The Switching Cost Puzzle

Karen Elisabeth Helgøy

Master Thesis

UNIVERSITETET I BERGEN

Acknowledgements

I would like to express my sincere gratitude to my supervisors Associate Professor Bjørn Olav Johanson and Associate Professor Thomas de Haan from the Department of Economics at the University of Bergen. I am grateful for the time and effort you have invested for meetings and your invaluable inputs. I would also like to thank my group members[1] from the practice-based course offered at the Department of Economics the Autumn of 2018 for allowing me to use the data from the survey we performed together. Lastly, a special thanks to my classmate Maren Bøe who took time to read through the thesis and providing insightful inputs.

---

[1] Alexander Andersen, Casper Berg, Maren Bøe, Sunniva Hillesund, Christine Kahrs, and Hannah Marøy.

Abstract

The average consumer in the Norwegian mobile subscription market could save around NOK 1 200 per annum or more by switching, but each year approximately only 1 in 3 do so. Moreover, the firms providing the most expensive subscriptions have a remarkable high market share compared to the relatively cheaper mobile subscription suppliers. The apparent reluctance to switch away from expensive contracts could allow firms to exploit locked-in customers.

Following the insights from behavioural economics this thesis introduces different types of consumers to a model of competition and switching cost. The model predicts what an incumbent firm's strategy is in a market with consumes who exhibit either time-consistent or -inconsistent preferences. The main finding is that even low switching cost can deter naïve consumers' propensity to switch. Therefore, it is easy for an incumbent firm to set a high market price without losing much of its market share.

Additionally, some partial evidence for the predictions are found by looking at the mobile subscription market. The evidence is based on data collected from Nkom, the mobile suppliers' own webpage, and two questionnaires.

Contents

Figures

Tables

VII

1 Introduction

Markets are often characterized with substantial costs of switching between different brands of nearly identical products, and the implications of these costs on consumer welfare has been widely discussed. Switching costs relate to the costs, both real and fictious, of either switching to a new provider or cancelling the agreement (Wilkinson and Klaes, 2018). One of the most acknowledged conjectures of the implications of switching cost is given by Paul Klemperer. Klemperer (1995) states: *"[…] consumer switching costs give firms a degree of market power over their repeat-purchasers, and mean that firms' current market shares are important determinants of their future profits."*. In microeconomic literature, switching costs are thought of as being substantial in many markets and to have a considerable impact on strategic moves.

Regarding the potential importance of switching costs, Porter (1980) states: *"[…] the impact of all strategic moves on switching costs should be considered"*. The justification for considering the impact of switching cost is that any strategic move which hinder consumers' ability to switch, could potentially decrease consumer's welfare. This is because consumers play a vital role in the competitive process by having the ability and the willingness to move their purchases to the firms where the best deals are available (Hviid, 2013).

In some markets, consumers seem to switch less frequent than they should, or at least less frequently than what would have been most beneficial for them. One example is the telecommunication market, where Telenor, Telia, and ice have respectively 47.5 %, 37.2 %, and 9.9 % of the total number of private mobile subscriptions in 2019 (Nkom, 2020). Thus, the three largest mobile suppliers have 93.5 % of the market demand even though there are many mobile subscription suppliers. Additionally, it is surprising that Telenor has the largest share of demand since it is the most expensive supplier, with its 20 to 250NOK higher listed prices per month compared to its competitors.[2]

The National Communications Authority in Norway (Nkom) estimates that 37 % of private customers have switched mobile subscription providers in the last two years (Nkom, 2019), suggesting there is a low switching frequency in the mobile market. When asked if switching mobile suppliers is difficult, consumers say they perceive it to be easy even if they

---

[2] Tabulated price differences between Telenor and the most popular mobile suppliers can be found in Table 5.1.

have never switched before.[3] Given the relatively low switching frequency and the perception that switching is easily done, there is evidence to claim that the mobile market has in fact low switching costs.

The observations from the telecommunication market suggests that substantial switching costs might not provide a sufficiently explanation behind the expensive firms' ability to maintain a high market share over time. The effective effort needed for switching providers appears not that high, yet many consumers choose to stay at the most expensive suppliers of mobile subscription. This contrasts with the established models building on rational consumers and which requires switching costs to be very high for a firm to manage to sustain higher prices and share of customers over a long time-horizon.

Another part of the economic literature, specifically the behavioural economics literature, points out how anomalies can be explained by adding psychological aspects to economic models (Heidhues and Kőszegi, 2018). Behavioural economics suggest that self-control problems is a new type of market failure stemming from the fact that consumers have cognitive limitations and psychological biases where they, among other things, do not learn from their previous mistakes. Combining the behavioural insights to theory used in economics is thought to increase the explanatory power of economic theories since it often provides it with more realistic psychological foundations (Wilkinson and Klaes, 2018). In this thesis, different consumer types are added to the competition model with switching cost, thereby providing an explanation for why customers seem to switch less frequently than they should (given the very low physical switching costs). The explanation originates from the perception that people are likely to procrastinate and postpone activities with even small switching costs, because of an over-optimism concerning future self-discipline. This will be modelled using hyperbolic time-discounting combined with naïveté in a simple framework.

The hypothesis of this thesis is that low switching costs can create high prices (to specific consumer types) and sustained market shares for an incumbent firm who faces competition from a competitive fringe. Previous literature which combines consumer types with switching costs has argued that naïveté gives firms incentives to increase switching costs.[4] However, in this thesis, even very small switching costs is deterring.

---

[3] Result from a survey performed in the practice-based course at the Institute for Economics at the University of Bergen in 2018, see Figure 5.17.

[4] Notable, DellaVigna and Malmendier (2004), only addressed partial naïveté. However, it is argued that the results found in this thesis would also be applicable to less naïve consumers (although in a weaker degree).

The remainder of the thesis is organized as follows. In Chapter 2 existing articles about switching cost are presented. In Chapter 3 the behavioural insights are presented, where the standard model is introduced in Subsection 3.1, and the $\beta\delta$-model is introduced in Subsection 3.2. In Chapter 4 a simple model with switching cost is presented, starting with an illustration of the implications of switching cost for different consumer types in Subsection 4.1, followed by the presentation of the model of competition with switching cost in Subsection 4.2. In Chapter 5, the predictions of the model are compared with the Norwegian mobile market. Chapter 6 is the discussion part of the thesis, where Subsection 6.1 discuss the implications of the derived model, and Subsection 6.2 discuss the validity of the model. Lastly, Chapter 7 concludes.

2 Literature Review

2.1 SWITCHING COSTS

Switching costs are potential real and/or fictious costs associated with the process of switching between different products, brands, service suppliers, etc., for a consumer. Klemperer (1995) divides switching costs into four categories and separates them into unavoidable costs and costs that can be a product of firm strategy. The four categories of switching costs are physical, informational, artificial, and/or psychological switching costs. The physical transaction cost of switching, and the psychological cost connected to brand-loyalty are examples of unavoidable costs. The comparability between competing products (physical cost), the information needed to use a brand or the quality of it (informational costs), and rewards connected to repeated use of a product through discount coupons, loyalty programs, etc. (artificial costs), are examples of switching costs that can be manipulated by firms.

Switching cost is, and has been a highly popular topic for economic articles since the 1980s (Farrell and Klemperer, 2007). In May 2020, there existed 1 586 records with the topic *Switching cost* in the category *economics* at the Web of Science archive. Figure 2.1 shows the trend of the amount published articles. In the remaining part of chapter 2.1, a small selection of the most acknowledged articles about switching costs and their main findings are summarized.
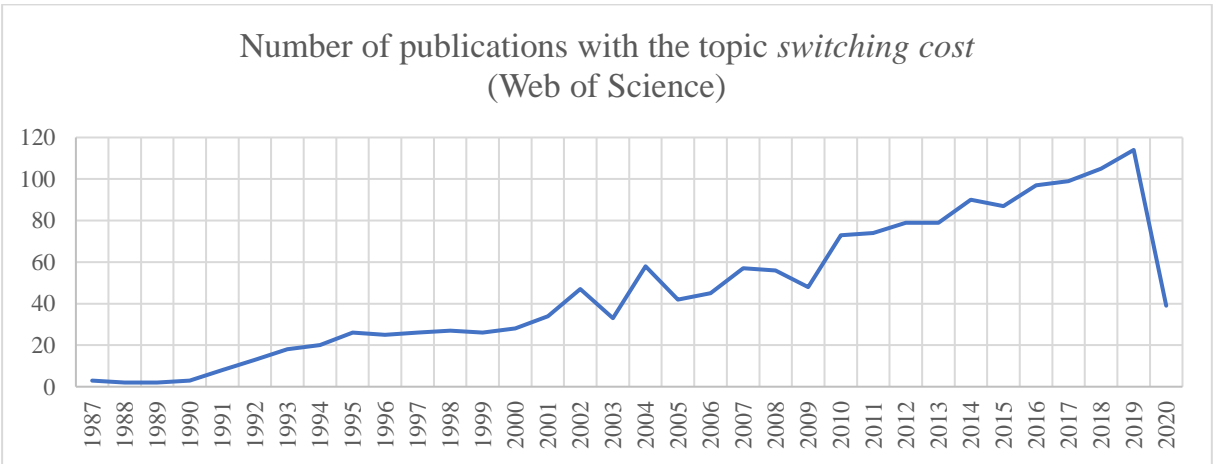
Figure 2.1: Records of publications with the topic "switching cost" in the category "economics" at Web of Science (May 2020). Total amount: 1586. Source: (Web of Science, 2020)

2.1.1 Klemperer (1987, 1995)

Klemperer wrote about switching costs in his PhD thesis, and is currently among those who has written the most papers within the topic. A shortened version of one the chapters from his PhD thesis got published as a scientific article in 1987. In the article he presents a model

explaining the corporate strategy connected to the goal of a large market share, and he makes two points about markets with switching costs. Firstly, switching costs make the firm's demand more inelastic, leading to reduced rivalry. Secondly, the gained monopoly power for firms over their respective customer type leads to vigorous competition for market share before consumers have attached themselves to any supplier (Klemperer, 1987).

The model by Klemperer (1987) shows how there might be hard competition for market share in the early stages of a market's development because of the prospects of larger profits in the future. The prospects of larger profits in the future is due to the resulting monopoly rents from the locked-in customers because of the switching costs in a mature market. Klemperer also mentions that due to reduced consumer welfare, any monopoly gains might be reduced through regulatory policies. Thus, switching costs have also the potential to make firms worse off than in a standard oligopoly.

In Klemperer's 1995 article, he reviews recent publications on competition in markets where consumers have costs of switching between competing firm's products. He examines how firms' incentives for either setting a low price to capture market share or setting a high price to harvest profits by exploiting the firms' current locked-in customers changes as different factors and expectations alters. Klemperer (1995) concludes that switching costs generally raise prices and create deadweight losses identical to those under a closed oligopoly. Additionally, since switching costs often reduces competition, firms might waste even more social surplus in costly activities to increase the switching costs.

2.1.2 Farrell and Shapiro (1988)

Farrell and Shapiro (1988) presents an analysis of consumer switching costs in an overlapping-generations model of duopolistic competition. They separate between established and uncommitted buyers, where it is assumed that one firm serves all the attached customers while its rival serves the new customers. They further assume firms cannot discriminate between the different customers.

Under their model, switching costs encourage entries of new firms, even when entry is inefficient. Farrell and Shapiro state that, when looking at economies of scale, incumbent firms could exclude rivals due to cost advantages while still making positive economic profits.[5] However, the incumbent has also incentives to exploit its committed buyers, letting newly

---

[5] Farrell and Shapiro's results of pro-entry tendencies are also persistent under moderate economies of scale or in the presence of network externalities.

established firms serve the new customers. Thus, switching costs will most often tend to promote entry of new firms because incumbent firms choose the fat-cat strategy.

They further find that under great economies of scale, there would be no entry in equilibrium. Entry for a new firm would be unattractive since it could not compete for the attached buyers due to their switching costs. Furthermore, the incumbent would not have incentives to set a price which encourages new firms to enter the market, because it would harden the competition if the incumbent set a favourable price for new entrants.

2.1.3 Beggs and Klemperer (1992)

Beggs and Klemperer (1992) study an infinite-period market with consumer switching costs, where they analyse the evolution of duopolies' prices and market shares as new consumers arrive and a fraction of old consumers leave every period. Their model shows that prices rise as firms discount the future more, and prices will fall if consumers discount the future more heavily, if the turnover of consumers increases, or if the rate of growth of the market increases.

Beggs and Klemperer states that switching costs give consumers incentives to purchase from the same firm as he/she previously bought from, even if a competing firm is selling a functionally identical product. They also find that the prices offered in markets with switching costs exceeds the prices offered in markets without switching costs. Furthermore, the higher profits (because of the switching costs) attracts new entries, even though the new firms must overcome the disadvantage of locked-in customers at existing firms.

2.1.4 Chen (1997)

Chen (1997) studies the implications of offering discounts to new customers in markets with switching costs in a two-period duopoly model for a homogeneous good. He finds that "*in equilibrium, firms will offer the same prices and discounts in a mature market even if they have different market shares and the demands faced by these firms in a new market become more elastic*" (Chen, 1997). In likeness to Farrell and Shapiro, he believes firms can charge different prices to existing and new customers, and further defend the statement by saying switching costs will naturally separate those customer types. He does examine regimes where all customers must be treated equally as well.

2.1.5 DellaVigna and Malmendier (2004)

DellaVigna and Malmendier (2004) analyse how rational firms respond to consumer bias. They model consumers' dynamic inconsistencies and other consumer anomalies regarding

timing of rewards and payments, thus showing the implications of consumer types for contract design. The implications are different for investment goods (goods that have immediate physical and/or psychological costs) and leisure goods (goods with immediate benefits and delayed costs). They show that even if there is perfect competition, naïve consumers will not be able to maximize their welfare. Their findings for (partially) naïve consumers are put down to three points, and they will be summarized in the following paragraphs.

Firstly, firms have incentives to price investment goods below marginal cost. This is because naïve consumers tend to overestimate their usage of such goods and would therefore overestimate the value of the discount on marginal cost. Sophisticates on the other hand, will use the cost as a form of commitment. DellaVigna and Malmendier use the health club industry as evidence for this prediction since other theories like price discrimination cannot be used to describe that industry's practice (DellaVigna and Malmendier, 2006).

Secondly, firms price leisure goods above marginal costs because naïfs underestimate their future usage. DellaVigna and Malmendier states this prediction is present in the credit card financing, where naïve consumers are attracted by offers which have favourable initial terms. Evidence for this prediction was also found in the mobile subscription industry, where they set a low price for the subscriptions and a high price for usage that exceeds what is included. Naïfs underestimates how much they will use these goods and may therefore end up paying way more than expected for their monthly bills.

Lastly, for all types of goods, firms will have incentives to introduce switching costs. DellaVigna and Malmendier write it is common for credit card companies to have introductory or "teaser" offers for limited periods. If there is a cost for ending the relationship with the provider or switching to another, some users will remain members longer than they would have otherwise. Naïve consumers will for example underestimate the amount of their borrowing after the teaser period is over in the credit card financing. Firms would therefore find it advantageously (strictly prefer) to induce switching costs on naïfs since they underestimate their renewal probability of their contracts: *"... if the firm could charge infinitely high switching cost, it could in principle extract an infinite amount of surplus from the consumer* [if the consumers are partially naïve]*"* (DellaVigna and Malmendier, 2004).

DellaVigna and Malmendier argue that market interactions might not reduce sophisticated consumers' welfare. Sophisticates might gain if they are in effect being subsidized by naïve consumers, which might be the case with credit card financing. Furthermore, due to market mechanisms, firms are encouraged to create commitment devices, allowing

sophisticated consumers to increase their long-run welfare. This is present when consumers e.g., invests in life insurance policies.

For naïve consumers, who have non-rational expectations, DellaVigna and Malmendier note two adverse welfare effects. Firstly, there will be an overall reduction in efficiency in terms of net surplus to consumers and producers. Secondly, in monopoly, there will be a redistribution of surplus from consumers to producers since producers are able to take advantage of the self-control problems to increase their profits. Lastly, they note that these two adverse effects on the welfare of naïve consumers will also have implications for government policy.

2.1.6 Farrell and Klemperer (2007)

Farrell and Klemperer (2007) write a literature review about the implications of switching costs. They underline that the implications of switching costs are dynamic: *"Switching costs shift competition away from what we normally think of as the default (a single consumer's needs in a single period) to something broader – a single consumer's needs over time"* (Farrell and Klemperer, 2007). The dynamic implication of switching costs comes from the fact that *"large switching costs lock in a buyer once he makes an initial purchase, so he is effectively buying a series of goods, just as (more generally) with strong enough relationship-specific economies of scope, sellers compete on bundles of goods rather than single goods"* (Farrell and Klemperer, 2007).

Furthermore, when looking at markets where a dominant firm set prices and competitive firms are price-takers, the dominant firm will exploit its locked-in customers:

> *"If incumbents must set a single price to old and new buyers, a firm with a larger customer base puts relatively more weight on harvesting this base than on winning new customers. Thus switching costs create a fat-cat effect that actually encourages entry that focuses purely on new customers, and makes competition stable: large shares tend to shrink and small to grow."* – (Farrell and Klemperer, 2007).

3 Time Discounting & the $\beta\delta$-Model

Economic theory often assumes consumers (and firms) to behave rationally. Consumers maximizing their future utility will sometimes devote less importance to utility attained in later periods. This is captured by adding a discount factor (δ^t) to the utility function, where $\delta \in (0,1]$. [6] The value of the discount factor is determined by how the consumer values future outcomes, i.e., how much he/she cares about attained future utility, in addition to factors that diminish the expected utility generated by a future outcome, e.g., uncertainty or changing tastes (Frederick, Loewenstein, and O'Donoghue 2002). If the consumer values future outcomes less than the current outcome, the discount factor will be less than 1, creating an exponential form for the attained utility over time. Utility maximizing with the discount factor δ will henceforth be called the standard model. The standard model will here be the rational case for consumer maximization of current and future utility.

The assumption of time-consistent preferences is a rather strong assumption, and inconsistency in dynamic utility maximization has been analysed since 1955 (Strotz, 1955). Findings on self-control problems challenges the assumption that the discount factor is time-consistent (DellaVigna, 2009). This chapter will therefore present the $\beta\delta$-model which exhibit intertemporal preferences and thus time-inconsistent discounting of the future utility stream. Time-preferences refers to the preference for immediate utility over delayed utility (Frederick et al., 2002).

The $\beta\delta$-model was first developed by Phelps and Pollak (1968), and has later been employed by several economists. Although this model was developed in 1968, the economic implications were not greatly discussed prior to the last 20 years, as shown in Figure 3.1. The standard model and the $\beta\delta$-model presented here, is formalized by O'Donoghue and Rabin (1999).

---

[6] The discount factor could be equal to 0, meaning the consumer only cares about the utility attained in the current period (myopic case). Nevertheless, since it is a rather strong assumption and would invalidate the notation (δ^t), it will be assumed the discount factor is larger than 0 in this thesis. In the current period, the discount factor is equal to 1 ($\delta^0 = 1$).
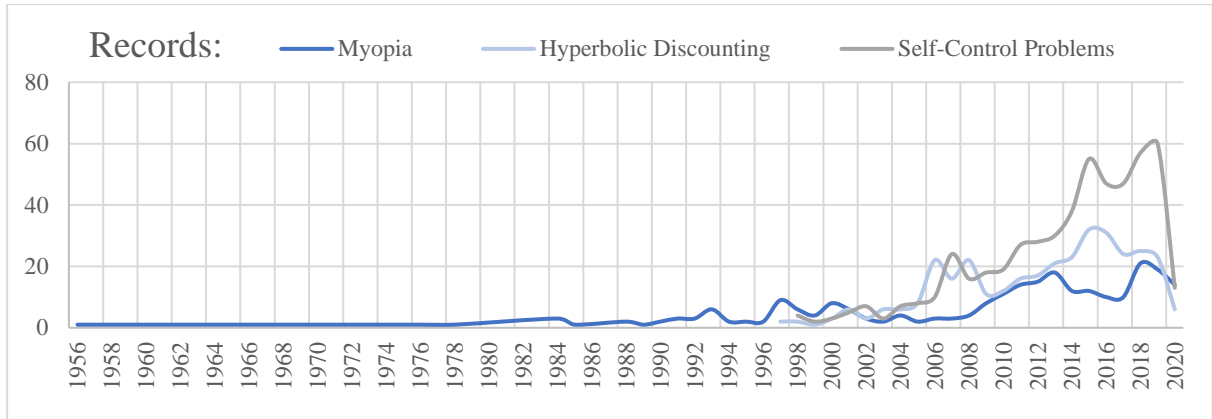
Figure 3.1: Records of publications with the topic "myopia", "hyperbolic discounting", and "self-control problems" in the category "economics" at Web of Science (May 2020). Total amount: respectively 533, 339, and 249. Source: (Web of Science, 2020)

3.1 STANDARD MODEL

The standard model exhibit time-consistency for consumers' preferences. This implies the discount factor between any two consecutive time periods is independent of the time-period the utility is evaluated (DellaVigna 2009). In other words, consumers behaviour is time-consistent since what they perceive is the best future reaction, will also be the best reaction in the future.

The standard model presented here is the version denoted by O'Donoghue and Rabin (1999). It is a simple standard model used by economists which denotes the present and future stream of utility for a consumer:[7] For all t,

$$U^t(u_t, u_{t+1}, u_{t+2}, \dots, u_\infty) \equiv \sum_{\tau=t}^{\infty} \delta^\tau u_\tau \tag{1}$$

U^t represents the consumer's time preferences viewed from period t and u_t denotes the consumer's utility in period t. The future stream of utility is discounted by the factor $\delta \in (0,1]$, indicating the future utility is less important compared to the present because people are impatient (while still ensuring the standard model exhibit time-consistent preferences).[8]

3.2 $\beta\delta$-MODEL

Time preferences, and thereof intertemporal preferences, is central for the self-control problems presented in the $\beta\delta$-model. Intertemporal preferences capture the fact that when people are evaluating outcomes in the distant future, they are patient and make plans. However,

---

[7] The future stream of utility could also be denoted as a definite stream (T). However, since the model derived under chapter 4 is of an indefinite time-period, an infinity stream of utility is denoted here.

[8] O'Donoghue and Rabin (1999) does not concern themselves with budget constraints, because they focus on the behavioural impact on dynamic utility maximization.

when the future gets near, the discounting gets steep and they become impatient and change their plans (DellaVigna, 2009). Another denomination for intertemporal preferences, is present bias or myopia. To recapitulate, present bias implies that people tend to be more impatient in the short run and become more patient over longer periods of time (Wilkinson and Klaes, 2018). Present biasedness is manifested in the $\beta\delta$-model using hyperbolic discounting.

