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Online Competition

Examining Competition Between Online and Dual-channel Retailers in the Norwegian Electronics Market

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Abstract

The purpose of this thesis is to explore competition among retailers online. Online retailing has grown significantly in recent years and is expected to keep growing. Simultaneously, traditional brick-and-mortar retailers are experiencing less growth. Many traditional brick-and-mortar retailers have chosen to adapt by entering the online channel, becoming dual-channel retailers. It is generally anticipated that the online channel is more competitive than traditional brick-and-mortar retailing, due to lower search costs, technology and barriers to entry. As dual-channel retailers operate in both markets, we wish to examine how this will affect their prices. We test the hypothesis of online efficiency through looking at the price levels and dispersion of online and dual-channel retailers.

We use a quantitative research methodology to examine whether online and dual-channel retailers prices are different. Using price data from various retailers within the electronics industry, we look at price levels and price dispersion to study competition between the retailer types. The results show that the prices of online and dual-channel retailers are significantly different. However, the results were the opposite of what we predicted, given the theory. We found that dual-channel retailers have significantly lower prices and lower price dispersion compared to online retailers. The results do not therefore support the existence of an online disutility cost, or the notion of online channel efficiency.

Preface

This thesis was written as a part of a master's degree in Economics and Business Administration with a specialization in Business Analysis and Performance Management (BUS) at the Norwegian School of Economics (NHH). Working on this thesis has been highly rewarding and challenging. I would like to express my gratitude to my supervisor Sissel Jensen for her advice, encouragement, and feedback throughout the writing process.

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Introduction

In recent years, online retailing has grown significantly. Since 2013, the revenues from online shopping in Norway have increased by 74%, reaching 105,1 billion NOK in 2017 (DIBS, 2018). This was a growth of 16% compared to 2016. As more consumers get accustomed to purchasing online, the revenues from online retailers are expected to keep growing. The revenues from online shopping can be roughly divided into the sub-categories goods, travel and services. Of these, online sales of goods are increasing rapidly, with a 21% revenue growth from 2016 to 2017. The sales of goods now constitute one third of all online sales. The fastest growing product categories are electronics, apparel and shoes (DIBS, 2018). In comparison, the growth for traditional-brick-and-mortar retailers in 2017 was 2-3% (Dagbladet, 2017).

Online retailers are generally believed to be more cost-efficient and have lower prices than their brick-and-mortar counterparts (Lieber & Syverson, 2011). The internet also gives consumers the opportunity to search for information at low-cost (Bailey, 1998). 66% of consumers state that time-efficiency is the reason behind their preference for buying online (DIBS, 2018). Experts have predicted that the growth of online shopping can potentially lead to the death of traditional retail stores (Dagbladet, 2017).

The topic of this thesis is to investigate retailers who have chosen to adapt by entering the online channel. Dual-channel retailers operate in both the online and brick-and-mortar channel, and we investigate how this may affect their prices. While online markets are characterized by low search costs, brick-and mortar-stores may differentiate on location. Operating in a more competitive channel could lead to intense price competition. Yet the dual-channel retailers may be able to offer unique consumer benefits and serve different consumer segments compared to online retailers. The outcome for dual-channel retailers pricing is therefore unclear.

The dual-channel retailers differ from the online retailers in that they have a brick-and-mortar store. 21% of those aged 15-74 have purchased products online, while collecting the goods in a physical store (DIBS, 2018). Of online buyers, 40% state that they prefer returning products to a brick-and-mortar store. Having a brick-and-mortar store may therefore be an advantage, even for consumers wishing to purchase products online. The object of this thesis is to study the competitive interaction between dual-channel and online retailers in the online market. The research question was thus: *Are dual-channel retailers prices different from online retailer's prices?*

The retailers in this thesis all sell electronics. Electronic products are highly differentiated, yet retailers carry many of the same products. A price comparison is therefore possible. Moreover, electronics was highlighted as one of the largest product categories for online commerce in 2017 (DIBS, 2018). There are also several dual-channel retailers operating in the market. The pricing of online and dual-channel retailers in this category is therefore relevant and possible. We investigate the price levels and dispersion for the online and dual-channel retailers in the electronics industry in order to see if they are significantly different.

1.1 Research question

This thesis aims to investigate the competition in the online channel in the electronics industry. The focus is on the difference in prices of online and dual-channel retailers. The thesis will outline how factors such as search cost, channel characteristics and information on the consumer side are expected to affect retailers in the online channel. The expected effect of the competition in the online channel on dual-channel retailers is outlined, as well as theory proposing an online disutility cost.

The research question is

Are dual-channel retailers prices different from online retailer's prices?

This will be investigated through analysis of price level and price dispersion of online and dual-channel retailers in the online channel.

1.2 Structure

This thesis consists of seven chapters. The first chapter contains the introduction, research question and overview of the structure of the thesis. In the second chapter, the electronics industry is outlined. The focus in this chapter is on the overall industry dynamics, as well as latest trends relating to online retail. In chapter three, the theoretical basis of the thesis is described. The theory focuses on how the nature of the online channel is expected to affect prices for retailers within the channel. Theory on dual-channel retailers operating in two channels, and how this may affect prices, is also included in chapter three. Chapter four outlines the data collection for the analysis on price dispersion and price levels, sampled from electronics retailers. How the data was analysed is presented in chapter five. In chapter six, the results of the analysis are presented and discussed. Chapter seven contains a summary and conclusion on the findings.

2. The Consumer Electronics Market

In this chapter, we will present the consumer electronics market in Norway. The first section contains an overview of the industry, with an explanation as to the channels of competition and where in the value chain this thesis is focused. The second section examines the retailer market, which is the subject of this thesis. The final section explores customer characteristics and the online channel in Norway.

2.1 An overview of the industry

In this section, the industry for consumer electronics will be presented, in order to gain an overview of the market.

Producers

Goods sold in the electronics industry in Norway are highly diversified (Schjøll & Lavik, 2008). The producers are often global firms localized abroad, each producing heterogenous products under unique brand names. Examples include Apple producing computers and phones under their brands iMac and iPhone, Samsung producing Samsung TVs and Galaxy phones, and Dell producing Dell computers. The technology behind the products changes rapidly, and innovation is therefore a key characteristic of electronics producers.

Distribution

The products move from producers to retailers through distributors. There are three major electronics distributors, Komplett Distribusjon, Also and Tech Data (Computerworld, 2015). In recent years, the number of distributors has decreased. Some producers have opted out of distributors, instead dealing directly with the retailers or the retailers procurement company (Schjøll & Lavik, 2008). Other retailers pursue a hybrid strategy of distribution. An example is Apple, who distribute directly to certain retailers known as Apple Premium Resellers, while also selling products through distributors (Aftenposten, 2013). With limited means to impact retailers except price, some distributors and producers have adapted exclusivity agreements with certain retailers. Exclusivity agreements, wherein one retailer gains exclusive rights to sell certain products by the distributor, avoids retailers competing aggressively on the product. Alternative methods for distributors and producers to avoid competition on their brands is to sell distinct products to each retailer. There is some evidence of this occurring in the electronics retailer industry. Schøll and Lavik (2008) found that brand overlap is 95% among different retailers, yet only 9%-25% of products were offered across retailers. Though retailers procure from the same distributors and producers of brands, it therefore appears that they may order different products, possibly avoiding price competition.

Retailers

The retailers are the final link in the supply chain and sell products to the consumers. The retailers in the industry mostly sell similar brands. There is some degree of vertical integration into the retailer segment, as several producers have vertically integrated into the online channel. This is typically through selling products on their web-page, in addition to allowing sales through other retailers. The main competitive dimension is price, as there are no real capacity constraints for retailers.

Channels

Electronics retailers can be divided into two channels; online and brick-and-mortar. The retailers choose which channels to operate in. The retailers opting to be present in both channels are called dual-channel retailers.

Online-only retailers, hereby called online retailers, are retailers only operating in the online channel. They typically have a web-site where customers can browse products, see availability and make purchases. The products are then shipped to the customers address. All communication between the retailer and the customer is done through the web-site or telephone. If an issue arises, the product can be sent back to the online retailer’s central location. The online channel is newer than the brick-and mortar channel.

Brick-and-mortar retailers are retailers with a physical store presence, so-called traditional retailing. They typically have a sales store with employees where the customer can see and hold the product, get recommendations and guidance from sales staff, and receive the product immediately after purchase. If the retailer is out of stock, the retailer orders the product, and the customer can collect it at the store. If there are any problems, the customer can address his concerns to the store employees. In the last couple of years, the number of traditional brick-and-mortar stores have decreased, with the channel becoming more consolidated (E24, 2017).

Dual-channel retailers are retailers who operate in both the online and the brick-and-mortar channel. They typically have stores with retail space as well as selling products through their web-sites, making them a hybrid between traditional brick-and-mortar and online retailers. The dual-channel store encompasses both the traits of online and traditional stores, but also may offer additional services. Examples are features such as “click and collect”, where a customer browses a product online and can pick it up at a brick-and-mortar store. Most dual-channel stores also give customers the opportunity to check availability of a product in a specific store prior to purchase. Following criticism for disparity between online prices and in-store prices for the same retailer, some dual-channel retailers adopted a policy of online prices in-store (Forbrukerrådet, 2017). Major retailers in the dual-channel are industry veterans Elkjøp and Power (E24, 2015). In recent years online stores such as NetonNet have also shifted towards dual-channel retailing, opening brick-and-mortar stores (Tek, 2016).

This thesis concentrates on the final step in the value chain, namely competition between different types of retailers downstream. Competition between brands and producers is therefore not elaborated on. The attention is on competition between dual-channel retailers with a policy of online prices in-store and online retailers.

2.2 The Retailer Market

In this section, some key features of the retailer market will be presented, in order to give context for the analysis in later chapters.

The consolidated retailer revenues for electronics have grown approximately 3-6% per annum in recent years (Elektronikkforeningen, 2018). In 2017, Elektronikkforeningen, the industry association for consumer electronics in Norway, assessed their annual members retailer revenues at approximately 30 billion NOK. The revenues for different categories are displayed below (Elektronikkforeningen, 2018)*:*

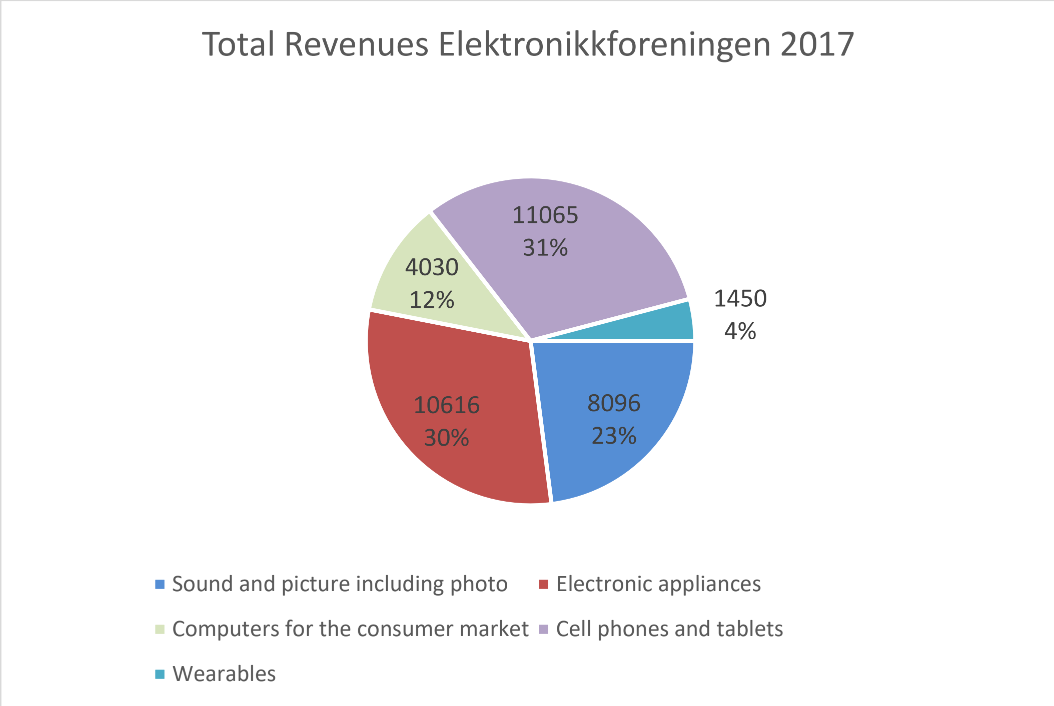

Figure 2-1: Total Revenues Elektronikkforeningen 2017 (in million NOK)

The revenues from figure 2-1 are the revenues for the categories listed, where some electronics products are not included, despite being sold by electronics retailers. An example would be gaming equipment, such as Playstation or Xbox, which does not fall into either of the above categories. Additionally, some retailers may not be members of the industry association and hence their revenues are not included. Therefore, the consolidated industry revenues are likely to be higher.

The retailers in the electronics industry do not publish market shares. Market shares are dependent on the definitions of the market, which are not immediately clear in the consumer electronics industry. This includes whether to assess competition as being contained within each channel or view channels as direct competitors. Electronics are also sold by a variety of store concepts, from niche to more general retailers. An example would be Elkjøp both having Megastores as well as the more limited concept Elkjøp Phonehouse. Using SSBs industry codes, many retailers one would assume to be competitors fall into different categories, so this is not a suitable measure of market shares (Schjøll & Lavik, 2008). Collecting the data independently is also difficult, as the retailers have different accounting years, and many are part of major corporations.

There are international measures of how the electronics market is performing. The EU ranks the Norwegian consumer electronics Market Performance at 78.6 out of 100 (Berg, 2016). This score is calculated based on the parameters of *comparability, trust, satisfaction, overall detriment and choice*. The score is slightly lower than the EU average for electronics, yet similar to other markets in Norway. Figure 2-2 illustrated below was collected from Consumption Research Norway (SIFO) and shows the ranking of different Norwegian retailer markets. Electronics (Elektronikk) is slightly below the overall market average, by 0.1 points.

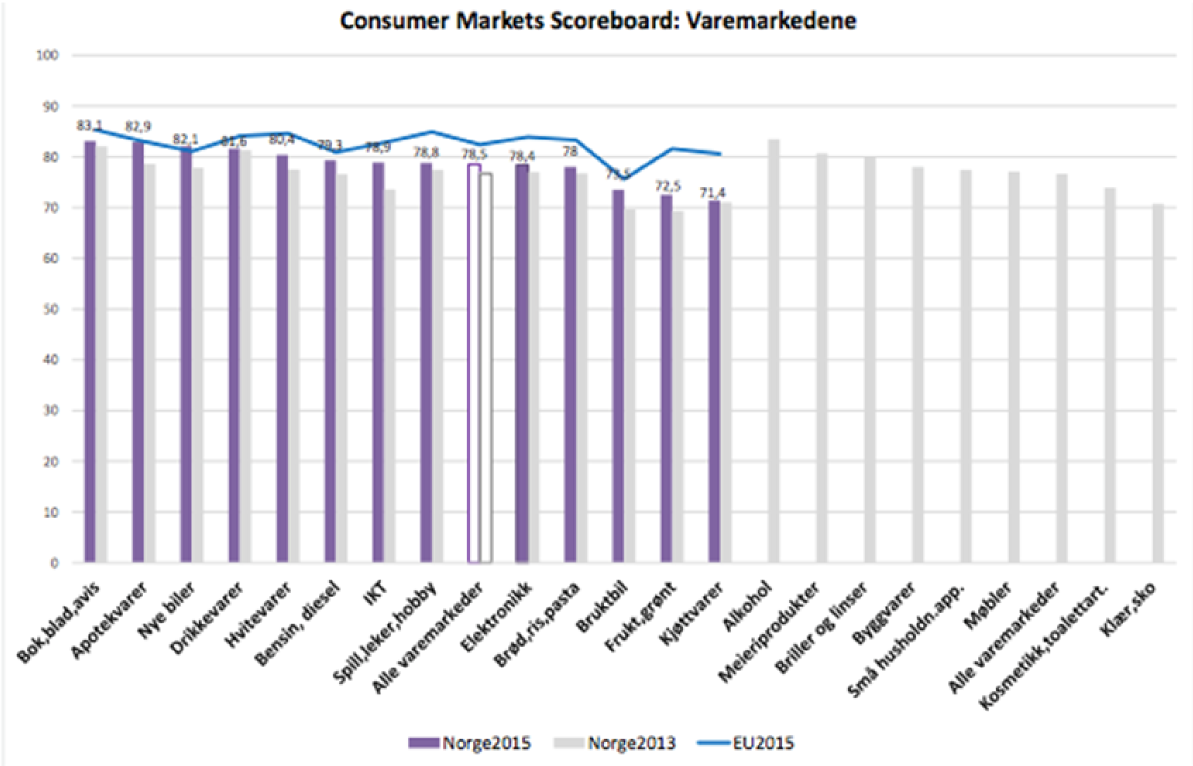

Figure 2-2 Norwegian markets ranked according to Market Performance Index (0-100) (Berg, 2016)

2.3 The customers

The customers in the consumer electronics industry are private individuals. One generally assumes that their demand is a function of price. A SIFO survey found that 63% of Norwegian consumers would regard themselves as price conscious (Lavik & Bøyum, 2017). A further 25% regard themselves as somewhat price conscious. This supports the assessment that most consumers are wary of prices when making purchases. However, other factors such as trust, availability and reputation of the retailers may also affect purchasing decisions.

