



Precision Pricing

An experimental study on the perception of precise prices

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Abstract

This thesis aims to achieve new contributions and insight on how a precise price affects consumer perception of both firms and products. The study is based on an experimental survey, conducted through Prolific, Amazon MTurk, and Qualtrics, with financial support from the Department of Accounting, Auditing and Law at NHH.

The experimental design is based on a belief that precise prices will affect consumers' perception of costs, pricing procedures, and fairness. Our experiment is based on a 2x2 factorial design, with four different treatment groups. All treatments obtain some information regarding a hypothetical firm, YourKitchen. Two groups are informed that YourKitchen has a cost-focus. All participants are further asked to provide a cost estimate for one of their products, which is priced at \$20 or \$20.17, depending on the treatment group. This design allows us to analyze how participants perceive precise prices, both in isolation, and in combination with a self-proclaimed cost-focus. Proceeding, participants are asked to rate statements regarding the characteristics, pricing procedure and fairness of the product. Ultimately, we assigned participants to one of two different groups, seeing either a round or precise price, and ask them to provide a profit estimate.

The results show that precise prices increase cost estimates, and this effect is statistically significant. This was expected, as former research show similar results. However, this effect is diminished when combined with a proclaimed cost-focus. This is contradictory to our hypothesis of positive synergies between the two manipulations. Interestingly, we found that both precise pricing and a self-proclaimed cost-focus, when seen in isolation, seem to have an almost identical effect on the cost estimates.

Prior research on the price precision effect have not investigated whether this effect is more than just a simple anchoring effect. Interestingly, we believe that the combination of the results from the cost and profit estimation questions indicate that the price precision effect is not solely an anchor effect.

Moreover, the majority of our participants seem to believe that precise pricing signals cost-based pricing. However, in contrast with our hypothesis and prior research, there is no data from our study suggesting that this increased perceived fairness. We discuss that this may be due to the asymmetric informational relationship.

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1 Introduction

The price of a product is of high importance to consumers, and has a great influence on their willingness to buy (Phillips, 2005). Consumers want to feel like they are getting value for money, which in turn depends mostly on the price of the product compared with their perceived value of the product, but also the way prices are presented (Phillips, 2005). Likewise, pricing is also extremely important for firms. It is a common practice for companies to use the prices of their products as a mean for signaling (Hayek, 1945; Kreps & Sobel, 1994). For instance, a company setting a high price for one of their products may want to signal high quality or scarcity.

1.1 Complication

Consumers and companies are increasingly concerned with “fair pricing” (Schlossberg, 2015; Buell, John & Mohan, 2020), a term which not only encompasses the price itself, but also companies’ underlying pricing procedures. In later years, consumers have started to call for more honesty and transparency from companies (Schlossberg, 2015; Buell et al., 2020; Meng & Nguyen, 2012). These demands include more information about companies’ environmental activities, as well as their costs and pricing procedures. Whereas more and more product cost information become accessible to consumers (Buell et al., 2020), there are still only a few companies operating with such transparency. While studies show that being transparent about costs and pricing procedures can have a number of benefits for a company (Ellen & Ferguson, 2013; Buell et al., 2020; Meng & Nguyen, 2012), the same studies show that this is only applicable when the company in question has a pricing procedure that the consumers perceive as being fair. Presumably, many companies opt not to share this information, as openness would not be beneficial to them (Meng & Nguyen, 2012).¹

However, what if these companies could influence consumers’ perceived fairness of their pricing procedure without being transparent about their costs? In this study, we examine

¹Upon deciding to write our master’s thesis on this topic, we contacted one of the firms we believe use precise prices for this purpose, and asked them whether they would be willing to contribute to our paper by disclosing the cost information about some products. In the answer we received, the firm stated that they “*did not see how such a cooperation would benefit them*”.

whether using precise prices as a pricing strategy can achieve this effect. Our hypothesis is that companies use precise prices as a way to signal to consumers that their prices are based on costs, trying to create the perception of fairness without disclosing any information about the underlying costs or pricing procedure.

1.2 Concern

While studies show that firms mostly choose 9, 5 or 0 price endings (Holdershaw, 1995), this is not always the case. We have observed some firms, such as Søstrene Grene and Normal, operating with extremely specific prices. In these stores, prices tend to be \$16.64 or \$12.23 rather than the more frequently used rounded or 9 endings. While precise prices for a long time was an unexplored field of study, some researchers have looked into what they refer to as the “precision effect” over the last couple of decades (Janiszewski & Uy, 2008; Schwarz & Zhang, 2013; Kadiyali, Simon & Thomas, 2010). These studies have found that very precise numbers influence people’s numerical judgements about the magnitude of the number, both seen in isolation and relative to other values. Their findings suggest that when being presented with an extremely precise number, people tend to believe that there must be a reason why the number is so precise (Janiszewski & Uy, 2008; Schwarz & Zhang, 2013; Kadiyali, et al., 2010).