> *Hyperbolic discount functions are characterized by a relatively high discount rate over short horizons and a relatively low discount rate over long horizons. This discount structure sets up a conflict between today's preferences, and the preferences that will be held in the future.* – Laibson (1997)

The primary implication of using hyperbolic discounting in utility maximization is that the discount factor between any two consecutive time periods is dependent of the time-period the utility is evaluated, thus creating time-inconsistency (Wilkinson and Klaes, 2018). The difference between hyperbolic and exponential discounting is illustrated in Figure 3.2.[9]
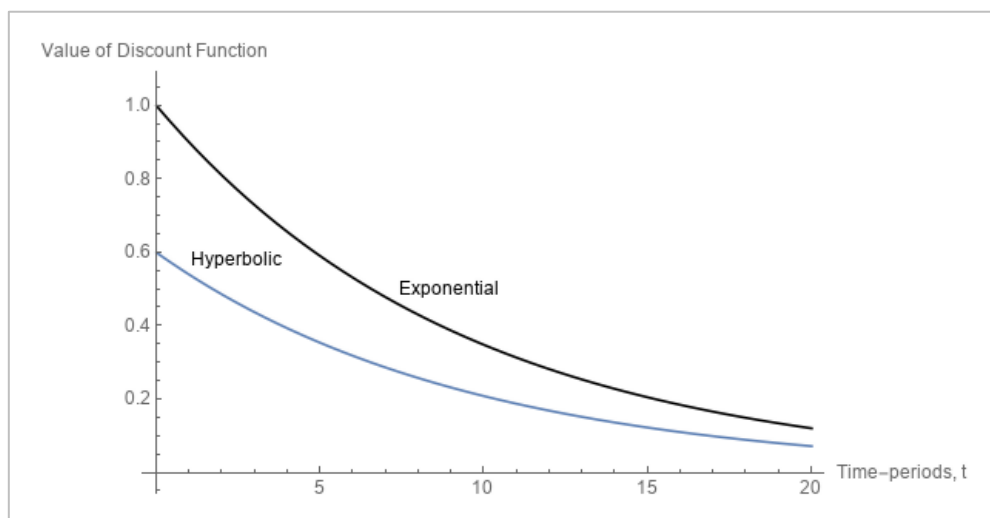
Figure 3.2: Hyperbolic and exponential discounting. $\delta = 0.9$ and $\beta = 0.6$.

Inconsistency between the optimal plan for future behaviour and the executed behaviour was first introduced by Strotz (1955). The inconsistency motivated the assumption of a higher discount rate between the current period and the next period, thus making the $\beta\delta$-model an attractive solution (Wilkinson and Klaes, 2018). O'Donoghue and Rabin (1999) distinct between three different consumer types depending on their self-awareness of their time-inconsistent behaviour, namely rational, sophisticated, and naïve consumers.

---

[9] The figure is based on a model and numbers presented in Wilkinson and Klaes (2018).

The introduction of the parameter β to the standard model will establish present biasedness for sophisticates and naïfs. Taking out the first period of the sum operator and adding the new β component in the standard model, it would now be: for all t

$$U^t(u_t + u_{t+1}, u_{t+2}, \dots, u_T) \equiv \delta^t u_t + \beta \sum_{\tau=t+1}^{T} \delta^\tau u_\tau, \text{ where } 0 < \beta, \delta \leq 1 \qquad (2)$$

This is the $\beta\delta$-model, which also is known as the hyperbolic, quasi-hyperbolic, present biased or quasi-geometric model (Wilkinson and Klaes, 2018). If $\beta = 1$, the $\beta\delta$-model is the same as the standard model, indicating the consumer have time-consistent preferences and exhibit exponential discounting. If $\beta < 1$ people will discount more when comparing present and future than when they compare two subsequent future periods, i.e., they are present biased and exhibit hyperbolic discounting. This is because between any future period and the next period, the discount factor will be $\delta \left(\frac{\beta\delta^{t+1}}{\beta\delta^t} = \delta \right)$, while comparing present and future, the discount factor will be $\beta\delta \left(\frac{\beta\delta^{t+1}}{\delta^t} = \beta\delta \right)$, which is less than δ. To recapitulate, the added β ensures that the discount rates are different from the standard model, and the discount factors in the $\beta\delta$-model is different depending on which consecutive periods one considers.

The discount function under the $\beta\delta$-model is $(\delta^t + \beta\delta^{t+1} + \beta\delta^{t+2} + \cdots + \beta\delta^T)$. The point that the discount factor depends on which consecutive period one considers is illustrated in Table 3.1. The table shows what the discount factors are under the $\beta\delta$-model viewed from different time-periods.

Table 3.1: Discount factor between any period and its consecutive.

Discount factor in period t

	t	$t+1$	$t+2$	$t+3$	$t+4$	$\cdots$	T
t	δ^t	$\beta\delta^{t+1}$	$\beta\delta^{t+2}$	$\beta\delta^{t+3}$	$\beta\delta^{t+4}$	$\cdots$	$\beta\delta^T$
$t+1$		δ^t	$\beta\delta^{t+1}$	$\beta\delta^{t+2}$	$\beta\delta^{t+3}$	$\cdots$	$\beta\delta^T$
$t+2$			δ^t	$\beta\delta^{t+1}$	$\beta\delta^{t+2}$	$\cdots$	$\beta\delta^T$
$t+3$				δ^t	$\beta\delta^{t+1}$	$\cdots$	$\beta\delta^T$
$t+4$					δ^t	$\cdots$	$\beta\delta^T$
$\vdots$						$\ddots$	$\vdots$
T							δ^t

(Current period)

3.2.1 Perception-perfect strategies

When analysing the $\beta\delta$-model, it is important to understand people's beliefs about their future time inconsistency. For those with time inconsistent behaviour, they will discount according to $1 + \beta\delta + \beta\delta^2 + \cdots$ today, and tomorrow and onwards they believe they will discount according to $1 + \hat{\beta}\delta + \hat{\beta}\delta^2 + \cdots$, where $\hat{\beta} \geq \beta$. $\hat{\beta}$ denotes the presumed degree of present biasedness, while β denotes the true degree of present biasedness (DellaVigna, 2009). The closer $\hat{\beta}$ is to β, the more self-aware is the person. The degree of self-awareness of the present biasedness can affect behaviour differently. Consumers who are aware of their present biasedness might utilise commitment devices (Strotz, 1955), while those who are unaware or ignores their present biasedness overestimates or underestimates their ability of performing the given activity.

O'Donoghue and Rabin (1999) defines a perception-perfect strategy as a strategy that in all periods (including periods after the activity is performed) a person chooses the optimal action given his/her current preferences and his/her perceptions of future behaviour.

3.2.1.1 Time-Consistent Consumers

Time-consistent preferences implies that the consumers exhibit correct estimation of their propensity to switch. Time-consistent consumers, henceforth TCs,[10] exhibits exponential discounting of future utility. The time-consistent case of consumers could also be captured in the $\beta\delta$-model by setting $\beta = 1$, since this would reduce the $\beta\delta$-model to the standard model. The perception-perfect strategy for TCs as defined by O'Donoghue and Rabin is:

> *Reflecting the fact that TCs do not have a self-control problem, [...] in any period, TCs will complete the activity if and only if it is the optimal period of those remaining given her preferences.*
> – O'Donoghue and Rabin (1999)

3.2.1.2 Sophisticated Consumers

Sophisticated consumers foresee their future self-control problems. Since β is less than 1, sophisticated people will exhibit hyperbolic discounting of future utility. The sophisticates are captured in the $\beta\delta$-model by setting $\beta = \hat{\beta} < 1$. The perception-perfect strategy for sophisticates as defined by O'Donoghue and Rabin is:

---

[10] Abbreviation for time-consistent consumers which is used in O'Donoghue and Rabin (1999).

> *[…] sophisticates know they will have self-control problems in the future, and therefore correctly predict future behaviour. […] in period t, sophisticates calculate when their future selves will complete the activity if they wait now, and then do the activity if and only if given their current preferences doing it now is preferred to waiting for their future selves to do it.*
>
> – O'Donoghue and Rabin (1999)

3.2.1.3 Naïve consumers

Naïve people do not foresee their self-control problems. Implying they are unaware of their self-control problems. Naïve consumers exhibit hyperbolic discounting of future utility. However, they believe they exhibit exponential discounting (or at least less hyperbolic discounting than their true value). It is therefore the perceptions of future preferences which separates naïve and sophisticated people. The naïfs are captured in the $\beta\delta$-model by setting $\beta < \hat{\beta} \leq 1$. The perception-perfect strategy for naïfs as defined by O'Donoghue and Rabin is:

> *Naïfs have present-biased preferences (since $\beta < 1$), but naïfs believe that they are time-consistent. As a result, the decision process for naïfs is identical to that for TCs (although naïfs have different preferences). […] in any period, naïfs will complete the activity if and only if it is the optimal period of those remaining given her current preferences.*
>
> – O'Donoghue and Rabin (1999)

4 Model

The model derived in this chapter is meant to illustrate the implications of switching cost for different consumer types. The foundations of the derived model are constructed by the supervisors. The simplest way to showcase the hypothesis of the thesis, is to only include the most necessary parameters and to have infinite time-periods. Only five parameters were chosen for this model, namely a discount factor, a present biasedness parameter, a consumer surplus parameter for each firm, and a switching cost. Although this model illustrates a rather extreme situation, it presents an explanation for the noted switching cost puzzle in a simple way.

The model derived in this chapter, assumes the incumbent firm has previously covered the market demand and consumers must now choose between staying a customer to the incumbent firm or switching to a new firm. This setting would be applicable to, e.g., markets which previously have been regulated by patents or under state-ownership, and which later respectively are unprotected or privatized. Examples of such incumbent firms could be any pharmaceutical company, Telenor, and SAS.

The main finding given in the model is that even low switching costs will decrease the switching frequency for time-inconsistent consumer (especially for naïve consumers due to their procrastination). Furthermore, the model predicts that firms will have incentives to increase their prices because of the self-control problems for the time-inconsistent consumers, which consequently would decrease their consumers surplus.

4.1 CONSUMER OPTIMIZATION PROBLEM

I will first look at the implications of switching costs for consumer behaviour. The consumers are either time-consistent discounters, or sophisticated or naïve hyperbolic discounters. Firm's strategies will currently be ignored, i.e., firm's strategies are assumed to be exogenous under Chapter 4.1. This implies that we only look at the demand side and keep everything on the supply side as given, which makes it easier to see the propensity of switching for the different consumer types.

This part of the model is an application of O'Donoghue and Rabin's (1999) model, with the difference that we look at infinite time-periods and do not restrict the consumers to perform the activity at least once.

In the model it will be assumed that consumers can be divided into three different types depending on their evaluation of future utility. The model exhibit thus three different time

preferences of future utility. The three consumer types are time-consistent (TC), sophisticated (S), and (fully) naïve (N) consumers. The consumer types have different reasoning behind the calculations of the trade-off of the completion of the activity, and it is their perceptions of the future that drives the solution for the switching cost puzzle. The optimal solutions are found for each of the types separately and then compared.

We do not concern ourselves of budget constraint, so we abstract from income effects. It is thus assumed that consumers simply maximize their stream of consumer surplus over time. For any reason, the consumer would attain a higher consumer surplus by purchasing from the new firm. The consumers decide their optimal plan of whether to switch in the current period. Following the perception-perfect strategies as described in Chapter 3, all the consumer types makes an "optimal plan" in the current period. The difference between the consumer types is their projection of the optimal plan. The strategy in each period is optimal in that period according to the consumers' perception. Sophisticates and TCs trade-off between staying forever or switch today, while naïfs trade-off between switching today or switching tomorrow. The reasoning behind those trade-offs are presented in the subsequent subsections.

To further simplify the expressions, it is assumed that the all the parameters in the function are constant over time. Meaning that, e.g., consumers do not change their expectation of their future consumer surplus. Consequently, each period would look the same since the consumers have no changes in their expectations.

Consumers' surplus from consuming are denoted v_i and v_j for respectively surplus attained at the incumbent firm and the new firm. It is assumed that the obtained consumer surplus is largest at the new firm due to some feature(s), like e.g. a lower price or better quality. The utility equations consist of five possible parameters; the discount factor (δ), the degree of present biasedness (β), the consumer surpluses (v_i, v_j) and the switching cost (s).

4.1.1 TCs

TCs provides the standard case of consumer optimization with their exponential discounting of future utility. Thus, illustrating how consumer most often are constructed in economic models. TCs perception-perfect strategy is to complete the activity in the given period if and only if it is the optimal period of those remaining given his/her preferences. This implies that they would either switch in the first period or never, i.e., TCs know they will never switch if they do not switch in the current period, because they would have no reasons to delay switching.

The possible attained utilities are either staying forever or switching in the current period:

$$U = \begin{cases} \displaystyle\sum_{t=0}^{\infty} \delta^t v_i & \text{if the consumer stay forever} \\ v_j - s + \displaystyle\sum_{t=1}^{\infty} \delta^t v_j & \text{if the consumer switch} \end{cases} \tag{3}$$

As previously pointed out, the utility attained from switching in the first period must exceed the utility from staying all the periods for a consumer to find it desirable to switch at all. Meaning the inequality formulated below must hold:

$$\sum_{t=0}^{\infty} \delta^t v_i < v_j - s + \sum_{t=1}^{\infty} \delta^t v_j \tag{4}$$

The parameter of interest in this equation is the switching cost. It is possible to find the threshold value for the switching cost to not deter switching. By simplifying the equation with respect to s and following the rule for the sum of an infinite geometric series, the switching cost threshold for TCs is:[11]

$$s_{TC}^* < (v_j - v_i)\frac{1}{1-\delta} \tag{5}$$

The equation states that a switching cost exceeding the expression to the right of the inequality sign would deter switching for TCs. The higher the gain in consumer surplus from switching and/or the more patient the consumer is, the higher is the critical switching cost that deter switching.

4.1.2 Sophisticates

Because of sophisticates' time-inconsistency, their optimal plan could be to switch in the consecutive period. However, if that is in fact the optimal plan, the sophisticated consumer knows that in the consecutive period, the optimal decision would be to delay the switching one more period. This is because in the consecutive period, the optimal plan would once again be to delay the decision one more period. The sophisticated consumer knows this would go on indefinitely, so there would only be one logical choice in the current period: switch now or accept that switching will never occur. Thus, sophisticates have the same plan as TCs, where they either switch in the current period or never switch. To summarize, since sophisticates are

---

[11] The simplifying derivation-steps can be found in Appendix A.1.1.a.

aware of their own self-control problems, they know that if they do not find it favourable to switch in the current period, they would neither find it desirable to switch in any later.

Sophisticates possible attained utilities are either staying forever or switching in the current period:

$$U = \begin{cases} v_i + \beta \sum_{t=1}^{\infty} \delta^t v_i & \text{if the consumer stay forever} \\ v_j - s + \beta \sum_{t=1}^{\infty} \delta^t v_j & \text{if the consumer switch} \end{cases} \tag{6}$$

In the same way as TCs, sophisticates attained utility from switching in the first period must exceed the utility from staying all the periods. The inequality that must hold for this to be the case is:

$$v_i + \beta \sum_{t=1}^{\infty} \delta^t v_i < v_j - s + \beta \sum_{t=1}^{\infty} \delta^t v_j \tag{7}$$

Following the same approach as under the case of TCs, the switching cost threshold for sophisticates is:[12]

$$s_S^* < (v_j - v_i)\left(1 + \frac{\beta\delta}{1 - \delta}\right) \tag{8}$$

Since $0 < \beta < 1$ and $0 < \delta \leq 1$, the switching cost threshold for sophisticates will be lower than TCs' threshold. A lower degree of present biasedness ($\beta \to 1$), more patience ($\delta \to 1$), and a higher consumer surplus gain from switching, would increase the critical switching cost which deter switching for sophisticates.

4.1.3 Naïfs

Naïve consumers are also time-inconsistent consumers like sophisticated consumers. Naïfs would also in the current period ideally plan to switch in the consecutive period because of their present biasedness. When the next period arrives, naïfs would once again use the same logic, and thus postpone switching again. Because naïfs are unaware of their own self-control problems, they believe delaying switching one period would (eventually) result in switching. Unlike sophisticates, naïfs believe switching today versus switching tomorrow is a realistic plan. Thus, naïfs find it realistic that the choice in the current period is to switch today or switch tomorrow. Since naïfs does not think that not switching today implies that they will never switch, they anticipate it would be possible to delay the switching one period. Thus, they project

---

[12] The simplifying derivation-steps can be found in Appendix A.1.1.b.

the possible attained utilities to be either switch in the current period or switch in the consecutive period:

$$U = \begin{cases} v_j - s + \beta \sum_{t=1}^{\infty} \delta^t v_j & \textit{if the consumer switch the first period} \\ \\ v_i + \beta\delta(v_j - s) + \beta \sum_{t=2}^{\infty} \delta^t v_j & \textit{if the consumer switch the next period} \end{cases} \tag{9}$$

For a naïve consumer to find switching in the current period preferred to delaying switching to the consecutive period, the utility attained from switching in the first period must exceed the utility from switching in the next period. Thus, this inequality must hold:

$$v_i + \beta\delta(v_j - s) + \beta \sum_{t=2}^{\infty} \delta^t v_j < v_j - s + \beta \sum_{t=1}^{\infty} \delta^t v_j \tag{10}$$

The switching cost threshold for naïfs is:[13]<'

$$s_N^* < (v_j - v_i)\frac{1}{1 - \beta\delta} \tag{11}$$

Since the denominator is higher for the naïfs, the switching cost threshold could be considerably less compared to TCs' and sophisticates' switching cost threshold. A lower degree of present biasedness ($\beta \to 1$), more patience ($\delta \to 1$), and a higher consumer surplus gain from switching, would increase the critical switching cost which deter switching for naïfs.

4.1.4 Numerical Example

A simple example introduces the main idea behind introducing consumer types to models with switching costs. Following the setting above, assume the consumers surplus values are $v_j = 1$ and $v_i = \frac{4}{5}$, implying a consumer would attain a 25 % higher consumer surplus for any reason if he/she switched to firm j. Inserting these consumer surplus values into the switching cost threshold equations for each consumer types, the critical switching cost will now be:

$$s_{TC}^* = \frac{1}{5}\frac{1}{1-\delta} \quad (12) \qquad s_S^* = \frac{1}{5}\left(1 - \frac{\beta\delta}{\delta - 1}\right) \quad (13) \qquad s_N^* = \frac{1}{5}\frac{1}{1-\beta\delta} \quad (14)$$

The subscript indicates that the critical switching cost is for respectively TCs, sophisticates and naïfs. These critical switching cost can be found for different values of β and δ. Starting off, δ is hold constant, while allowing for β to be in the interval $[0,1]$. Figure 4.1 illustrates how the critical switching cost changes for different discount factors.

---

[13] The simplifying derivation-steps can be found in Appendix A.1.1.c.
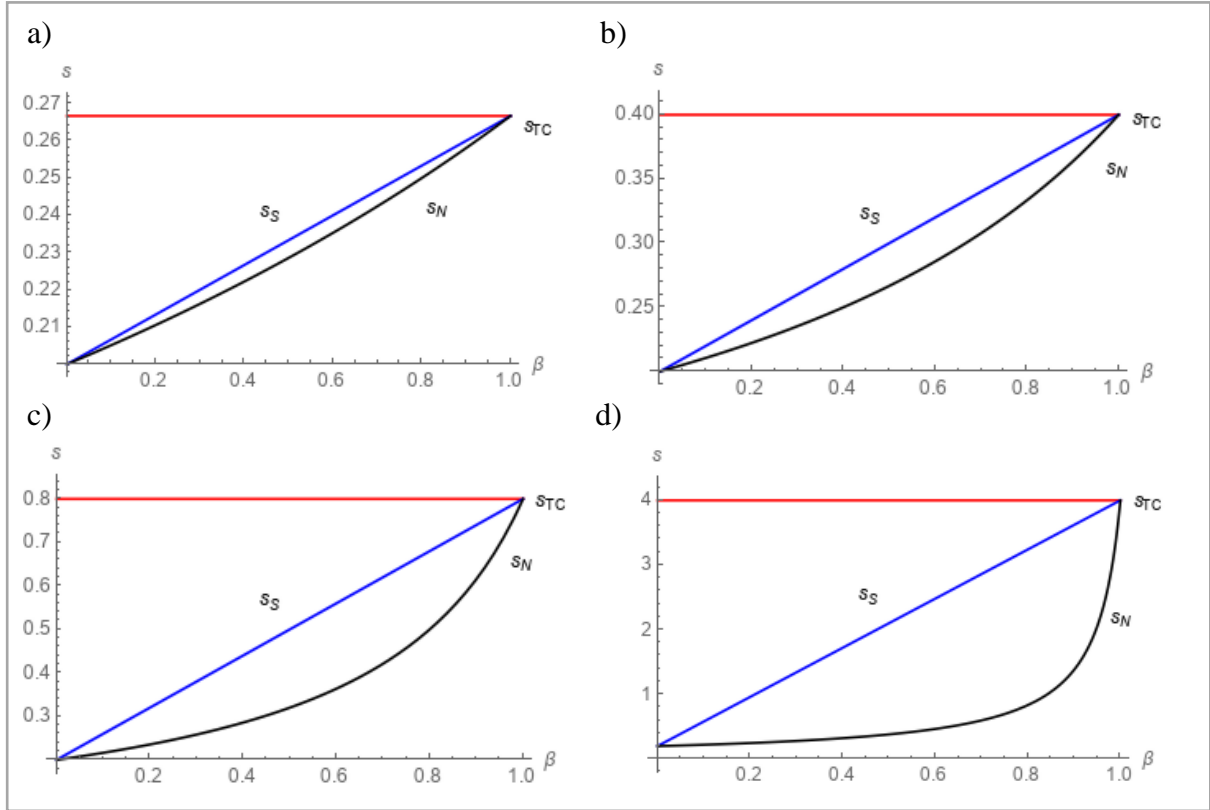
Figure 4.1: Critical switching costs with constant δ. Degree of present biasedness on the x-axis, threshold for switching to deter switching on the y-axis. The figures depict different discount factors: a) $\delta = \frac{1}{4}$, b) $\delta = \frac{1}{2}$, c) $\delta = \frac{3}{4}$, d) $\delta = 0.95$

In the figures, the red line, blue line, and black curve shows the critical switching cost for respectively TCs, sophisticates and naïfs. A switching cost above the critical switching cost line/curve for the respective consumer type would deter switching. The vertical distance between the red and the blue line illustrates that sophisticates prefer current consumption relatively higher compared to TCs, who only include their discount of future consumption. The vertical distance between the blue and black line illustrates the implications of unawareness of the biased preference for current consumption.

The more patient the consumer is, i.e., the higher δ, the larger is the difference between the critical switching cost for the different consumer types and the higher is the critical switching cost which deter switching. This can be seen by studying the differences of the y-axis for figure a, b c and d in Figure 4.1, which exhibit increasingly higher discount factor.

The less the consumer prefer current consumption, i.e., the higher β, the higher is the critical switching cost which deter switching. Furthermore, the implications of present bias are stronger among naïfs who are unaware of their extent of self-control problems. As the β moves toward 1, the critical switching cost converges toward the standard case presented by the TCs.