The customers in the electronics industry's behaviour and assessment of the industry has been researched by SIFO. Consumers were asked to rank their experience with the electronics industry on a scale from 1-5 (Berg, 2016). The dimensions researched were how much trust the customer has in the retailer (trust), whether the customer compares prices and quality prior to purchase (compares), whether the customer complains if there is an issue (complains), whether the customer agrees that the retailers provide enough and accurate information about the products (information) and whether product comparisons are easy and facilitated by the retailers (comparability). An answer of 4 or 5 was considered a positive assessment of the industry. The results are shown below in figure 2-3.

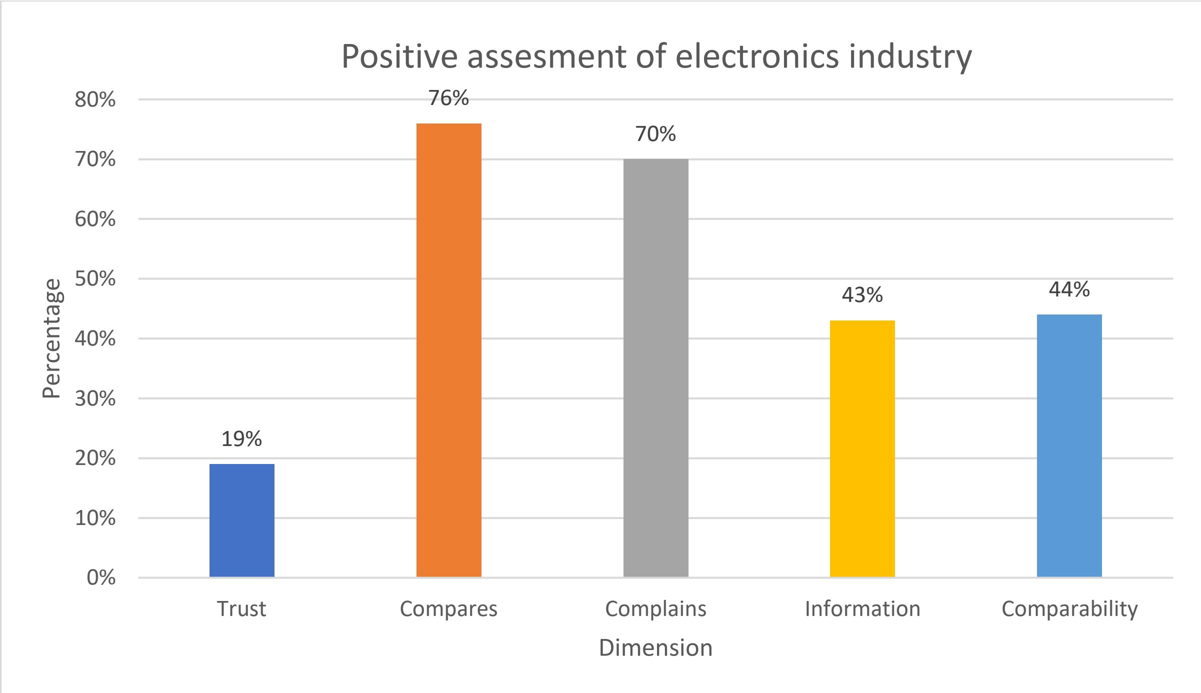

Figure 2-3 Consumers with a positive assessment of the consumer electronics industry (Berg, 2016)

The figure shows that 76% of the customers compares price and quality of different products prior to purchase, and 70% complain if there is a fault with the product. Of the five industries SIFO surveyed, electronics had the highest scores on these dimensions. 43% agree that retailers provide enough and accurate information about the products, and 44% say that it is easy to compare products.

Advertisements may also affect consumer behaviour. There are two main forms of advertisement, information-based advertisement and persuasive advertisement. In information based-advertisement the product and its functions are highlighted, whereas in persuasive advertisements focus is on differentiating the retailer (Tirole, 1988, p. 289). A retailer spending on information-based advertisement would increase demand for the product from all retailers. Therefore, the positive effect from advertisement is not limited to the retailer bearing the cost. Other retailers can in effect freeride. This lowers incentives to advertise using information on specific products. Retailer differentiation, which could potentially build loyalty, may therefore characterize advertisements where retailer competition is intense. Another possibility is for producers and distributors to limit the possibility of price competition on their specific product through exclusivity agreements with certain retailers, as outlined previously. Retail Price Maintenance (RPM), distributors setting a minimum resale price, would also be a method for distributors to avoid price competition on products. However, the regulations on RPMs in Norway are strict, as they are generally labelled as anti-competitive and normally not allowed (The Competition Authority, 2014).

2.4 Online shopping

Online shopping has grown significantly in recent years, as noted in the introduction. A study by SIFO researched online shopping by product groups and the results are shown in figure 2-4 (Schøll, Alfnes, & Lanseng, 2016). They found that 62% of those under the age of 30 purchase 50% or more of their electronics online. For those over the age of 60, only 20% did most of their shopping online. Since there are only two main channels, namely brick-and-mortar and online, one can assume that the remaining 80% mostly shop in physical stores. For the 30-44 age group, a minority of 48% primarily buys electronics online. In the 45-50 age group, 34% shop more than 50% of their electronics online. Overall, 41% mainly purchase electronics online, while 59% prefer to buy in-store, using unweighted percentages. This gives an indication of the relative channel sizes of brick-and-mortar stores and online stores respectively.

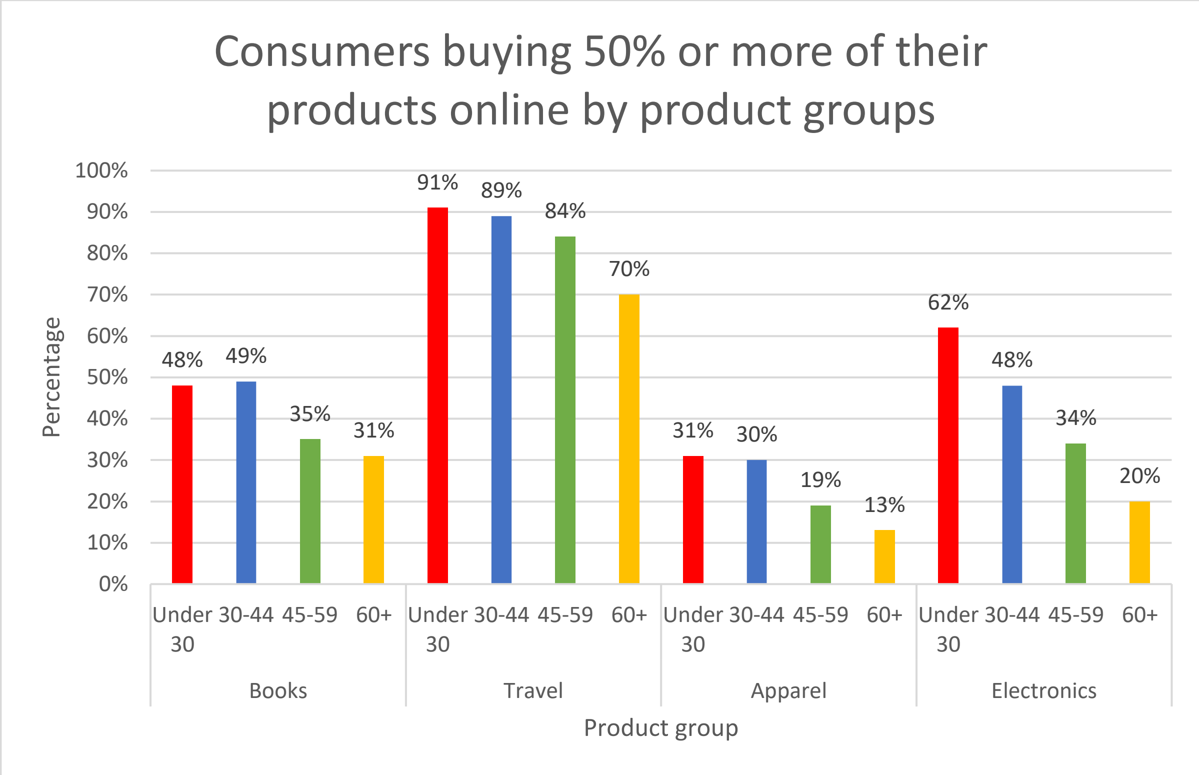

Figure 2-4 Online shopping by product groups (Schøll et al., 2016)

The tendency to buy online decreases with age. The figure also shows the data for other industries. Online shopping is more common in electronics than in apparel, though less than in the travel industry. For all age groups aggregated, the electronics industry and book industry have similar percentages of online shopping. However, in electronics, the younger age groups are the most active online shoppers, while the distribution is more uniform in books.

The attitude towards online shopping is also generally positive, with a SIFO study finding that 81% of respondents reported exclusively positive experiences (Sletterneås, 2009). Figure 2-5 shows the percentage of people reporting satisfaction with online shopping, ordered by gender and age.

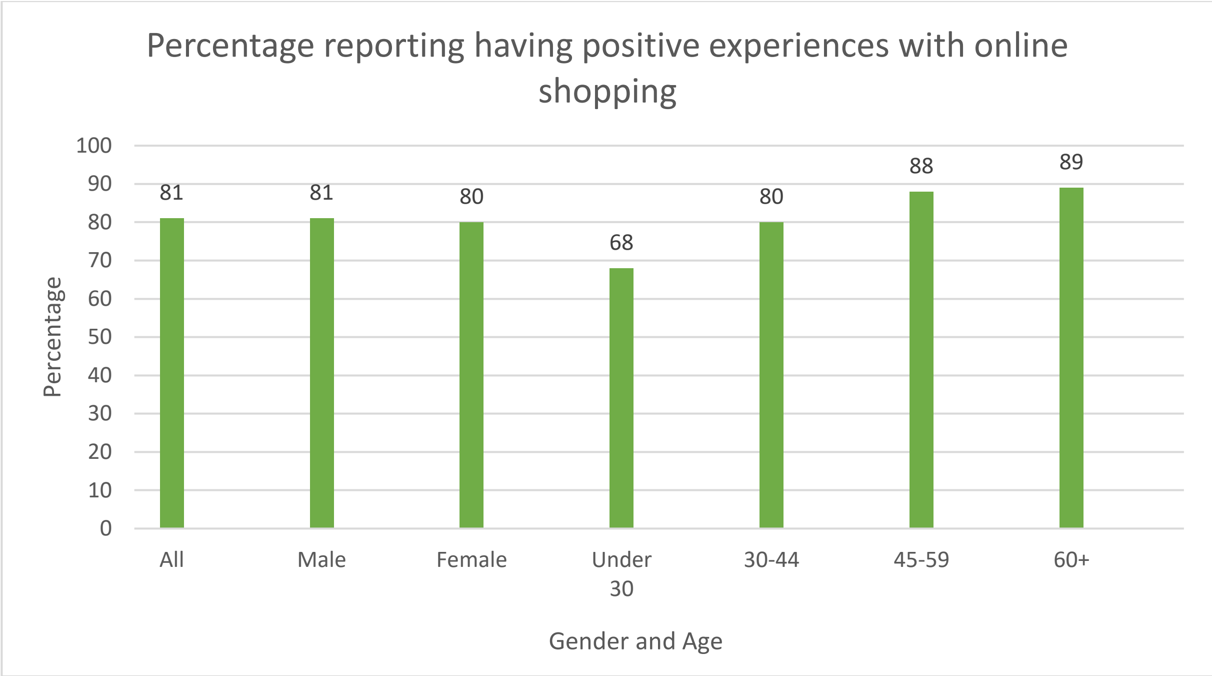

Figure 2-5 Respondents reporting exclusively positive experiences with online shopping (Sletterneås, 2009)

All groups except those under-30 have scores at or above 80%. For those under 30, 68% report exclusively positive experiences with online shopping, slightly lower than for the other age groups. Other studies have found that younger consumers are generally less likely to read terms and investigate an online page, so the higher number of negative experiences may reflect this (Sletterneås, 2009).

The internet can also be used to compare prices and find information. Figure 2-6 shows how many percent state that they use the internet to acquire information prior to purchase.

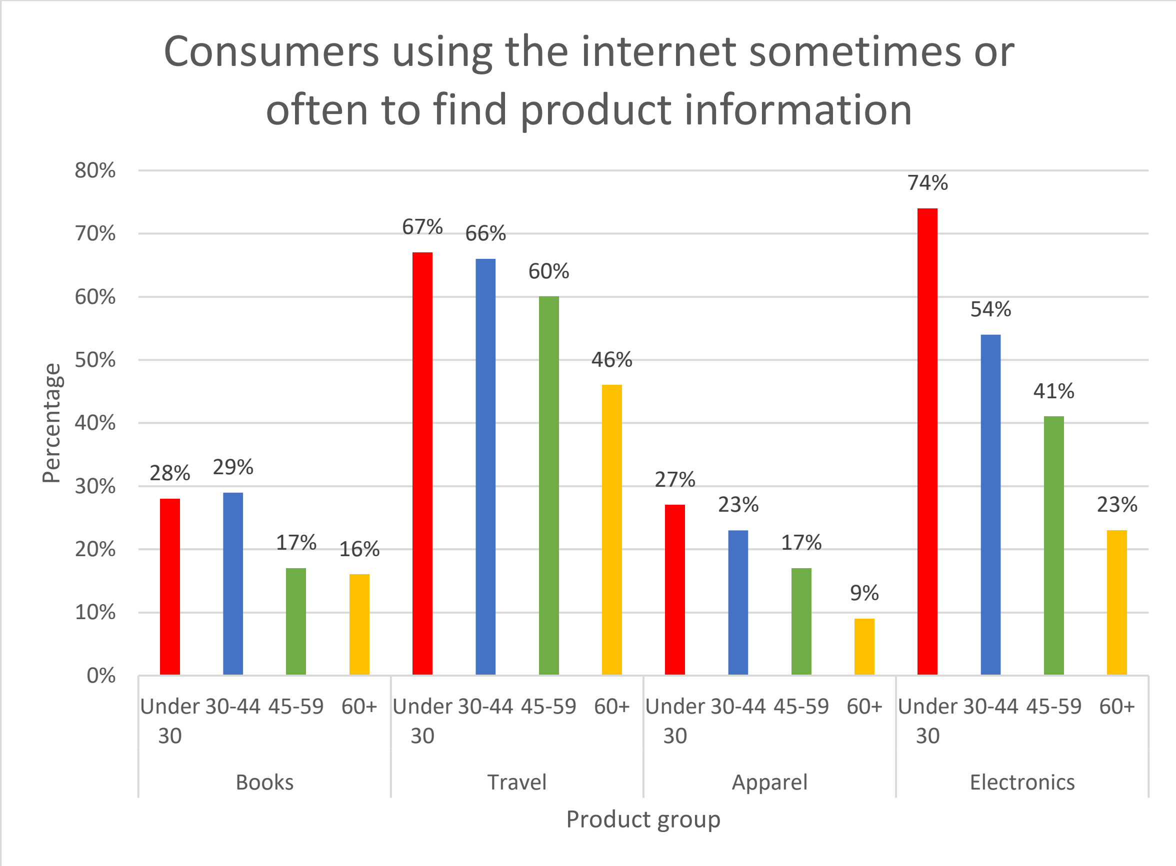

Figure 2-6 Percentage reporting using the internet sometimes or often to find product information (Schøll et al., 2016)

The figure shows that in electronics, the younger age groups report a higher degree of researching products through the internet, than the older age groups. In the 60+ age group, only 23% say they research product information online, compared to 74% in the under 30 group. It appears that online research is more common in electronics than in books and apparel. This could potentially be aided by the available tools, such as price comparison websites. Examples include Prisjakt.no and Prisguiden.no, which lists products prices at various retailers. This encourages online information gathering on prices.