Prior research on the price precision effect has concluded that this is an anchor effect (Janiszewski & Uy, 2008), or been unable to reject that it is an anchor effect in its’ entirety (Kadiyali et al., 2010). To our knowledge, there is no research articles addressing whether the precision effect is being used as a part of firms’ pricing strategies, and whether precise prices influence consumers’ thoughts on other aspects regarding products and firms, such as pricing procedures and perceived fairness. With this thesis, we seek to investigate whether precise prices influence consumers’ estimates of a product’s production costs, as well as the pricing procedure they believe the firm operates with. Thus, our research question is: How does precise prices, compared to rounded prices, influence consumers’ perception of a firm’s product costs and pricing procedure?

1.3 Course of Action

In this thesis, we conduct an experiment investigating this phenomenon. The participants are presented with information about the hypothetical kitchen supply store YourKitchen, and later on their competitor CutleryHaven. Based on some limited information about the firms, as well as the price of one of their products, the participants are asked to provide answers to a variety of questions, one of which includes providing a production cost estimate for one of YourKitchen's product.

We recruited all participants through the crowd sourcing platforms Amazon Mechanical Turk (MTurk) and Prolific. MTurk and Prolific have large and diverse bases of members, which combined with their effective and inexpensive data collection stood out as our preferred alternatives. MTurk and Prolific were used in combination with the online survey tool Qualtrics to conduct the experiment. A total of 448 people participated, a satisfactory number based on our power calculation. We used a randomized design; the participants were randomly divided into four different treatment groups in a 2x2 factorial design. By using a control group and assigning the participants randomly, we intended to control for other variables, as the groups will be subject to exactly the same external influences aside from the two manipulations we have included in the experiment. Depending on which group a participant belongs to, they were informed that YourKitchen have a consistency-focus or a cost-focus, and the price of the product was either precise or rounded.

1.4 Contribution

From our hypothesis testing we found that consumers' production cost estimates are higher for products with precise prices compared to products with rounded prices. This effect is of statistical significance, and is consistent with previous research. However, the effect diminishes as the firm has a self-proclaimed cost-focus. This is contrary to our hypothesis that a precise price and cost-focus would have positive synergies. While treatment 3 (precise price and cost-focus) has the highest cost estimation mean, this mean is not statistically significantly higher than the means of treatment 1 (precise price and consistency-focus) and 2 (rounded price and cost-focus).

While precise prices increase participants' production cost estimates, they also seem to reduce participants' estimations of profit per product. Not only do these results correspond, they indicate that there might be more to the price precision effect than a sole anchoring effect.

Our results show that many consumers believe that precise prices signal a cost-based pricing procedure. Based on previous research, one would thus expect precise prices to have a positive effect on consumers' perceived price fairness. However, our results show no such effects. This may be because firms are using precise prices as a strategy to create the appearance of fairness without actually disclosing any information about their costs or pricing process. As a result, companies need to carefully consider whether using precise prices aligns with their overall pricing and transparency goals, as well as whether it may be effective in influencing consumer perceptions.

1.5 Structure of the Paper

This paper is organized into six main sections. Following the introduction, the second section provides a literature review of existing and pertinent literature on the topic. Section three outlines the methodology and data used. Results are presented in section four, followed by a conclusion and discussions in section five. Finally, section six presents potential avenues for future research.

2 Literature Review

In the following, we present theories that lay the foundation for our hypotheses, ultimately concluding with the hypotheses. The purpose of our literature review is to form a clearer picture on our motivation for this paper, including previous findings related to our research question. Furthermore, we believe it will illustrate why our research paper will be a contribution to this field of study. We will begin with presenting theory and earlier findings regarding fairness in pricing, cost transparency and different pricing procedures. Thereafter, we will present earlier research on the signaling effect, and how this is related to odd pricing. Lastly, we present research on the psychological effect that precise numbers have on people, popularly referred to as the “precision effect”.

2.1 Fairness in Pricing

Although the focus on fair pricing has increased over the last decades (Meng & Nguyen, 2012), this is not a new topic within economic theory. The cardinal rule of fair behavior is that one firm or individual should not benefit by simply imposing an equivalent loss on someone else (Okun, 1981). Okun (1981) showed that perceived price unfairness triggered a firm’s customers to look for other alternatives. He explained these observations with consumers finding price increases that were not justified by increased costs as being unfair. Okun emphasizes how the fairness of an action depends mostly on its outcomes for the agent and the individuals affected by it.

Daniel Kahneman has further elaborated on this subject with several studies. One of his experiments found that 82% of consumers found it unfair that a hardware store increased the price of snow shovels from \$15 to \$20 the day after a snowstorm (Kahneman, Knetsch & Thaler, 1986a). Kahneman also found that 79% of consumers found it acceptable that a grocery store, which due to a shortage had to pay 30 cents more per lettuce head, raised the price equivalently. However, when the wholesale price of peanut butter increased, 79% of the respondents found it unfair to increase the price of peanut butter that were already in stock. These results indicate that consumers find price increases acceptable only when costs have increased, which further implies that they find a cost-based pricing procedure being fair.