Next off, β is held constant, while allowing for δ to be in the interval [0,1]. Figure 4.2 illustrates how the critical switching cost changes for different degrees of present biasedness.
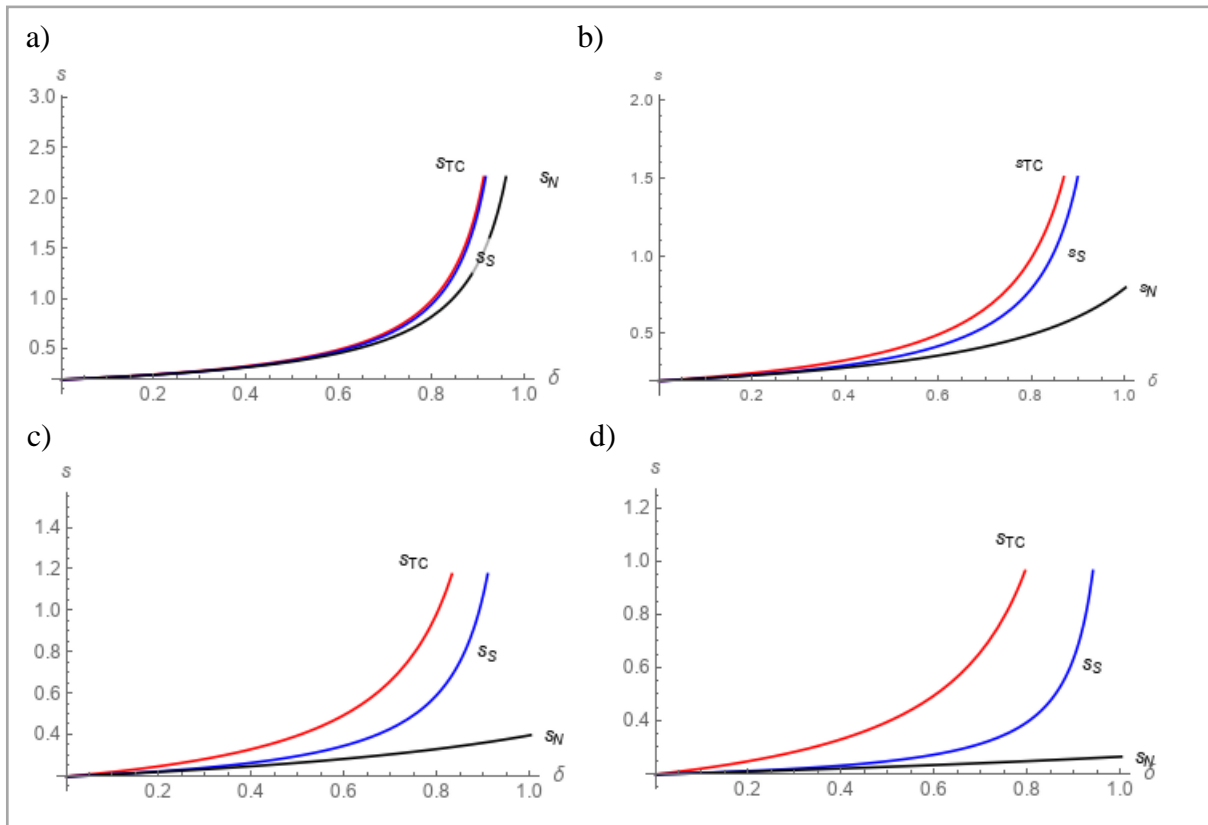
Figure 4.2: Critical switching costs with constant β. Discount factor on the x-axis, threshold for switching to deter switching on the y-axis. The figures depict different degrees of present biasedness: a) β = 0.95, b) β = $\frac{3}{4}$, c) β = $\frac{1}{2}$, d) β = $\frac{1}{4}$

The figure illustrates that there can exist stickiness problems for very low switching costs when consumers are naïve and have a high degree of present biasedness. While TCs' and sophisticates' critical switching cost eventually grows towards an infinitely high value the more patient they are, naïfs have a relatively low critical switching cost (most prevailing in figure b, c, and d). Sophisticates do have a bit higher stickiness compared to TCs, however, no matter the degree of present biasedness, they eventually get a high critical switching cost.

In likeness with Figure 5.1, the higher β and/or δ, the higher is the critical switching cost which deter switching. In other words, the implications of switching costs are larger the less patient and/or more present biased the consumer is.

By considering the discount factor to be $\frac{9}{10}$ and the degree of present biasedness to be $\frac{1}{2}$, the difference between the consumer types and their respective critical switching cost value are further illustrated. Inserting these values into equation 12, 13, and 14, we have that:

$$s^*_{TC} = 2, \qquad s^*_S = 1.1, \qquad s^*_N \approx 0.36$$

Models with switching cost often assume consumers to be time-consistent, so one would expect that their estimated switching propensities is highly overestimated if consumers exhibit

time-inconsistent preferences. This is because, in this numerical example, sophisticates have 45 % lower critical switching cost and naïfs have 82 % lower critical switching cost than TCs.

4.2 A DYNAMIC MODEL OF COMPETITION WITH SWITCHING COSTS

This section analyses the possible implications for the incumbent firm's pricing strategies, when including the different types of consumer behaviour. Consider a simple indefinite-period model of a market for a nondurable good where it is the same consumers who faces the firms in all the time-periods. There are two types of firms in the market: an incumbent monopolist, firm i, and a number of small competitors, collectively denoted by f and called fringe firms.[14] Ignoring the switching costs, consumers view the fringe firms and the incumbent firm as identical. The incumbent offers a product to the price p_t^i. The firm could, but would not, set a price which causes the consumers to get negative consumer surplus because that would result in zero demand. Firm i has market power because it is known in the market and consumers incur a switching cost if they are to switch to any of the fringe firms. The incumbent firm will strategically adapt itself to the entries of the fringe firms. The fringe firms adapt themselves in the market following firm i's strategies. The new firms act consequently as price takers. For simplicity, assume none of the firms have production costs.

I assume that the consumers have unit demands and when consuming the product offered by the incumbent firm, each consumer receives a surplus from equal to 1 less the price p_t^i, when paying the price p_t in period t. Consumers expect that i's price tomorrow will be the same as i's price today. Implying they believe firm i will charge the same price forever, hence we can write $p_t^i = p^i$. In the first period of the model, consumers are given an extra choice where they can switch to a new small competitor (any fringe firm) of the incumbent firm. It is assumed that the consumers incur a one-time cost of switching to any of the fringe firms. The consumers are differentiated with respect to their switching cost, $s = 5\theta \geq 0$, where θ denotes the type of consumer. The total mass of consumers is normalized to 1. A consumer of type $\theta \in [0,1]$ who switch to a firm f pay a switching cost equal to $s = 5\theta$. θ is uniformly distributed over its range, where the lowest consumer type, $\theta = 0$, has a switching cost equal to zero, and the highest type, $\theta = 1$, has a switching cost equal to 5. The level of switching cost depends on

---

[14]Several small (identical) competitors to an incumbent firm is also known as a competitive fringe. Competitive fringes are a term used to denote small producers who have no market power and who supply output competitively in response to whatever market price the dominant firm (here the incumbent firm) chooses to set. See CHURCH, J. R. & WARE, R. 2000. *Industrial organization: a strategic approach*, Irwin McGraw Hill Homewood, IL.

different reasons (psychological, informational, ability to learn, etc.) and θ is private information to the consumer (so it is difficult for the firm to price discriminate based on the switching cost). The period the consumer switch, his/her consumer surplus will be equal to $1 - p_f - 5\theta$, and in the consecutive periods it will be equal to $1 - p_f$.

Next, since the fringe firms are assumed to be identical, and given that there are no switching costs associated with switching away from a fringe firm, it is possible to infer a Nash equilibrium exists in which all the fringe firms charge a price equal to their marginal cost. This implies that the fringe firms essentially are playing an undifferentiated Bertrand game in every period, where they end up in a Bertrand Paradox and set their price equal to zero, denoted: $p_f^* = 0$.

4.2.1 Demand Function

In this Subsection, demand functions will be derived based on the framework provided by O'Donoghue and Rabin (1999). The consumer types' plan resembles the equations presented in Subsection 4.1, but here the parameters will be defined.

4.2.1.1 *Exponential Discounters*

In Chapter 4.1.1, the expected utilities from switching in the first period or staying forever were derived. The same optimization of plan is used here, hence TCs will still not choose to switch any later than the first period. Consumers (expected) consumer surplus from staying forever is equal to:

$$v^i + \sum_{t=1}^{\infty} \delta^t v^i = \frac{1}{1-\delta} v^i \tag{15}$$

And if the consumer chooses to switch in period 0, the expected utility is:

$$v^f - s + \sum_{t=1}^{\infty} \delta^t v^f = \frac{1}{1-\delta} v^f - s \tag{16}$$

The superscript f indicates it is the consumer surplus attained at any of the fringe firms. We have that $v^i = 1 - p^i$, $v^j = 1$ and $s = 5\theta$. By inserting these values into the expected utility functions, we will have that the expected utility from staying forever at the incumbent firm is equal to $(1 - p^i)\frac{1}{1-\delta}$, and the expected utility from switching in period 0 is equal to $\frac{1}{1-\delta} - 5\theta$.

The incumbent firm would be interested in the consumer who are indifferent between staying forever and switching in period 0. By equalizing the two expected utility equations and solving for θ, we will find the consumer type of the indifferent consumer:

$$\left(1 - p^i\right) \frac{1}{1 - \delta} = \frac{1}{1 - \delta} - 5\theta$$

$$\theta^*_{TC} = \frac{1}{5(1 - \delta)} p^i \tag{17}$$

Along the interval $[0,1]$, θ^*_{TC} distinguish between those consumer types who want to switch to a fringe firm $(< \theta^*_{TC})$ and those who stay at the incumbent firm $(> \theta^*_{TC})$. Given that the incumbent firm is located at 1 in the interval and set a price less or equal to 1 (if $p^i > 1$, no consumers would want to purchase the product offered by the incumbent firm), its demand will be equal to:

$$D_{TC}\left(p^i\right) = 1 - \frac{1}{5(1 - \delta)} p^i \tag{18}$$

4.2.1.2 Hyperbolic Discounters

Time-inconsistent consumers expected consumer surplus is the same in this section as under Chapter 4.1.2 and 4.1.3 for respectively sophisticates and naïfs. The same projection of optimal plan is used here. To recapitulate, consumers expected utility from staying all periods at the incumbent firm is equal to:

$$v^i + \beta \sum_{t=1}^{\infty} \delta^t v^i = v^i + \beta \frac{\delta}{1 - \delta} v^i = v^i \left(1 + \frac{\beta\delta}{1 - \delta}\right) \tag{19}$$

The derived utility from switching in period 0 is:

$$v^f - s + \beta \sum_{t=1}^{\infty} \delta^t v^f = v^f \left(1 + \frac{\beta\delta}{1 - \delta}\right) - s \tag{20}$$

And the derived utility from switching in period 1 is:

$$v^i + \beta\delta(v^f - s) + \beta \sum_{t=2}^{\infty} \delta^t v^f = v^i - \beta\delta s + \beta \sum_{t=1}^{\infty} \delta^t v^f = v^i + v^f \frac{\beta\delta}{1 - \delta} - \beta\delta s \tag{21}$$

The only modification here is the superscript f to indicate it is the consumer surplus attained at a fringe firm. Since sophisticates and naïfs have different optimal plans, the demand functions for each of those consumer types are derived separately.

We start the analysis of hyperbolic discounters by deriving the demand function for the sophisticates. Sophisticates chooses between switching in the first period or staying forever. Inserting the consumer surplus values into the expected utility functions, we will have that the

expected utility from staying forever at the incumbent firm is equal to $\left(1 - p^i\right)\left(\frac{1-\delta+\beta\delta}{1-\delta}\right)$, and the expected utility from switching in period 0 is equal to $\frac{1-\delta+\beta\delta}{1-\delta} - 5\theta$. By equating these expected utilities, the indifferent consumer can be found when solving for θ:

$$\left(1 - p^i\right)\left(\frac{1-\delta+\beta\delta}{1-\delta}\right) = \frac{1-\delta+\beta\delta}{1-\delta} - 5\theta$$

$$\theta_S^* = \frac{1-\delta+\beta\delta}{5(1-\delta)}p^i \tag{22}$$

Along the interval $[0,1]$, θ_S^* distinguish between those consumer types who would want to switch to a fringe firm ($< \theta_S^*$) and those who stay at the incumbent firm ($> \theta_S^*$). The demand for the incumbent firm located at 1 in the interval, is thus: given that $p^i \leq 1$

$$D_S\left(p^i\right) = 1 - \frac{1-\delta+\beta\delta}{5(1-\delta)}p^i \tag{23}$$

Next, we derive the demand function for the naïfs. Naïfs optimal plan is to either switch in the first period or switch in the next period. The same procedure as under TCs and sophisticates are used for naïfs. The expected utility from switching in the first period is equal to $\frac{1-\delta+\beta\delta}{1-\delta} - 5\theta$, while the expected utility from switching in the next period is $\frac{1-\delta+\beta\delta}{1-\delta} - p^i - \beta\delta 5\theta$. The indifferent consumer is found by equating these expected utilities and solving for θ:

$$\frac{1-\delta+\beta\delta}{1-\delta} - 5\theta = \frac{1-\delta+\beta\delta}{1-\delta} - p^i - \beta\delta 5\theta$$

$$\theta_N^* = \frac{p^i}{5(1-\beta\delta)} \tag{24}$$

Along the interval $[0,1]$, θ_N^* distinguish between those consumer types who would want to switch to a fringe firm ($< \theta_N^*$) and those who stay at the incumbent firm ($> \theta_N^*$). The demand for the incumbent firm located at 1 in the interval, is thus: given that $p^i \leq 1$

$$D_N\left(p^i\right) = 1 - \frac{p^i}{5(1-\beta\delta)} \tag{25}$$

4.2.1.3   Remarks

The demand functions display less elasticity with hyperbolic discounting compared to exponential discounting. In the figures below, naïfs display approximately perfect inelasticity, sophisticates display mild inelasticity in Figure 4.3 and elastic demand in Figure 4.4, while TCs display perfect unit elastic demand Figure 4.3 and elastic demand in Figure 4.4.
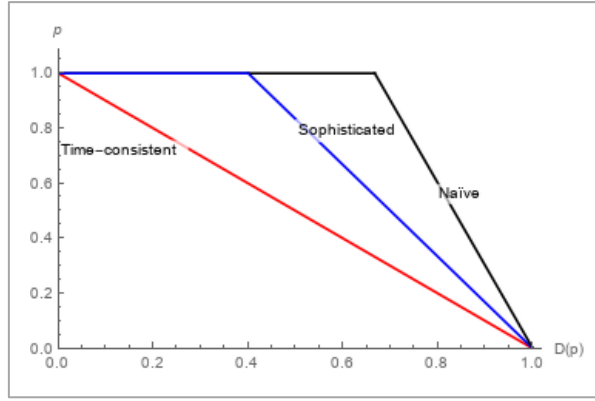
Figure 4.3: Incumbent's demand for different prices when
$\beta = 0.5 \text{ and } \delta = 0.8$
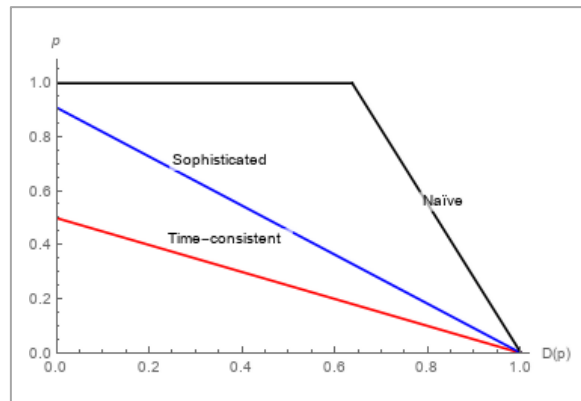
Figure 4.4: Incumbent's demand for different prices when
$\beta = 0.5 \text{ and } \delta = 0.9$

4.2.2 Profit Maximation

The incumbent firm's price is set independently of the competitive fringe and depends on the incumbents' demand which is determined by the consumer surpluses, consumers degree of patience, consumers preferences for current consumption, and the switching cost. The incumbent firm maximizes its profit with respect to its price. If the incumbent firm (i) enjoys monopoly status, it would optimally charge a price, p^M, which cover all the consumer surplus. By inserting the demand-functions for the respective consumer types, the optimal market price offered by the incumbent firm will be found. However, there might also exist a corner solution if the participation constraints for the consumer types is unfulfilled.

If all the consumers in the market are time-consistent and $p^i \leq 1$, the profit function for the incumbent firm would be:

$$\pi^i_{TC} = \left(1 - \frac{1}{5(1-\delta)}p^i\right)p^i \tag{26}$$

The first-order condition for profit maximized price is found when differentiating this profit function with respect to p^i and equalizing to zero:

$$\frac{\partial \pi_{TC}^i}{\partial p^i} = 1 - \frac{1}{5(1-\delta)}p^i - \frac{1}{5(1-\delta)}p^i = 0$$

By solving the first-order condition with respect to p^i, it is found that the optimal price for the incumbent firm to set to TCs is:

$$p_{TC}^i(\delta) = \frac{5(1-\delta)}{2} \tag{27}$$

This is the optimal price only if δ is sufficiently high, so the expression is below 1.[15] When δ is too low, the optimal price will instead be 1. The threshold for there to be an interior solution for optimal price is found. The participation constraint for the consumers is:

$$1 \geq p_{TC}^i(\delta) \tag{28}$$

Solving for δ, we find that the condition is: $\delta \geq \frac{3}{5}$. This implies δ must exceed $\frac{3}{5}$ for $p_{TC}^i(\delta)$ to be the optimal price in the market. If this is the case, the incumbent firm's demand will be:

$$D_{TC}^i = 1 - \frac{1}{5(1-\delta)}\frac{5(1-\delta)}{2} = \frac{1}{2}$$

If $\delta < \frac{3}{5}$, resulting in a corner solution for the incumbent firm's price, the incumbent firm would set its price equal to 1. The incumbent firm's demand share under this case would be:

$$D_{TC}^i = 1 - \frac{1}{5(1-\delta)}$$

Next, if all the consumers in the market is sophisticates and given that $p^i \leq 1$, the profit function for the incumbent firm would be:

$$\pi_S^i = \left(1 - \frac{1-\delta+\beta\delta}{5(1-\delta)}p^i\right)p^i \tag{29}$$

Leading to the first order condition:

$$\frac{\partial \pi_S^i}{\partial p^i} = 1 - \frac{1-\delta+\beta\delta}{5(1-\delta)}p^i - \frac{1-\delta+\beta\delta}{5(1-\delta)}p^i = 0$$

Solving the first-order condition with respect to p^i, the optimal price for the incumbent firm to set to sophisticates is:[16]

$$p_S^i(\delta, \beta) = \frac{5(1-\delta)}{2(1-\delta+\beta\delta)} \tag{30}$$

---

[15] The second-order condition for this solution to be a global maximum is fulfilled, see A.1.2.a.
[16] The second-order condition for this solution to be a global maximum is fulfilled, see A.1.2.b.

This is the optimal price only if δ and/or β is sufficiently high, so that the expression is below 1. When δ and/or β is too low, the optimal price will instead be 1. Therefore, the threshold for there to be an interior solution for optimal price must be found. The participation constraint for the consumers is equal to:

$$1 \geq p_S^i(\delta, \beta) \tag{31}$$

When simplifying with respect to the discount-factors, we have that: $\delta(3 + 2\beta) \geq 3$. If this inequality is fulfilled, the incumbent firm's demand share will be:

$$D_S^i(\beta, \delta) = 1 - \frac{1 - \delta + \beta\delta}{5(1 - \delta)} \frac{5(1 - \delta)}{2(1 - \delta + \beta\delta)} = \frac{1}{2}$$

If $\delta(3 + 2\beta) < 3$, resulting in a corner solution for the incumbent firm's price, the incumbent firm would set its price equal to 1. The incumbent firm's demand share under this case would be:

$$D_S^i = 1 - \frac{1 - \delta + \beta\delta}{5(1 - \delta)}$$

Since p_{TC}^i has a larger denominator compared to p_S^i, the price offered to sophisticates exceeds the price offered to TCs (if $\beta < 1$).

Lastly, if all the consumers in the market is naïfs and given that $p^i \leq 1$, the profit function for the incumbent firm would be:

$$\pi_N^i = \left(1 - \frac{p^i}{5(1 - \beta\delta)}\right) p^i \tag{32}$$

Leading to the first-order condition:

$$\frac{\partial \pi_N^i}{\partial p^i} = 1 - \frac{p^i}{5(1 - \beta\delta)} - \frac{p^i}{5(1 - \beta\delta)} = 0$$

By solving the first-order condition with respect to p^i, the optimal price for the incumbent firm to set to naïfs is:[17]

$$p_N^i(\delta, \beta) = \frac{5(1 - \beta\delta)}{2} \tag{33}$$

Both p_{TC}^i and p_S^i have a larger denominator and numerator, so the price offered to naïfs is far higher than the price offered to sophisticates and TCs. However, this is the optimal price only if δ and/or β is sufficiently high, so the expression is below 1. When δ and/or β is too low, the optimal price will instead be 1. The threshold for there to be an interior solution for optimal price is found. The participation constraint for the consumers is:

$$1 \geq p_N^i(\delta, \beta) \tag{34}$$

---

[17] The second-order condition for this solution to be a global maximum is fulfilled, see A.1.2.c.

When simplifying with respect to the discount-factors, we have that: $\beta\delta \geq \frac{3}{5}$. If this is satisfied, the incumbent firm's demand share will be:

$$D_N^i(\delta,\beta) = 1 - \frac{1}{5(1-\beta\delta)}\frac{5(1-\beta\delta)}{2} = \frac{1}{2}$$

However, since the incumbent firm can set the price for naïfs higher, it is most likely not fulfilled. Thus, the incumbent would set a price equal to 1 $\left(\text{if } \beta\delta < \frac{3}{5}\right)$, and its demand share would be equal to:

$$D_N^i = 1 - \frac{1}{5(1-\beta\delta)}$$

4.2.2.1 *How the optimal price changes with different δs and βs*

The more time-consistent and patient the consumers are, the lower is the optimal price given by the firm. In other words, the optimal price for the firm to set to time-inconsistent consumers is higher than what is offered to TCs. To illustrate this, I have included four figures illustrating how the optimal price change with different discount factor values.

Firstly, β is held constant. Figure 4.5 and Figure 4.6 illustrates that the higher δ, the lower is the optimal price which is set in the market for all the consumer types. When holding β constant, sophisticates eventually converge towards TCs.

Figure 4.5: Incumbent's optimal price with $\beta = \frac{1}{2}$.
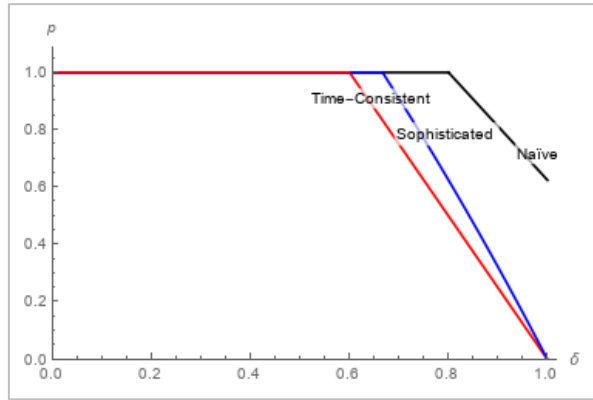
Figure 4.6: Incumbent's optimal price with $\beta = \frac{3}{4}$.

Secondly, δ is held constant. Figure 4.7 and Figure 4.8 illustrates that the higher β, the lower is the optimal price for the firms. The optimal price offered to naïfs and sophisticates will eventually converge towards TCs' offered price.
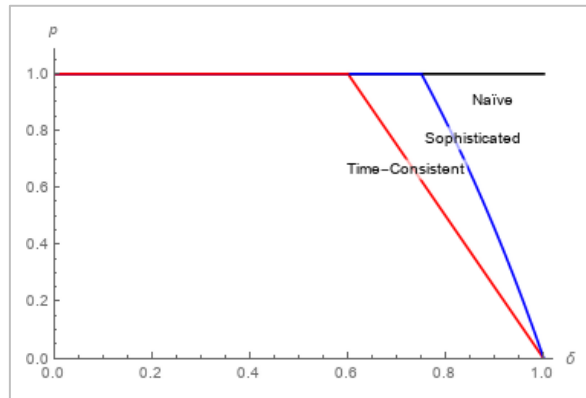

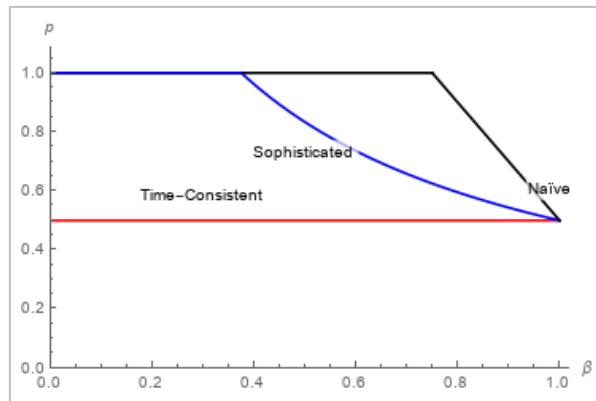*Figure 4.7: Incumbent's optimal price with $\delta = \frac{8}{10}$.*
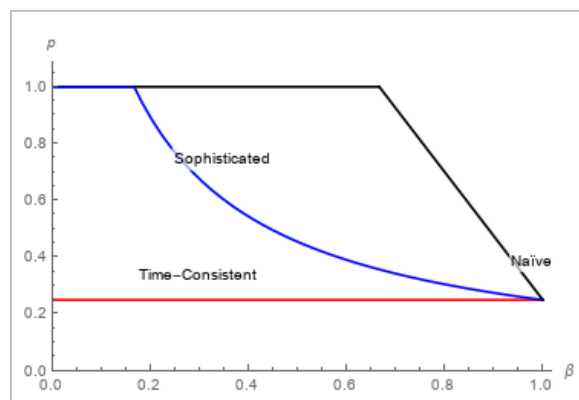

Figure 4.8: Incumbent's optimal price with $\delta = \frac{9}{10}$.

