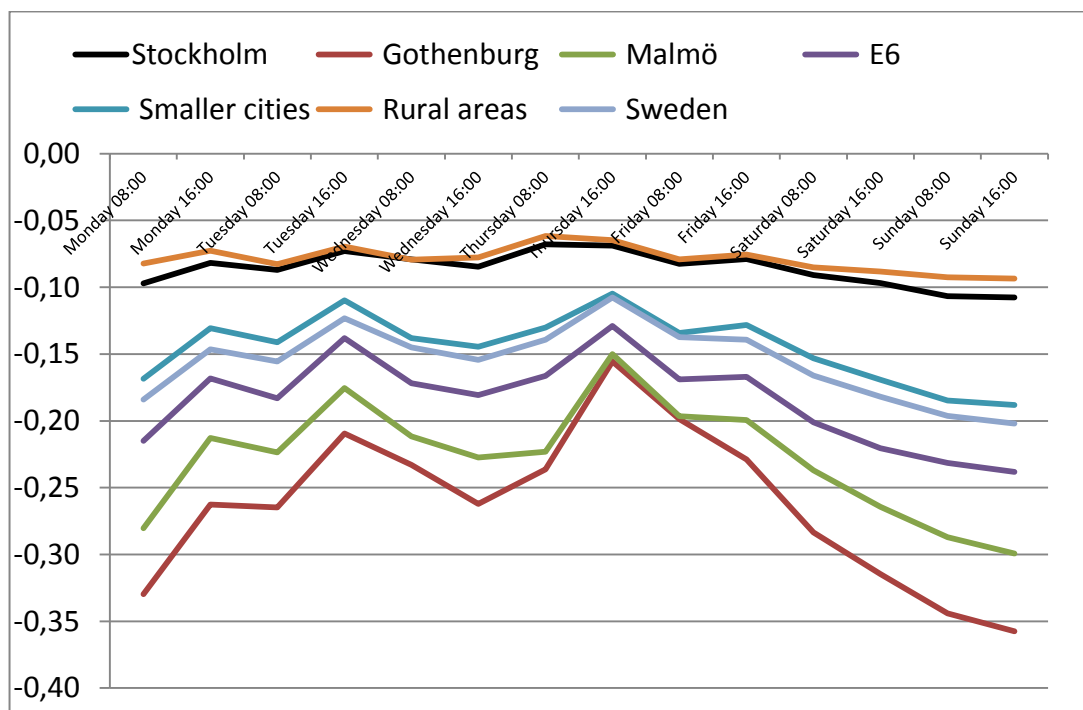
The recommended prices provide no *direct* information to private customers (that pay the pump price) on *where* and *when* gasoline prices are lowest. If the private customers that pay the pump price are aware of the level of the recommended prices, they may use this information to adapt to irregular price cycles. They can then use the difference between the recommended price and the pump price to evaluate the price level. If a customer has the willingness/ability to wait, she may then wait if the pump price is close to the recommended price.

In principle, the public available recommended prices may therefore help informed private consumers to adapt to an inter-temporal price discrimination pattern. Under the weekly pattern in Norway described above, the consumers may use a simple calendar-based strategy; buy gasoline on Sunday or Monday morning. When the average price increase on Monday at noon was NOK 0.50-0.60 (Foros and Steen, 2013), the potential benefit from adopting to the weekly cycles was significant. The Norwegian Competition Authority (2010) argues that consumer surplus for a large fraction of private consumers (that adapt to the cycle and move their consumption to low-price days) may increase under an Edgeworth fashioned price cycle.[26]

As described above, the price pattern in Sweden is different. There is no pattern with an industry-wide sharp increase at a given day. Said that, we find significant

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[26] The discussion in the Norwegian Competition Authority (2010) is based on Gabrielsen and Sørgard (2009); Gabrielsen was chief economist in the Norwegian Competition Authority.

differences, but the amplitudes are quite small. Therefore, the potential benefit from adapting to the weekly price pattern is limited – at least, compared to the effort needed. Private consumers need to know the level of recommended prices. Furthermore, they must check the difference between the recommended prices and the pump price. When the difference is above a given threshold, they decide to fill gasoline (see Noel, 2012). We doubt that a large fraction of the consumers follow such an effort intensive strategy for consumers.

Corporate customers with a rebate agreement linked to the recommended price pay the same price regardless from which outlet within a chain they buy from. Since corporate consumers may check the level of recommended prices, and these are (in practice) identical for all chains, they can follow a simple strategy to choose the chain with the highest rebate.