While consumers demand that a price increase is justified by higher costs, they do not insist that a cost reduction should result in a corresponding decrease in price (Kahneman, Knetsch & Thaler, 1986b). This applies to cost reductions related to both cheaper supplies and increased efficiency. Consequently, a cost-based pricing procedure seems to be of most importance to consumers when it comes to price increases.

Kahneman, Knetsch and Thaler (1986a) found that consumers in general believe they are entitled to a “reasonable” price, while firms are entitled to a “reasonable” profit. The authors refer to this as “dual entitlement”. They conclude that consumers find pricing that seems solely intended to further increase profits beyond what they find reasonable is viewed as unfair (Kahneman, Knetsch and Thaler, 1986a).

More recent studies have shown that fair pricing can be of even higher importance to customers’ perceived price fairness than a fair price (Meng & Nguyen, 2012). In other words, consumers can under certain circumstances care more about the pricing procedure a firm used to determine a price than they care about the price itself. Meng and Nguyen (2012) finds that while consumers find cost-based pricing procedures being fair, more market-based pricing procedures diminish perceived fairness. In most cases consumers will not know which pricing procedure(s) a firm operate(s) with. However, in the last decades, we have seen a growing trend towards more price and cost transparency.

2.2 Cost Transparency

The term cost transparency refers to a company’s disclosure of their costs of producing and providing a given good or service, typically per unit of the product (Mohan et al., 2020). This is a strategy that, historically speaking, mostly has been employed in supplier-firm relationships to facilitate collaboration on cost-reduction measures in supply chains. However, over the last decades there have been a trend towards increased cost transparency also in consumer-firm relationships (Mohan et al., 2020). Although firms disclosing their production costs publicly is still a relatively rare sighting, an increasing number of firms opt to do so. Along with the rise of the Internet, third parties have also started revealing such information, helping consumers get a better understanding of the costs of different goods and services, while also allowing them to compare prices across different firms.

Despite cost transparency being quite rare in consumer-firm relationships today, several studies have been conducted on the potential positive effects it can have for a brand and its' sales. Buell, Johan & Mohan (2020) found that cost transparency can increase trust and deepen the relationships among firms and consumers. Furthermore, being transparent about production costs can increase consumers' willingness to buy a product significantly. The authors conducted a field experiment at a large US university involving a chicken noodle soup which was sold during lunchtime. While the control group only received information in regard to the soup's ingredients, the experimental group were also presented with the costs of ingredients and labor per portion. Disclosing the soup's relevant costs led to a 21.1% increase in consumer's willingness to buy compared to the control group.

In spite of the potential positive effects of cost transparency, there are only a few companies operating with such openness. Studies have found that cost transparency would not be beneficial for many firms (Meng & Nguyen, 2012). This includes luxury brands, firms with high margins, and products comprised of costs that consumers find "unfair", such as marketing costs. Furthermore, there are low-cost companies pretending to be high-cost companies that would not benefit from disclosing their costs. Studies find that cost transparency can have a negative impact on a brand and its sales when consumers believe that the price and/or pricing procedure is unfair. Nonetheless, customers may view secrecy about pricing procedures as unfair (Kimes, 2002)

2.3 Pricing Procedures

When determining the price of a good or service, firms use a variation of pricing procedures. This is also called strategic pricing. Two of the most common pricing practices are cost-based pricing and market-based pricing (Business Development Bank of Canada, 2022; Schlissel & Chasin, 1991). Firms operating with cost-based pricing determine the price based on the production costs of the products, while firms operating with market-based pricing determine the price based on what the consumers are willing to pay. Studies show that perceived procedural fairness is very important to consumers, and can under some circumstances have a bigger impact on customer experience than the price itself (Meng & Nguyen, 2012). Consumers tend to perceive that a market-based pricing procedure is unfair, and prefer firms operating with cost-based pricing.

2.4 Signaling Effect

The signaling effect is an effect which describes how consumers can deduce information from the price of a good or service, such as quality (Hayek, 1945; Kreps & Sobel, 1994). With asymmetrical information between firms and consumers, only the firms themselves know the exact quality of their own products. Consequently, firms use their prices as tools to influence consumers' perception of their products' quality, as well as other attributes (Wolinsky, 1983). Several studies have been conducted on firms pricing their products to signal high quality. Schnabel and Storchmann (2010) further examined the hypothesis first published by Bagwell & Riordan (1991), that high-quality producers distinguish themselves from producers with low quality by charging a price that exceeds the full information equilibrium. This signaling effect declines as consumers receive more information about the product. Ariely, Carmon, Shiv & Waber (2008) conducted an experiment where they found that participants responded differently to a pill depending on whether they were told the medication was cheap or expensive. Pain reduction was higher for the participants that were informed that the pill costed \$2.50 than for those who were informed that it costed \$0.10, which further indicates that consumers associate a higher price with higher quality when they have little to no information about the actual quality of the product.