4.2.3 Numerical Example

A simple example introduces the main idea behind introducing consumer types to models with switching costs to firms' maximization problem. In Table 4.1, two numerical examples with different discount factors are presented.

The more patient the consumer is and/or the less customers prefer current consumption, i.e., the higher δ and/or β, the lower is the optimal price set by the incumbent. Fewer naïfs will switch compared to both TCs and Sophisticates (given that the incumbent firm set the price equal to 1). Additionally, Table 4.1 shows that, contingent on $p^i \leq 1$, it is optimal for the incumbent firm to set a price which ensures it get half the market demand. If, however, the incumbent firm set the corner solution, resulting to a price equal to 1, they would obtain a higher market share than $\frac{1}{2}$.

Table 4.1: Numerical example of optimal price set by the incumbent firm for different consumer types and its market share

	$\delta = \dfrac{8}{10} \; and \; \beta = \dfrac{1}{2}$	$\delta = \dfrac{9}{10} \; and \; \beta = \dfrac{1}{2}$
TCs	$p^i_{TC} = \dfrac{5\left(1 - \frac{8}{10}\right)}{2} = \dfrac{1}{2} = 0.5$ $D^i_{TC} = \dfrac{1}{2}$	$p^i_{TC} = \dfrac{5\left(1 - \frac{9}{10}\right)}{2} = \dfrac{\frac{1}{2}}{2} = 0.25$ $D^i_{TC} = \dfrac{1}{2}$
Sophisticates	$p^i_S = \dfrac{5\left(1 - \frac{8}{10}\right)}{2\left(1 - \frac{8}{10} + \frac{1}{2}\frac{8}{10}\right)} = \dfrac{5}{6} \approx 0.83$ $D^i_S = \dfrac{1}{2}$	$p^i_S = \dfrac{5\left(1 - \frac{9}{10}\right)}{2\left(1 - \frac{9}{10} + \frac{1}{2}\frac{9}{10}\right)} = \dfrac{5}{11} \approx 0.45$ $D^i_S = \dfrac{1}{2}$
Naïfs	$\beta\delta = \dfrac{2}{5} \Longrightarrow p^i_N = 1$ $D_N = 1 - \dfrac{1}{5\left(1 - \frac{1}{2}\frac{8}{10}\right)} = \dfrac{2}{3}$	$\beta\delta = \dfrac{9}{20} \Longrightarrow p^i_N = 1$ $D_N = 1 - \dfrac{1}{5\left(1 - \frac{1}{2}\frac{9}{10}\right)} = \dfrac{7}{11} \approx 0.64$

5 Evidence from the Mobile Market

This chapter provides some supporting evidence from the mobile market for the predictions made in the model presented in Chapter 4. Chapter 5.1 introduces some insights to the market structure of the Norwegian mobile subscription market, where subsection 5.1.1 looks at the total turnover in the mobile market for private subscriptions, subsection 5.1.2 looks at the market shares, and lastly subsection 5.1.3 looks at the listed prices in the market. Chapter 5.2 includes results from two questionnaires, where subsection 5.2.1 introduces some sample characteristics, subsection 5.2.2 looks at consumers' preferences, subsection 5.2.3 looks at consumers' perception of the different mobile suppliers, subsection 5.2.4 looks at the respondents attentiveness in the market, and lastly subsection 5.2.5 looks at the respondents switching behaviour.

5.1 MARKET STRUCTURE

The data for this chapter is collected from Nkom and the mobile subscription suppliers' own webpages. Nkom is the Norwegian Communications Authority and they are an executive supervisory and administrative authority for services within electronic and postal communication in Norway, enforcing market regulations where needed. Nkom also provides public statistics and data in their online database *ekomstatistikken*.

5.1.1 Profits

The total turnover for mobile services amounted to almost NOK 18.1 billion in 2019 (Nkom, 2020). Nkom states that subscription revenues account for an increasingly larger share of mobile sales. In 2019, private subscription revenues accounted for almost 79 % of total sales. Figure 5.1 shows the combined revenues from private mobile subscription in the Norwegian mobile market reported to Nkom.
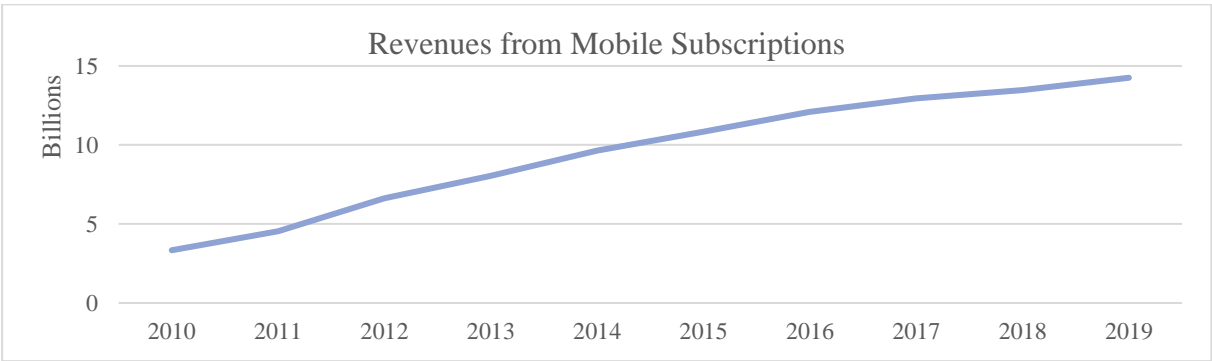

Figure 5.1: Revenues from private mobile subscriptions (Nkom, 2020)

5.1.2 Market Shares

Nkom (2020) states that Telenor served more than 2.7 million mobile subscriptions at the end of 2019. This represented approximately 48 % of the total number of mobile subscriptions. Telenor has had a slight decrease over time but has still a high market share. Telia is the second largest supplier, with a market share of 36 %. Like Telenor, Telia also experience some very minor decreases in market share. Ice is a relatively new supplier in the market for mobile subscriptions, but have managed to become the third largest supplier, with a market share of approximately 10 %. Combined, these three Mobile Network Operators (MNO)[18] have a market share of 94 %. Figure 5.2 shows the development of number of customers to the most popular mobile subscriptions suppliers in the market. The data for the figure is collected from Nkom (2020).
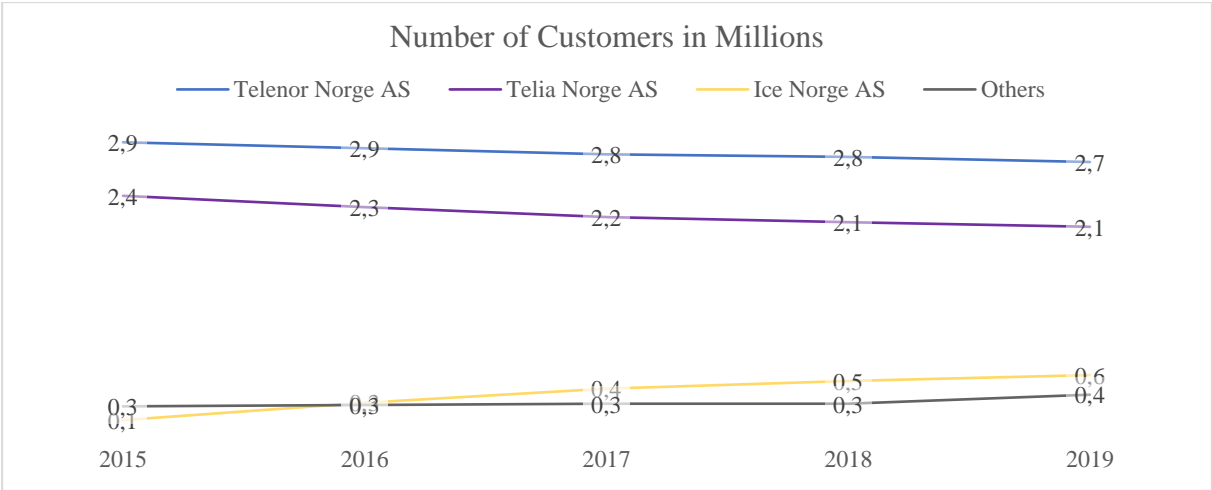
Figure 5.2: Number of customers based on number of firm and private subscriptions (Nkom, 2020)

5.1.3 Price

The different mobile suppliers set similar prices in the market. A remark with respect to prices, is that for any subscription Telenor's listed prices exceeds all the other mobile suppliers. Additionally, Telia offers the second most expensive subscriptions. Figure 5.3 graphs the listed prices of some of the largest mobile suppliers. The data was collected from the mobile subscription suppliers' own webpages (Telenor, 2019, Talkmore, 2019, Telia, 2019, ice, 2019, Fjordkraft, 2019, Chili Mobil, 2019, OneCall, 2019). Even though Talkmore and OneCall are appointed as respectively Telenor's and Telia's cheaper brands, they still set higher prices than ice and the other mobile suppliers who are depicted in Figure 5.3.

---

[18] In Norway, Telenor and Telia are the only MNOs with national coverage, while ice, the last MNO, only have partial coverage and borrows the rest from Telia.

Figure 5.3. Listed prices graphed for some mobile subscription suppliers
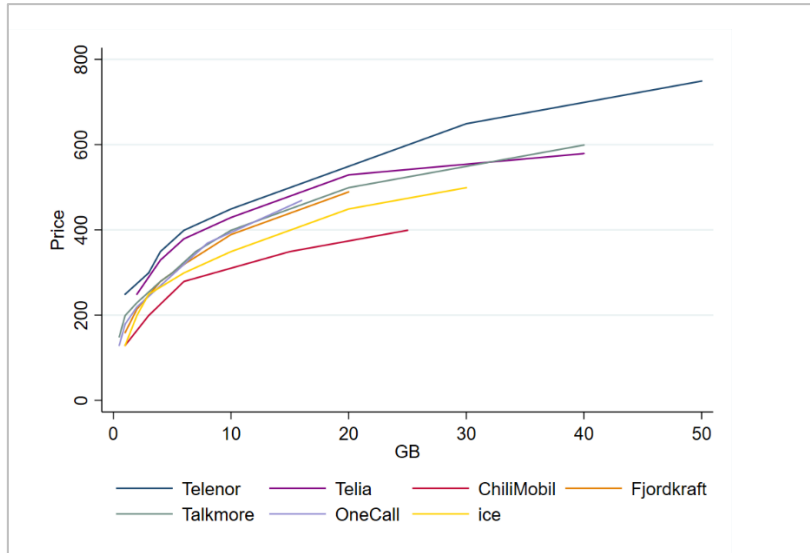
Since Telenor has the highest share of consumers, the price differences between Telenor and the other mobile suppliers are highlighted. Table 5.1 lists the price differences. The prices were collected from the mobile subscription suppliers own webpage (Telenor, 2019, Talkmore, 2019, Telia, 2019, ice, 2019, Fjordkraft, 2019, Chili Mobil, 2019, OneCall, 2019). Telenor's listed prices for subscriptions with monthly payments are 20 to 200 NOK more expensive than all the other mobile suppliers.

Table 5.1: Overview of (listed) price differences between Telenor and other mobile suppliers. The cells show the difference in price between Telenor and other providers of mobile subscription for given offered GB subscriptions.

GB Data

	1	3	4	6	10	15	20	25	30	40
Talkmore	50		70		50		50			100
OneCall	70		80	80						
ice	120	50		100	100	100	100		150	
Fjordkraft	90		70	80	60		60			
Chili	120	100		120		150		200		
Telia			20	20	20	20	20			120

5.2 RESULTS FROM QUESTIONNAIRES

The results presented in this chapter is from a survey performed in 2018 and a short online survey performed in connection to the thesis in 2020. The surveys collected information about the respondent's choice, attention and switching behaviour in the market for Norwegian mobile subscriptions. The last survey had also added a couple questions that were meant to give

34

a slight insight into consumers potential self-control problems and time discounting of future utility.

The questionnaire from 2018 was performed in connection to a practice-based course offered at the Institute of Economics at the University of Bergen. The survey was made in cooperation with the Norwegian Competition Authority and implemented to investigate if ice was a sufficient competitor to the other MNOs in the Norwegian mobile market. We performed the questionnaire face-to-face at Bergen train station and published it online at our private Facebook accounts in September 2018. The results in this chapter consist of a combined sample (both face-to-face and internet-based replies) of 579 replies from the 2018-survey.[19]

The questionnaire performed in connection to the master thesis this year was internet-based. It was published on my private Facebook account in Mars and consists of 177 replies. The questionnaires included both open and closed questions. Questions that has price answers are open answers, allowing the respondents to enter their answers themselves. All the other questions either had rating scales or a set of closed quantity categories since it is easier to process such answers.[20]

The collected data from both questionnaires is processed using Power Query in Excel, and the figures are made by using Power Pivot. In the following Subsections, only English translations of the asked questions are mentioned. The surveys are meant to be a support (or disclaimer) to the main theoretical analysis of the thesis.

5.2.1 Supplier of Mobile Subscription

The first question in both surveys was "Which corporation provides your mobile subscription?". The sample from the survey performed in 2018 consisted of customers from 12 mobile subscriptions suppliers, while the sample from the survey performed in 2020 consisted of customers from 10 mobile subscriptions suppliers. In both samples, most respondents have mobile subscriptions from the two largest mobile suppliers. In Figure 5.4 the two largest suppliers have collectively 68 % and 67 % customers from the subject pool in respectively the 2018- and 2020-survey.

---

[19] A copy of the 2018-survey in Norwegian can be found in Appendix A.2.1.
[20] A copy of the 2020-survey in Norwegian can be found in Appendix A.2.2.
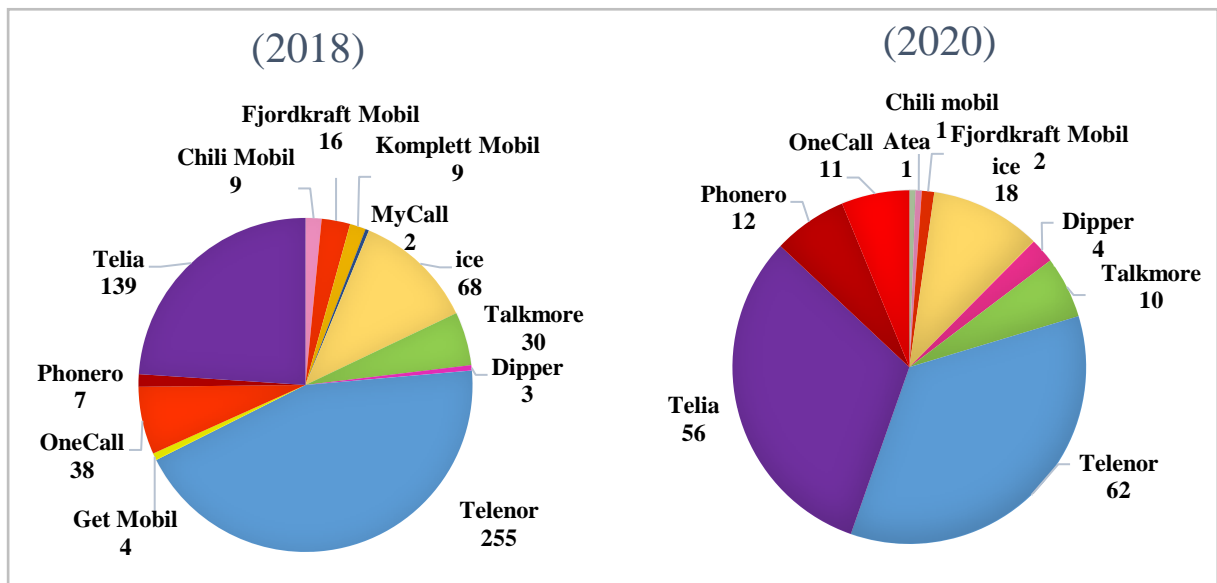
Figure 5.4:"Which corporation provides your mobile subscription?"

Since four of the mobile suppliers (Phonero, OneCall, Talkmore, and Dipper) are subsidiary companies to either Telia or Telenor, the two MNOs have in fact a higher share of customers. In Figure 5.5 the subsidiary companies are added under the parent company. For the 2020 sample, the two MNOs shares 87 % of the sample. The survey performed in 2018, the sample was more representative. Telenor had a larger share of the market. However, Telia and ice have acquired several mobile suppliers since 2018.[21]
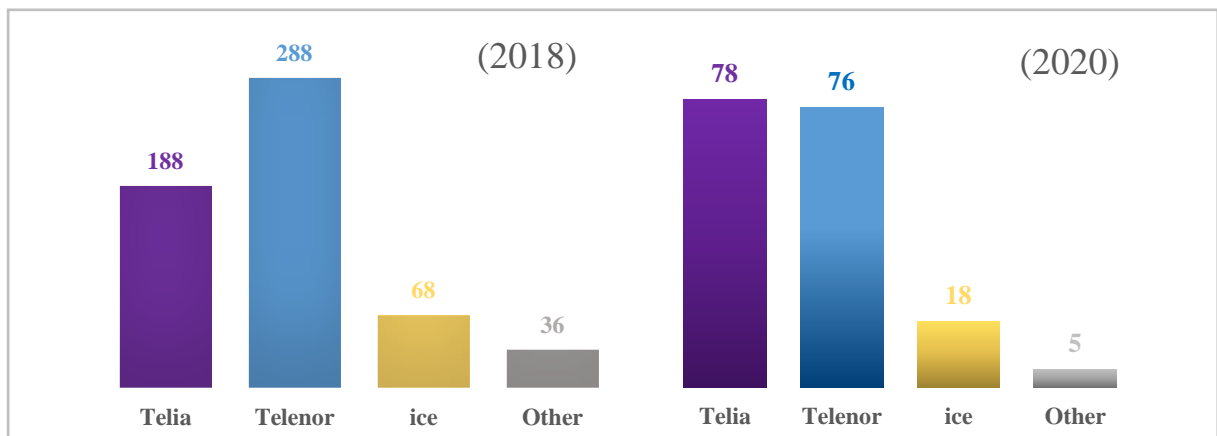
Figure 5.5:" Which corporation provides your mobile subscription?". Subsidiaries added under parent company

5.2.2 Consumers' Preferences

The following results are meant to say something about consumers preferences in the mobile market, indicating how much attention they devote, and how often they switch mobile supplier or subscription. If the respondents payed for their own mobile subscription, they were

---

[21] Telia acquired Phonero at the time of the survey and Get Mobil, while ice bought Komplett Mobil's customer.

asked: "What features did you find important when you last choose a mobile subscription?". If the respondents did not pay for their own mobile subscription, they were asked: "What features would you find important when choosing a mobile subscription?". The results from these questions were combined and are illustrated in Figure 5.6. In this figure the subsidiary companies are added under the parent companies.[22]
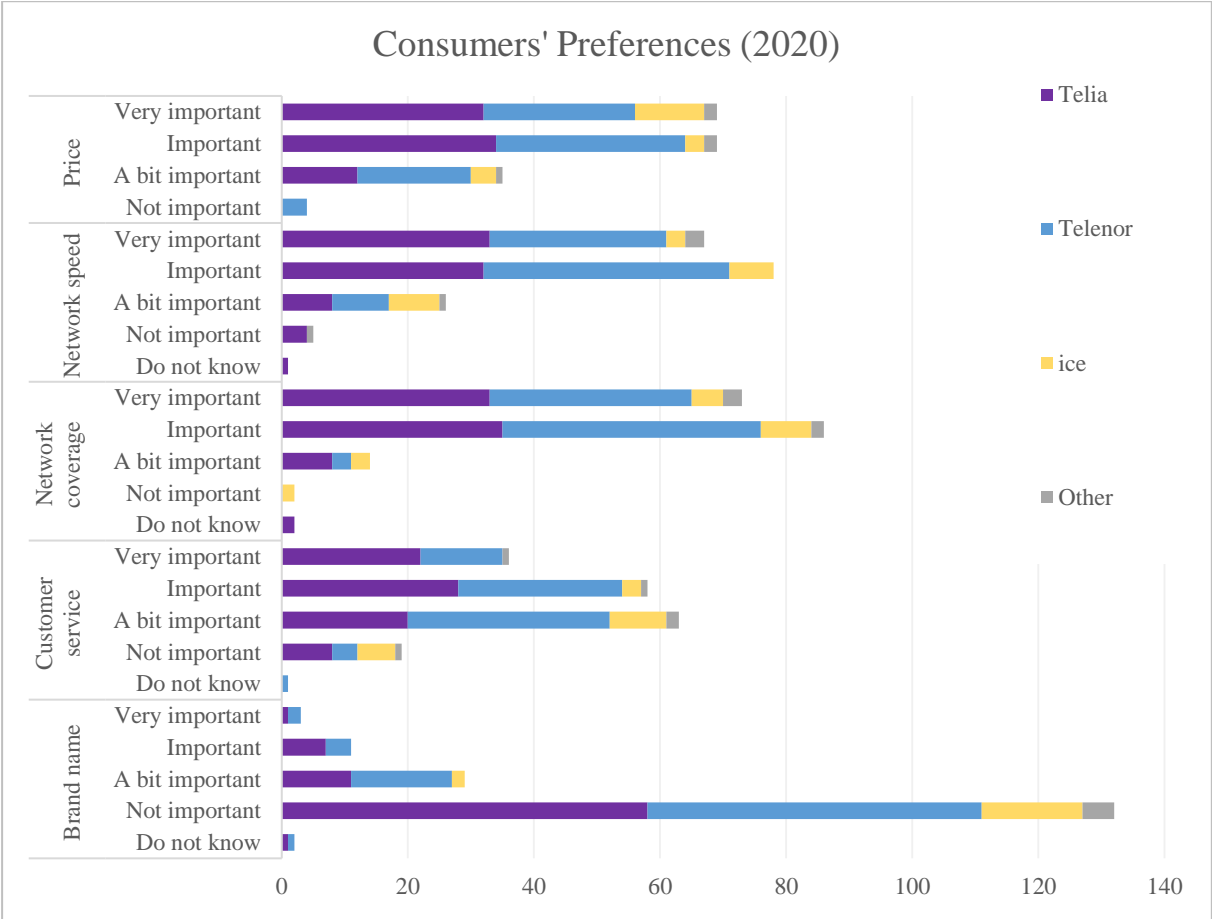
Figure 5.6: Degree of importance for different mobile subscription features

Features the respondents might deem important when choosing a mobile subscription can be an indicator of mobile subscriptions substitutability and how much attention the consumers devote when making their choice. Most customers find price, network speed, and coverage very important or important. Customer service is of mixed importance, and brand name is mostly not important.

That the respondends do not find brand name important is a bit unlikely, since brand name does often have a signaling value. There exist only three MNOs in the Norwegian Mobile Market and consumers do often perceive subscriptions offered by them better than subscriptions

---

[22] The same figure depicting respondents' preferences by all mobile suppliers can be found in Appendix figure 8.

offered by MVNOs or VNOs[23]. Additionally, Telenor are regulated by Nkom, where it is required to offer mobile network at a reasonable price and quality to all the MVNOs and VNOs in the market. Thus, if brand name does not matter, then all the mobile suppliers should be viewed as almost identical. This does not seem to be the consumers thoughs, since Telenor and Telia has a substantial higher market share.