3. Theory

When studying the competition in the online channel, a theoretical understanding of channel dynamics would be useful. Online retailing differs from traditional retailing in a number of ways, and this is likely to impact the competition within the channel. A theoretical basis for how operating in both the brick-and-mortar channel and the online channel is likely to affect the dual-channel retailers is also critical for understanding competition between dual-channel and online retailers. We examine the competition between retailers in the online channel through price level and price dispersion. Price level is defined as the price at which a product is offered in a channel. Price dispersion can be defined as "firms in the same market selling identical goods for different prices (simultaneously)" (Lewis, 2008, p. 654).

Most economic literature suggests that increased competition leads to lower prices, and a more efficient market (Bonnano & Hayworth, 1998; Machlup, 1952, p. 393). Bertrand competition seems a plausible assumption regarding the competition in the electronics industry, as retailers face few capacity constraints. Price is therefore the competitive factor retailers must decide on. In a perfect market, price dispersion for identical products should be zero, as retailers selling at a premium would lose all sales to the competitor with the lowest price. All retailers therefore have the same price for identical products in a competitive market. If the market is not perfectly competitive, the degree of price dispersion may indicate the extent of competition (Scheffler, Schiele, & Horn, 2016). Most literature on the prevalence of price dispersion indicates that the less price dispersion for a homogenous good, the more competitive the market is (Barron, Taylor, & Umbeck, 2004; Clay, Krishnan, & Wolff, 2001; Scheffler et al., 2016).

Empirically, different prices can be observed in many markets. Multiple theories explain why retailers are able to have different prices for identical products (Baylis & Perloff, 2002). Early research on online markets suggested that price dispersion may be a result of immature markets (Brynjolfsson & Smith, 2000). With time, the market is expected to become more competitive, and prices converge. A second explanation is that price dispersion reflects differences in services, attributes or costs (Baylis & Perloff, 2002). Thirdly, retailers may choose prices strategically to cater to specific consumers, based on information levels and search costs. We therefore explore how these aspects are expected to affect dual-channel and online retailers.

In this chapter, theory relating to competition between dual-channel and online retailers will be presented. The following section explores the online channel dynamics, in terms of how search costs and informed consumers are expected to shape the channel competition, both for online and dual-channel retailers. This relates to the third reason for price dispersion, and we present theory on how we would expect online retailer dispersion to be lower than dual-channel dispersion considering online search costs. The second part of the theory relates to the second reason for price dispersion, differences in services and cost. We present a model predicting dual-channel retailers pricing decisions based on differentiated value propositions and online disutility mitigation. The final section involves theory on how costs are expected to differ for the online and dual-channel retailers. This could enable dual-channel retailers to have higher prices compared to online retailers in the online channel. The theory gives a basis for analysing how dual-channel retailers are affected by being present in two different channels, and the implication for pricing.

We do not elaborate on the theoretical basis of immature markets for price dispersion. This is due to the research indicating online immature markets mainly being concentrated 20 years ago. Moreover, as online retailing has grown significantly, and approximately 41% purchase more than half their electronics online as outlined in figure 2-4, an immature market is improbable.

3.1 Search Costs

Search costs are costs associated with consumers having to orientate themselves in the market. In a market with many sellers of a product, consumers can choose to gather more information on prices and products. The customer incurs a search cost when gathering information. This is not necessarily a monetary cost, but the value of the time it takes to gather the information, the alternative cost, or the reduction in utility from delaying purchase until after information is gathered. The consumer therefore weighs the cost of conducting further search against the potential gain. In this section, we will outline how search costs are expected to affect prices in electronic market places, as well as consumer information levels in the online channel for online and dual-channel retailers.

3.1.1 Search costs in electronic marketplaces

A potential cause of price dispersion is that retailers may choose consumer segments based on search costs or information levels of the consumers. In this section, search cost in an electronic marketplace is presented, in order to examine the probable effect on pricing of online and dual-channel retailers. Markets are commonly modelled through a circular city model, conceptualized by Salop (1979). The circular market is illustrated in figure 3-1

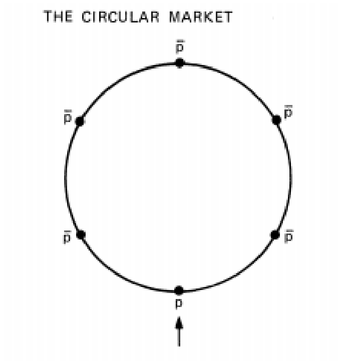

Figure 3-1 The Circular Market (Salop, 1979)

The circular market is typically used to describe retailer's location decisions, with the distance between retailers on the circle representing a transport cost. Diamond (1985) demonstrates that there exist search costs in commodity markets. Bakos (1997) adapts the circular market model to an online setting by redefining certain aspects of the original model, namely converting transport costs to search cost. This model has been used to explain how search cost in online markets are expected to differ from brick-and-mortar markets. In this section, we will explain the foundation of Bakos' search cost model and note the expected effect on the prices of dual-channel and online retailers.

In figure 3-1, there are *m* retailers and *n* buyers in the market. The retailers are spread uniformly around the circumference of the circle with their product offering, each offering one differentiated product. The retailers have constant marginal cost. The buyers' have individual preferences that are uniformly spread around the circumference of the circle. Each buyer wishes to purchase one product and is utility maximizing with a reservation cost, *r*. If they purchase a product that is not perfectly aligned with their preferences, they incur a "fit" cost, *t*, represented as a loss of utility. This fit cost is equal to the distance from the buyer to the seller on the circle.

Retailers move first and decide where on the circle they wish to be located. Buyers do not know the retailers' prices and product offerings. The buyers can find the price and product offerings of one additional retailer by incurring a search cost, *c*. The buyer must therefore weigh the information he already has against the expected gain of conducting more search along the circle. If the cost of search, *c*, exceeds the price difference between the products in the market, the consumer would opt to stop searching. Sellers in the market would assess the search cost, and price accordingly. High search costs can therefore lead to increasing prices, as sellers know that the consumer has limited information and the search cost discourages further search.

As search costs decrease, the profit margins of the sellers also decrease. The buyers can find the seller which maximize their utility at a low cost, and prices will converge towards marginal cost. With differentiated products, the sellers will still be able to have a slight price premium above marginal cost. If products are homogenous, the only differentiating factor for the sellers will be price. Under Bertrand competition, the result of no search cost would be intense rivalry between the retailers.

Bakos expresses how search costs in online markets are lower than in traditional markets. This is due to the ease of acquiring information online versus having to physically visit a store to check product offerings and prices. A consumer checking retailer web-sites for prices sequentially would therefore have lower search costs than a brick-and-mortar consumer checking prices in-store. Sequential search would still yield an equilibrium with increasing prices, due to the consumer having to incur the search cost for every retailer checked. Bakos argues that the internet is ideal for acquiring information, due to the easy availability, large number of sources and possibility of price comparison web-sites. If the cost of becoming informed is low, there is a higher chance of Bertrand competition in the online market, as retailers' rivalry increases with lower search costs

From the model we have that we would expect the internet to lead to lower prices and less price dispersion, as search costs are reduced and buyers can easily detect price differences. This could affect online and dual-channel retailers to different extent. Buyers of online retailers are expected to be familiar with the internet, and hence comfortable conducting search through the internet. The majority of online buyers therefore have low search costs, and online retailers are expected to have low prices and dispersion. Dual-channel retailer's prices would be easy to find and compare to online retailers for online buyers. However, search cost in the traditional market is higher than in online markets. Dual-channel retailers have customers in both the brick-and-mortar channel and the online channel and some of their buyers will therefore have higher search costs than others. However, they are unable to price discriminate between the channels due to their guarantee to have the same prices online and in-store. Low search costs in the online channel are therefore expected to put downward pressure on dual-channel retailers prices as well.

3.1.2 Information Cost

While the model above is based on sequential search by the buyer, the internet also gives consumers the opportunity to conduct simultaneous search. That is, checking the prices of multiple retailers with at once, through price comparison web-sites or search engines. Here the consumer can easily compare prices and product characteristics. This would lower search costs further, as there is no longer a variable cost associated with the search. Instead, the consumer can choose whether to be perfectly informed and incur the one-time cost or be uninformed. Varian (1980) proposes a model where some consumers are informed, and some are uninformed. Retailers may then choose which consumer segment to focus on. The model is briefly explained below, and the expected effect on dual-channel retailers and online retailer's prices is outlined.

There are multiple buyers in the market and each buyer wishes to buy one unit of a homogenous good. Buyers have a reservation price of r. In the market there are two types of buyers, informed and uninformed, denoted by I and M respectively. Informed buyers are a percentage of the total buyers in the market. Informed buyers know all the prices in the market and choose to purchase the product where the price is the lowest, if the price is below their reservation price. Uninformed buyers do not know the prices in the market, and choose seller at random, buying if the price is below reservation price.

The sellers, n, have a constant marginal cost of c, and decide a price, p, at which to sell their product. The seller with the lowest price in the market will sell to all the informed customers, as well as some uninformed customers. The other sellers in the market will only sell to their respective fraction of uninformed consumers $(\frac{M}{N})$.

In order to capture the informed consumers, the sellers have to set the lowest price. This is Bertrand competition with a homogenous product, and so one would expect price to move towards marginal cost. The seller with the lowest price in the market will have a profit of $(P_{min} - c) * ((\frac{M}{N}) + I)$. A potential strategy is therefore for the retailer to set his price as low as possible, in the hope of capturing the informed consumers by having the lowest price in the market.

Sellers also have a second strategic option. They can charge the monopoly price, $p*$, and only sell to their fraction of uninformed consumers $\frac{M}{N}$. This only holds if the monopoly price is below the reservation price, $p* < r$. Otherwise, the retailers setting a high price can maximum set a price of r. If the minimum price, p_{min}, is approximately marginal cost, c, the retailers may gain a larger profit from charging a monopoly price. The retailer is guaranteed profits of $(p-c)(\frac{M}{N})$ from uninformed consumers for any price below r. If these guaranteed profits of high price exceed the expected profits from price competition, the retailer will choose to set a high price.

If a significant number of customers are uninformed, the equilibrium outcome would be for sellers to set either a high or low price. Low price retailers would try to attract the informed buyers, while the high price retailers would try to gain as much profit as possible from the uninformed customers. The uninformed consumers therefore create price dispersion in the market.

One can also extend the model to include a cost of becoming informed (Salop & Stieglitz, 1977). A buyer can choose to be an informed buyer, given they incur a cost of x. This cost could be the search cost, as outlined in section 3.2.1. If the expected gain from becoming informed outweighs the cost, the buyer would choose to be informed. The expected gain can be formalized as the difference between the average cost in the market and the minimum cost. As uninformed consumers select retailers randomly, the expected cost of a uniformed buyer would equal the average cost in the market. By becoming informed, the buyer finds the minimum price.

As long as there are buyers who have search costs higher than the expected gain from search, there will be uninformed customers in the market. A reduction in search cost will therefore lead to more informed consumers, and lower prices. If there is a high proportion of uninformed consumers in the market, the retailers are more likely to follow a monopoly pricing strategy.

As explained in section 3.1.1 we expect search costs to be lower online. The presence of price comparison web-sites for electronics decreases search costs. Therefore, we expect a high number of online buyers to be informed on prices in the market. This assumes that those shopping online also have little effort in accessing information online. This should lower price and reduce price dispersion. As all sellers in the online channel must set price close to marginal cost, the average price in the channel should be low, with minimum prices at or close to marginal cost.

The low search cost online would also affect dual-channel retailers online sales. However, dual-channel retailers have a larger potential customer base than online retailers. Online retailers only sell to customers who are comfortable shopping online, while dual-channel retailers can sell to customers online and in traditional stores. From chapter 2, we have that only 23% of the age group 60+, and 41% of those aged 45-59 use the internet to find product information. The same age groups also report less shopping online, at 20% and 34% respectively. Therefore, one would expect the brick-and-mortar consumers, and in effect some of the dual-channel retailers' buyers, to be on average less informed. By setting a low price in the online channel, the dual-channel retailers also set a low price in the brick-and-mortar stores. Therefore, the expected gain from lowering prices online may not make up for the loss of profits in the brick-and-mortar channel. We therefore expect more dual-channel retailers to follow a high price strategy compared to online retailers.

From the model above, we have that buyers have varying levels of information. The retailers can choose to either compete on price and sell to all informed buyers as well as a proportion of the uninformed buyers. Alternatively, the retailers can choose to set a higher price, and only sell to their proportion of uninformed buyers. We would expect online buyers to have a lower cost of information, due to lower search costs online. A larger proportion of online buyers will therefore be informed. Dual-channel retailers have a larger customer pool, due to being present in both channels, yet must set the same price across the channels. If brick-and-mortar buyers have higher search costs, we would expect a larger proportion to be uninformed. A larger proportion of uninformed customers make dual-channel retailers more likely to follow a high-price strategy. We would therefore expect to see higher average prices, and larger price dispersion in dual-channel retailers.

From the models on search cost, we expect dual-channel retailers to have higher prices on average than online retailers. This prediction comes from the assessment that a larger proportion of dual-channel retailers would follow a high price strategy, raising average prices. This would also make price dispersion larger for dual-channel retailers than for online retailers.

3.2 Dual-channel retailers

In this section, we will present two models of dual-channel retailers and how they are expected to be affected by and differ from their online competitors. We present theory from Balasubramanian (1998), Nault and Rahman (2011), and Viswanathan (2005) in order to form expectations on price levels and dispersion of online and dual-channel retailers. The first section explores how introduction of an online retailer into the market is expected to affect brick-and-mortar retailers, and how the equilibrium changes if the brick-and-mortar retailers become dual-channel retailers. The following section explores how the technological nature of the online channel is expected to lead to a competitive environment, where dual-channel retailers can offer a distinct value-proposition.

3.2.1 Disutility costs

In order to investigate the competition within the online channel, the co-existence of online and brick-and-mortar retailers has been investigated. Balsubramanian (1998) models a market with an online retailer and brick-and-mortar retailers. In this section, the model will be explained in broad strokes, and later extended to also include dual-channel retailers. An illustration of the model consisting of online and brick-and-mortar retailers is pictured below:

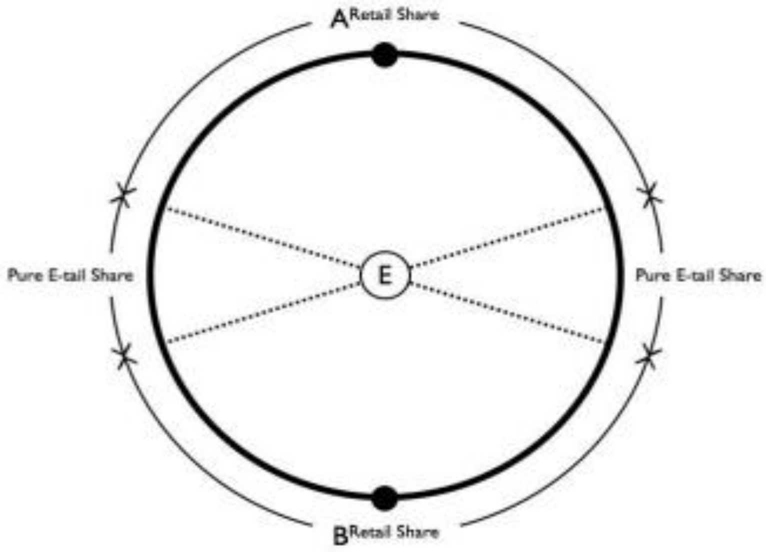

Figure 3-2 Spatially Differentiated Market with an Online Retailer (Balasubramanian, 1998, as illustrated in Nault & Rahman, 2011).

As we can see from figure 3-2, this model also builds on Salops model of a spatially differentiated market. The brick-and-mortar retailers are located around the circle. Every retailer sells identical goods and have marginal cost equal to zero. The buyers are spread around the circumference of the circle. The distance from the buyer to the closest retailer is their transportation cost.

Balasubramanian (1998) extends the model by including an online retailer (E) in the center of the circle, as seen in figure 3-2. The online retailer is in the center because they differ significantly from brick-and-mortar retailers. Online retailers do not have a physical location and are therefore able to cater to a larger geographic area through one (online) location, while also not being restricted by retail space, meaning they are able to have a larger assortment of products at any time. Further on, there are no opening hours or need for the consumer to physically transport himself to the store.

The distance between the customer and the online store is characterized as an online disutility cost. This is the equivalent to the transportation cost for physical retailers. The online disutility cost consists of three dimensions: trust, after-sales support, and lack of "touch and feel". The trust dimension involves privacy and security risks of online purchase as well as ambiguity relating to the retailers' quality and intention to deliver the product ordered. The after-sales support dimension consists of the added difficulty in returning the product should it be faulty or receiving help should a problem arise. The lack of "touch and feel" involves not being able to see and hold a product prior to purchase. The online retailer is located at the same distance from all the buyers in the market, equal to the radius of the circle.