Firms can also set their price with the purpose of signaling the cost of a product (Bagwell, 1987). Consumers typically infer that a higher-priced product has higher quality and is thus costlier to produce than lower-priced products. When consumers have limited or no information about products in a market, low-cost firms are incentivized to set higher prices in order to make consumers believe that they have higher costs (Jiang, Sudhir & Zou, 2021). However, the same study has shown that companies should not set their price too high, since consumers delay purchases of goods they believe cost significantly less to produce than they are being sold for, as they believe they can acquire such goods cheaper at a later time.

There is evidence that the rightmost digit of a price can communicate meanings and influence consumers' choices (Schindler, 2006). Consequently, retailers seem to prefer certain price endings, such as .9 or .99, as this seems to signal that the price is low. This pricing strategy is typically called odd pricing.

2.5 Odd Pricing

Odd pricing is a pricing strategy whereby firms make micro-adjustments to their prices, typically involving the last digit of the price of a good or a service. This strategy is also often referred to as psychological pricing (Garland et al., 1997), which is based on the theory that such prices have a psychological impact on consumers and their willingness to purchase, and there is no shortage of anecdotal evidence to support this theory. The odd pricing term includes both prices ending in odd numbers, as well as pricing just below zero (Fox, Gendall & Wilton, 1988). Although the origin of odd pricing is unknown, there are evidence that this strategy was being used already back in the 19th century (Schindler & Wiman, 1989). Since then, odd pricing has become increasingly widespread. In 1948, an analysis on odd pricing were conducted, which involved 3,025 retail store advertisements in newspapers in the US (Rudolph, 1954). This study revealed that 64% of the prices ended with an odd digit. Almost 50 years later, Holdershaw (1995) conducted a similar study based on 1,188 newspaper advertisements, revealing that 87% of the investigated cases would be categorized as odd prices, with the majority of the odd prices ending with the digit 9.

There is no coincidence that more and more firms have opted for a pricing strategy that includes odd pricing. Gabor & Granger (1964) found that consumers' willingness to purchase were higher when they were presented with an odd price than with the next lowest price point. Several later studies have also examined this subject. Schindler & Kibarian (1996) discovered that odd pricing can lead to an 8% increase in sales. A study conducted by Fox et al. (1998) supports this, as it provides empirical support that an odd pricing strategy generated greater-than-expected demand. The effect seems to be the strongest for products which price ends with the digit 9. A study based on 2,292 price ads provides a strong indication that prices ending with 9 signals a low price, which increases demand (Schindler, 2006). This signaling effect is more effective when consumers have limited or no other information about the product other than the price, as the consumers possess less information to base their decision on (Anderson & Simester, 2003).

Brenner & Brenner (1982) suggested that the significant 9-digit effect originates from a biological constraint, as consumers capacity for storing directly accessible information is limited. Thus, reading a price tag from left to right, they suspect that consumers are

especially exposed to the first digit of a price, as this is regarded as the most valuable information they deduct from a price. For instance, if a product is listed at \$599, the digit 5 is regarded as more significant information than the 9 digits. On the contrary, other studies suggest that the last digit, especially if the last digit is 9, is the most important. Anderson & Simester (2003) found that by raising the price of a woman's dress from \$34 to \$39, they managed to increase demand by a third. In comparison, changing the price from \$34 to \$44 had no significant impact on demand. Research conducted by Robert Schindler (2006) supports this, as he concludes that there is evidence that the rightmost digits can communicate meanings to consumers. His paper addresses that prices ending with 99 can have a lower-price meaning, although products with such prices tend to be priced higher rather than lower than their competitors. Odd pricing has formerly been believed to suggest to consumers that goods or services are priced at the lowest possible amount (Harper, 1966), and may consequently convey an image of honesty a round figure would not have achieved (Schwartz, 1973).

The Palmerston North Study from 1995 examined 1,188 newspaper ads over a seven-day period, and found that 96.8% of the advertised products had prices ending with 0, 5 or 9 (Holdershaw, 1995). These results illustrate the rarity of prices ending with the remaining seven digits, and research on this matter is also a rarity. Akpinar et al. (2022) found that consumers are likely to perceive multi-digit prices with repeated 1-endings, such as \$3111, as more discounted than prices with repeated 9-endings, such as \$2999. Other than this very niche research article, there is seemingly not done much specific research on prices ending with these other digits and what signaling effects such prices might give. However, in later years researchers have paid more attention to precise numbers/prices, and what effect such precise values have on people's judgements and consumer behavior.

2.6 The Precision Effect (Anchoring Effect)

Various studies show that how precise a number is influences people's numerical judgements about the magnitude of the number, both seen in isolation and relative to other values (Janiszewski & Uy, 2008; Schwarz & Zhang, 2013; Kadiyali, Simon & Thomas, 2010). When being informed that the winner of a marathon won with a completion time of 2 h 48 min 2.92 s, participants were significantly more likely to believe that the runner-up

finished right behind the winner compared to participants that were informed that the winner's completion time was 2 h 48 min (Schwarz & Zhang, 2013). The intuition is that the specificity in the former example seems to indicate that it was a close race.