5.2.3 Consumers' Perception

Next, the respondents were asked: "In what degree do you agree with the following statements? A) My mobile subscription provider provides the best mobile subscription. B) My mobile subscription provider is the leader in new technology". The answers are illustrated respectively in Figure 5.7 and Figure 5.8. The daughter companies of Telia and Telenor are merged with the parent company in the figures.

Figure 5.7 shows similar figures for Telia and Telenor. Most of the respondent's choose the neutral answer. 30 % of both Telia's and Telenor's customers (either direct customers or through the daughter companies) opt that their supplier offer the best subscription in the mobile market.
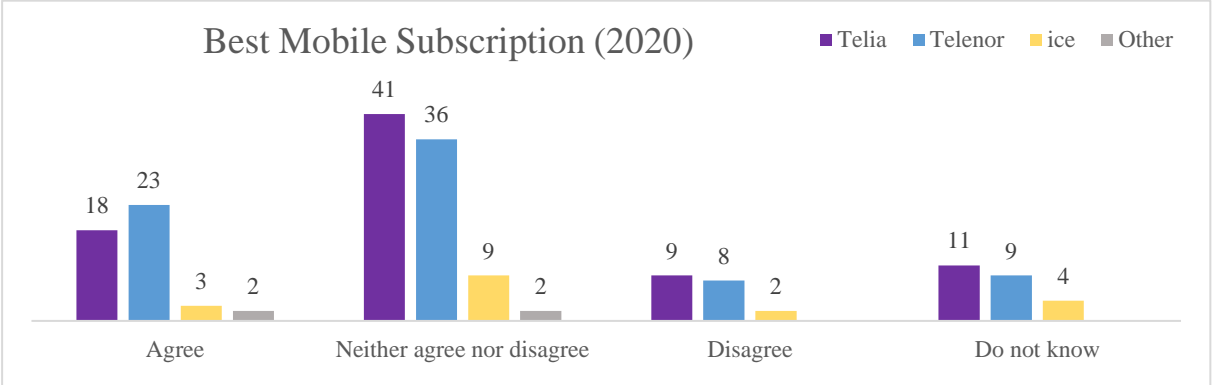
Figure 5.7: The degree of agreement of the statement:
"My mobile subscription provider provides the best mobile subscription"

Figure 5.8 shows that most respondents opt the neutral answer. No one of ice's customers perceive ice's technology as superior, while Telenor has the most customers who perceive their supplier's technology is the best.

---

[23] Mobile subscription suppliers without their own mobile network, thereby Mobile Virtual Network Operators or Virtual Network Operators. MVNOs and VNOs borrow Mobile Network from either Telenor or Telia in the Norwegian mobile market.
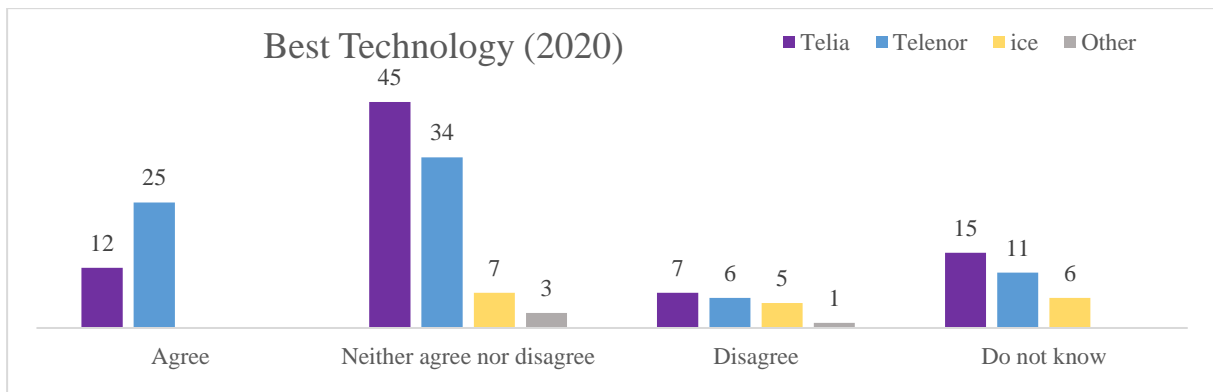
Figure 5.8: The degree of agreement of the statement:
"My mobile subscription provider is the leader in new technology"

The next figure is from the survey performed in 2018, where we asked the respondents "Who has the best network coverage?" with the choices being *Telenor, Telia, Ice, Everyone has the same coverage,* and *I do not know*. Figure 5.9 illustrates the respondents' answers. 52 % of the sample believe Telenor offers the best network coverage, 9 % that Telia offers the best, 2 % that it is ice, 8 % that it is equal coverage and 29 % opted the "do not know"-option. Similar results can be found online when looking at consumers perception of the supplier's network coverage (Bytt.no, 2020). However, all three MNO offers national coverage (either in their own or borrowed through another).
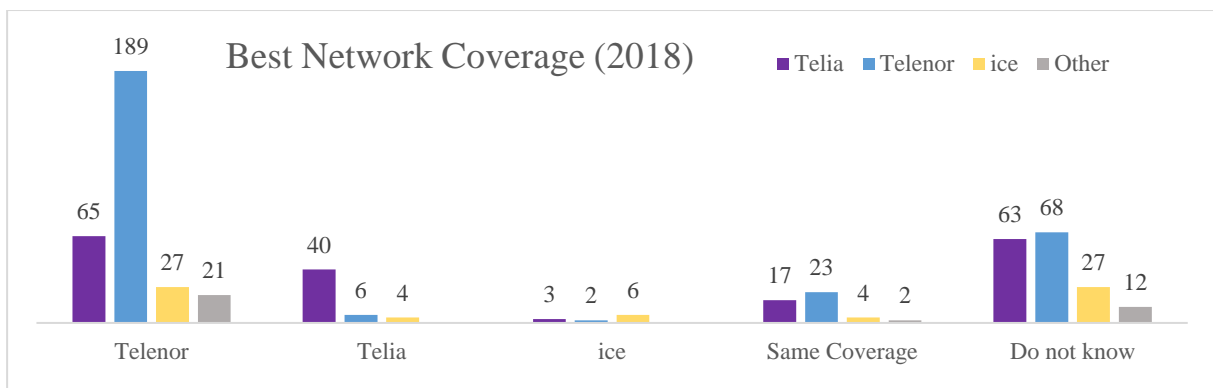
Figure 5.9: "Who has the best network coverage?"

5.2.4 Consumers' Attentiveness

Figure 5.10 shows the results from the question: "How often do you check the prices of other subscription providers than your current provider?" combined with what the respondents answered with respect to the degree of importance towards the mobile subscriptions' price. As before, daughter companies are merged with the parent company in the figure. 78 % of the subjects who found price to be very important or important, but only 12 % of the subjects check the prices offered in the market every year or more. 44 % of the respondents do never check the prices for mobile subscriptions. The respondents that has ice or mobile subscriptions under

39

"Other" checks prices more often compared to respondents with subscriptions at Telia or Telenor.

Figure 5.10: Frequency of checking prices and importance of price

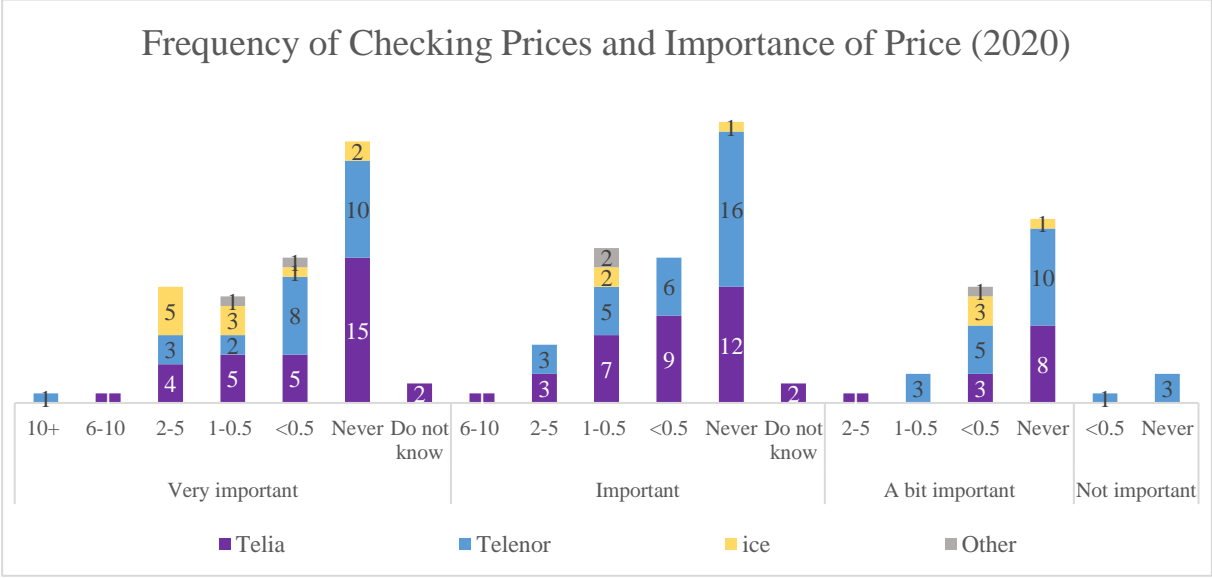The respondents were also asked: "How much is the most you think you could save per month if you changed to a different mobile subscription?". Figure 5.11 depicts the monthly amount the self-paying respondents expects to save by switching mobile supplier. Of those that pay for their own mobile subscription, 70 % answered an estimated amount saved by switching. The answers varied in the interval 0 to 300, with the median reply being 49. The average amount expected saved was 51, and most respondents thought they would not save anything (or marginally).
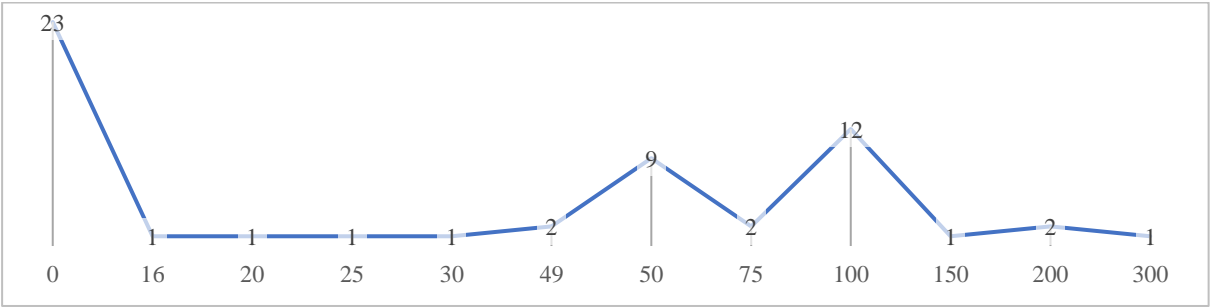
Figure 5.11: Expected amount saved per month (2020)

Figure 5.12 depicts the estimated (rounded) percentage saved per month. The figure was made by subtracting the expected amount saved per month to reported monthly price for the subscription (the answer to "What is the price for your mobile subscription?"). The estimated percentage saved varies from 0 to 44 % of reported price, with the median reply being 14 %. The average expected percentage saved is 14 %. 36 % of those who expect to save marginally, or nothing have subscriptions at Telia.

40

22

0% 5% 8% 11% 12% 14% 16% 17% 20% 21% 25% 27% 29% 30% 31% 33% 40% 44%

1 1 1 1 2 1 5 1 1 4 1 4 1 3 2 2 1

Figure 5.12: Estimated monthly percentage saved of reported price (2020)

5.2.5 Switching Behaviour

To shed some light into the respondents' switching behaviour, they were asked: "How often do you change supplier of mobile subscriptions?". Figure 5.13 depicts the respondent's answers. In general, it seems like people tend to have the same mobile supplier over a longer time-period. 30 % of the sample have never switched, 57 % 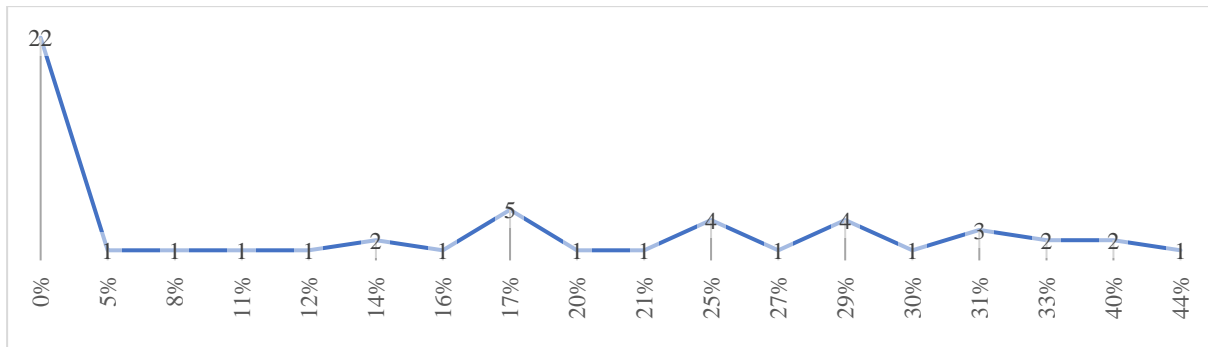switches less than every other year, and 13 % switches more often. Telenor has the largest share of subjects who never switch.

Supplier Switching Frequency (2020)

2-5 times a year		Once a year or every other year				Less than every other year							Never				
Talkmore	OneCall	ice	Talkmore	OneCall	Telia	Chili mobil	Fjordkraft Mobil	ice	Talkmore	Telenor	OneCall	Phonero	Telia	ice	Talkmore	Telenor	OneCall	Telia
1	1	6	1	1	2	1	2	8	5	9	5	2	22	3	1	15	4	5

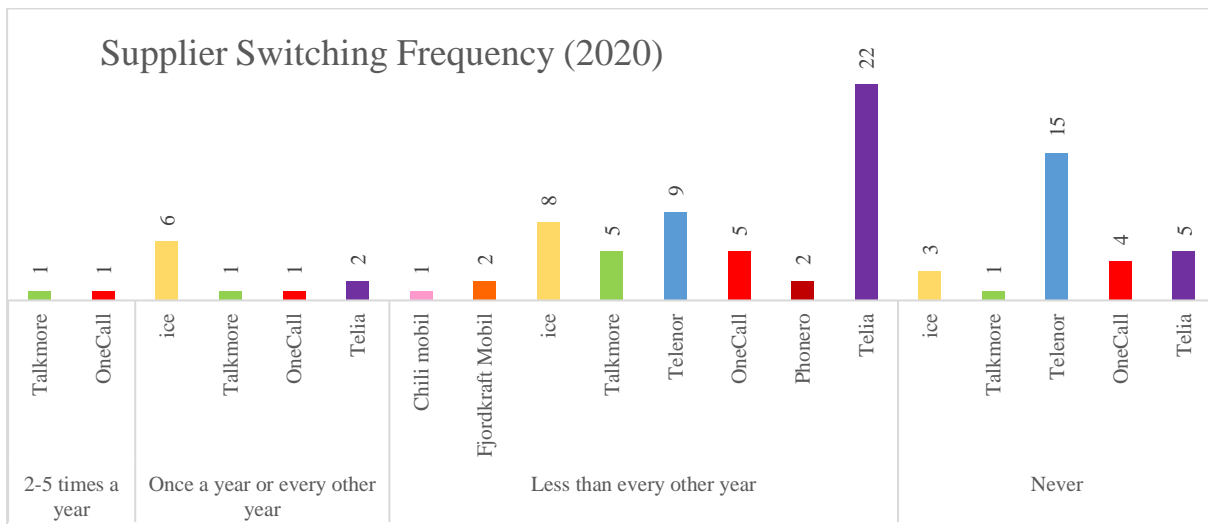*Figure 5.13: How often the respondents switch mobile subscription suppliers*

Next, we asked: "How often do you change mobile subscriptions?". Figure 5.14 depicts the respondent's mobile subscription switching frequency by mobile supplier. 49 % switch mobile subscription less than every other year, 23 % never switch, and 28 % switches more often than every other year. The respondents switch subscriptions more often than suppliers.
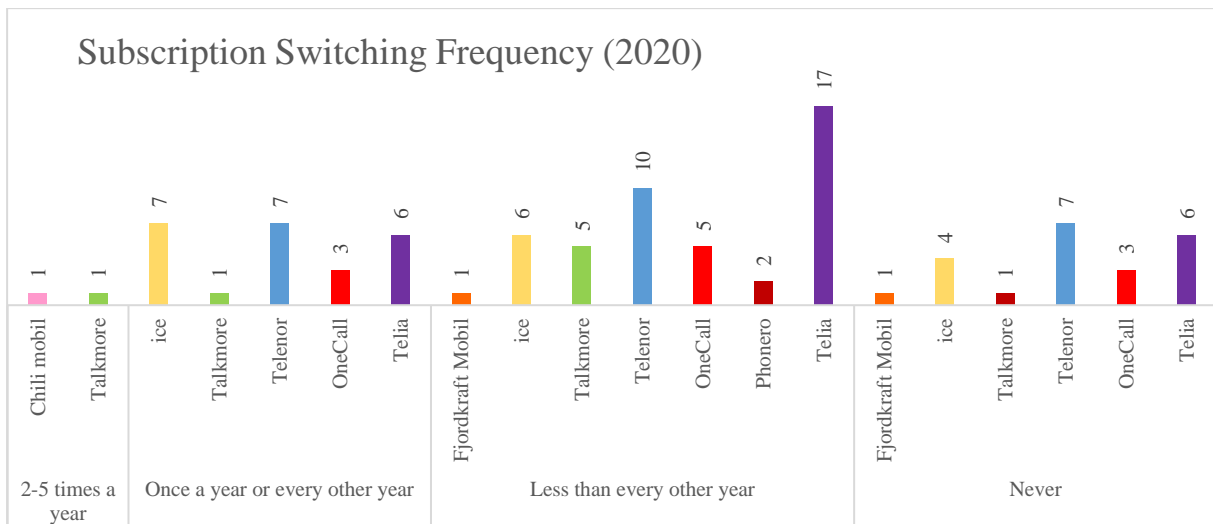
Figure 5.14: How often the respondents switch mobile subscriptions

The respondents were also asked: "When did you last change supplier of mobile subscription?". Figure 5.15 depicts the answers, but a mistake occurred in the online version of this question, where the option *between one and two years* was not included, so the answers is possibly biased. The figure shows that 29 % of the sample has switched within two years. 15 % have never switched suppliers. When estimating the average of the replies, by denoting *less than a half year, between a half year and one year, over 2 years,* and *never* respectively 1, 2, 3, and 4. It is found that the average number is 2,8. This implies the average reply for when consumer last switched suppliers is over 2 years. Telenor has the largest share of subjects who has never switched.
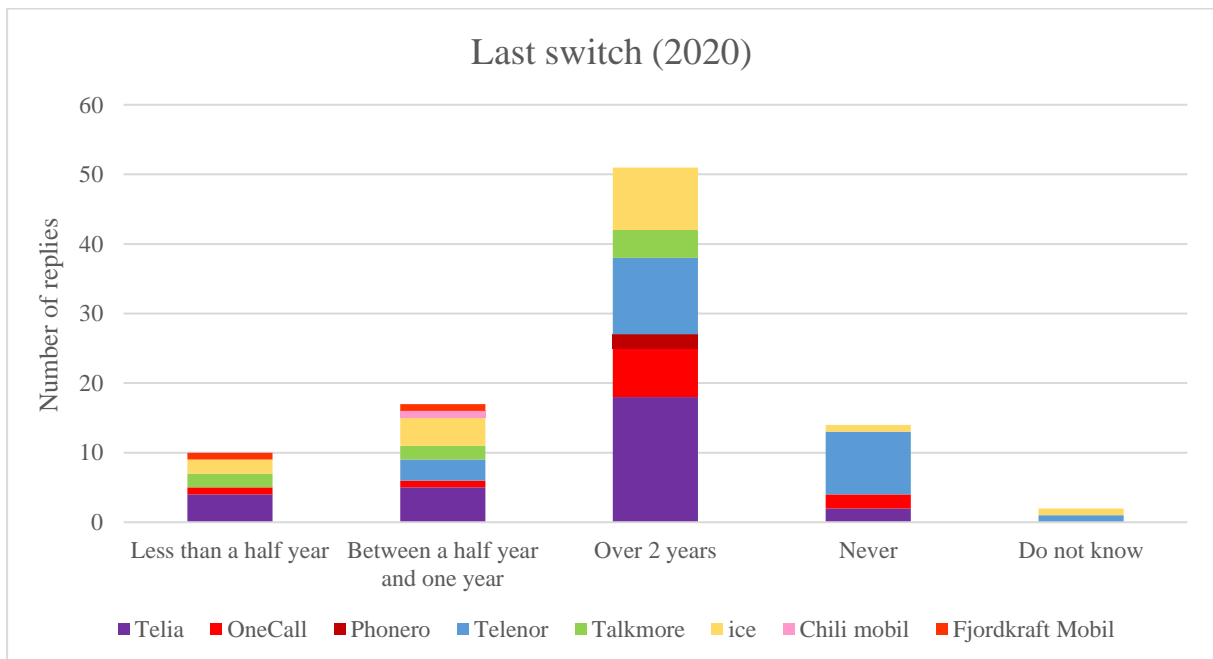

Figure 5.15: Overview of when the respondents last switched.

Moreover, the respondents were asked: "How long do you expect it will be before you switch the next time?". Figure 5.16 shows the answers (the same mistake as the previous question occurred in this question). 32 % of the subjects estimates they will switch within two years, and 12 % believe they will never switch suppliers. Following the same strategy as mentioned above, the average answer for predicted next switch is found. The average number is 2.5, so most subjects expect it will be over 2 years till the next switch.
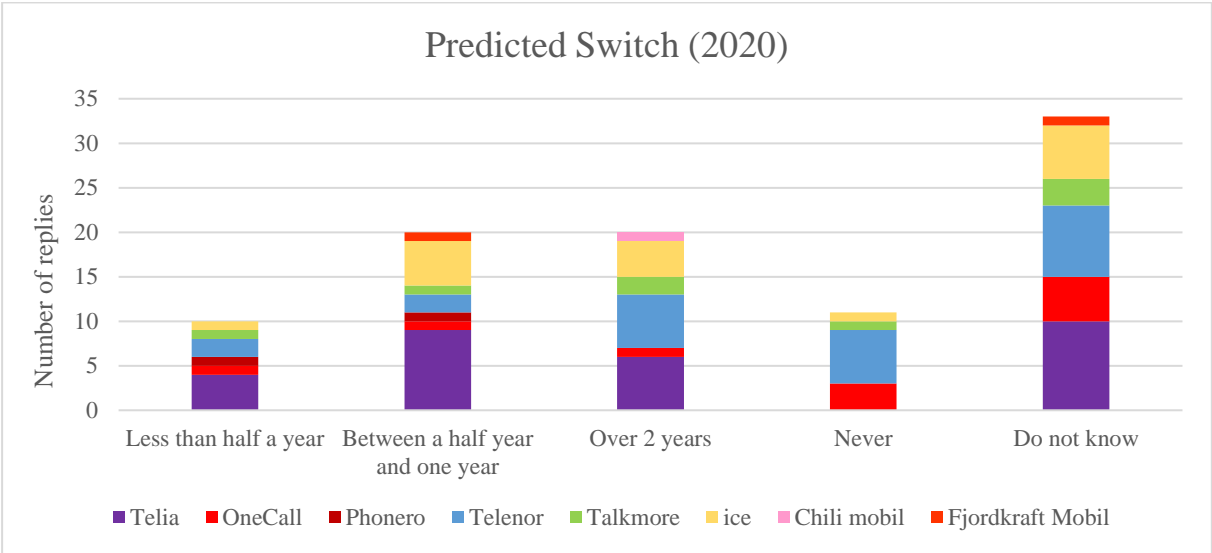
Figure 5.16: Overview of when the respondents predict to switch next.