The buyer is indifferent to which type of retailer to buy from but wishes to maximize utility. The final cost for the buyer is therefore their transportation cost or disutility cost to the retailer plus the cost of the product. The buyers will choose to purchase from the retailer that minimizes cost, which is the retailer located nearest. The outcome is therefore that the online retailer sells to customers located the farthest away from the brick-and-mortar retailers. In figure 3-2, this is illustrated by the traditional retailers being located at the top and bottom of the circle. The online retailer sells to customers located on the middle of the circle circumference, as shown by the dotted lines. This is where the transport cost for the customers is greater than the online disutility cost. The brick-and-mortar store *A* will then sell to buyers located nearer, towards the top of the circle. Similarly, *B*, will sell to buyers located towards the bottom of the circle.

The model outlined above only includes purely online or brick-and-mortar retailers, ignoring dual-channel retailers. Nault and Rahman (2011) extends the model to also include dual-channel retailers. The market is illustrated below in figure 3-3:

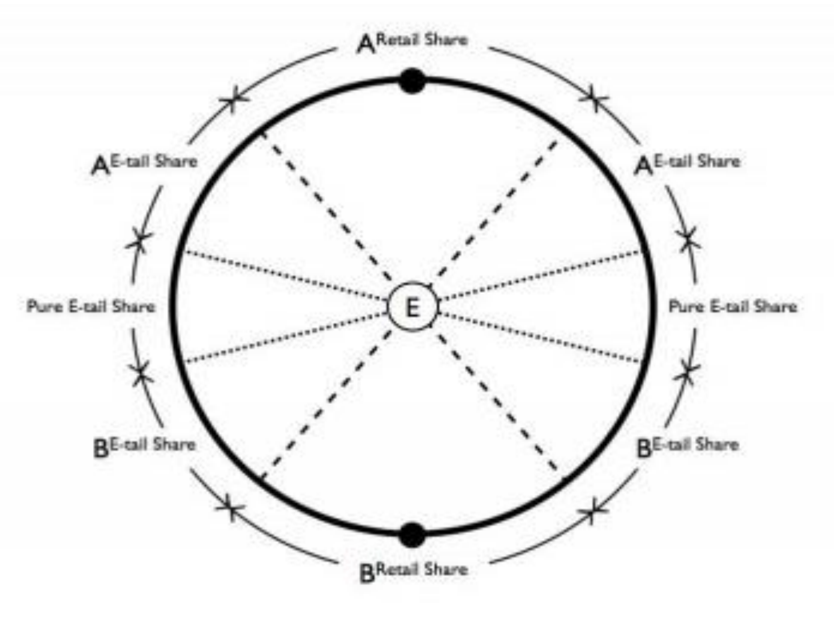

Figure 3-3 Circular market with online and dual-channel retailers (Nault & Rahman, 2011)

Here *A* and *B* are dual-channel retailers and are located on opposite sides of the circle circumference. The online retailer, *E*, is located in the center. Generally, the conditions from the model above are unchanged.

Dual-channel retailers differ from brick-and-mortar retailers in that they operate in both channels. This could bring benefits for the consumer. The consumer is able to approach the dual-channel retailers physical store for after-sales support and help, despite purchasing the product in their online store. There may also be added trust for the dual-channel retailer compared to an online retailer, because of the physical stores of dual-channel retailers. These benefits are larger for consumers who live in close proximity to the physical store and hence have lower transport costs should they wish to approach the physical store. Disutility from online purchases from a dual-channel retailers online store is therefore decreased for customers living relatively close to the dual-channel retailers physical store. The extent of this mitigation is therefore dependent on the buyer’s proximity to the physical retail store of the dual-channel retailer.

Under these conditions, the online retailer will sell to buyers located far away from the brick-and-mortar retailers, as their disutility costs will not be mitigated by the dual-channel retailer. This is annotated by the Pure E-tail share in figure 3-3. The dual-channel retailer will sell to consumers located near their physical store, both in the online and brick-and-mortar channel. The consumers located closest to the dual-channel retailers brick-and-mortar store, will purchase from the physical store as the online disutility cost outweighs the transport cost. This is denoted as B and A retail share in figure 3-3, for retailers *B* and *A* respectively. The consumer located farther away from the dual-channel retailers physical store, yet in relative close proximity, will buy from the dual-channel retailers online store. This is because the online disutility cost from purchasing online is partly mitigated for these consumers by having a physical store in relative close proximity. This is annotated in figure 3-3 as *B e-tail share* and *A e-tail share* for dual-channel retailers *B* and *A* respectively.

The cost to the consumer is the cost of the product plus the disutility cost or transport cost. Mitigation of disutility costs may therefore enable dual-channel retailers to charge higher prices in their online stores compared to online retailers, as the disutility is lower. The larger the mitigation of online disutility costs, the higher prices can be sustained for dual-channel retailers as opposed to online retailers. If the disutility costs are low, there will be more competition in the online channels, and dual-channel retailers prices are likely to be similar to online retailers. Dual-channel retailers prices are therefore a function of the mitigation. This should lead to higher prices for the dual-channel retailers. Moreover, as the mitigation is dependent on the retailer's physical location, and these differ for the dual-channel retailers, we would also expect higher price dispersion. The extent of this price premium depends on the online disutility costs, and extent of mitigation the dual-channel retailers offer.

A number of factors could shape online disutility in the Norwegian electronics market. Buyers from online retailers in Norway have stronger legal rights than buyers from traditional retailer, due to not being able to assess a product prior to purchase. A buyer from an online store has the right to reverse the purchase at no cost within 14 days (The Cancellation Act, 2014). This right does not extend to buyers from traditional stores. The ability to reverse the purchase may reduce the disutility of online shopping.

The lack of retailer product differentiation may also lower the disutility. The electronics retailers carry differentiated products by producers. The product itself, e.g. an iPhone 6 is identical whether purchased from an online store or a traditional retailer. Therefore, the consumer can mitigate "touch and feel" by visiting a physical store prior to purchase to hold and enquire about the product. The consumer can then buy the product online. If this mitigates disutility to a large extent, the consumer would opt for this, and dual-channel retailers would not be able to sustain a large price-premium.

The competitive outcome therefore depends on the disutility consumers incur from the online channel, and whether the dual-channel retailers are able to mitigate this disutility. If disutility costs are high, and mitigation is high as well, we would expect the price level of online stores to be significantly lower than dual-channel retailers. Moreover, as dual-channel retailers can differentiate on location of their brick-and-mortar store, shown as location of store A and B in figure 3-3, we also expect more price dispersion for dual-channel retailers.

3.2.2 Technology in channels

Dual-channel retailers operate in both the online and brick-and-mortar channel and are therefore affected by channel characteristics in both. Viswanathan (2005) models a market with a dual-channel retailer and examines how technology is likely to affect competition and prices for different retailer types. In this section, the model will be briefly outlined, and as well as the expected effect of channel competition on the prices of online and dual-channel retailers.

The channels, online (*A*) and brick-and-mortar (*B*), are modelled as two adjacent circles. There are three different firms in the industry, *a*, *h* and *b*. Retailer *a* is an online retailer and retailer *b* is a brick-and-mortar retailer. Retailer *h*, is a dual-channel retailer, and is located at the intersection between the channels, signifying that it operates in both. A visual illustration of the model is provided in figure 3-4 below:

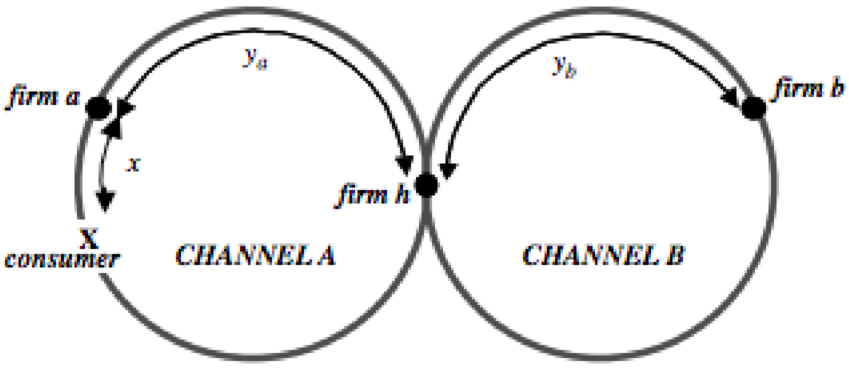

Figure 3-4 Spatial Model of Competition (Viswanathan, 2005)

The retailers in both channels offer identical products. The retailers differentiate within their channel by focusing on different services and add-ons which may be valuable to the consumer. Some consumers may value service, while others value fast delivery, low prices or user reviews of products. The retailers therefore choose which of these aspects to focus on in their store. This differentiation determines the retailer's location on the circle, within their channel.

In figure 3-4, there are *n* customers in the market, which are divided into channels according to preferences. Within the channel, the consumers have a unique set of channel characteristics which they value. This could for example be web-site design, next-day delivery or e-mail notifications for a consumer who prefers the online channel. If a firm focuses on a highly informative web-store, they may not appeal to certain consumers who instead value fast interface, and vice versa. There is therefore a tradeoff for the stores regarding which channel characteristics to focus on. The dual-channel retailer has characteristics valued by both online channel buyers and traditional buyers, appealing to both customers types. Consumers are uniformly spread along the circles based on their ideal configuration of channel needs.

If a consumer purchases something other than his perfect bundle, he incurs a misfit cost. The misfit cost is the loss of utility from purchasing from a retailer who lacks some of the channel characteristics which the consumer values. This is represented as the distance from the consumer to the retailer on the circle. The total cost for the consumer is the price of the product plus the misfit cost. The retailers therefore have to consider the misfit cost in their pricing decisions.

The misfit costs are a function of channel technology. IT-technology creates opportunities for online stores to customize the user experience to each buyer. Through using cookies, user profiling and recommendation systems, online stores can tailor the shopping experience to the individual consumer. More of the characteristics the buyer values could therefore be present, reducing the misfit costs. In such, the misfit cost becomes a function of channel technology.

The opportunity to use technology to decrease misfit costs, are different in the two channels, and hence they are modelled as individual circles in figure 3-4. Retailers in channel *b*, the brick-and-mortar channel, have less opportunity to customize the user experience, as the channel is less technologically oriented. Instead stable factors such as location, sales staff and layout comprise the brick-and-mortar retailers value characteristics. This leads to misfit costs being reduced in channel *A* as technology improves, while channel *B* retailers remain differentiated with high misfit costs for the buyers.

Viswanathan shows that if retailers set prices simultaneously under these conditions, the prices within each channel is dependent on the retailers in that channel, as well as the dual-channel retailer. That is, the prices in channel *A* are a function of the retailer *a* as well as the dual-channel retailer, *h*. As technology improves, the misfit costs will decrease. Therefore, Viswanathan argues that the online channel retailers value propositions converge, leaving the remaining competitive factor as price. This will lead to intense rivalry within the online channel. We would therefore expect low price levels and dispersion for the online retailers.

The dual-channel retailer is affected by the competition in both channels. As the competition in the online channel intensifies, the prices of the dual-channel retailer adjust downwards to remain competitive. As the online channel grows, due to consumers experiencing lower misfit costs, the dual-channel firm competes primarily with the online firms. However, the dual-channel retailer offers value propositions associated with both channels, such as pick-up in-store. This could enable higher prices than online retailers. As there are still significant misfit costs in the brick-and-mortar channel, the dual-channel retailers must decide on specific value propositions. These are likely to differ, and we would therefore expect price dispersion for the dual-channel retailers. The expected relationship is therefore for online retailers to have the lowest prices, followed by dual-channel retailers, and brick-and-mortar retailers have the highest prices.

From the model in figure 3-4, we have that the price of the dual-channel retailer is significantly affected by the competition in the channels. Online value propositions are expected to converge due to technology, which leads to low prices and dispersion. Dual-channel retailers offer a wider set of value propositions, which enables prices to be higher than online retailers. Decisions on value propositions in the brick-and-mortar channel should also lead to higher price dispersion compared to online retailers.

3.3 Cost Heterogeneity

Cost differences between the channels may also impact prices for the different types of retailers. In this section, we explore how costs are expected to affect competition and prices within the online channel, in order to make predictions on price levels and dispersion for online and dual-channel retailers.

It is generally proposed that online stores have lower fixed costs than brick-and mortar stores (Lieber & Syverson, 2011). In the brick-and-mortar channel, retailers have physical stores in which to sell and display products, as well as sales staff to guide and help potential customers. The retailer must maintain an inventory of products to show potential buyers, and also have costs associated with managing the stores opening hours. Location of the store is an important factor, with more favorable retail spaces more costly. Brick-and-mortar retailers therefore have a substantial cost base for their retail operations.

Online stores generally have lower fixed costs. There is a fixed cost associated with setting up and maintaining an online store, but they are generally less than the equivalent for a physical store. The online retailer needs storage space but is not dependent on a central location. Perhaps most importantly, one online store can cater to customers all over the world, whereas physical stores are highly location specific. One physical store only serves the people who live in close proximity, an online store can ship products all across the globe. The cost base is therefore assumed to be lower in an online store and be spread on a larger potential customer base.

Lower costs are likely to affect prices. Under Bertrand competition, prices will converge to cost. If the cost is higher for brick-and-mortar retailers, the converging price for these retailers will also be higher. A dual-channel retail has to maintain brick-and-mortar stores in addition to their online store, increasing costs. The implication for dual-channel retailers is that they compete against online retailers on price, but online retailers generally have lower costs. Therefore, it may not be possible for dual-channel retailers to have similar prices as online stores.

A cost disadvantage for brick-and-mortar retailers compared to online is evident. However, some have argued that this cost-disadvantage does not necessarily translate into a cost-disadvantage for dual-channel retailers (Lieber & Syverson, 2011). Dual-channel retailers are generally large and have an established distribution network. They may also have built-up loyalty and awareness amongst the consumers. By leveraging these assets into the online channel, they may be able to get an advantage over online retailers. Operating in both channels could increase benefits from economies of scale, and dual-channel retailers could therefore gain a cost advantage.

Higher fixed costs in the brick-and-mortar channel would constitute a barrier to entry. With lower fixed costs in the online channel, the entry barriers are lower (Bailey, 1998). In general, it is proposed that "as more competitors enter a market, incumbent firms will find it more difficult to maintain mark-ups over marginal cost" (Gerardi & Shapiro, 2009, p. 2). Prices over marginal cost can only be sustained if there are barriers to entry, otherwise other firms will see the industry making extraordinary profits and move into the industry. More competitor's lower prices and decreases price dispersion, making the market as a whole more efficient. The online channel is therefore likely to consist of more retailers and be more competitive. This should lower the online retailer's prices and decrease price dispersion.

The effect on dual-channel retailers is more ambiguous. If the costs of dual-channel retailers are higher, we would expect higher prices. If economies of scale reduce the costs, we may see lower prices for dual-channel retailers. The low barriers to entry in the online channel should also increase competition, which will affect the online operations of dual-channel stores and put downward pressure on prices.

3.4 Theory: Summary and Predictions

The theory presented in this chapter give a basis for forming expectations regarding the pricing of online and dual-channel retailers

We expect brick and mortar buyers to be less informed than online buyers, due to the differences in search cost in the markets. As dual-channel retailers cater to both consumer segments, they are expected to have a larger proportion of uninformed buyers. Dual-channel retailers are therefore more likely to follow a high-price strategy and this will raise dual-channel retailers average product prices relative to online retailers, and increase price dispersion.

The technological nature of the online channel is also expected to lead to lower prices and dispersion for online retailers. Online retailers can use technology to cater to multiple consumer needs, and hence the "fit" cost will decrease for buyers in the online channel. As a result, the channel will be highly competitive. Dual-channel retailers are also affected by the technology of the online channel, and the "fit" cost for their online buyers will decrease. However, dual-channel retailers can differentiate on location of their physical store, and features such as click-and-collect in-store. This may lead to differentiation of dual-channel retailers and allow for higher prices. As the differentiating factors differ for various dual-channel retailers, we also expect higher price dispersion.

Theory on mitigation of online disutility cost can also lead to higher prices for dual-channel retailers. Dual-channel retailers can mitigate online disutility costs for consumers in their online stores. As a result, they may also charge higher prices relative to online retailers.

Costs may differ for online and dual-channel retailers and this is likely to impact prices. Low fixed costs online will likely decrease barriers to entry and increase competition in the online channel. This will reduce prices and price dispersion for online retailers. Same prices online and in-store for dual-channel retailers means prices of dual-channel retailers must include the cost of brick-and-mortar stores as well as online stores. The higher costs of brick-and-mortar stores may therefore increase cost. The expectation would then be for dual-channel retailers to have higher prices than online retailers. However, there is also some evidence of cross-channel synergies and economies of scale. This could decrease dual-channel retailer prices relative to online retailers. Therefore, the cost effect is ambiguous.