A study conducted by Janiszewski and Uy (2008) examined consumer's estimations of a retailer's purchase cost for a variety of different products, depending on whether they were presented with a rounded or precise price. The study showed that participants presented with a precise price believed the retailer to have relatively higher costs than those presented with a rounded price. They suggest that consumers tend to accept a price closer to the anchor price when they perceive this price to be low. Similarly, Kadivali et al. (2010) found that people negotiate less and accept a higher price when the starting price is precise, even if a rounded starting price is actually higher.

Kadivali et al. (2010) found that the uncertainty induced by a precise price can affect consumers' perceived magnitude of the price. As precise prices are most widespread for products in lower price ranges, consumers tend to expect that large prices are rounded to the nearest convenient number. When seeing a large precise price, they might judge the price to be smaller than a rounded price at a similar price level, even if the rounded price actually is lower. For instance, the participants in one of their experiments incorrectly judged the precise price \$395,425 to be lower than the rounded price \$395,000. In another experiment, the participants were willing to pay a higher price for a house when the listing price was precise (e.g. \$364,578) than when the listing price were rounded up to the closest rounded price (e.g. \$365,000).

How the information including precise numbers/prices are presented to people is essential for whether there is a precision effect or not, shows Schwarz and Zhang (2013). The impact precise values have on people's judgement are only present when the information presented comes from a human communicator, rather than when the information stems from an automated procedure with no communicative intent (e.g., a computer calculating the average price of a product at various retailers).

The findings from the three research articles discussed here illustrate the effect precise numbers has on people's numerical judgements. The variety of the different experiments proves that this effect is applicable to a great range of situations, and not only to the price/cost of a product. Thus, based on prior research, one cannot dismiss the probability

that consumers providing higher cost estimations or willing to pay more for products with precise prices is solely a result of the anchoring effect. While Janiszewski and Uy (2008) describe their results as an anchor effect, Kadiyali et al. (2010) are unable to conclude that their results are a result of anchoring effects. These studies have not further investigated whether precise prices influence consumers' thoughts on other aspects regarding products and firms, such as pricing procedures and perceived fairness.

2.7 Hypotheses

We want to investigate to what degree precise prices affects consumers' perceptions on a firm's production costs and pricing procedure. With the purpose of answering our research question, we have a number of hypotheses we would like to test. Previous studies have shown that consumers believe that a firm's purchase cost for a product is higher when they charge a precise price rather than a rounded price (Janiszewski & Uy, 2008). We believe the same will apply when it comes to their production cost. Thus, our first hypothesis is:

Hypothesis 1: *Consumers believe that a firm's production cost for a product is higher (relative to the price) when they charge a precise price rather than a rounded price*

In our experiment, we have four different treatment groups. Based on our first hypothesis, we expect that treatments presented with precise prices (e.g., \$20.17) will provide higher estimations of production costs compared to those presented with rounded prices (e.g., \$20). This is supported by previous research on the psychological effects of precise prices (Janiszewski & Uy, 2008), which has found that precise anchors lead to cost estimates closer to the anchor value than rounded anchors.

Additionally, we believe that the "cost-focus" manipulation (i.e., emphasizing the link between the price and the underlying costs of production) will further increase this effect, as a cost-based pricing strategy is viewed as more fair (Meng & Nguyen, 2012). Consequently, we expect that answers between the control group (rounded prices and consistency-focus) and treatment 3 (precise prices and cost-focus) will differ the most (i.e., there are positive synergy effects between a precise price and a self-claimed cost focus).

Hypothesis 2: *Consumers believe that the effect of a precise price is increased when a firm claims a cost focus, implying positive synergies between a precise price and cost focus.*

While previous research has investigated the psychological phenomenon known as the “precision effect”, none have, to our knowledge, examined precise prices in the context of pricing strategy.

Procedural fairness, or the perceived fairness of the process used to set a price, has been found to sometimes be even more important to consumers’ overall perceptions of price fairness than the price itself (Meng & Nguyen, 2012). We believe that some firms that consistently use precise prices in their pricing strategy are aware of the precision effect, and use it as a way to signal to consumers that their prices are based on their underlying costs. Therefore, our third hypothesis is that consumers will perceive firms that use precise prices as having a cost-based pricing strategy.

Hypothesis 3: *Consumers believe that firms that use precise prices have a cost-based pricing strategy.*

Developing hypothesis 3 further, we believe that consumers may also perceive precise prices as being more fair than rounded prices. This is a key aspect as to why we believe firms use a precise pricing procedure. Previous research has shown that consumers generally perceive cost-based pricing as being more fair than market-based pricing (Kahneman et al., 1986a), and that perceived procedural fairness can be even more important to consumers than perceived price fairness (Meng & Nguyen, 2012). In relation to our hypothesis of precise prices signalling a cost-based pricing strategy, we thus hypothesize that consumers will perceive precise prices as being more fair and reasonable than rounded prices.