In the questionnaire performed in 2018, we asked the respondents to what degree of easiness they found switching suppliers and when they last switched mobile suppliers. Figure 5.17 shows the respondents perception of easiness of switching mobile suppliers separated for those who have switched suppliers and those who never have. The average reply for respondents who have switched is 4.1, indicating consumers find it rather easy to switch suppliers of mobile subscriptions. The average reply for respondents who have not switched is also 4.1. Combined, 37 % find switching very easy, 37 % rather easy, 14 % neither hard nor easy, and 5 % find switching rather hard.

Figure 5.17: Respondents' replies for easiness of switching mobile supplier.

43

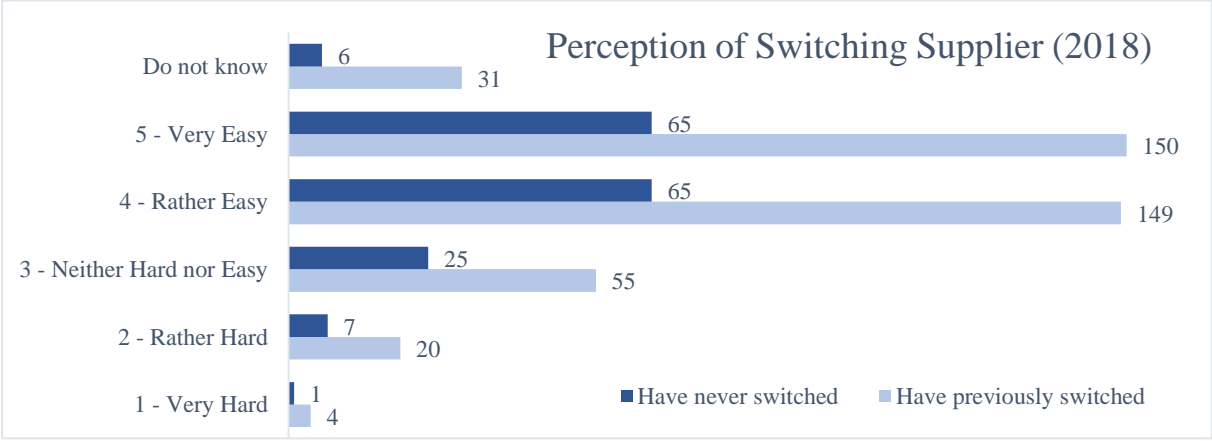Figure 5.18 depicts the respondents' perception of difficultness of switching mobile suppliers combined with how long since they last switched. 25 % of the sample have switched within the last year, 46 % switched for more than a year since and 26 % had never switched. Those who have switched within the year, find on average that the easiness of switching suppliers is 4,21. For those who switched for more than a year ago, the average reply of easiness of switching suppliers is 4,06. Lastly, those who have never switched find the easiness of switching suppliers on average to be 4,22.
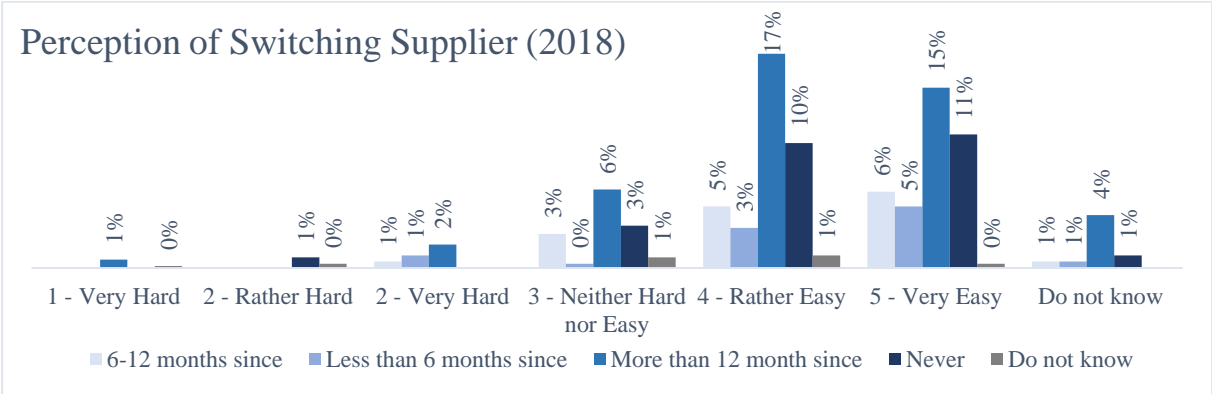
Figure 5.18: Perception of easiness of switching suppliers combined with duration since the respondents last switched suppliers

In the 2018-questionnaire, the respondents were also asked which mobile suppliers they had before they switched. Figure 5.19 depicts which mobile supplier respondents had last (on y-axis) and who they have switched to (column). Most of the subjects switched to either Telenor, Telia or ice. 33 % of those who have switched, switched to Telenor, 23 % to Telia. 18 % to ice, 7 % to Talkmore, 7 % to OneCall, and 12 % to various other.
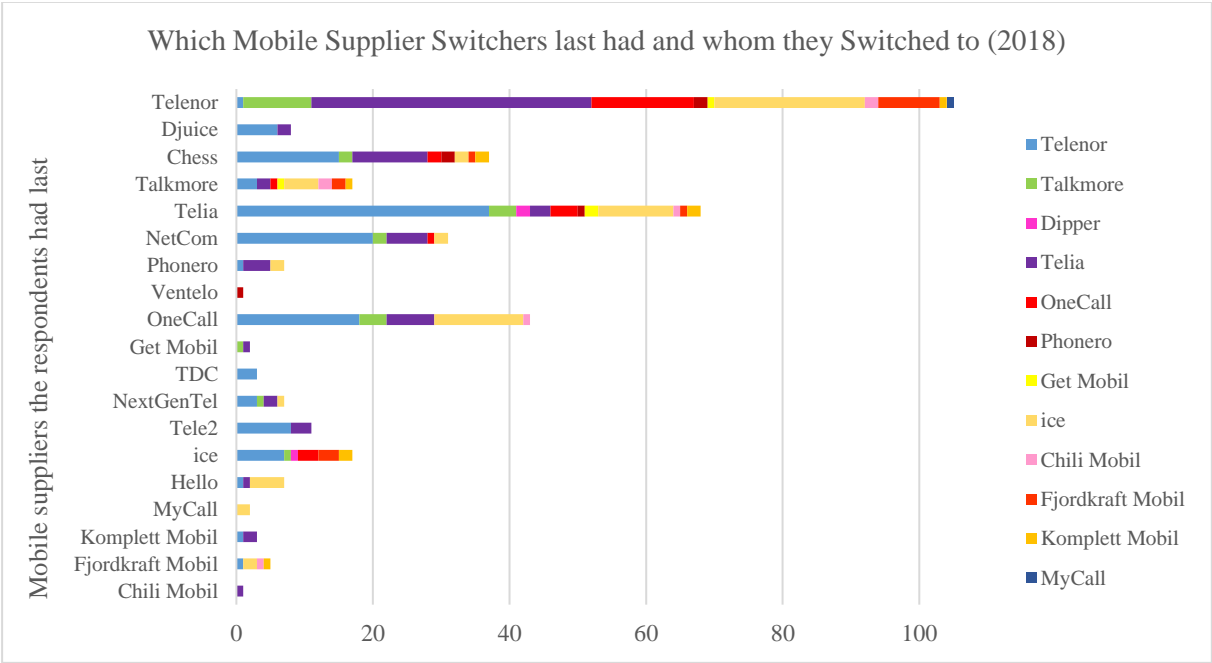
Figure 5.19: Overview of mobile suppliers the respondents switched to and who they had last.

The respondents of the 2018-survey were also asked which mobile supplier they would switch to if their current mobile supplier stopped offering mobile subscriptions. Figure 5.20 depicts the answers sorted by the respondents' current mobile subscription. 40 % of the subjects would switch to Telenor, 26 % to Telia, 11 % to ice, 7 % to OneCall, 6 % to Talkmore, and the restoring 10 % to various other suppliers. 63 % of subjects who have Telenor would switch to Telia, and 75 % of those who have Telia would switch to Telenor.

Figure 5.20: Overview of the mobile suppliers respondents would switch to if their current stopped offering mobile subscriptions

6 Discussion

The discussion is separated into two chapters. Chapter 6.1 discuss the implications of the derived model, where subsection 6.1.1 highlights the thesis' attribution to the current literature, and subsection 6.1.2 mentions some policy implications if it is hyperbolic discounting which drives the switching cost puzzle. Chapter 6.2 discuss the validity o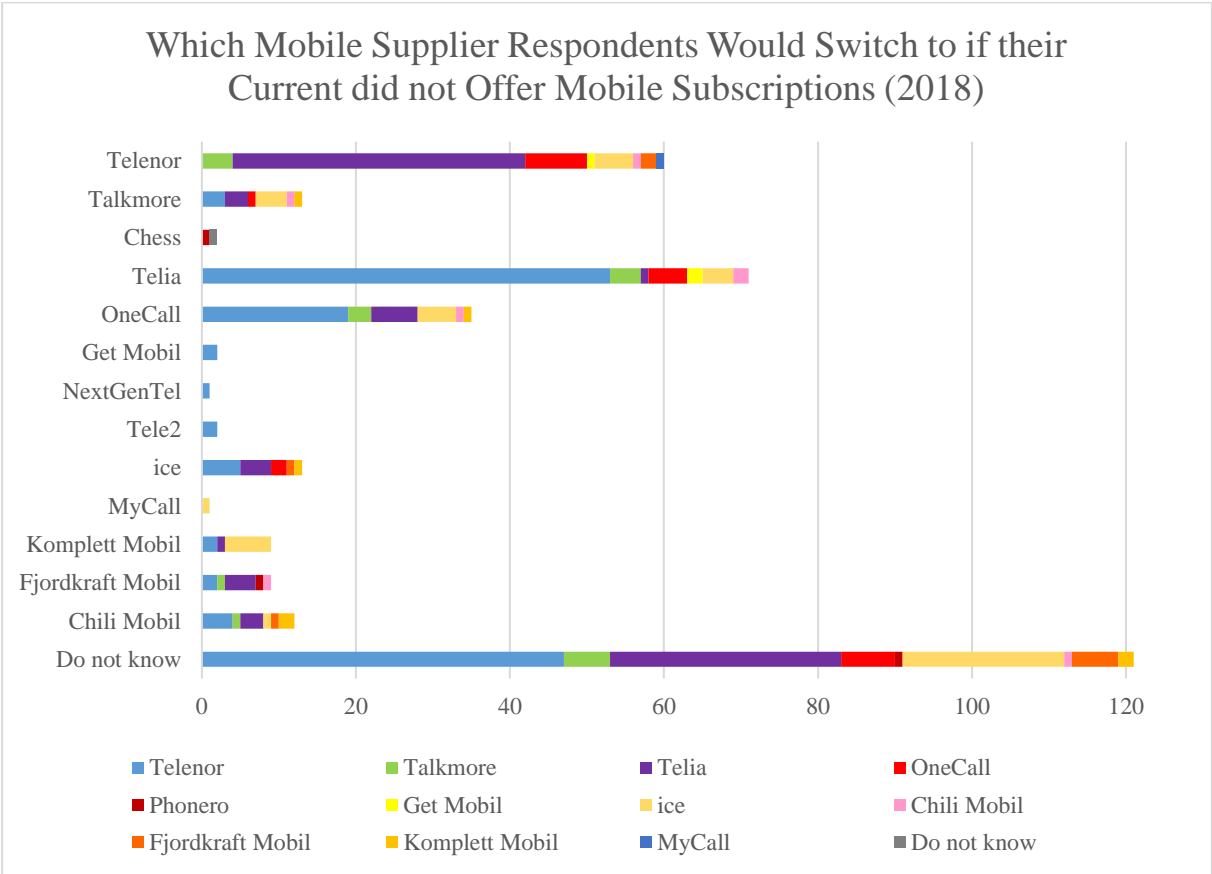f the model, where we in subsection 6.2.1 discuss how applicable the predictions of the model is to the mobile market, subsection 6.2.2 discuss the assumptions of the model, and lastly subsection 6.2.3 discuss other potential solutions to the switching cost puzzle.

6.1 IMPLICATIONS OF THE DERIVED MODEL

I have studied a model of competition in which, because of different discount factors, some consumers become more "locked-in" to their current supplier. It was found that the incumbent firm in the market would strategically adapt itself to the entries of the competitive fringe and exploit some of its locked-in consumers. Naïveté resulted in a larger incumbent price compared to time-consistency, while sophistication lead to a price in between the two "extremes". The incumbent firm choose to serve the customers with a relatively higher switching cost and let the consumers with low switching costs switch to a fringe firm.

6.1.1 Contribution to the Literature

This thesis contributes to the literature on the market interaction between time-consistent and -inconsistent consumers and the literature for switching costs implications on market outcomes. There exist a range of articles for each of the mentioned literatures, but as far as the author of this thesis know, there currently only exist one article combining those literature strands, namely the article by DellaVigna and Malmendier (2004).

DellaVigna and Malmendier (2004) focus on how firms have incentives to increase its switching cost to naïve consumers as to set a higher price. This thesis argument that even a low switching cost can be deterring for naïve consumers (although fully naïve and for a different market setting), so incumbent firms can just increase their prices without the need of increasing its switching costs.

Klemperer (1987) states that switching costs make demand more inelastic. In the derived model in this thesis, the added consumer types to the problem made the demand more inelastic compared to the standard model. In fact, if consumers have a sufficiently high degree of present

biasedness and are unaware of this self-control problem, a great share of the demand will in fact have perfectly inelastic demand in the model.

6.1.2 Policies to Increase Switching

If cognitive limitations are the root of the problem, behavioural economics argues that there may exist simpler and more cost-effective tools to address the problem rather than using tax incentives or bans. Behavioural interventions are interventions which help people implement their "true" preferences and/or interventions that revaluates the cost-benefit analysis for the consumer (Weimer, 2020). You can try to make people act according to their true preferences by, e.g., providing decision aids, planning aids, feedback, reminders, active choice, simplification, or commitment devices. To change the cost-benefit analysis, you could change the default options (if they serve as reference points), anchoring (the first "valuation" that people are exposed to), social information (social comparisons), or framing.

If even small switching costs can deter consumers to not switch, then competition authorities' goal for increasing switching frequency should be focused on changing consumer behaviour (in addition to decreasing the switching costs). It would be possible for the government (Nkom) to implement a nudge policy to increase the switching frequency. This implies the regulator influence consumers' choices in a way that will make the consumer better off by his/her own judgement (Thaler and Sunstein, 2009). This is also supported by DellaVigna and Malmendier (2004), who recommends the best policy is to educate naïve consumers as far as possible regarding their lack of self-awareness. Furthermore, Wilkinson and Klaes (2018) argue that there is a role for a paternalistic government to intervene in situations where consumers are not able to maximize their welfare, if it can obtain more information regarding the future preferences of these consumers than the consumers themselves.

Allcott and Rogers (2014) studied the impact of a nudge for reducing electricity consumption in households by providing feedbacks with social comparison. They found strong effects in the short-run where recipients of the reports improved, reducing their consumption levels. There was not a huge effect in the long-run. However, the nudge was a relatively small and cheap signal. Allcott and Rogers (2014) found indications of adjustments in the nudge-recipients' behaviour. They argued that the social comparison is an important driver for those who reduced their consumption level and found sustained behavioural change over time (although in a lower effect than in the short-run). I.e., the consumers got more self-aware and adjusted their behaviour slightly.

A similar nudge as the one Allcott and Rogers (2014) studied could be easily implemented in the mobile subscription market. Since much indicates that people react to social comparisons, statements like; "You are currently paying *X* per month for your mobile subscription. This is more than what the average consumer are paying for an equivalent subscription. You could achieve *Y* per month if you switch.", would potentially increase some naïve consumers self-awareness. Reme et al. (2018) analysed some Norwegian mobile subscription consumers' behaviour after a "poke" was implemented due to changed mobile subscription and found that more customers switched after receiving the "poke".

Lastly, it might be interesting to mention that soon the mobile subscription market will have e-SIM, making switching mobile suppliers even easier (Jansen, 2019). Thus, any physical switching costs should be marginal.

6.2 VALIDITY OF THE MODEL

In this section, I argue that the predictions made in the model presented in this thesis are partially supported by what is observed in the mobile subscription market. However, there might exist other reasons than procrastination among naïve consumers which "creates" the switching cost puzzle.

6.2.1 Applicability

There is some partial evidence from the mobile market which supports the model presented in this thesis. Most respondents (in both surveys) had subscriptions at Telenor or Telia, the two most expensive mobile suppliers in the mobile market. Although all the mobile suppliers' services are as good as identical, much suggests that consumers do not view them as homogeneous.

The respondents perceived it to be easy to switch mobile suppliers, yet the average respondent does not switch suppliers within two years. Some respondents expect a major cost-reduction if they switch. Nevertheless, most of the respondents expect to save nothing or marginal by switching supplier of mobile subscription. As mentioned, over a third of those who expect to save nothing have subscriptions at Telia. One would expect they would in fact save a reasonable sum if they switched to another mobile supplier (except Telenor).

The respondents of the 2020-survey were also asked: "In the past month, have you delayed any activity which could have been better done earlier?", which 63 % admitted they had (see Figure 6.1). Figure 6.2 combine this question with how long since the participa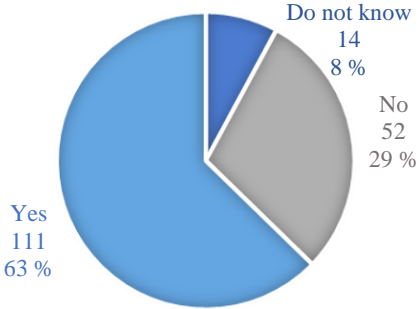nts last switched mobile suppliers. It is observed that a major part of those who reported they have never switched consists of

Figure 6.1: "In the past month, have you delayed any activity which could have been better done earlier?"

those who have procrastinated. Additionally, Figure 6.3 combined the answers from the procrastination question with respondents predicted next switch of mobile suppliers.
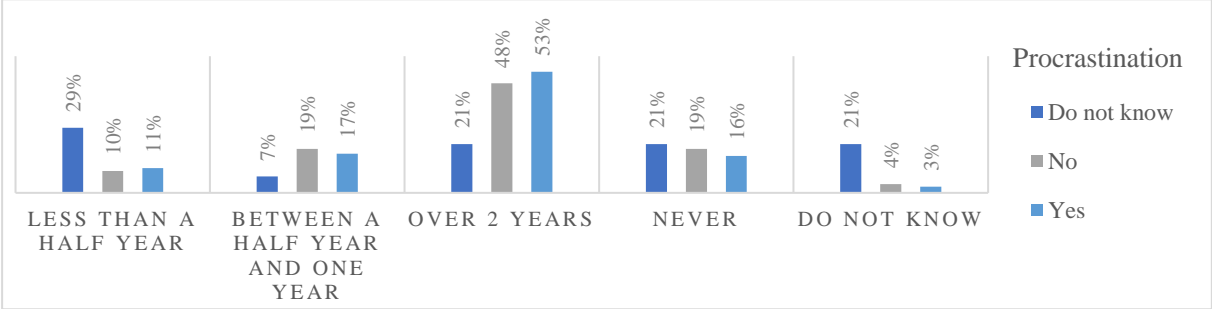

Figure 6.2: "In the past month, have you delayed any activity which would have been better done earlier?" combined with "When did you last change supplier of mobile subscription?"
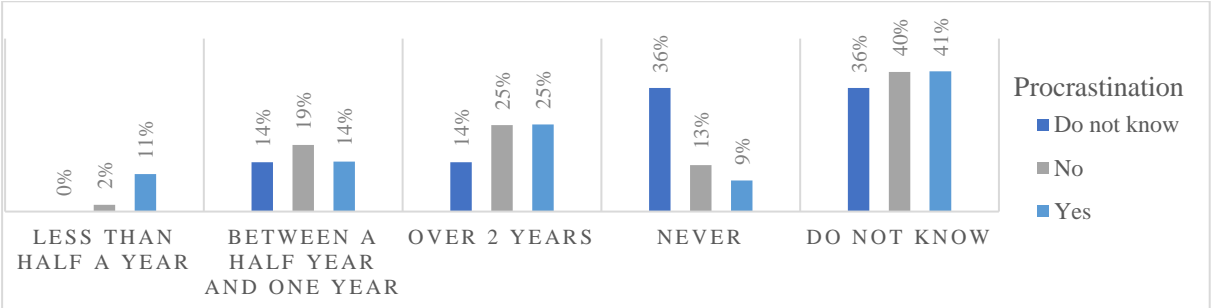

Figure 6.3: "In the past month, have you delayed any activity which would have been better done earlier?" combined with "How long do you expect it will be before you switch the next time?"

The respondents of the 2020-survey were additionally asked: "If you could choose between receiving a payment of 100NOK now or a certain amount X in 4 weeks, what would be the lowest amount of X for which you would choose the later payment?". The average of the answers was 321NOK. Excluding the extreme answers (less than 100NOK, more than 1000NOK), the average of the answers is 293NOK. Most of the respondents answered 200NOK in one month would be equally as good as 100NOK today. The respondent's answers are illustrated in Figure 6.4. The answers suggest the respondents show some degree of present biasedness.
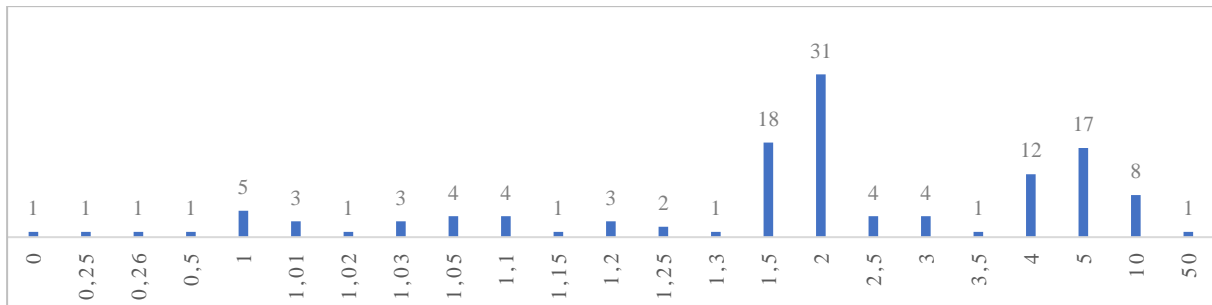
Figure 6.4: : "If you could choose between receiving a payment of 100NOK now or a certain amount X in 4 weeks, what would be the lowest amount of X for which you would choose the later payment?". 1=100NOK.

If the questionnaire were to be performed once again, a better implementation would be to add "Thaler (1999) questions" to shed some insight into the respondent's consumer types. Additionally, more questions regarding procrastination would be needed to say something concrete about the respondent's procrastination habits. Adding such questions would shed better light on the applicability of the model.

6.2.2   The Model Assumptions

The model's validity is partially critical on the fact that the switching costs mainly consist of what is observable, i.e. physical costs, and not a substantial psychological cost. Most of the other assumptions which is made can be viewed as standard in economic models. The predictions of the model would most likely persist (though perhaps to a lower degree) if the assumptions were weakened.