The hypotheses are

- *Dual-channel retailers prices are higher than online retailer's prices*
- *Dual-channel retailers have more price dispersion relative to online retailers*

3.5 Empirical research

Multiple researchers have studied price levels and dispersion online. In this section, we will present some of the findings from these studies. First, Bailey's (1998) study on price levels in online and physical markets will be presented. This study is highly influential in the field of online market efficiency (Baylis & Perloff, 2002). The following sections will present studies on price dispersion and the online market in general. Though we found no studies examining the exact same topic as we are studying, the studies outlined are relevant in that they have studied aspects which are closely related to our topic.

Bailey (1998) compared price levels in the brick-and-mortar and online channel using data on books, CDs and software. The hypothesis was that the nature of the internet would lead to lower prices and less price dispersion. The results indicated the opposite. Prices were higher in the online channel than in the brick-and-mortar channel, and dispersion was greater. As the data was from 1996 and 1997, Bailey hypothesized immaturity of online markets could be the reason for the results. There were few retailers in the market, and customer search may have been low. Therefore, he hypothesized that as the online channel grew, online prices would lower and converge.

Brynjolfsson and Smith (2000) conducted a similar analysis as Bailey, using data from 1998 and 1999. Comparing prices on books and CDs, they found lower prices in the online channel. The prices were lower using both "pure" prices and when including shipping and handling. A possible reason for the difference in result from Bailey, could be the newer data in Brynjolfsson and Smiths study. The online channel may have become more competitive over time. However, the methodologies of the studies differed, so direct comparisons between the studies are difficult.

While the above studies focus on online versus brick-and-mortar retailers, Carleton and Chevalier (2001) looked at the prices of different retailers online. They found that prices for DVD players were higher for dual-channel retailers, authorized resellers, and manufacturer's websites. This study therefore supports our hypothesis that dual-channel retailers have higher prices in the online channel.

Studies on price dispersion have found significant dispersion in the online channel. Clemons, Hann and Hitt (2002) found that online airline tickets had a price dispersion of approximately 20%. Brynjolfsson and Smith (2000) found price dispersion to be significantly larger online compared to physical markets using data on books. Clay et al. (2001) also found higher dispersion online than in brick-and-mortar retailers for books. Bayliss and Perloff (2002) studied price dispersion for electronic products digital cameras and scanners online. They found high price dispersion for both product categories.

Png, Lee and Yan (2000) investigated the competitiveness of online markets. Their results indicated that online markets are more competitive, with lower search costs.

Degeratu, Rangaswamy, and Wu (2000) found that for groceries, price sensitivity is lower and brand sensitivity higher for online consumers. Smith and Brynjolfsson (2001) found that customers using price comparison websites were price sensitive, yet also highly sensitive to prior experience with the retailers and retailer brand. The effect of price-comparison websites on dispersion online was studied by Brown and Goolsbee (2002). They found that on introduction of a price-comparison site, price dispersion initially increased. However, when a large proportion of consumers started using the sites, dispersion fell.

In summary, the empirical studies differ in results. Empirical studies on price level have found that online prices are both higher and lower than prices in the brick-and-mortar channel. Studies on price dispersion have to a large extent confirmed the existence of large price dispersion online. Most of these studies were done at the introduction of internet commerce. The results may therefore be affected by the immaturity of the market, as proposed by Bailey (1998).

4. Data collection

This thesis investigates online competition through analysing whether online and dual-channel retailers prices differ. We therefore analyse whether the retailer types have different price levels, and price dispersion. The data needed is thus price data from electronic retailers. In this chapter, the data collection for the analysis will be outlined. We first describe the product selection for the analysis by explaining which product categories were selected and how individual products were chosen. We then classify retailers into dual-channel and online retailers. Finally, the data sources, data limitations and data transformation are explained.

4.1 Product Categories

The electronics retailers carry many and diverse products. These can be divided into product categories. A table illustrating the different product categories at the dual-channel retailer Elkjøp is included below:

Category	***English translation***
Data	*Data*
Mobil og GPS	*Mobiles and GPS*
Tv, Lyd og Bilde	*TV, Sound and Picture*
Hvitevarer	*Appliances*
Hjem og husholdning	*Home and household*
Styling og Velvære	*Styling and Wellness*
Gaming	*Gaming*
Wearables og trening	*Wearables and Exercise*
Foto og Video	*Photo and Video*
Leker og Hobby	*Toys and Hobby*

Kjøkken, vaskerom og møbler	*Kitchen, Laundry and Furniture*
Filmer og serier	*Movies*

Table 4-1 Product Categories of Elkjøp

As we focus on the consumer electronics retailers in general, as opposed to a specific product category, the data for the analysis should include products from several product categories. There is also the issue of space and time-scope of the thesis, where including all product categories would not be practical in the time-frame. Therefore, to focus while yet having some breadth, eight product categories were selected.

Some categories are less relevant to electronics than others, despite being sold by electronics retailers. An example from Elkjøps categories above could be *Kitchen*, where Elkjøp sells everything needed to upgrade a kitchen, not just the electronic appliances. The products one most closely associates with electronics are rather products such as televisions, speakers, computers and mobiles. We expect all electronics retailers to have products in these categories. Therefore, these product categories were chosen. Four additional categories were chosen at random, namely Wearables, Playstation 4 Games, Headphones and Xbox-Games. For these categories, we found that it was possible to find the exact same product at multiple retailers. Further on, in these categories there is sufficient data to do an analysis. Thereby, the total number of categories for the analysis was 8.

4.2 Product selection

Within each category, we selected different products. The consumer electronics industry mainly consists of differentiated goods based on brand, specifications or technology. In order to make the price comparisons as accurate as possible, price should be the only differentiating factor. Therefore, the products in the analysis should be identical for all retailers.

For electronics, the product name is an easy way to identify whether a product is the same from different stores. The product name is set by the producer and is the same for all retailers. In instances where the name was shortened or simplified, the specifications were compared to see if the product was identical.

In some categories, there were similar products that were not identical. If two products had technological differences, such as storage space or screen width, they were classified as two different products. Superficial differences, such as colour, were not regarded as an important aspect in electronics, and the products were classified as one product. An example would be an iPhone 6 rose gold and an iPhone 6 gold, both being classified as an iPhone 6 despite colour differences. There was not found an instance where a retailer had different prices for the same product in different colours.

Similar yet distinct products were also a subject in the categories of Playstation 4 games and Xbox games. Many of these came in downloadable versions as well as in physical disc versions. On one hand, the game in itself is the same, and so one can argue that there are no technological differences. However, one can also argue that having a disc with the game is different from having a downloadable version, in that receives a physical product. Therefore, we classified downloadable and disc-versions as different products, and as such only disc-versions are included in this thesis.

When selecting which products to compare prices on, three main objectives forms. Firstly, the products should be available in most stores sampled. Secondly, there should be a mix of product brands. Third, both popular and random products should be sampled.

The first criterion of having the product available in most stores chosen for the price comparison, is to secure validity of the data. If a product is only available in one store, there would be no comparative basis. If there are few retailers who have a specific product, it could be due to bulk-purchasing, or the product going out of stock. If this is the case, the price may be below marginal cost and not reflecting the industry. Since this paper is primarily concerned with prices in relation to each other, there therefore should be multiple price points for each product. When attempting to find data, it was challenging finding products where all retailers within that category had the product. A representation in both the dual-channel retailers, as well as for all the different groups of online retailers was therefore prioritized.

There should be a mix of brands in the products sampled. This is to ensure a wide product variety, to reflect the purchasing patterns of consumers. It could also be that some retailers have better procurement terms with certain producers and distributors and are able to have lower prices in a specific brand due to this. The prices of that brand would in that case not reflect their pricing overall. Only including one brand may lead to misrepresentations and should therefore be avoided. Therefore, multiple brands were sampled in each product category.

Both popular and random products should be sampled. This is to avoid the price comparison only consisting of the most popular products, while at the same time maintaining representativeness. Competitors may elect to sell popular products at a loss, to attract consumers and hopefully make up the difference in sales of other goods. Only including popular products may therefore lead to systematic errors in the data. Similarly, the popular products most likely comprise a significant portion of the retailer's sales, so omitting them would also lead to data errors.

For the data collection, approximately 15 products were sampled in each category. The five most popular products in the category were included, as indicated by Prisjakts "most popular" feature, while the remaining ten products were chosen randomly. However, due to the requirement of the product being available from several retailers, many of the randomized products were rejected. The number 15 was chosen as it was believed to be representative, and because in each category it was possible to find 15 products offered by multiple retailers. It was also feasible considering the time-constraint.

In summary, the price analysis encompassed 8 product categories. 15 products were sampled within each product category. This amounted to 120 unique products, and 794 individual prices.

4.3 Prices

For the analysis, price data was collected from the retailers in the industry. All prices are the base-line prices, not including shipping, transport- or transaction-costs. This applies to both dual-channel stores and online-stores. The reasons behind the decision to only use base-line prices, is that transport costs are difficult to estimate, and including shipping could overstate prices for dual-channel retailers.

Transportation costs to and from brick-and-mortar stores are difficult to estimate, and it would therefore not be practicable to include them in the prices. Consumers buying from a physical store have to visit the store, but the distance would vary for consumers. Using a standard transport cost could be misleading, as the average transport cost is likely to be lower for retailers with many stores. We could have estimated a transport cost for each retailer based on number of stores, but this disregards location of stores. Customers of retailers with central locations likely have lower transport costs than customers of less central retailers, despite the number of stores being the same.

A potential solution to applying transport costs, could be to also include shipping costs for the dual-channel retailers. A key characteristic of a dual-channel retailer is that they sell through an online store, where a customer can have a product shipped. However, for the dual-channel retailer, the customer has an option buy a product online and collect it at a nearby store. One would therefore assume that the consumer only chooses shipping when the transport cost exceeds the shipping cost. Uniformly applying shipping costs would therefore be misleading, as consumers choose between collection and shipping, based on cost. The average cost for the consumer would therefore be lower than shipping cost. Including shipping would over-price dual-channel retailers products.

Transport costs also exist for customers of online retailers. Smaller parcels may be delivered to the customers mail-box, so shipping cost is the full cost for the consumer. However, when purchasing larger products, shipping is usually to the customers nearest postal office. The customer incurs transport costs to and from the postal office to collect the item. Shipping costs would therefore not be an accurate reflection of the full price of receiving a larger product. Estimating transport costs to post-offices have many of the same uncertainties as estimating transport costs to retailers.

For this analysis pure prices were therefore viewed as the best way to conduct the analysis. We acknowledge that this method has flaws, as it is not a complete representation of the price the buyer incurs.

4.3.1 Relative prices

In the electronics industry, the price of a product varies significantly. A television can cost several thousand NOK, while a tv-game costs significantly less. An outright price comparison would test if product prices overall are different in the two channels. Price differences would be in absolute terms, and not relative. The expensive items would therefore be weighted more heavily than the cheaper products. This would affect measures on price level. Performing an analysis on raw price data would therefore be misleading. In order to study relative price difference, we had to normalize prices.

Several approaches were investigated in terms of transforming prices from absolutes to relative. A method would be to use the retailers cost of a product as the normalized price. Relative prices could then be found through calculating the retailer's percentage price premium. This method is theoretically sound, but difficult in practice. It was not possible to find cost information for all retailers and products and so we were not able to use this normalization procedure.

A second approach was to use the average price of a product across retailers as a measure of the normalized price. The retailers average and minimum prices could then be calculated as a percentage premium or discount over the average industry price. However, this creates issues relating to the normalized price being a function of the retailers' price. This approach was therefore rejected.

The final normalization measure was an attempt to find a price outside the market. This would create relative prices, which would ensure that prices could be compared. It also avoids the issue of the normalized price being a function of the retailers' prices. The normalized price was therefore found using prices from the UK. The price was not including shipping or transports, similar to the Norwegian prices. The UK was chosen as it is a large market, where we expect competitive prices. The UK and Norway are also both bound by the same European Union regulations through memberships in the EU (UK) and European Economic Area (Norway). This approach at normalizing prices is not a perfect solution and limits the results of the analysis, yet yields relative prices.

The data was normalized using prices outside the market, namely from Amazon.co.uk, converted into NOK. This retailer was chosen as it is a large international retailer and is expected to have competitive prices. All the individual prices were transformed using the formulae below:

$$p_{ij} = \frac{P_{ij} - \tilde{P}_i}{\tilde{P}_i}$$

$$\tilde{P}_i = price\ of\ product\ at\ Amazon$$

$$P_{ij} = Price\ of\ product\ i\ at\ retailer\ j$$

$$p_{ij} = relative\ price\ of\ product\ i\ at\ retailer\ j$$

The relative price of a product at a retailer was therefore the percentage difference from the normalized price of that product. This was done on all price data in the price level analysis.

4.3.2 Price collection

Prices were found by searching for the product at Prisjakt.no, a price comparison website for consumer electronics. The prices were validated by performing random cross-checks against the web-sites of the different retailers. Additionally, checks were performed at Elkjøp Gullgruven and Power Åsane, as well as Spaceworld Soundgarden in Bergen city centre, to validate that the prices displayed on the web were identical to those in-store. All prices were collected and cross-checked during week 8 and 9 in 2018. All prices within a category were collected on the same day.

The normalized price of the product was found through searching Amazon.co.uk. The price quoted was converted to Norwegian kroner. All foreign prices were collected on the same day, using the same exchange rate for conversion.

4.4 Retailers

This thesis compares online and dual-channel retailers and so the following section describes the classification of retailers into online or dual-channel retailers.

4.4.1 Dual-channel retailers

In this thesis, dual-channel retailers are defined as retailers who have an online store as well as physical stores. In the physical stores, consumers can receive help and support, and purchase and receive the product, and complain should there be an issue. The customer can also choose to purchase from the online store. Examples of dual-channel retailers in the Norwegian market are Elkjøp and Power. To study the pricing decisions of dual-channel retailers bound to have the same price both online and in the physical store, only retailers offering such a guarantee were included. These retailers are unable to charge a different price across the channels.

4.4.2 Online retailers

Online retailers are retailers who sell through an online shop on the internet. The customer browses online and orders, and the products are then shipped through a delivery agency, such as the postal service or pick-up points. Examples of such retailers are Dustin, Proshop and Multicom.

Some web-based retailers have in recent years expanded with a physical presence. Categorizing these can therefore be more complicated. One example is Komplett. Komplett is known as an online retailer but operates a physical showroom. Here customers can “try” products prior to ordering (Ottemo, 2012). However, there is only one showroom in the country, and it functions quite differently from a traditional store. Customers are not able to complain about a product, purchase it directly or make returns. With only one showroom, the physical distance from the majority of people makes visiting to see a product not a practical option. Moreover, people wishing to see a product prior to purchase could equally visit a brick-and-mortar retailer, and then purchase from an online retailer. This would yield the same result for the customer. We therefore assess that the online disutility costs are not mitigated by operating one showroom and classify Komplett as an online retailer in this analysis.

Net-on-Net is another online store with a physical presence. Although previously existing solely online, in late 2016 they opened a warehouse-store (Jansen, 2016). They have since expanded with two more warehouse-stores. The concept is built on the idea of a self-service warehouse. However, most of their revenues and business model is still built around the online web-shop. Further, with only three physical warehouse-stores, the physical distance is large for most customers. The warehouse-stores focus on self-service and efficiency, and so disutility costs may not be mitigated. However, the existence of three stores means that they do have similar characteristics as dual-channel retailers, albeit in a smaller scale. Characterizing them as an online retailer would be incorrect. It therefore appears that NetonNet operates somewhere in between an online retailer and a dual-channel retailer.

Dual-channel retailers	**Online retailers**
Elkjøp, Power, Spaceworld Soundgarden, NetonNet	Komplett, Dustin, CDON.com, Gamezone, Proshop, Multicom

Table 4-2 Categorization of Retailers

4.4.3 Exclusions

In the analysis, producers who have integrated forward into retailers, such as Apple and Samsung selling directly from their own online stores, were excluded. This was in part due to only having a limited number of products, and because literature suggests alternative pricing strategies for these types of producers/retailers. In order to avoid distortion effects, producer-retailers were therefore excluded.