Hypothesis 4: *Consumers perceive precise prices as being more fair than rounded prices.*

In accordance with our first hypothesis, we believe that consumers perceive precise prices as signaling higher production costs (i.e., profit estimation can be viewed as an inverse cost estimation). As a result, we expect to see consistency between these hypotheses. Put differently, if our first hypothesis holds true, we can expect consumers to perceive products with precise prices as yielding lower profit estimates than those with rounded prices. Therefore, our fifth hypothesis is:

Hypothesis 5: *Consumers will perceive products with precise prices as being less profitable than those with rounded prices.*

3 Methodology

To operationalize our thesis and test our hypotheses, we will use an explanatory design with an experimental method and a quantitative approach. The experimental method allows us to manipulate variables and establish causality, while the quantitative approach allows us to collect and analyze data in a systematic and objective way.

In this study, we will rely on the data collected from the experiment as our primary source of information. To analyze the data, we will use predetermined empirical methods, such as statistical tests, to compare our hypotheses to the results obtained from the experiment. We will treat the data as cross-sectional, as we are not studying the same participants over time.

Lastly, we wish to remark that the design is inspired by an experimental draft written by Joel Berge (2022). We have adapted and modified the design to fit the specific research questions and objectives of our study.

3.1 Experimental Design

To study our thesis in a controlled and systematic way, we have chosen an experimental research design, which allows us to isolate the causal effect of one or more independent variables on a dependent variable (Lewis, Saunders & Thornhill, 2012). Our study consists of three main parts, in which the first part divides the participants into four different treatment groups in a Two-by-Two (2x2) factorial design. By using a control group and randomly assigning the participants to one of four different groups, we aim to control for other variables and ensure that the groups are subject to the same external influences, except for the two manipulations we have included in the experiment. This allows us to isolate the effect of the manipulations on the dependent variable (Lewis et al., 2012).

Through this experiment, we hope to understand how precise prices affect consumers' perceptions of a company's costs and pricing procedure, as well as the fairness of these. Additionally, we want to investigate whether manipulating the firm's cost-focus (i.e., emphasizing the link between the price and the underlying costs of production) may strengthen this effect. This is because focusing on the costs of production may further

reinforce the perception that the precise price is justified and reasonable, given its perceived link to the underlying costs.

The 2x2 factorial design allows us to investigate both of these effects. Prior to elaborating on the treatment of each experimental group, we wish to illustrate an overview of the 2x2 factorial design in Table 3.1.

#	A	B
1	A/1	B/1
2	A/2	B/2

Table 3.1: Overview of 2x2 factorial design

3.2 Mixed Method and Research Design

In our endeavour to attain the desired results, we deemed it necessary to collect both quantitative and qualitative data, thus employing a mixed methods research design for our experiment. The majority of the questions we included could be classified as quantitative research, however we also included one qualitative, open-ended question. We found the inclusion of this question to be of paramount importance, as it allowed the participants to articulate their thoughts and reflections regarding specific pricing that was not covered by the more quantitative questions.

3.3 Data Collection

We recruited all participants ($n = 448$) from the crowd-sourcing platforms Amazon Mechanical Turk, MTurk ($n = 237$), and Prolific ($n = 211$). To increase the robustness of our data, we decided to use two different platforms for gathering purposes. The platforms are crowd-sourcing marketplaces allowing businesses as well as individuals to outsource virtual tasks that requires human intelligence. Studies have shown that MTurk's large and diverse base of members are slightly more representative than standard Internet samples (Buhrmester, Gosling & Kwang, 2011), and is regarded as an effective and inexpensive tool for data collection. Consequently, it has grown to become widely used among social scientists as a source of survey and experimental data (Chandler & Paolacci, 2014), and

stood out as our preferred recruiting platform for this experiment. MTurk also gave us the possibility to only accept participants with a certain approval rate, reducing the chance of receiving frivolous participants that could disturb our results and validity. Moreover, the last few years, Prolific has grown significantly, and is viewed as a highly user-friendly experimental tool (Palan & Schitter, 2018). Prolific also allows the option of pre-screening participants on different metrics. When members satisfying our requirements had accepted participating in our experiment, they were re-directed to the actual experiment in the online survey tool Qualtrics. We found the combination of using MTurk, Prolific and Qualtrics being fit for purpose for our experiment. While MTurk and Prolific were favorable for recruiting purposes, Qualtrics stood out as the best option for designing both the experimental- and survey-based part in our study.

Prior to participating in the experiment, the participants were informed that they could earn between \$1 to \$3. Their payment consisted of a fixed amount (\$1) and a possible bonus payment (\$2) contingent upon whether one of their cost- and profit estimates would be somewhat accurate (+/- \$2 from a predetermined amount). This measure was implemented to incentivize the participants to increase their efforts when answering this question, and to avoid frivolous responses. Previous research has indicated that incentives can increase effort in judgment tasks and lead to a decrease in the variance of the responses (Camerer & Hogarth, 1999). Upon completion of the experiment in Qualtrics, all participants received a unique code which they returned to MTurk or Prolific to receive their payment. The average payment was \$1.57, with an average completion time of 6 minutes and 31 seconds, which corresponds to an hourly wage of \$14.49, representing an increase of 99.2% compared to the federal minimum wage for covered non-exempt employees in the United States.