The model presented in the thesis presents an extreme version of rationality, and since consumers expectations stay the same for the infinite time-periods, the model would probably not be realistic when allowing for new customers to enter in later periods. Even though it is a highly abstract model, it shed light on mechanisms which can be thought of as playing a role when consumers decide whether to switch to other firms in a basic and straightforward way. Additionally, most of the economic models are abstractions from reality because they e.g. build on several, often unrealistic, assumptions, but the simplicity of abstract models makes them attractive for describing complex economic phenomena.

It is the naïfs which drives the most extreme results, and in the model, they fall for the same error forever. This is a rather extreme behaviour, i.e., the assumptions that parameters and the type of consumers are static over time is rather strong. It is doubtful that consumers would fall for the same mistake forever, but one could expect a quite large postponing period where a certain consumer type is stuck at more expensive firms. Additionally, O'Donoghue and Rabin (2001) argue consumers are likely to procrastinate activities over long time-horizons due to

constantly shifting preferences, i.e., the consumers changes their options over time and thus continuously delay finishing the activity.

To lessen the extreme assumption of naïveté, one could include partially naïve consumers. This would present a weaker assumption for consumer behaviour, and would result in less extreme result, but partially naïfs would still have a stronger present biasedness compared to sophisticates. This indicates there would nevertheless be quite strong results in line with what is presented in this thesis. Additionally, if allowing for consumers to change behaviour, they could suddenly change to be sophisticates. Nevertheless, firms can also set the prices higher for sophisticates compared to TCs.

If the model opened new customers entering in later periods, firms could have incentives to offer discounts to new customers. However, if customers can pretend that they are new or if the good can be resold, it would be impossible to separate new and old customers. Additionally, if consumers know the discount is only temporary, it is not sure it would work as an inducement to encourage switching. Firms who compete over a longer time-horizon, can also often manage to set a price higher than the marginal cost via tacit collusion. How easily firms manage to coordinate their prices depends on the market structure among other things, but it is beyond the scope of this thesis to discuss this. Lastly, if some consumers switch, firms could want to get them back by setting a (personal) lower price.

Some interesting issues lie beyond the scope of this thesis. It would be interesting to extend this framework to firms who are more symmetric and introduce teaser-rates. Then the implications of naïveté and sophistication could be analysed in a more realistic framework. Also, it would be interesting to analyse how the incumbent firm would strategically adapt itself in a model which consist of all the consumer types and where it does not know how large share that are naïve, sophisticated or TC.

6.2.3 Other Solutions to the Switching Cost Puzzle

The switching cost puzzle could potentially be explained by unobservable psychological switching costs. This could for example stem from a high degree of brand loyalty. However, this would imply the result from the 2018-survey indicating respondents perceive switching to be easy and the result from the 2020-survey which indicates brand name is of little importance are inaccurate.

Another explanation behind the switching cost puzzle could be that consumers exhibit projection bias. This is although not so different from time-inconsistent preferences since it

resembles what O'Donoghue and Rabin (2001) study, and would perhaps also imply consumers are in fact procrastinating switching suppliers.

Lastly, a potential behavioural bias which might be the root cause of the switching cost is inertia. Reme et al. (2018) studies consumers' inertia in the mobile subscription market, focusing on the decision of whether to switch to a competing provider. Inertia is driven by frictions in consumer choice. They find *"that the propensity to switch provider after* [a] *price change increases among consumers whose costs decrease with the new prices[...]* [and that] *the increase is largest right after consumers are informed of the upcoming change as opposed to when the price change is implemented."* (Reme et al., 2018).

7 Concluding Remarks

The thesis provides one potential explanation for the existence of markets where a few high price suppliers hold the bulk of the market share, yet consumer switching cost barriers appear small. A naïve hyperbolic discounting consumer misinterprets his/her own future discounting process, leading him/her to procrastinate switching suppliers. This would allow for dominant incumbent firms to maintain a price in the market without losing much market share. Furthermore, the switching cost level needed to deter a naïve consumer from switching is in this model often much lower than the level needed to deter more rational consumer.

Appendix

A.1   MODEL - CALCULATIONS

A.1.1 Switching Cost Threshold

A.1.1.a   TCs

$$\sum_{t=0}^{\infty} \delta^t v_i < v_j - s + \sum_{t=1}^{\infty} \delta^t v_j$$

$$\sum_{t=0}^{\infty} \delta^t v_i < -s + \sum_{t=0}^{\infty} \delta^t v_j$$

$$s < \sum_{t=0}^{\infty} \delta^t v_j - \sum_{t=0}^{\infty} \delta^t v_i$$

$$s < (v_j - v_i) \sum_{t=0}^{\infty} \delta^t$$

$$s_{TC}^* < (v_j - v_i) \frac{1}{1-\delta}, \qquad when \; |\delta| < 1$$

A.1.1.b   Sophisticates

$$v_i + \beta \sum_{t=1}^{\infty} \delta^t v_i < v_j - s + \beta \sum_{t=1}^{\infty} \delta^t v_j$$

$$s < v_j - v_i + \beta \sum_{t=1}^{\infty} \delta^t v_j - \beta \sum_{t=1}^{\infty} \delta^t v_i$$

$$s < v_j - v_i + (v_j - v_i)\beta \sum_{t=1}^{\infty} \delta^t$$

$$s < (v_j - v_i)\left(1 + \beta \sum_{t=1}^{\infty} \delta^t\right)$$

$$s_S^* < (v_j - v_i)\left(1 + \frac{\beta\delta}{1-\delta}\right), \qquad when \; |\delta| < 1$$

A.1.1.c   Naïfs

$$v_i + \beta\delta(v_j - s) + \beta \sum_{t=2}^{\infty} \delta^t v_j < v_j - s + \beta \sum_{t=1}^{\infty} \delta^t v_j$$

$$s(1 - \beta\delta) < v_j - v_i + \beta\delta(v_j - v_j) + (v_j - v_j)\beta \sum_{t=2}^{\infty} \delta^t$$

$$s(1 - \beta\delta) < (v_j - v_i)$$

$$s_N^* < (v_j - v_i)\frac{1}{1 - \beta\delta}$$

A.1.2 Second-Order Condition

A.1.2.a   TCs

The second-order condition for profit maximized price is found by second differentiating the profit function:

$$\frac{\partial^2 \pi_{TC}^i}{\partial p^{i^2}} = -\frac{2}{5(1 - \delta)} p^i < 0$$

The function is concave, so a potential stationary point would in fact be a global maximum.

A.1.2.b   Sophisticates

$$\frac{\partial^2 \pi_S^i}{\partial p^{i^2}} = -2\frac{1 - \delta + \beta\delta}{5(1 - \delta)} < 0$$

A.1.2.c   Naïfs

$$\frac{\partial^2 \pi_N^i}{\partial p^{i^2}} = -\frac{2}{5(1 - \beta\delta)} < 0$$

A.2   SURVEY

A.2.1 2018

1) Hvilket selskap har du mobilabonnement (tale, SMS, data) hos i dag?
□_____
□   Vet ikke – (Avslutt)

2) Hvilken type mobilabonnement har du?
□   Kontantkort
□   Abonnement/månedlig betaling
□   Annet _____ (Avslutt)
□   Vet ikke (Avslutt)

3) Betaler du for ditt mobilabonnement selv?
□   Ja – jeg betaler selv
□   Nei – noen andre betaler for meg

Hvem:
- □   Familie
- □   Arbeidsgiver
- □   Andre: _____
- □   Vet ikke (Avslutt)
□   Vet ikke (Avslutt)

4)   Valgte du selv dette mobilabonnementet eller valgte noen andre dette for deg?
- □   Ja – jeg valgte dette selv (5A)
- □   Nei – noen andre valgte dette for meg (5B)
- □   Vet ikke (5B)

5A) Hva var viktigst for deg da du valgte din nåværende leverandør av mobiltelefonitjenester?
(Velg én)   5B) Hva hadde vært viktigst for deg hvis du selv skulle valgt leverandør av mobiltelefonitjenester? (Velg én)
- □   Pris på mobiltjenestene (ringeminutter, SMS og mengde data)
- □   Nettverksdekning
- □   Nettverkshastighet
- □   Kvalitet på kundeservice
- □   Utvalg av mobiltelefoner og kvalitet på disse
- □   Merkevarenavn
- □   Annet_____
- □   Pris på mobiltjenestene (ringeminutter, SMS og mengde data)
- □   Nettverksdekning
- □   Nettverkshastighet
- □   Kvalitet på kundeservice
- □   Utvalg av mobiltelefoner og kvalitet på disse
- □   Merkevarenavn
- □   Annet_____

6)   Omtrent hvor mye koster ditt mobilabonnement (og/eller kontantkort) per måned?
- □   _____ NOK til mobilabonnement
- □   _____ NOK til kontantkort
- □   Vet ikke

7)   Hvor mange GB datatrafikk har du inkludert i mobilabonnementet ditt?
- □   _____
- □   Ingen
- □   Vet ikke

8)   Hvilke av disse leverandørene av mobilabonnement kjenner du til? Svar: ja eller nei.
- □   Chili Mobil
- □   Fjordkraft Mobil
- □   Get Mobil
- □   Ice
- □   Komplett Mobil
- □   MyCall
- □   OneCall
- □   Oyatel
- □   PepCall

☐ Phonero
☐ Saga Mobil
☐ Talkmore
☐ Telenor
☐ Telia
☐ Telipol
☐ Andre: _____

9) Anta at din leverandør ikke lenger tilbyr mobilabonnement, slik at du må foreta et annet valg. Hva ville du mest sannsynlig ha gjort?
☐ Jeg ville valgt en annen leverandør av mobilabonnement
Hvilken leverandør ville du mest sannsynlig ha valgt?
☐ Leverandør: _____
☐ Vet ikke
☐ Annet: _____
☐ Vet ikke

10) Når byttet du sist leverandør av mobilabonnement?
☐ For mindre enn 6 måneder siden (11A, 12A)
☐ For 6-12 måneder siden (11A, 12A)
☐ For mer enn 12 måneder siden (11A, 12A)
☐ Har aldri byttet leverandør av mobilabonnement (11B, 12B)
☐ Vet ikke (12B)

11A i)
Du har byttet leverandør av mobilabonnement. Hvem var din forrige leverandør?11B)
Du har aldri byttet leverandør av mobilabonnement. Hva er/tror du er årsaken til dette? (Velg én)
☐ _____
☐ Vet ikke

11A ii)
Var det en selger som gjorde at du byttet, eller gjorde du byttet selv?
☐ Selger
☐ Meg selv
☐ Vet ikke
☐ Jeg er fornøyd med nåværende leverandør
☐ Jeg vet ikke hvordan man bytter leverandør
☐ Jeg har ikke satt meg inn i hva andre leverandører kan tilby
☐ Annet: _____
☐ Vet ikke

12 A) På en skala fra 1-5, hvor lett eller vanskelig synes du det er å bytte leverandør av mobilabonnement, der 1 er svært vanskelig og 5 er svært lett?   12 B) På en skala fra 1-5, hvor lett eller vanskelig tror du det er å bytte leverandør av mobilabonnement, der 1 er svært vanskelig og 5 er svært lett?
☐ 1 – Svært vanskelig
☐ 2 – Ganske vanskelig
☐ 3 –Verken vanskelig eller lett
☐ 4 – Ganske lett

- □   5 – Svært lett
- □   Vet ikke
- □   1 – Svært vanskelig
- □   2 – Ganske vanskelig
- □   3 – Verken vanskelig eller lett
- □   4 – Ganske lett
- □   5 – Svært lett
- □   Vet ikke

13) Hvem har best mobildekning?
- □   Telia
- □   Telenor
- □   Ice
- □   Alle har like god dekning
- □   Vet ikke

14) Hva er din alder?
- □   Under 18 år
- □   18-29 år
- □   30-39 år
- □   40-49 år
- □   50-59 år
- □   60+ år
- □   Vil ikke svare

15) Hva er ditt kjønn?
- □   Kvinne
- □   Mann

16) Hva er din høyeste fullførte utdannelse?
- □   Ungdomsskole
- □   Videregående skole
- □   Høyskole/universitet (1-3 år)
- □   Høyskole/universitet (Mer enn 3 år)
- □   Vet ikke/vil ikke svare

A.2.2   2020

Spørreundersøkelse til masteroppgave

Som en supplerende del til masteroppgaven min i samfunnsøkonomi ved Universitetet i Bergen, utfører jeg en spørreundersøkelse om det norske mobilmarkedet. Formålet ved spørreundersøkelsen er å se på adferden i markedet for mobiltjenester, og se om den kan si noe om konkurransedyktigheten i markedet.
Spørreundersøkelsen er anonym og vil ta ca. 2-5 min.
Tusen takk på forhånd!
*Må fylles ut

1. Hvem har du mobilabonnement hos? *

   Markér bare én oval.

   ⬭ Telenor

   ⬭ Telia

   ⬭ ice

   ⬭ Fjordkraft Mobil

   ⬭ MyCall

   ⬭ OneCall

   ⬭ Oyatel

   ⬭ PepCall

   ⬭ Phonero

   ⬭ Saga Mobil

   ⬭ Talkmore

   ⬭ Telipol

   ⬭ Hudya

   ⬭ Sponz

   ⬭ Gudbrandsdal Energi/mobil

   ⬭ NorgesEnergi mobil

   ⬭ happybytes

   ⬭ 'tise

   ⬭ Andre: _____

2. Hvem betaler for ditt mobilabonnement? *

   Markér bare én oval.

   ⬭ Jeg betaler selv   *Hopp til spørsmål 3*

   ⬭ Arbeidsplassen   *Hopp til spørsmål 6*

   ⬭ Foreldrene mine   *Hopp til spørsmål 6*

   ⬭ Andre: _____

   Hopp til spørsmål 7

   Ditt Mobilabonnement

   (Åpne svar spørsmål kan stå ubesvart dersom du ikke vet/ikke vil oppgi)

3. Hva er prisen på ditt mobilabonnement?

   _____

59

4. Hvor mange GB data er inkludert i ditt mobilabonnement?

_____

5. Hvordan ville du rangert følgende egenskaper når du valgte ditt nåværende mobilabonnement? *

Markér bare én oval per rad

	Ikke viktig	Litt viktig	Viktig	Veldig viktig	Vet ikke
Pris	◯	◯	◯	◯	◯
Nettverksdekning	◯	◯	◯	◯	◯
Nettverkshastighet	◯	◯	◯	◯	◯
Kundebehandling	◯	◯	◯	◯	◯
Merkenavn	◯	◯	◯	◯	◯

Hopp til spørsmål 7

6. Hvordan ville du rangert følgende egenskaper hvis du skulle ha betalt selv for ett mobilabonnement? *

Markér bare én oval per rad

	Ikke viktig	Litt viktig	Viktig	Veldig viktig	Vet ikke
Pris	◯	◯	◯	◯	◯
Nettverksdekning	◯	◯	◯	◯	◯
Nettverkshastighet	◯	◯	◯	◯	◯
Kundebehandling	◯	◯	◯	◯	◯
Merkenavn	◯	◯	◯	◯	◯

60

7. I hvor stor grad er du enig i følgende påstander? *

Markér bare én oval per rad

	Uenig	Verken enig eller uenig	Enig	Vet ikke
Min mobiloperatør tilbyr det beste mobilabonnementet i markedet	○	○	○	○
Min mobiloperatør er lederen innenfor ny teknologi	○	○	○	○

8. *

Markér bare én oval per rad

	Aldri	Mindre enn hvert andre år	En gang i året eller annen hvert år	2-5 ganger i året	6-10 ganger i året	Flere enn 10 ganger i året	Vet ikke
Hvor ofte sjekker du prisene til andre mobiloperatører enn din nåværende mobiloperatør?	○	○	○	○	○	○	○
Hvor ofte bytter du mobiloperatør?	○	○	○	○	○	○	○
Hvor ofte endrer du type mobilabonnement?	○	○	○	○	○	○	○

9. *

Markér bare én oval per rad

	Aldri	Mindre enn ett halvt år siden/til	Mellom ett halvt år og ett år siden/til	Over 2 år siden/til	Vet ikke
Når byttet du sist mobiloperatør?	○	○	○	○	○
Hvor lenge tror du at det er til at du skifter mobiloperatør?	○	○	○	○	○

10. Hvor mye tror du at du kan spare per måned hvis du byttet til et annet mobilabonnement enn ditt eksisterende?

_____

Åpne svar spørsmål kan stå ubesvart dersom du ikke vet/ikke vil oppgi.

11. I løpet av den siste måneden, har du utsatt en aktivitet som du burde ha utført tidligere? *

Markér bare én oval.

◯ Ja
◯ Nei
◯ Vet ikke

1st version (changed after 1 hour, due to comments that the 1st version was difficult to interpret):

12. Hvilken verdi må en utbetaling om 4 uker være for at den skulle vært like god som en utbetaling på 100kr i dag?

_____

2nd version:

12. Dersom du kunne valgt mellom å motta en betaling på 100kr nå eller et bestemt beløp, X kr, om 4 uker, hva måtte X ha vært for at du hadde foretrukket å motta den sene betalingen?

_____

Litt informasjon om deg

13. Kjønn

Markér bare én oval.

◯ Mann

◯ Kvinne

◯ Annet

◯ Vil ikke oppgi

14. Hva er din alder?

Markér bare én oval.

◯ Under 19 år

◯ 20-29 år

◯ 30-39 år

◯ 40-49 år

◯ 50-59 år

◯ over 60 år

◯ Ønsker ikke å oppgi

15. Hva er din høyeste fullførte utdanning?

Markér bare én oval.

◯ Ungdomsskole

◯ Videregåendeskole

◯ Universitet eller folkehøyskole

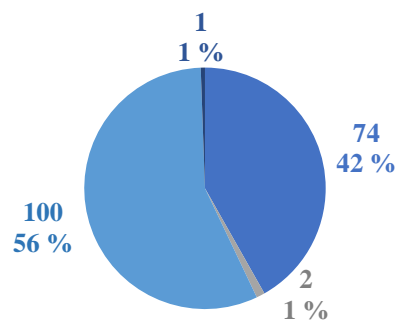◯ Vil ikke oppgi

Tusen takk!

Dette innholdet er ikke laget eller godkjent av Google.

Google Skjemaer

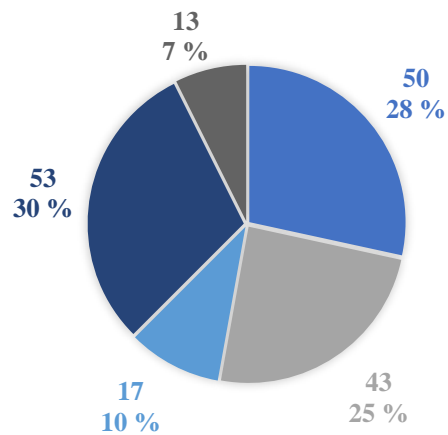## A.2.3 Additional results

Gender Distribution (2020)

- ■ Female
- ■ Decline to state
- ■ Male
- ■ Other

1
1 %

74
42 %

2
1 %

100
56 %

Appendix figure 1: Gender distribution

Age Distribution (2020)

- ■ 20-29 years
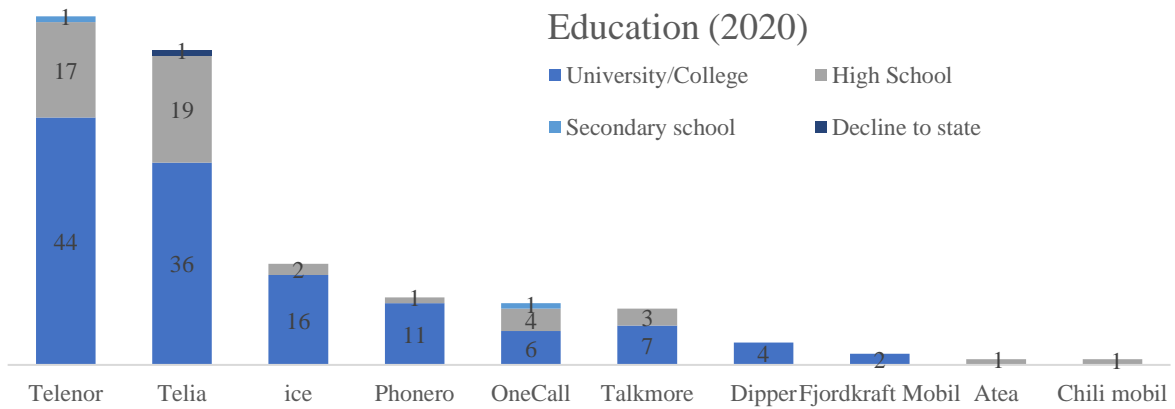- ■ 30-39 years
- ■ 40-49 years
- ■ 50-59 years
- ■ over 60 years

13
7 %

50
28 %

53
30 %

43
25 %

17
10 %

Appendix figure 2: Age distribution

64

Educational Distribution (2020)

- High School
- Secondary school
- University/College

48
27 %
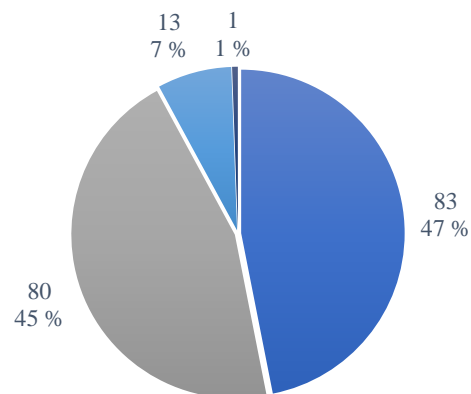
2
1 %

126
72 %
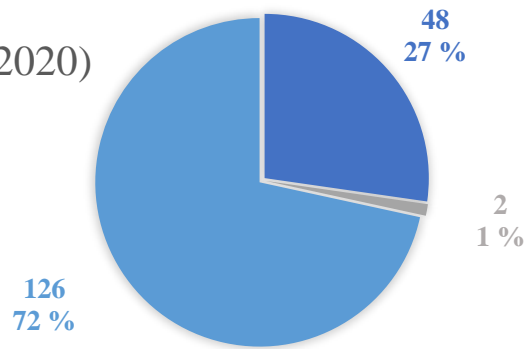
Appendix figure 3: Educational distribution

Education (2020)

- University/College
- High School
- Secondary school
- Decline to state

Appendix figure 4: Education and mobile supplier

Payer of Subscription (2020)

- Firm
- I
- Parents
- Spouse

13
7 %

1
1 %

83
47 %

80
45 %

Appendix figure 5: Payer of subscription.