4.5 Competitive setups

This thesis looks at the pricing behaviour of online retailers as opposed to dual-channel retailers online in the Norwegian electronics market. However, as explained in section 2.2, the electronics industry in Norway does not have clear market boundaries. The rivalry within a market is affected by which retailers are defined as within the market boundaries. The retailers sampled for this thesis all carry electronic products. Yet, some retailers may not be in direct competition with each other and should perhaps have been regarded as substitutes rather than rivals. In an effort to account for this, the analysis was done on different setups. The setups reflect possible market definitions.

Setup 1: Setup one is the main setup. This involves all online stores as well as all dual-channel retailers, except NetonNet. NetonNet is excluded due to the ambiguity in classifying them as a dual-channel retailer, outlined in section 4.2.2.

Dual-channel retailers	Online retailers
Elkjøp, Power, Spaceworld Soundgarden	Komplett, Proshop, Dustin, Multicom, CDON, Gamezone

Table 4-3 Setup 1

Setup 2: In setup two we also included NetonNet as a dual-channel retailer. If the results are similar to the results in set-up 1, we can assume that NetonNet behaves like a dual-channel retailer, despite their limited brick-and-mortar presence. If the results are dissimilar, NetonNet may be acting as an online retailer despite having three ware-house stores.

Dual-channel retailers	Online retailers
Elkjøp, Power, Spaceworld Soundgarden, NetonNet	Komplett, Proshop, Dustin, Multicom, CDON, Gamezone

Table 4-4 Setup 2

Setup 3: In setup three, we exclude niche retailers. Niche retailers are defined as retailers having less than half the products sampled. This was done in order to look at the most direct competitors' behaviour in the two channels. For retailers with similar product ranges, we expect that the main differentiating factor to be channel. Therefore, CDON, Gamezone and Spaceworld Soundgarden were excluded from the analysis. CDON and Gamezone mainly focus on games and consoles, while Spaceworld Soundgarden focuses on sound products such as headphones and speakers.

Dual-channel retailers	Online retailers
Elkjøp, Power	Komplett, Proshop, Dustin, Multicom,

Table 4-5 Setup 3

Setup 4: Setup four consists only of stores which have an explicit focus on price as part of their strategy. This was defined as those retailers where their web-site clearly emphasized a price focus. Retailers, such as Multicom and Spaceworld Soundsgarden, were not found to have such a price focus, and were therefore excluded. Excluding retailers without a price-focus was done in order to see if price-focused dual-channel retailers were able to sustain a price premium against other price-focused online stores. Non-price focused retailers may be differentiated along a dimension which is not included in this analysis. Therefore, excluding these should leave similar retailer types where the differentiating factor is retailer type.

Dual-channel retailers	Online retailers
Elkjøp, Power	Komplett, Proshop, Dustin, CDON, Gamezone

Table 4-6 Setup 4

5. Methodology

In this chapter, the methodology used to analyse price level and price dispersion will be outlined. To investigate the online competition, we look at the pricing of dual-channel and online retailers. The aim is to answer the questions in section 3.4:

Do dual-channel retailers have significantly higher prices than online retailers?

Are dual-channel retailers prices more dispersed than online retailers prices?

5.1 Analysis of differences in price level

Testing differences in price levels, whether dual-channel retailers have higher prices than online retailers, was done using a t-test. A t-test compares populations of data that are normally distributed. Prices in our sample are expected to be approximately normally distributed, due to sample size and nature of the data. As per the Central Limit Theorem, a larger sample size ensures the distribution is approximately normally distributed, given a continuous data set (Keller, 2012, p. 306). The sample size in our study is 120. This should be sufficient to assume normality. Assuming normalcy is consistent with other studies on prices, e.g Bailey (1998). Prices are expected to be approximately normally distributed as most retailers are expected to have relatively similar prices, while some have prices which are further off.

A t-tests tests whether samples are significantly different using mean and standard deviation. In order to conduct a t-test, the sample means, and standard deviations must first be found. These are used to compare the two populations. The formulas for mean and standard deviation are outlined below (Keller, 2012):

Mean:

$$\mu = \frac{1}{N}\sum_{i=1}^{n_k} x_i$$

Standard deviation

$$\sigma = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \mu)^2}$$

Where:

$$\mu = mean\ relative\ price$$

$$\sigma = standard\ deviation$$

$$N = number\ of\ products$$

$$x_i = relative\ price\ for\ product\ i\ in\ the\ data\ series$$

The same products were sampled in both populations. Every price in the dual-channel sample has a match in the online sample, as they both reference the same product. Since the observations in the two samples are tied, it is appropriate to use a paired t-test. The paired t-test tests whether there is a significant difference between population mean differences. In our analysis, we have a clear hypothesis that the dual-channel retailers have higher prices than online retailers. The hypothesis that is tested is:

$$H_o: \mu_h = \mu_o$$

$$H_A: \mu_h > \mu_o$$

Where

μ_h - Mean relative price of dual-channel retailers

μ_o - Mean relative price of online retailers

The null hypothesis states that there is no difference between the prices of online and dual-channel retailers. The alternative hypothesis states that the prices of dual-channel retailers are higher than the prices of online-retailers. Methodically, we test whether the difference between the dual-channel retailers mean price deviation from the normal price is larger than the online retailers.

The test statistic for a paired t-test is given by (Selvanathan, Selvanathan, & Keller, 2014):

$$t = \frac{\bar{X}_D - \mu_D}{\frac{s_D}{\sqrt{n_D}}}$$

Where:

$\bar{X}_D$is the difference between the paired sample means

μ_D is the true mean difference in the population. In our instance it is zero, as the null hypothesis is that $\mu_D = \mu_h - \mu_o = 0$

s_D is the sample standard deviation between pairs

n_D is the number of observations in the sample. The number of observations in both samples are the same, which gives $n_D = n_h = n_O$

We reject the null hypothesis if

$$t > t_{\alpha, n_D - 1}$$

Where α is the significance level and n_{D-1} is the degrees of freedom. $t_{\alpha, n_D - 1}$ is also known as the critical value and can be found using t-tables of known distributions. If the critical value is less than the t-statistic, we cannot reject the null hypothesis. That is, there is no evidence that the populations are significantly different. Rejecting the null hypothesis when it is in fact true, is called a Type 1 error. Accepting the null hypothesis when it is false, is called a Type 2 error.

5.2 Analysis of differences in price dispersion

Our hypothesis also specified that price dispersion will be different for the two types of retailers and we expect online retailers to have lower price dispersion compared to dual-channel retailers. In order to assess differences in price dispersion, we analysed the mean price dispersion as well as the variance of price dispersion for the two retailer types. We expect that dual-channel retailers have larger price dispersion, meaning a higher mean dispersion as well as a higher dispersion variance.

Price dispersion was calculated as the relative price range for products within each channel, using the following formula

$$R_i^k = 1 - \frac{max(p_i^k)}{min(p_i^k)}$$

where

R_i^k= price dispersion for product *i* in channel *k*

$max(p_i^k)$= the maximum price for the product *i* in channel *k*

$\min(p_i^k)$= the minimum price for product *i* in channel *k*

We evaluated the price dispersion through the mean and the standard deviation. Analysing mean was done using a paired t-test, similar to the analysis of relative prices. The t-test procedure will therefore not be outlined again. However, instead of testing the relative prices of the retailers, we test the price dispersion of the retailers. The test therefore evaluates whether the mean price dispersion is different for the two types of retailers

The analysis in variance was done using an F-test. This was to see whether the distribution of price dispersion differed in the two samples. The F-test tests whether two sample variances are significantly difference. An F-test uses sample variances to make inferences about the population variances (Selvanathan et al, 2014). As we wish to compare the population variances using sample variances, an F-test was therefore chosen as the analyis tool. The procedure is outlined below: The F-test infers whether the two population variances. σ_h^2 and σ_o^2, are significantly different by using the ratio, $\frac{\sigma_h^2}{\sigma_o^2}$. The sample variance, s^2, is a consistent and unbiased measure for the population variance, σ^2, the sample is drawn from.

The estimator for $\frac{\sigma_h^2}{\sigma_o^2}$ is therefore $\frac{s_h^2}{s_o^2}$. Researchers have found that these ratios divided by their degrees of freedom is F-distributed. If the null hypothesis holds, the F-distribution should equal one. The variances of the two populations would then not be significantly different.

The F-statistic is defined as (Selvanathan et al, 2014):

$$F = \frac{s_h^2 / \sigma_h^2}{s_o^2 / \sigma_o^2}$$

Where:

σ_h^2 = The population variance of dual-channel retailers

σ_o^2 =The population variance of online retailers

s_h^2 = The sample variance of dual-channel retailers

s_o^2= The sample variance of online retailers

The degrees of freedom for the distribution are $v_1=n_1-1$ and $v_2=n_2-1$

We test the hypothesis:

$$H_0: \frac{\sigma_h^2}{\sigma_o^2} = 1$$

$$H_0: \frac{\sigma_h^2}{\sigma_o^2} > 1$$

The null hypothesis states that the price variance of dual-channel retailers and online retailers is not significantly different. The alternative hypothesis states that the price variance of the dual-channel retailers is significantly higher than the price variance of the online retailers.

6. Results and discussion

We expect online retailers to have lower price dispersion and price levels compared to dual-channel retailers, as stated in our hypotheses. We base this expectation on dual-channel retailers having a larger number of uninformed consumers, differentiated value propositions and mitigation of online disutility cost. Cost differences may also influence dual-channel retailers prices, though the direction is unclear. The online channel is expected to be highly competitive due to low search costs and low barriers to entry. We therefore expect online retailers to have lower prices and less price dispersion compared to dual-channel retailers.

In this chapter, we will present the results from the analysis outlined in chapter five. The aim of the analysis is to test whether the prices of online retailers are significantly lower and less dispersed than the prices of dual-channel retailers. First, we show whether average prices differ for the different types of retailers. The second set of results show whether price dispersion is significantly different for online and dual-channel retailers. In the following section, the findings are discussed in light of theory presented in chapter three. In the discussion, we conclude on the hypothesis.

The analysis on price levels of dual-channel retailers and online retailers were tested using relative prices with a paired t-test. The analysis on price dispersion was done using relative price dispersion, using a t-test to assess mean dispersion and an F-test to assess whether the distribution of the price dispersion differed for the two types of retailers. The analysis was done on different setups, reflecting differences in market definitions.

6.1.1 Price level

In order to answer whether dual-channel retailers have higher prices compared to online retailers, each price is transformed into a percentage of the normalized prize. Throughout the discussion and results, prices refer to the difference of retailer price to the normalized price, as explained in section 4.3.1. A negative price indicates that the retailers price was lower than the normalized price. Due to the transformation, the relative price difference between the retailers is the focus, not the absolute deviations from normalized price. The average prices are illustrated below in figure 6-1:

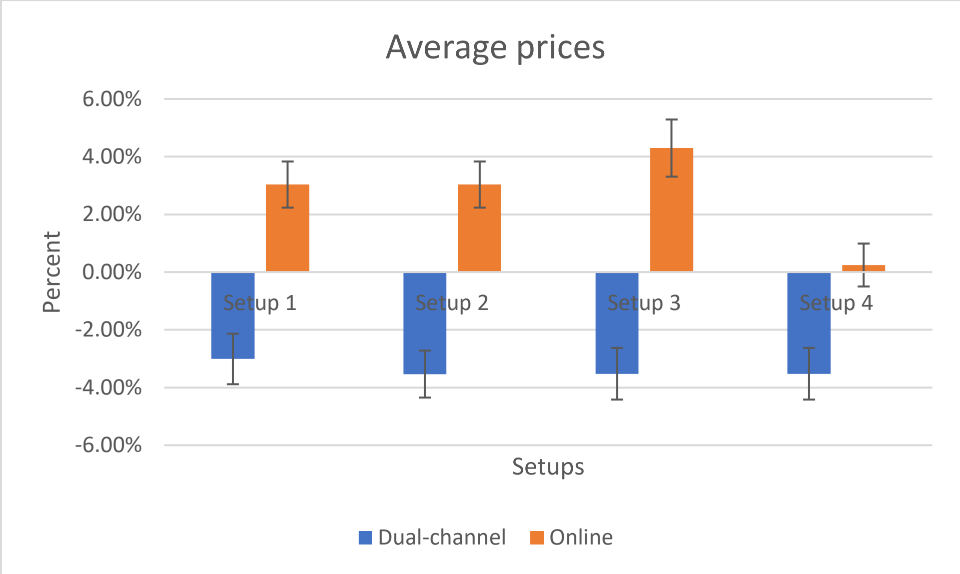

Figure 6-1 Average price for online and dual-channel retailers in different setups

From the figure, it is clear that online retailer's prices were on average higher than the dual-channel retailers in all four set-ups. The difference varied between each set-up, indicating that the inclusion or exclusion of specific retailers impacted average price. The average price of dual-channel retailers was negative for all set-ups, meaning the mean price was lower than the normalized price. The error bars were similar in the different setups, with slight variations. The error bars were the widest for online retailers in setup three, and the lowest in setup four. The error was the largest for dual-channel retailers in setup three and four, and the lowest in setup two. The difference in errors for different setups varied more for the online retailers than the dual-channel retailers.

Setup one consisted of the online retailers and the dual-channel retailers except NetonNet. For this group, there is a price difference of approximately 6%, in favor of dual-channel retailers. Dual-channel retailers therefore appear to have lower average prices than online retailers. This contradicts our hypothesis.

Setup two was similar to setup one, but also included NetonNet in the dual-channel retailers. This increased the difference between the online and dual-channel retailers. The dual-channel retailers average price was slightly reduced This indicates that NetonNets average price may be slightly lower than the average of the dual-channel retailers. This could be because their limited presence in the brick-and-mortar channel make them different from dual-channel retailers. However, if NetonNet priced similar to online retailers, we would expect the average prices of online and dual-channel retailers to become more similar om this setup. Instead the opposite occurs. It may therefore be that NetonNets hybrid model is significantly different from both traditional dual-channel retailers and online retailers.

When excluding niche retailers in setup three, the average price of the dual-channel retailers barely changed. The effect was opposite for the online channel, with the average price increasing by over 1%. Setup three was therefore the setup with the largest difference in the prices for online and dual-channel retailers. The errors were also the largest for online retailers in this setup, at almost 1%. This indicates that the non-niche online retailer's prices are highly dispersed, while the dual-channel retailers are less so. This could be due to differentiation among non-niche online retailers, meaning some online retailers increase the average price significantly. Online retailers may serve different segments, and price accordingly, despite not being niche retailers. This result could also be due to the definition of niche retailers in this thesis, as it is done based on the data collection and products sampled, and hence may not truly reflect the market definitions of niche retailers. A niche retailer may thus have been included as a non-niche retailer, due to having specialized in exactly the product categories included in this thesis.

Excluding retailers without a "price-focus" in setup four, decreased the price for online retailers by more than 3% compared to setup three. This indicates that the non-price-focused retailers increased the average price in the first three setups to a large extent. The same effect was not seen for the dual-channel retailers. This indicates that there may be some degree of retailer differentiation among the online retailers, where some are able to compete on other parameters than price.

Testing was done to see if the differences in average prices outlined above were significantly different. The dual-channel and online retailers average prices were compared using a paired t-test, meaning we tested the differences in the two samples. This was done as each relative price for online retailers corresponded to a price of the dual-channel retailers, as they were both for the same product. The results are displayed below:

	Difference	T-value
Setup 1	-6,05 %***	-4,720

Setup 2	-6,57 %***	-5,446
Setup 3	-7,82 %***	-5,565
Setup 4	-3,77 %***	-3,490

Table 6-1 Significance testing on average prices

**Significant at 10%   ** Significant at 5%   ***Significant at 1%*

The price difference between the dual-channel and the online retailer's average prices is displayed in table 6-2. The table shows the t-statistic and the significance level for testing on the price levels of different setups. The price difference is interpreted as by how much on average the dual-channel retailers are priced higher than the online retailers. Hence a negative value indicates that the dual-channel retailers' average prices are lower than the online retailer's average prices. The significance level and t-statistic say whether the retailer was significantly different, and if we can reject the null hypothesis of no difference.

In all setups the price difference was found to be significant. We can therefore reject the null hypothesis of no difference. The t-statistic in each setup was negative. This means that the prices of the dual-channel retailers are significantly *lower* on average than the prices of the online retailers. This holds for all setups and is the opposite relationship of what was expected. Therefore, we have no proof for our alternative hypothesis that the prices of dual-channel retailers are on average *higher* than the online retailers. Instead the tests show that the prices of dual-channel retailers are significantly *lower* than the prices of online retailers.