3.4 Evaluation of the Data

In the following, we evaluate the collected data from our experiment. Firstly, we examine the validity and reliability of the data, including various measures that is implemented to best ensure a high degree of both validity and reliability. Subsequently, we elucidate the experiment in more detail before combining the design and the data to draw conclusions.

3.4.1 Validity

The validity of our experiment was assessed in order to determine the extent to which the data collected could be used to draw meaningful conclusions regarding the potential effects under investigation (Dahlum, 2021). The validity of any experiment is typically divided into internal and external validity, and this section will evaluate whether the validity of our experiment is sufficient.

3.4.1.1 Internal Validity

Internal validity can be conceptualized as the extent to which one can be confident that the causal relationship being tested is a result of the variables under investigation and not due to extraneous factors (Bhandari, 2022a). A high level of internal validity is critical to the credibility and trustworthiness of the conclusions drawn and is a prerequisite for demonstrating a causal relationship between two variables.

The participants of our experiment were allocated to the four different treatments using a randomization procedure. This measure improves the internal validity of our experiment, as it eliminates potential pre-existing differences between the treatments (Bhandari, 2022b). Random allocation of the participants to the treatments ensures that any observed differences between the treatments are due to the experimental manipulations, rather than any other extraneous variables. Therefore, any differences in behavior between the treatments can be assumed to be a result of the manipulations in the treatments.

Previously, it was discussed that measures were implemented to prevent the same individuals from participating more than once. This was deemed necessary in order to maintain the internal validity of the experiment, as independent participants were sought and to prevent any bias from participants re-taking the experiment. To this end, it was decided that no more than one participation per IP address would be allowed. While this disallows different individuals from taking the experiment from the same internet café or library, it was deemed an appropriate step to take.

To ensure the internal validity of our study, we implemented several measures in addition to the experimental design. These measures were described in detail in the publicly available preplan on aspredicted.org, which outlined our research design and methods.

For example, we sent respondents who failed the attention check back to the first page, and if they failed a second time, we excluded them from the experiment. This helped us ensure that only attentive and understanding participants were included in the study. We also set a minimum requirement for response time to exclude participants who were only trying to finish the experiment as quickly as possible to receive their payment.

In addition, we excluded respondents who indicated that the cost of producing the set of glasses was \$0 or that the profit per product was higher than the product price, as they had clearly misunderstood the questions. We determined that including such respondents in the experiment would have compromised the validity of our results.

To minimize the chance of participants misinterpreting any of the questions or information they were presented with, we chose our wording carefully. Misinterpretations could severely affect the participants' answers, decreasing our internal validity. The same can apply to certain questions in a quantitative survey, where the alternatives available to the respondents cannot sufficiently reflect their thoughts on the matter. Consequently, when the respondents were asked which intentions firms have when using precise pricing, we included an open-ended alternative so that they could express points of view that were not covered by the included alternatives.

As MTurk and Prolific give participants the option to undertake the experiment from either a computer or a smartphone, allowing them to participate from wherever they have an Internet connection, some of the participants might have faced disturbances when answering the survey. This might have affected their concentration, attention span and answers. However, we believe that the random assignment of participants to the different treatments helped even out such effects. Furthermore, we are free to abstain from paying respondents that have not fulfilled their task satisfactorily. This incentivizes the respondents to be attentive when participating in the experiment. Thus, we do not believe this have hurt our internal validity significantly.

We exercised caution by refraining from disclosing the purpose of the experiment during the survey. This decision was made in order to reduce the likelihood of respondents adjusting their answers based on what they thought we wanted to find.

3.4.1.2 External Validity

In order for an experiment to have a high degree of external validity, it is necessary that the results can be generalized and applied to a population beyond the sample size used in the experiment (Dahlum, 2021).

Our objective of achieving a high degree of external validity was a decisive factor when selecting MTurk and Prolific as our preferred platforms for recruiting participants. Studies show that MTurk's member base is representative of the US population as a whole, even more so than standard Internet samples (Buhrmester et al., 2011). Furthermore, studies suggest that Prolific offers a representative sample of both the US and the UK population (Palan & Schitter, 2018). Therefore, MTurk and Prolific emerged as the best choice among the available online options.

Before conducting the experiment, we conducted a power calculation to determine the minimum sample size necessary to achieve a sufficient probability of finding statistically significant results. Based on the calculation, we determined that a sample size of at least 288 participants would be required. However, in order to increase the robustness of our findings and ensure a high degree of external validity, we decided to recruit a sample of 448 participants. We believe that this sample size is sufficient to generalize our findings to a larger population

3.4.2 Reliability

To what degree our experiment is reliable depends on whether our data collection techniques and analytic procedures would induce to the same results if we were to rerun the experiment on a later occasion, or if someone else were to conduct the same experiment (Lewis et al., 2012). There are several different threats to the reliability. A researcher must be aware of both participant and researcher errors, as well as participant and researcher bias. Avoiding these threats required us to be methodologically rigorous when designing, conducting and analyzing our experiment.