Payer of Mobile Subscription (2020)

Legend: ■ Firm ■ I ■ Parents ■ Spouse

Supplier	Firm	I	Parents	Spouse
Atea		1		
Chili mobil		1		
Fjordkraft Mobil		2		
Dipper	4			
Talkmore	2	6	2	
OneCall		10	1	
Phonero	10		2	
ice	1	16	1	
Telia	27	25	3	1
Telenor	38	18	6	
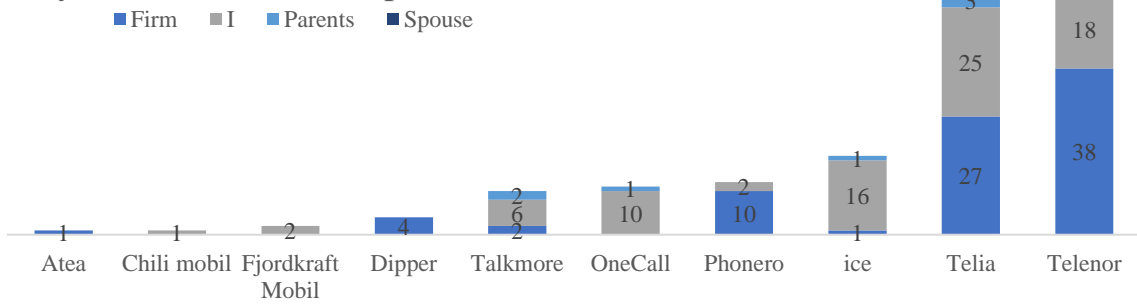
Appendix figure 6: Payer of subscription and mobile supplier

Time-discounting (2020)

| X	Count
0	1
25	1
26	1
50	1
100	5
101	3
102	1
103	3
105	4
110	4
115	1
120	3
125	2
130	1
150	18
200	31
250	4
300	4
350	1
400	12
500	17
1000	8
5000	1
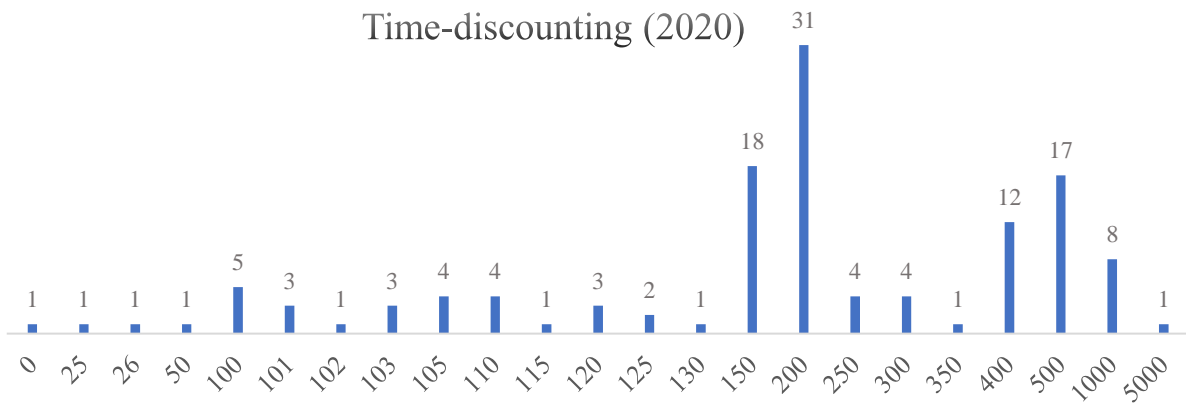
Appendix figure 7: "If you could choose between receiving a payment of 100NOK now or a certain amount X in 4 weeks, what would be the lowest amount of X for which you would choose the later payment? (X can be any amount)"
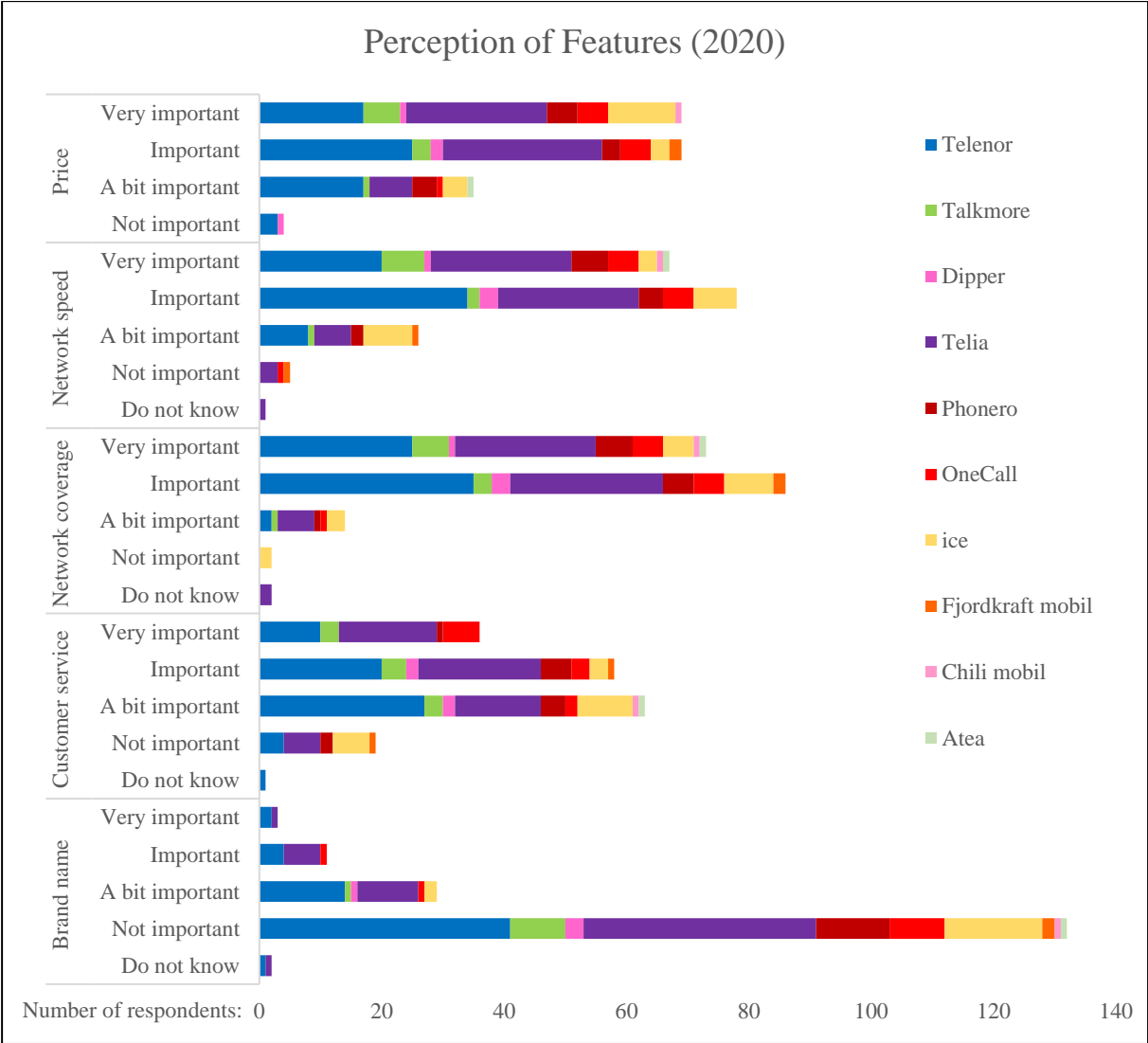
Appendix figure 8:" What features did you find important when you last choose a mobile subscription?" or "What features would you find important when choosing a mobile subscription?"
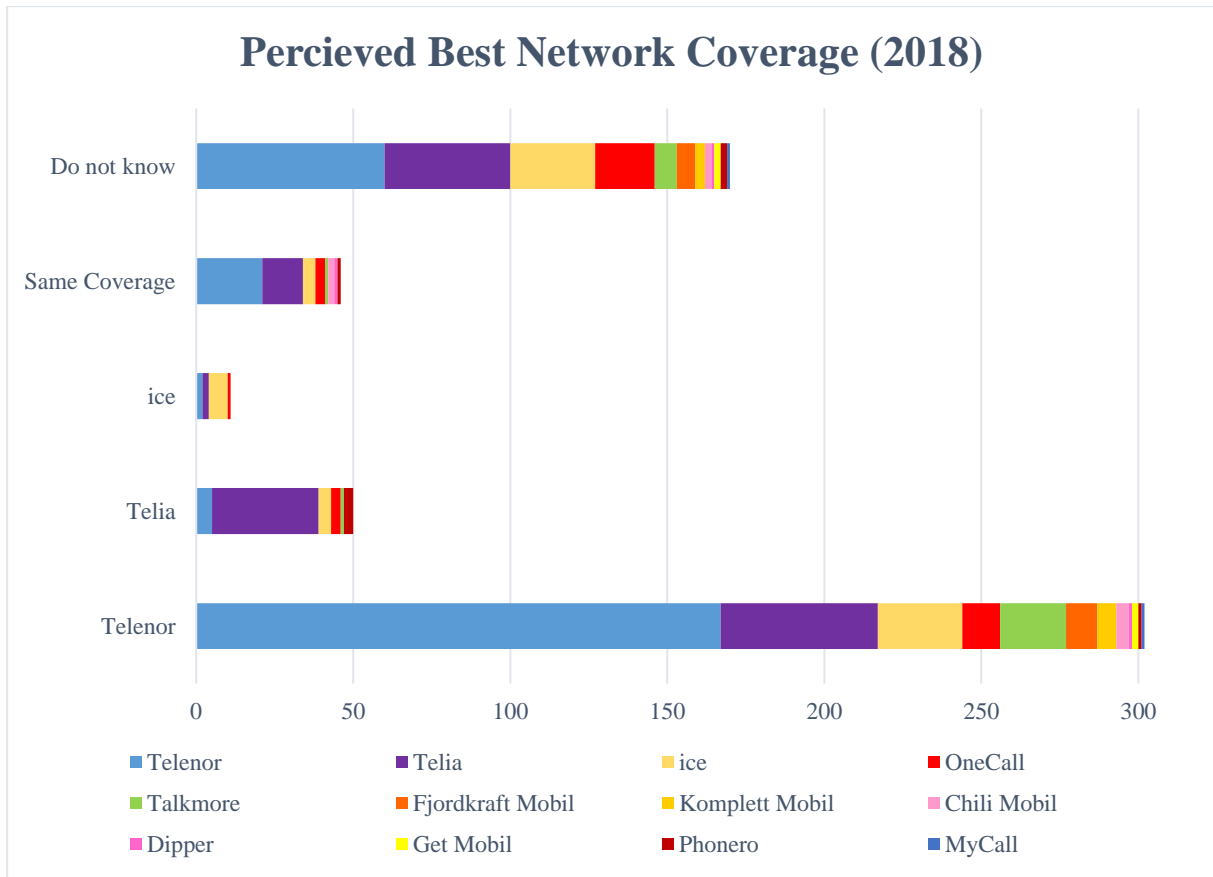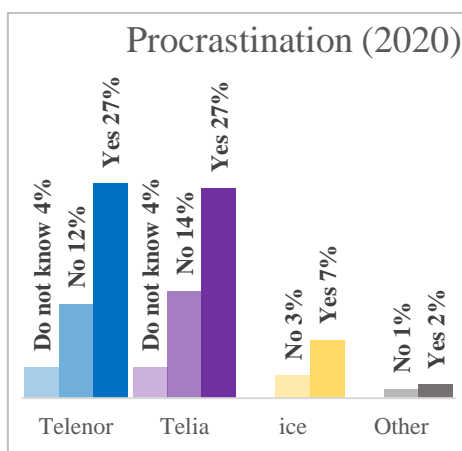
Appendix figure 9: Percieved best network coverage by all mobile suppliers
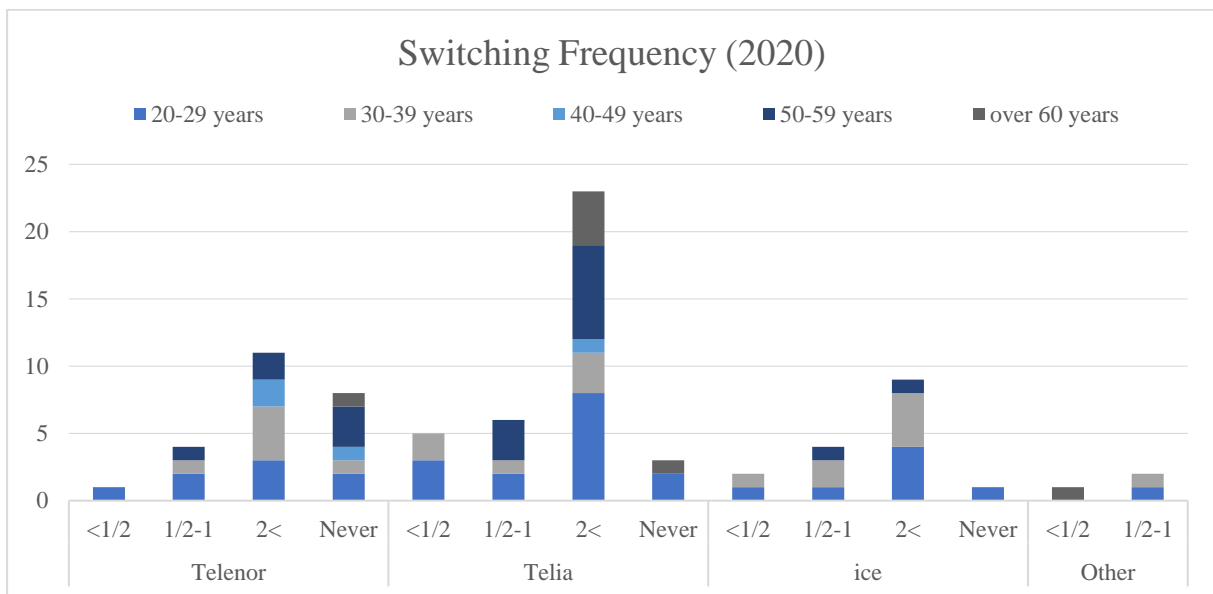
Appendix figure 10: Participants' age combined with "How often do you change supplier of mobile subscriptions?"

68
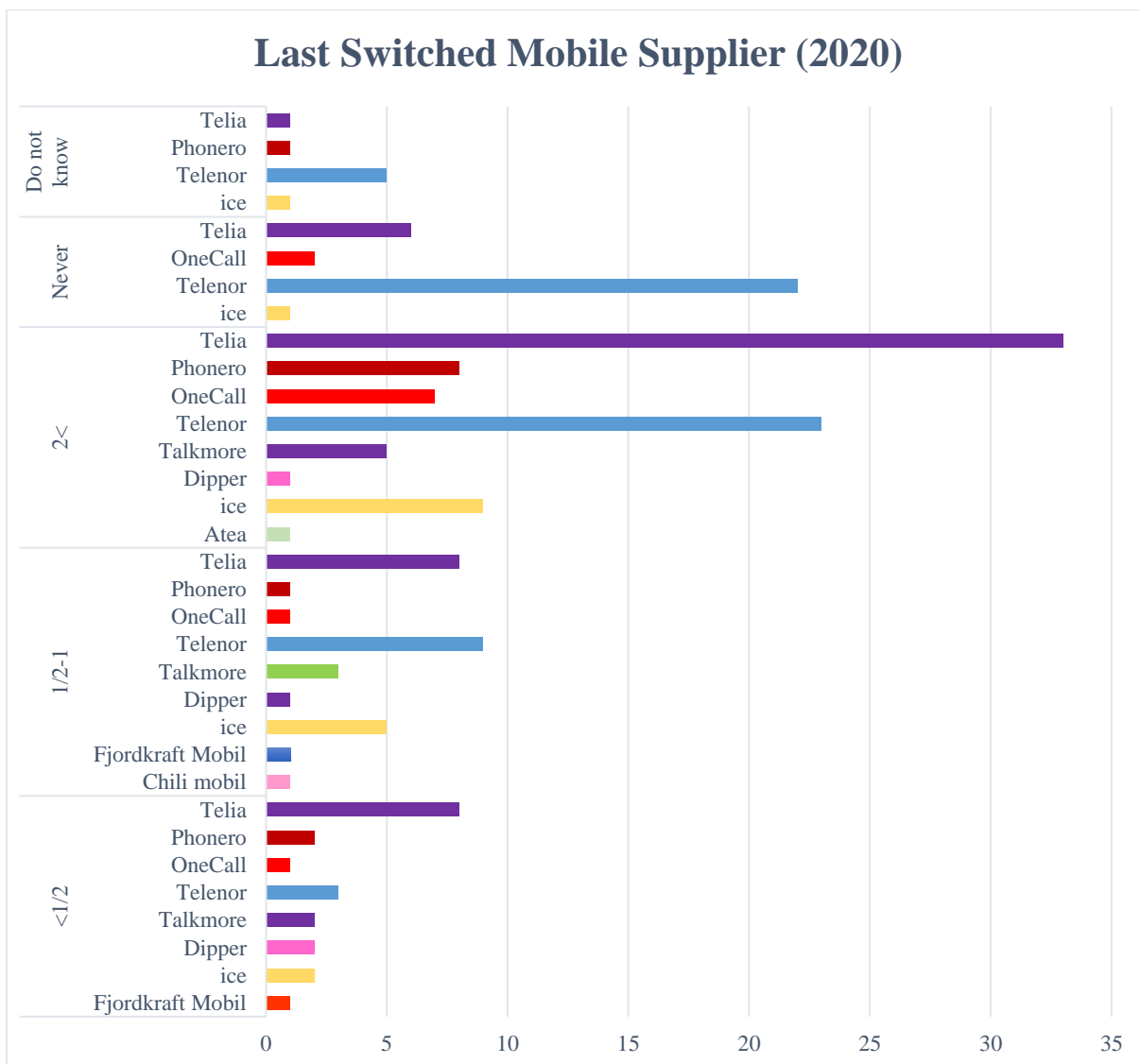
Appendix figure 11: "When did you last change supplier of mobile subscription?" by all mobile suppliers.

Appendix figure 12: "In the past month, have you delayed any activity which would have been better done earlier?" by mobile supplier.

A.3 THE MOBILE MARKET

A.3.1 Listed Prices

Appendix Table 1: Overview of price and GB offered by different providers in the mobile market.

Data source: (Chili Mobil, 2019, Telenor, 2019, Talkmore, 2019, Telia, 2019, ice, 2019, Fjordkraft, 2019, OneCall, 2019)

GB data	Chili	Fjordkraft	ice	OneCall	Talkmore	Telenor	Telia
1	129	159	129	179	199	249	
2		214	199	219	229		249
3	199		249			299	
4		279		269	279	349	329
5					299		
6	279	319	299	319		399	379
7					349		
8				369			
10		389	349		399	449	429
12				419			
15	349		399			499	479
16				469			
20		489	449		499	549	529
25	399					599	
30			499			649	
40					599	699	579
50						749	
60						799	
150 (∞)	499						

Resources

ALLCOTT, H. & ROGERS, T. 2014. The short-run and long-run effects of behavioral interventions: Experimental evidence from energy conservation. *American Economic Review,* 104**,** 3003-37.

BEGGS, A. & KLEMPERER, P. 1992. Multi-Period Competition with Switching Costs. *Econometrica,* 60**,** 651.

BYTT.NO. 2020. *Dette mobilnettet har den beste dekningen* [Online]. www.bytt.no: bytt.no. Available: https://www.bytt.no/mobilabonnement/beste-dekning [Accessed 12.06 2020].

CHEN, Y. 1997. Paying customers to switch. *Journal of Economics & Management Strategy,* 6**,** 877-897.

CHILI MOBIL. 2019. *Abonnement* [Online]. www.chilimobil.no: Chili Mobil. Available: https://www.chilimobil.no/kundeservice/prisoversikt/abonnement/ [Accessed 02.11 2019].

CHURCH, J. R. & WARE, R. 2000. *Industrial organization: a strategic approach*, Irwin McGraw Hill Homewood, IL.

DELLAVIGNA, S. 2009. Psychology and Economics: Evidence from the Field. *Journal of Economic Literature,* 47**,** 315-372.

DELLAVIGNA, S. & MALMENDIER, U. 2004. Contract Design and Self-Control: Theory and Evidence. *The Quarterly Journal of Economics,* 119**,** 353-402.

DELLAVIGNA, S. & MALMENDIER, U. 2006. Paying not to go to the gym. *american economic Review,* 96**,** 694-719.

FARRELL, J. & KLEMPERER, P. 2007. Coordination and Lock-In: Competition with Switching Costs and Network Effects. *Handbook of Industrial Organization.* Elsevier B.V.

FARRELL, J. & SHAPIRO, C. 1988. Dynamic Competition with Switching Costs. *The RAND Journal of Economics***,** 123-137.

FJORDKRAFT. 2019. *Våre mobilabonnement* [Online]. www.fjordkraftmobil.no. Available: https://www.fjordkraftmobil.no/mobilabonnement/fordel/ [Accessed 02.11 2019].

FREDERICK, S., LOEWENSTEIN, G. & O'DONOGHUE, T. 2002. Time discounting and time preference: A critical review. *Journal of economic literature,* 40**,** 351-401.

HEIDHUES, P. & KŐSZEGI, B. 2018. *Behavioral industrial organization*, Centre for Economic Policy Research.

HVIID, M. 2013. Behavioural Remedies in Final Consumer Markets: Theory and Evidence. *Behavioural Economics in Competition and Consumer Policy***,** 83-94.

ICE. 2019. *Velg ditt mobilabonnement* [Online]. www.ice.no: ice. Available: https://www.ice.no/mobilabonnement/?utm_expid=.5VfIeaEgTo2bpuVEUYY6Bg.0&utm_referrer=https%3A%2F%2Fwww.ice.no%2F [Accessed 02.11 2019].

JANSEN, M. 2019. *What is an eSIM? Here's everything you need to know* [Online]. www.digitaltrends.com: Digital Trends. Available: https://www.digitaltrends.com/mobile/esim-explainer/ [Accessed 16.03 2019].

KLEMPERER, P. 1987. Markets with Consumer Switching Costs. *The Quarterly Journal of Economics,* 102**,** 375.

KLEMPERER, P. 1995. Competition when consumers have switching costs: an overview with applications to industrial organization, macroeconomics, and international trade. *Review of Economic Studies,* 62**,** 515.

LAIBSON, D. I. 1997. Golden Eggs and Hyperbolic Discounting. 112.

NKOM, N. C. A. 2019. Analyse av markedet for tilgang til og samtaleoriginering i offentlige mobilkommunikasjonsnett. Nasjonal kommunikasjonsmyndighet.

NKOM, N. C. A. 2020. *Ekommarkedet 2019* [Online]. Nkom, Norwegian Communication Authority. Available: https://ekomstatistikken.nkom.no/#/article/ekom2019#mobil_ab [Accessed 27.05 2020].

O'DONOGHUE, T. & RABIN, M. 1999. Doing It Now or Later. *American Economic Review,* 89**,** 103-124.

O'DONOGHUE, T. & RABIN, M. 2001. Choice and procrastination. *The Quarterly Journal of Economics,* 116**,** 121-160.

ONECALL. 2019. *Mobilabonnement* [Online]. www.onecall.no. Available: https://onecall.no/mobilabonnement [Accessed 02.11 2019].

PHELPS, E. S. & POLLAK, R. A. 1968. On second-best national saving and game-equilibrium growth. *The Review of Economic Studies,* 35**,** 185-199.

PORTER, M. E. 1980. *Competitive strategy: Techniques for analyzing industries and competitors*, Simon and Schuster.

REME, B.-A., RØHR, H. L. & SÆTHRE, M. 2018. The Poking Effect: Price Changes, Information, and Inertia in the Market for Mobile Subscriptions.

STROTZ, R. H. 1955. Myopia and inconsistency in dynamic utility maximization. *The Review of Economic Studies,* 23**,** 165-180.

TALKMORE. 2019. *Mobilabonnement med lave priser og full Telenor dekning* [Online]. www.talkmore.no: talkmore. Available: https://talkmore.no/abonnement [Accessed 02.11 2019].

TELENOR. 2019. *Mobilabonnement* [Online]. www.telenor.no: Telenor. Available: https://www.telenor.no/privat/mobil/mobilabonnement/ [Accessed 02.11 2019].

TELIA. 2019. *MOBILABONNEMENT* [Online]. www.telia.no: Telia. Available: https://www.telia.no/mobilabonnement/ [Accessed 02.11 2019].

THALER, R. H. 1999. Mental accounting matters. [Chichester] ;.

THALER, R. H. & SUNSTEIN, C. R. 2009. *Nudge: Improving decisions about health, wealth, and happiness*, Penguin.

WEB OF SCIENCE. 2020. *Results Analysis: Publication Years* [Online]. Web of Science: Web of Science. Available: wcs.webofknowledge.com/RA/analyze.do?product=WOS&SID=C5QZGYJXLsrRodJ vRxe&field=PY_PublicationYear_PublicationYear_en&yearSort=true [Accessed 15.05 2020].

WEIMER, D. L. 2020. When Are Nudges Desirable? Benefit Validity When Preferences Are Not Consistently Revealed. *Public Administration Review,* 80**,** 118-126.

WILKINSON, N. & KLAES, M. 2018. *An introduction to behavioral economics,* London, Palgrave Macmillan.