The price difference between the average price of dual and online retailers varied between -7,82% and -3,77%, depending on setup. The largest difference was found in setup three and one. Setup three excluded niche stores, defined as stores having less than 50% of the products sampled. This difference of -7,82% was found to be significant at a 1% level, with online retailers being on average significantly more expensive than dual-channel retailers. The lowest difference was found in setup four, where non-price focused retailers were excluded. The difference was -3.77%, and was significant at a 1% level. The result from all set-ups is therefore that the dual-channel retailers are cheaper on average than the online retailers. This is the opposite relationship of what was expected. This indicates that the average price of an online retailer is significantly higher than the average price of a dual-channel retailer.

6.1.2 Price dispersion

Distribution of prices was investigated using the price dispersion for each product for dual-channel and online retailers. This was calculated as the price interval of the product for the retailer type as a percentage of the minimum price, as outlined in section 5.2. The mean dispersion was analysed using a t-test, while the variance of the dispersion was analysed using an F-test. The average dispersion of the retailers in different setups is presented below in figure 6-2:

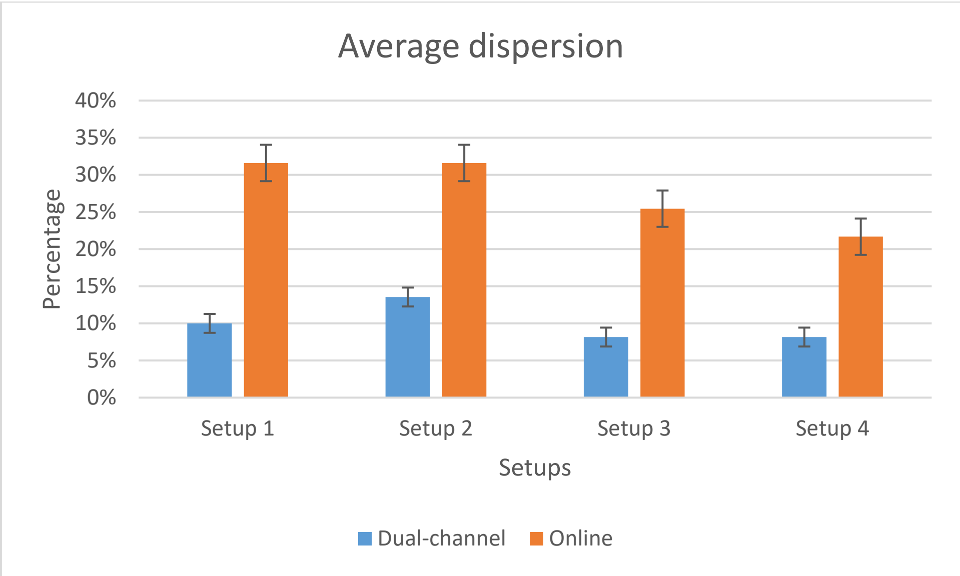

Figure 6-2 Average price dispersion for online and dual-channel retailers

The results are interpreted as average dispersion for products within the two channels. From the graph, it is clear that the online retailers have a larger average price dispersion than dual-channel retailers. This is true for all set-ups. The error bars varied in the different setups. The online retailers had lower error bars than the dual-channel retailers in all setups, with the largest in setup two. Online retailers had the largest error bars in setup one, with the lowest in setup four.

In setup one the dual-channel retailers have an average price dispersion of 10%, while the dual-channel retailers have an average price dispersion of approximately 31%. This means that dual-channel retailers highest price for a product was on average 10% higher than the lowest price a dual-channel retailer offered. Online retailers highest price for a product was 31% higher than the lowest price for an online retailer. This category includes all retailers, except NetonNet which is excluded from dual-channel retailers. The large difference indicates that price dispersion is much greater for online retailers. This means that the online retailers prices are less uniform, and hence directly contradicts our hypothesis.

Setup two differed from setup one, as we also included NetonNet. This increased the dispersion for the dual-channel retailers. This indicates that NetonNets prices were outside the range of the other dual-channel retailers. This could be due to NetonNet serving a separate consumer segment than online and dual-channel retailers, due to their unique hybrid concept.

Setup three excluded niche retailers. This decreased dispersion both for online and dual-channel retailers. The difference between the two retailer types is still large despite the exclusions. The reduction shows that the niche retailers' prices are outside the range of other retailer's prices for certain products. However, the inclusion or exclusion of niche retailers does not appear to have a significant effect on the difference between the retailer types. Therefore, setup three shows that niche retailer's prices increase dispersion, but as this holds for both retailer types, it cannot in itself explain the large difference in price dispersion between retailer types. Dual-channel retailer dispersion is lower in setup two than online dispersion in setup three. Both these groups consisted of four retailers. Therefore, it does not appear that number of retailers can explain the dispersion results.

Setup four excluded non-price-focused retailers. This further decreased the dispersion for online retailers, however the dispersion was still higher than dispersion in dual-channel retailers. It therefore appears that market definitions, as characterized by our setups, are unable to explain the dispersion results. Instead, there may be retailer differentiation among online retailers not addressed in our setups, which could explain the dispersion.

The online retailers are more dispersed while also having higher average prices. Using the average price in the channel, retailers with prices that are significantly higher than average raise the mean significantly. There is evidence of this occurring, as the average price of dual-channel retailers were lower in setup one of the first part of the analysis, compared to setup four. Setup four only eliminated one online retailer. It therefore appears that this retailer's prices impacted the average price to a large extent.

In order to assess the nature of the dispersion, we also analysed differences in variance. We expect online retailers to have less variance in the price dispersion compared to dual-channel retailers. Price dispersion variance for online and dual-channel retailers is displayed below in figure 6-3

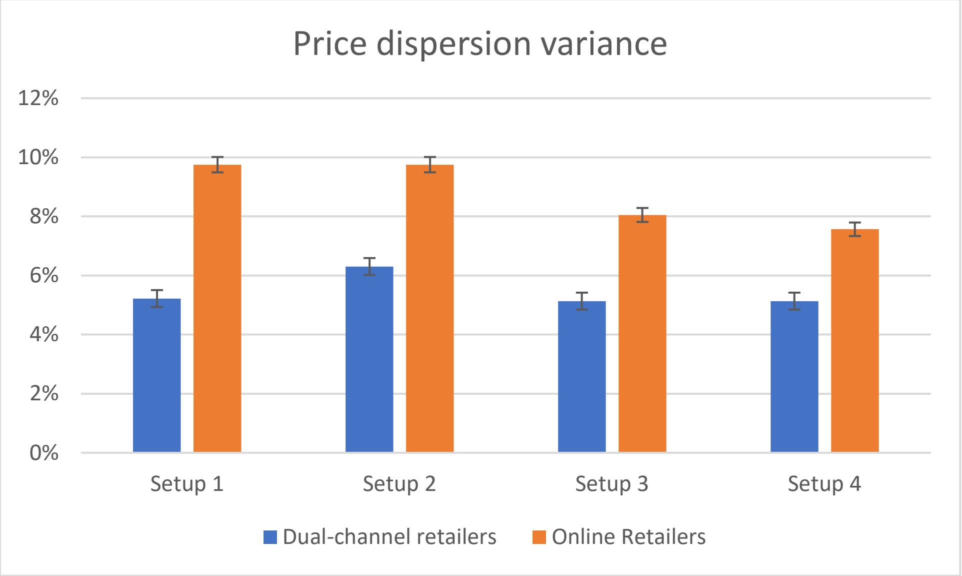

Figure 6-3 Price dispersion variance

The results are interpreted as the variance for the price dispersion for each retailer type. From the graph, it is clear that the variance for dual-channel retailers is lower than the variance for online retailers. This is true for all setups. The difference is the largest in setup one, and the lowest in setup four.

The variance looks to a large extent to follow the same pattern as average dispersion shown in figure 6-2. The variance in dual-channel retailers prices is consistently lower than the variance for online retailers. It therefore appears that online retailers prices are more dispersed than dual-channel retailers, which is the opposite of what we expected.

Removing niche-retailers in setup three and non-price focused retailers in setup four, reduces the variance of online retailers. It is therefore possible that these two groups are not direct competitors of the remaining retailers or are differentiated. Their prices may therefore represent maximum or minimum prices within the channel. However, even when excluding these groups, we still see a large difference between online and dual-channel retailers. It is therefore not sufficient as an explanation in itself.

We tested whether the dispersion of the retailer types were significantly different using a t-test and an F-test. The t-test tests whether the mean dispersion is significantly different for the two retailer types, while the F-test tests whether the variance is different for the retailer types. Thereby, the t-test can tell us whether the price dispersion is different on average, while the F-test can tell us if there is a difference in how the dispersion is distributed for the two retailer types. The results of the analysis are presented in the table below:

	Difference in Mean	T-value	Difference in Variance	F-value
Setup 1	-21,61 %***	-7,485	-4.532%***	0,535
Setup 2	-18,05 %***	-6,483	-3.447%***	0,646
Setup 3	-17,28 %***	-5,608	-2.915%***	0,637
Setup 4	-13,51 %***	-5,819	-2.431%**	0,678

Table 6-2 Signficance testing on price dispersion

**Significant at 10%   ** Significant at 5%   ***Significant at 1%*

The negative values indicate that the dispersion was lower for the dual-channel retailers compared to online retailers. This is the opposite of what we expected. The difference in mean varied from -13,51 in setup four, to -21,61% in setup one, while the difference in variance was between -4.532% and -2.431%, with all differences found to be significant for both mean and variance. The significance level of the differences was 1% for all tests, except for setup four in the F-test, where the difference was found to be significant at a 5% level. The difference was the largest in setup one. However, the significance in setup three and four mean that the retailers are significantly differently dispersed even when excluding niche and non-price-focused retailers. The inclusion of these can therefore not explain why we find evidence contradicting our hypothesis. We can therefore dismiss our hypothesis that dual-channel retailers prices are more dispersed than online retailers, in all setups. Instead we find compelling evidence that the dual-channel retailers prices are less dispersed than online retailer prices.

A large price-dispersion for online retailers is not in line with the theory outlined in chapter three. The lower search costs online should translate into more informed consumers. This should put downward pressure on prices, and cause convergence. The lower fixed costs should also enable prices to be below those of dual-channel retailers. Dual-channel retailers on the other hand should be affected by the competition in the online channel. Due to the presence of an online disutility cost, the dual-channel retailer should be able to compete with slightly higher prices than the online retailer.

In order to see how the minimum and maximum prices were distributed, they were displayed in graph 6-7 below. This graph shows the percentage at which the online (dual) retailers had the maximum or minimum price of a product. From graph 6-7 we see that the online retailers have more maximum prices as well as more minimum prices in all setups compared to dual-channel retailers.

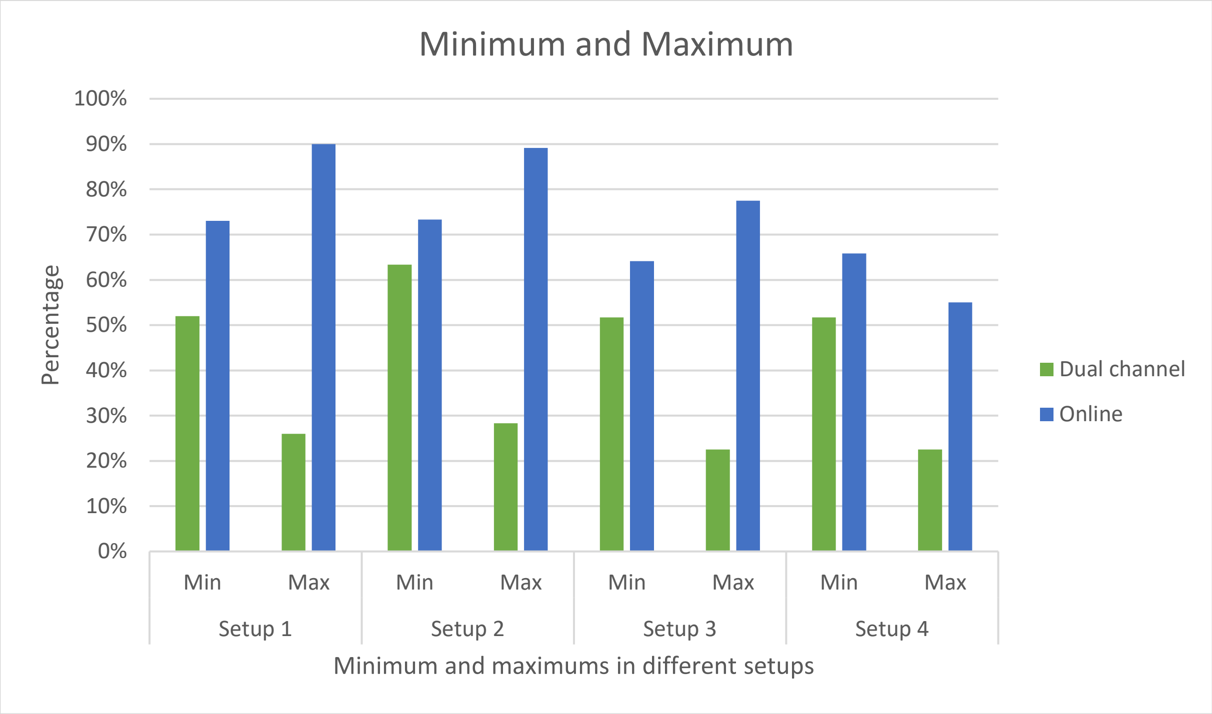

Figure 6-4 Minimum and Maximum Prices

The graph is interpreted as the percentage at which the retailers had the lowest or highest price for products. The total exceeds 100%, as retailers often had the same price. From the graph, it is apparent that the maximum price was often found in online retailers. The online retailers also had the highest percentage of the lowest price in all setups. The large dispersion within the channel is likely a result of having both very low and very high prices.

From the analysis results, we can dismiss the null hypothesis that there is no significant difference between the online and dual-channel retailers price dispersion. However, the relationship is the opposite of what was hypothesized, with dual-channel retailers having less dispersion than online retailers. We therefore find no evidence for our hypothesis. The prices of online and dual-channel retailers are significantly different, as is the dispersion within the retailers.

6.2 Discussion

The aim of our analysis was to test the hypothesis; *dual-channel retailers have higher prices and more price dispersion relative to online retailers*. The results from our analysis do not support our hypothesis. We find that prices of online retailers are on average higher and more dispersed than the prices of dual-channel retailers.

We found a significant difference between the two retailer types for all setups, in both the price level and price dispersion analysis. There is thus strong evidence that prices are different for online and dual-channel retailers. The null hypothesis, no difference between the retailers, can therefore be rejected. However, the relationship we found was the opposite of our hypothesis. Our hypothesis of online channel retailers having lower prices and less dispersion is therefore also rejected. Instead we found strong evidence that the dual-channel retailers, compared to online retailers, have lower prices and less price dispersion.

The results found in our analysis, are similar to Bailey's findings on online markets in 1998. He found both higher prices and dispersion in the online channel compared to the brick-and-mortar channel. Bailey theorized that this could be due to the immaturity of the online channel at the time of the analysis. However, this explanation for our results seems intuitively improbable. Online retail has grown and become a significant channel in the past 20 years. As nearly half of consumers in Norway say that they purchase electronics online, it is not an insignificant segment. Instead, we look at how informed consumers, the nature of price comparison websites, retailer differentiation, economies of scale and price discrimination could explain our findings. First, we discuss how our analysis setup might have influenced the results.

Our analysis was done on electronic products which were widely available through multiple retailers. In such, the products sampled may not reflect the range of products available at each retailer. Popular products are more likely to be sold by multiple retailers, and so popular products are more likely to be included in our analysis. It is possible that dual-channel retailers to a large extent follow a loss-leader strategy. That is, to advertise popular products at low prices, in order to lure the customer into the store. Once the customer is in-store, the retailer may attempt to upsell the product, or sell complementary products. This strategy could be more successful in brick-and-mortar stores, as the customer is likely to interact with sales staff and interact with products. In an online store, the retailer has less opportunity to interact with the customer in order to upsell. As brick-and-mortar retailers have physical stores, they could therefore potentially gain more from a loss-leader strategy. They could then sell more expensive products to uninformed brick-and-mortar customers, while selling popular products at a low price to online customers. Moreover, they may have an opportunity to upsell to the online customers, through their features such as “click and collect”. This feature allows the customer to reserve the product online, only to pick it up in the physical store. As the customer does not pay before visiting the physical store, there is an opportunity for the dual-channel retailer to interact with the customer and upsell. As such, the dual-channel retailers may have a larger incentive to follow a loss-leader strategy online.

Lower search costs in the online channel should lead to a higher number of informed consumers, which should decrease prices. One possible explanation for the observed result could therefore be that the number of informed buyers in the online channel is low. The search cost in the online channel is low, yet it is possible that for many buyers the cost outweighs the perceived gain of information. This could be the case for the electronics market, because the products are technological. Consumers may struggle in comparing product prices and specifications, as understanding product differences requires technological proficiency. If a sufficient proportion of the consumers are uninformed, some online retailers would follow a high price strategy, as explained in section 3.2.2. This would raise the average price of the online retailers.