The crucial question is whether the main effect from online recommended prices is (i) to provide more information towards customers about where and when to fill gasoline or (ii) to increase transparency among competitors. If the main effect is to make the consumers better informed, the system may be welfare enhancing (see e.g. Motta, 2004). In contrast, if the information exchange arrangement helps market players to increase transparency among market players, this may facilitate potential horizontal coordination (Motta, 2004, and Kühn, 2001, among others).

As discussed above, it is hard to see how the recommended prices available on the headquarters' web-sites provide information to private customers paying the pump price when filling gasoline. Furthermore, for corporate customers the recommended prices do not contain any information about *when* or *where* they may tank at a low price. For business customers with a rebate agreement, the retail price is typically linked to the recommended price. Therefore, the net price is determined of two elements; the rebate and the recommended price. The recommended prices are changed symmetrically and to the same level (see further discussion below). Due to the transparency and the immediate response from rivals, the firms have few incentives to try to capture business customers from rivals by undercutting rivals' recommended prices. The price competition for business customers is then primarily in the level of the rebates offered (obviously, they also compete in other dimensions as the number of stations and location of stations).

In other countries with a higher presence of vertical separation, a detrimental effect from preventing the headquarters to use price support arrangements and recommended prices may be that it forces the headquarters to use vertical integration in cases where vertical separation is a more efficient ownership structure. In Sweden, where vertical integration is so frequently used, such a concern is not present. Therefore, a restriction on the headquarters information exchange about recommended prices would not have a negative impact by forcing them to reorganize the ownership structure.

Given that the recommended prices have a minor role with respect to intra-chain vertical price coordination, the role of the public recommended prices would be in particular interesting for further investigation in the Swedish market. For instance, with respect to pump prices, Faber and Janssen (2011) argue that recommended prices in the Netherlands are used to coordinate retail gasoline prices across Dutch gasoline stations.

In Table 5 we have scrutinized on the weekly pattern in price changes in recommended prices across companies and weekdays.

**Table 5** *Recommended price changes for each company in 2012*

		Statoil	Preem	OKQ8	Shell	St1	Jet
Monday	Price -	12	12	12	11	12	12
	Price 0	31	31	30	29	30	30
	Price +	10	10	11	11	11	10
Tuesday	Price -	8	9	7	8	8	8
	Price 0	30	29	31	29	30	29
	Price +	14	14	14	13	14	14
Wednesday	Price -	6	5	7	6	6	6
	Price 0	41	42	40	39	41	40
	Price +	5	5	5	5	5	5
Thursday	Price -	15	15	15	14	15	15
	Price 0	26	26	26	25	26	26
	Price +	11	11	11	11	11	11
Friday	Price -	5	5	5	5	5	5
	Price 0	37	37	37	35	37	36
	Price +	10	10	10	10	10	10
Saturday	Price -						
	Price 0	51	52	52	50	52	51
	Price +	1					
Sunday	Price -						
	Price 0	52	52	52	50	52	51
	Price +						

Note: Recommended price decrease: Price -, No recommended price change: Price 0, Recommended price increase: Price +. All numbers refer to number of recommended prices changes within each company

We observed from Figure 16 that the recommended prices did not differ much across the companies on average, suggesting that we should observe some symmetry with regards to pricing dynamics across the companies. Indeed, *the pricing pattern of recommended prices is strikingly similar across the four firms* (note that the recommended prices for St1 and Jet are determined by Shell and Statoil which

implies that the focus should be on the first four columns). Price changes take place less than twice a week; on average recommended prices are decreased 0.87 times per week, increased 0.97 times per week.