A possible explanation why we do not see similar high average prices for dual-channel retailers, could be dual-channel retailers larger customer pool, from catering to consumers in both channels. If a larger number of dual-channel retailers follow a low-price strategy, their average prices and dispersion will be lower. This could be a result of dual-channel buyers on average being more informed than online buyers. More informed consumers in the brick-and-mortar channel could be a result of the technological nature of electronics. Buyers from the brick-and-mortar stores are able to ask staff and enquire about the technological differences in products. Online buyers have to research and attempt to understand differences by themselves. In the studies in section 2.3, only 43 % said they were content with the information provided by retailers and 44% were pleased with comparability. Dual-channel customers may become more informed by being in contact with the brick-and-mortar stores. They are then able to leverage this knowledge to purchase from the lowest priced brick-and-mortar store. This would increase information levels, and lower prices for dual-channel retailers.

There are some limitations to this justification. It is possible for a buyer from an online store to approach a brick-and-mortar store to gather information. Yet, it is possible that a large proportion of online buyers are situated far away from brick-and-mortar stores. This is compatible with the theory outlined in chapter 3.2, where the buyers purchase from the retailer which minimizes the cost of the product plus transport cost or online disutility costs. Being situated far away from a retailer, and therefore not being able to gain information on technological products, may therefore lead to online buyers being uninformed. The internet was theorized in section 3.2.1 to lead to lower search costs, as information is readily available and easily accessible. However, this is dependent on the customer being able to understand the information and make comparisons. If the technical nature of electronics makes this difficult for many consumers, the internet may not lower search costs to a significant extent.

The idea that the online buyers are less informed than the brick-and-mortar buyers could be the reason for the results found, however this appears intuitively improbable. The online channel has price comparison websites where little technological knowledge is required, beside product name. In section 2.3, figure 2-3 showed that 76% of consumers state that they compare price on electronic products. Therefore, one would expect the opposite, hypothesized relationship. However, as the studies were based on self-rapport, it is possible that people overestimate their level of information search prior to purchase.

Price comparison websites could also be the reason for higher prices online than for dual-channel retailers. 76% of consumers state that they compare price on electronics prior to purchase. A reasonable assumption would be that this is done through a price comparison website. This allows for simultaneous search, as opposed to the consumer independently searching each retailer sequentially. The price comparison website therefore reduces search costs for the consumer. However, price comparison websites charge the retailers listed on their pages. Prisjakt, the price comparison website used in this thesis, does not charge retailers listed in their searches. However, retailers may choose to be “profiled” on Prisjakt. When a retailer is profiled, their prices are displayed in colour, with their logo and store information. Profiled retailers pay a fee per potential buyer that is redirected to the retailer’s page, or a fee per redirect that ends in a sale (Prisjakt, 2018). Online retailers are more likely to get a substantial amount of their sales through these price comparison websites. This is both due to being smaller than dual-channel retailers, and because online buyers are more likely to use a price comparison website compared to brick-and-mortar buyers. Therefore, the fees paid to price comparison websites is also likely to be higher for online retailers. This increases online retailer's costs, which can raise average price.

A third possible contributor to the results, could be economies of scale. The two primary dual-channel retailers are the largest retailers in the electronics industry in Norway. The largest dual-channel retailer, Elkjøp, has stated that they have more beneficial procurement arrangements due to size and are therefore able to offer lower prices (Nettavisen, 2017). Online retailer's higher prices could therefore be due to a cost disadvantage against large dual-channel retailers. This could create a situation where only dual-channel retailers are able to compete for the price-sensitive consumers. If online retailers know they cannot compete on prices, a strategy would be to charge higher prices, to gain profits from uninformed consumers. Online retailers would then to a large extent follow a high price strategy.

It is also possible that the dual-channel retailers follow an aggressive strategy at present, in order to raise prices in the future. The analysis data was collected over a short period of time in spring 2018. It is possible that this specific time-period is not representative of the overall competition in the online channel. Power, a large dual-channel retailer, rebranded in 2017, with a promise to focus on price (Ottemo, 2017). They may deliberately price below online retailers in order to gain market share and establish themselves in the online market. The other dual-channel retailers may have followed, due to high rivalry among dual-channel retailers. Significant economies of scale for dual-channel retailers, can facilitate lower prices. This would lead to lower prices and dispersion for dual-channel retailers and could explain our results.

From our data, it also appears that the online retailers are differentiated. Removing retailers without a price focus in setup four of the analysis, drastically reduced the average price and dispersion for online retailers. This indicates that some online retailers may not compete on price alone, but also follow a differentiation strategy. The model outlined in section 3.3.2 predicted that the value propositions in the online channel would converge due to the technological nature of the channel, leaving the competitive factor to be price. This would lower prices in the online channel. However, our results indicate that this has not happened. Differentiated online retailers may offer intangible advantages that is not offered by other online retailers. Examples of differentiating factors for online Norwegian electronics retailers is free shipping, free returns and express shipping, which only some online retailers offer. An impatient customer may therefore be willing to pay a price premium for a product, in order to secure fast delivery. The online retailer who offers express delivery will appeal more to impatient consumers and be able to charge higher prices. Retailer differentiation would increase average prices and price dispersion for online retailers overall.

In summary, we reject our hypothesis. There is no indication that dual-channel retailers have higher prices or higher price dispersion compared to online retailers. On the contrary, we find convincing evidence that dual-channel retailers have lower prices and less price dispersion than online retailers. This could be due to analysis conditions, such as product selection and the time-period of the analysis. It could also be due to price comparison web-sites increasing costs for online retailers relative to dual-channel retailers, economies of scale and information asymmetry between the channel buyers. We believe that no explanation is independently fully satisfactory, and that the cause of the high dispersion and prices for online retailers is likely a mixture of several of the factors outlined above.

7. Conclusion

In this thesis, the competition in the online channel has been investigated, through looking at prices of dual-channel and online retailers for electronic products. This was investigated by comparing price levels and price dispersion for the two retailer types.

We used theory from Bakos (1997), Varian (1980) and Viswanathan (2005) to predict that the online channel will be highly competitive and online retailers will have low prices and low price dispersion. The internet should decrease search costs for the consumer, which should lead to more consumers choosing to become informed on prices at different retailers. This would lead to retailers having to choose a low-price strategy, as the profitability of a high-price strategy decreases with a larger number of informed consumers. The online retailers could also have lower fixed costs, and lower barriers to entry, meaning prices premium would not be sustainable in the long run as more competitors enter the channel.

Theory from Nault and Rahman (2011), Varian (1980) and Viswanathan (2005) formed the basis for our hypothesis that dual-channel retailers will have higher prices and more dispersion compared to online retailers. As the dual-channel retailers also operate in the brick-and-mortar channel, they are more likely to have a higher proportion of uninformed consumers. This should lead to a larger number of dual-channel retailers pursuing a high price strategy. Dual-channel retailers are also able to differentiate from online retailers on the location of their physical stores as well as features such as collect in-store. Retailer differentiation should increase prices and dispersion. Additionally, dual-channel retailers may be able to have a price premium against the online retailers, due to mitigation of online disutility costs. The dual-channel retailers are able to mitigate this cost due to having brick-and-mortar stores the consumer can approach. The hypothesis was therefore that the dual-channel retailers have higher prices and higher price dispersion than the online retailers.

We analysed prices of online and dual-channel retailers through t-tests and F-tests to assess price levels and dispersion. The results were that the online retailers had higher average prices and a higher price dispersion compared to dual-channel retailers. We therefore dismissed the null-hypothesis of no significant difference, yet have no evidence for our hypothesis, as the relationship is the opposite of what we expected. We therefore also dismissed our hypothesis, There is no evidence that the online retailers generally have lower prices than dual-channel retailers. There is also no evidence that the online retailers have less price dispersion than dual-channel retailers.

Possible explanations as to why the online retailers had higher average prices and more dispersion compared to dual-channel retailers were proposed. An explanation could be that the technological nature of electronics products mean that search costs are not lower in the online channel. The online consumers would then to a larger degree be uninformed compared to dual-channel consumers. The outcome could therefore be that the dual-channel retailers are priced lower and with less dispersion than the online retailers.

A second possible explanation could be that there is retailer differentiation in the online channel. Theory predicted that online retailers value propositions would converge due to technology. If this does not hold, and online retailers are differentiated, consumers may prefer one retailer over another. They may therefore be willing to incur a price premium to purchase from one specific retailer. This could lead to high price dispersion within the online retailers.

A third explanation is dual-channel retailer consumer segmentation. As our analysis was only conducted using products widely available, these may not be representative of the electronics industry in general. It is possible that the dual-channel retailers to a larger extent than online retailers follow a loss-leader strategy, as they have the possibility to influence consumers in-store at their physical locations. Dual-channel retailers may therefore set low prices for popular products, and appeal to the price-sensitive consumer segment. Consumers in the physical store may be less price sensitive, and dual-channel retailers can use sales staff to influence this segment into purchasing higher-priced, less available products. In such, it is possible that our analysis did not capture a full picture of the market by only using widely available products.

A final explanation proposed is that the nature of price comparison websites increase costs and prices for online retailers, to a larger extent than dual-channel retailers. Price-comparison websites charge the retailers for linking to their page. As online retailers are more likely to get a large portion of their buyers from such web-sites, their prices associated with them are also likely to be higher. Therefore, higher prices among online retailers may reflect higher costs associated with being dependent on price-comparison websites for buyers.

In summary, the hypothesis put forth in this thesis was not supported by the analysis. We find no evidence to support the notion that the online channel is highly competitive. There is also no indication that online retailers have lower prices and less dispersion compared to dual-channel retailers. Instead, we find evidence that dual-channel retailers prices are lower and less dispersed compared to online retailers.

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9. Appendix

Appendix A: Products sampled in the analysis with minimum, maximum and normalized price

Product Name	Minimum Price	Maximum Price	Normalized Price
Samsung UE40MU6175	5490	5694	5409
Samsung UE43MU6175	5490	6854	5951
Samsung ue75MU7005	22990	31939	25897
LG 55UJ630V	4990	5990	5409
Samsung UE43M5515	5490	6790	5951
Sony bravia kd-55XE9005	11982	14990	12997
Sony bravia KD-65XE9005	17990	29738	20910
Samsung QE65Q7F	16990	17990	17333
LG65UJ630V	9990	11285	10829
Sony Bravia KD-55A1	4990	13082	7902
Sony bravia kd-65XE7096	20990	30840	24271
Sony Bravia KD-65XE8505	10990	15997	12997
Samsung ue43m5515	12990	12990	12997
Samsung galaxy s8 sm-g950F 64 GB	5490	6790	6493
Apple iphone 7 32GB	29990	35990	33810
Huawei mate 10 pro dual sim 128 GB	6399	6999	7577
Sony xperia xz1 compact g8441	5789	6773	6125
Cat s60	7444	8227	7577
Apple iphone 8 64 GB	4489	5109	4715
Apple iphone 8 256 GB	5390	5990	5734
Samsung galaxy s8 plus sm-G955F 64 GB	7390	7790	7577
Samsung galaxy xcover 4 SM-G390F	8990	10180	9528
Samsung galaxy note 8 SM-N950F/DS 64 GB	7485	9829	7794
Sony Xperia Xz1 G8341	2209	2790	2482
Huawei mate 10 lite	9690	11473	10070
Huawei honor 9 4gb ram 64 GB	4490	5990	5409
Apple iphone 7 128 gb	3290	3990	3566
Sony xperia l1 g3311	3745	5264	4325
Ps4 shadow of the colossus	6790	7930	7100
Ps4 monster hunter: World	1690	1890	1724
Ps4 assasins creed origins	339	399	314
Ps4 call of duty wwII	528	587	488
Ps4 FIFA 18	349	598	488
Ps4 far cry 5	399	599	531
Ps4 Crash Bandicoot N-sane Trilogy	389	528	423
Ps4 Gran turismo: Sport VR	499	599	488

Ps4 Just dance 2018	269	356	314
Ps4 Need for Speed Payback	329	599	531
Ps4 Lego Worlds	249	549	531
Ps4 uncharted 4: A thiefs end	399	599	531
Ps4 South Park: The Fractured but Whole	225	299	314
Ps4 Middle-Earth: Shadow of War	249	549	314
Ps4 Destiny 2	249	553	531
Forza Motorsport 7	378	548	423
Call of duty ww2	249	566	488
Assasins Creed Origins	299	505	488
Far cry 5	399	599	531
Grand Theft Auto 5	349	553	531
Call of Duty Black ops 3	499	599	531
Players Unknown Battleground	347	389	379
FIFA 18	199	299	217
Need for Speed: Payback	398	549	423
Tom Clancy's Ghost Recon: Wildlands	399	549	423
Destiny 2	249	402	314
Steep: Winter Editions Game	259	549	314
Lego Ninjago Movie Video Game	318	498	423
LEGO worlds	335	549	423
For honor	204	249	217
Apple airpods	149	350	238
Bose QuietComfort 35 2	1590	1990	1789
Sony WH-1000XM2	3590	3990	3675
Jaybird x3	3689	3690	3675
Beats by Dre. Dre Solo3 Wireless	799	1249	1030
JBL reflect mini BT	1989	3077	2222
SONY WF-1000X	1990	2500	2157
Sony playstation Gold Wireless Stereo Headset	739	999	813
Plantronics Voyager Legend	517	739	596
Kingston HyperX Cloud Stinger	499	549	531
Apple earpods with remote and Mic	138	341	206
Sony WI-1000x	2290	3190	2547
AKG Y50BT	1590	2500	1897
SONY WH-H800	799	1149	965
Logitech H800	1285	1599	1398
Fitbit charge 2	1279	2484	1398
Fitbit alta HR	455	826	640
Polar loop 2	2284	2471	2331
Samsung galaxy gear fit 2 pro	1791	1999	1940
Garmin Vivosport	1050	1242	1073
Garmin Vivosmart 3	3890	4423	4000

Apple watch series 3 42 mm Aluminium with Sport Band	3485	4233	3675
Samsung gear s3 Frontier	1676	3475	2005
Fitbit Blaze	3485	3990	3577
Samsung Gear s3 Classic	2990	2990	2981
Samsung Gear Sport	3889	4514	4000
Apple watch series 3 Nike+ 42 mm Aluminium With Nike Sports Band	2990	3499	3350
Fitbit Ionic	2160	2801	2374
Garmin Forerunner 235	490	1409	748
Fitbit Flex 2	2495	4035	2764
JBL Xtreme	1140	1395	1355
JBL Flip 4	1590	1990	1832
Ultimate Ears UE Megaboom	1290	2026	1463
Ultimate Ears UE Boom 2	1495	2290	1789
Sonos Play:1	4990	4990	4976
JBL Boombox	1995	2472	2157
Sonos One	479	902	531
JBL Clip 2	1249	2321	1507
Sony SRS-XB40	855	1230	965
Sony SRS-XB30	1931	1990	1940
Marshall Kilburn	1990	1990	1940
Audio Pro Addon T3	990	1290	1073
Bose SoundLink Micro	2190	2190	2157
Bose SoundLink Revolve	3290	3290	3241
Bose SoundLink Revolve+	12489	14353	12780
Apple MacBook Air - 1,8GHz DC 8GB 256GB 13"	13988	16218	12997
Apple MacBook Pro - 2,3GHz DC 8GB 128GB 13"	13490	21573	14081
HP EliteBook 850 G3 T9X19EA#ABN	14783	15495	15165
HP EliteBook 840 G3 T9X23EA#ABN	11121	11990	11480
HP ProBook 650 G2 X2F75EA#ABN	14374	14523	14471
Lenovo ThinkPad X270 20HN0016MX	2982	3099	3024
Acer Chromebook 15 CB3-532 (NX.GHJED.012)	18995	19797	19284
MSI GS73VR 7RF-215NE	28990	29301	29040
Microsoft Surface Book 2 i7 dGPU 16GB 256GB 15"	4990	5012	4976
Acer Aspire ES1-732 (NX.GH4ED.012)	15499	18505	16249
Apple MacBook Pro - 2,3GHz DC 8GB 256GB 13"	17999	21455	19176
Apple MacBook Pro - 3,1GHz DC 8GB 256GB 13"	9189	9999	9420
Apple MacBook Air - 1,8GHz DC 8GB 128GB 13"	12999	16218	14190

Apple MacBook - 1,2GHz DC 8GB 256GB 12"	23462	28292	24813
Asus ZenBook UX530UX-FY024T	10999	23654	13648
Asus X556UA-DM916T	7290	8999	7859
HP Spectre 13-V103no	11995	12988	12347