Figure 17 *Density of recommended price changes for all companies in 2012*
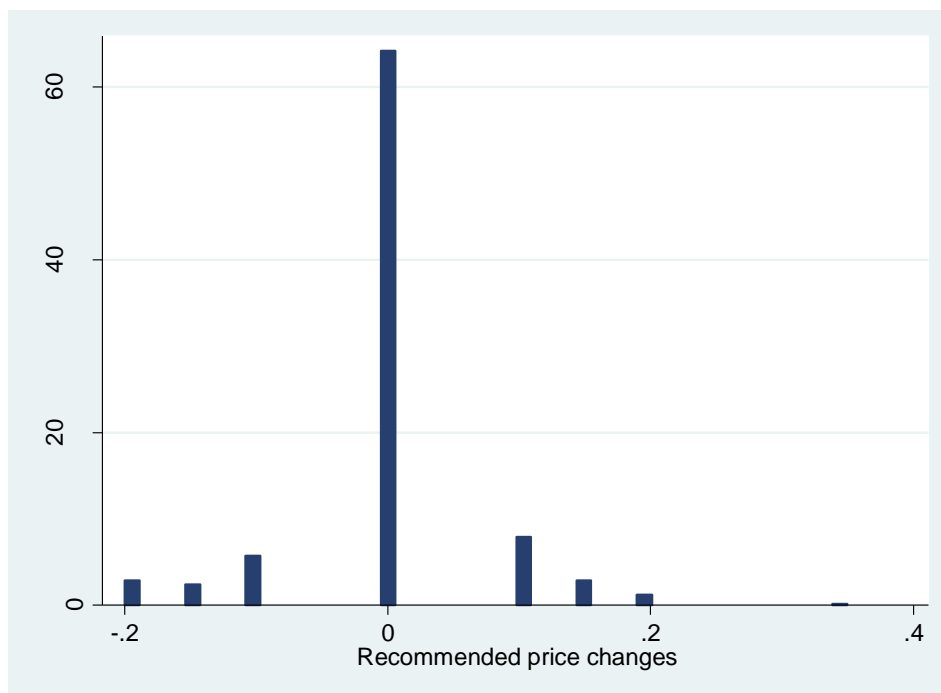
Another feature with the symmetric recommended price behaviour is that price changes are made with fixed values. Figure 17 displays a histogram of all price changes across companies. Most of the time recommended prices are not changed (73%), but if they are changed they are with one exception changed with fixed values; SEK 0.10, 0.15, and 0.20.[27]

Summing up we observe a stable and symmetric pattern for recommended prices with respect to both when changes are made, and the magnitude of the changes made.

There is no local competition when it comes to corporate rebates with rebate agreements linked to the recommended prices. The net price is independent of where these customers fill gasoline (for a given brand). If the pump price is the anchor for the rebates, we may expect that the undercutting incentives in areas with high degree of competition increase, while the opposite may be the case in areas with high degree of concentration. The effect is probably similar to the trade-off between geographical uniform and non-uniform prices. Uniform prices increase

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[27] On 2 January , 2012 three of the companies (Statoil (Jet) and Shell increased their recommended price with as much as SEK 0.35.

(decrease) prices in areas with high (low) degree of competition. The total effect is ambiguous.

Summing up, the degree of vertical integration seems to have increased and the concentration level has indeed increased significant with more than 45% over a period of 12 years. We observe that the companies are able to coordinate on almost identical recommended prices that are determining both the level of retail prices and a national level of prices on the rebate contracts. Hence, the potential efficiency gains from publishing recommended prices should be looked at critically by the competition authorities.

4   Concluding remarks

The most striking features we find in the Swedish market is the high degree of vertical integration (retail prices are thus primarily determined by the headquarters rather the local outlets) and that the price level and pricing pattern in Stockholm resemble isolated markets (rural areas). Stockholm represents as much as 15.6% of volumes sold of gasoline in Sweden in 2010, no other county council in Sweden come close.[28]

Typically, spatial competition implies that retail gasoline prices are spread as ripples in the water. When a station is undercutting its closest rival, the closest rival will answer, and so on. The situation is different in isolated markets. Such markets are typically found in rural areas. Surprisingly, retail gasoline price levels and patterns in Stockholm resemble isolated markets. So a question for further research is obviously why retail prices in Stockholm do not spread like ripples in water? Why do not gasoline prices in Stockholm look like the pricing pattern in Gothenburg and Malmo? For instance, one interesting question is whether the price pattern observed in Stockholm could have been achieved without the high degree vertical integration where all gasoline prices are set by the four major companies' headquarters. If retail prices were decided on the outlet-level, would it be possible to prevent a pricing behaviour where prices do not spread as ripples in the water in a market like Stockholm?

Given the high degree of vertical integration, it is of particular interest to understand the role of the recommended prices in the Swedish market. As opposed to other national markets recommended prices seem to have no (or only a minor) role as a device for vertical control of retail pricing in Sweden. A potentially significant worry is thus how the recommended prices affect the horizontal competition in Sweden. Related to this is also the interplay between competition in pump prices and competition through rebates linked to the recommended prices.

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[28] Source: http://spbi.se/statistik/volymer/lansvis/?county_id=5&year0=2010.

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