In order to minimize potential participant bias, the participants were anonymous, and we implemented several measures preventing the same persons to participate more than once. Consequently, the respondents were less likely to be self-conscious about their

answers or influenced by having undertaken the experiment already. Furthermore, we tried to minimize bias by phrasing our questions in a way that there would not be any misinterpretations of what we were asking for.

When collecting our data, we were careful to collect it as accurately and fully as possible to avoid any researcher bias in the form of subjective selectivity. The respondents that were removed during our data collection are those who had already participated in the experiment, those who had spent less than 120 seconds on the entire experiment and those who responded with bot-like behavior. Including data from such participants would have damaged the reliability and validity of our results.

Prior to launching the final version of the experiment on MTurk and Prolific in November, we conducted two pilot studies on MTurk to refine our research design and ensure the reliability of our results. Thus, we believe that our experiment has a high level of reliability, meaning that it would most likely yield similar results if it were to be repeated by us or by other researchers.

3.4.3 Philosophy of Science

The purpose of experiments is to investigate the probability of changes in independent variables causing changes in other, dependent variables (Hakim, 2000). In a classical experiment, a sample of participants are randomly assigned to either the control group or the experimental group (Lewis et al., 2012). Those assigned to the latter will be exposed to some pre-planned manipulation, with the purpose of testing whether the manipulation has an effect on the relationship between the independent and dependent variable. Thus, researchers can obtain powerful evidence concerning the causal relations underlying their theory (Angrist & Pischke, 2008; Cook & Campbell, 1979), which is their ultimate objective (Bloomfield, Nelson & Soltes, 2016).

The philosophical approach to science, called constructive empiricism, is helpful to describe the goals of empirical research (Bloomfield et al., 2016). According to constructive empiricism, the aim of scientific research is to generate empirically adequate theories that are true to the observed constructs. It states that theories can be accepted without believing that the constructs are real, as long as they are accepted as useful (Bloomfield et al., 2016). Unlike scientific realism, constructive empiricism maintains that science

does not aim at truth about unobservable constructs (SEP, 2021). Believing that a theory about an unobservable construct is true is riskier than believing that it is empirically adequate (Musgrave, 1985). Truth entails empirical adequacy, but not vice versa, as a theory that is empirically adequate may be false.

As discussed previously in this chapter, experiments are well suited to control and isolate the causal effect one or more independent variables has on a dependent variable (Lewis et al., 2012). Causality concerns relationships where a change in one variable necessarily changes another variable (Oppewal, 2010). There are three conditions for causality: covariation, temporal precedence, and controlling for other variables. In other words, causality requires (1) that there is a cause-effect relationship between the variables, (2) that the cause occur before the effect, and (3) that there cannot be any other explanations to the observed effect (Cook & Campbell, 1979; Shadish & Sullivan, 2012). By manipulating the independent variable of the experimental group before analyzing the effects, one cannot only observe whether the variables have covariation, but one will also ensure temporal precedence. By randomly assigning participants to the groups, and keeping everything but the manipulation of the independent variable equal, one can dismiss any other explanations to the observed effect(s) (Lewis et al., 2012).

When designing an experiment, one should be aware of the Hawthorne effect. The Hawthorne effect describes how participants of experiments change their behavior due to being observed (Svartdal, 2021). Participants may alter their responses with the intention of providing the answers they believe the researchers seek after. Thus, it is important not to reveal the purpose of the study to the participants, in order to reduce the chance of the Hawthorn effect hurting the validity of the results.

3.5 The Experiment

The following aim aims to elucidate the structure and design of the experiment, as well as to provide insight into the rationale for the construction of the individual pages viewed by participants.²

²Please refer to Appendix 1 (A1) for a more visual review of the experimental design. In this appendix, we aim to show what the participants sees whilst partaking in our study.

3.5.1 Randomization

Upon partaking in the experiment, a participant is randomly assigned one of four different treatment groups, as shown in Table 3.1 below.

Price/Cost Focus	Round	Precise
Neutral	Round/Neutral (RN)	Precise/Neutral (PN)
Cost Focus	Round/Cost (RC)	Precise/Cost (PC)

Table 3.2: 2x2 Factorial Design

3.5.2 Page 1: Introduction to YourKitchen

The first page of the experiment is a snippet from the website of a hypothetical kitchen supply store called YourKitchen. While the snippet was mostly identical for all treatments, they differed in terms of the firm’s outspoken core values. While two of the treatments (RN & PN) receive information suggesting that their core value is “consistency”, the other two (RC & PC) receive information suggesting that YourKitchen’s core value is “cost focus”. Apart from this difference, the text is the same. The intention of this manipulation is to test whether or not manipulating a cost focus will increase the effects we were looking for. We found it essential to make the design and the text for the different manipulations as similar as possible, to ensure that any differences in results between the different treatments could only be explained by the “cost” vs. “consistency” focus.

3.5.3 Page 2: Attention Check

This study implements an attention check on the second page in order to verify that participants have read and understood the presented information. The attention check asks participants to identify what type of items are being sold by YourKitchen, with four different possible answers. Those who fail to answer the attention check correctly on their first attempt are sent back to the information page for a second attempt. If they again fail to answer the attention check correctly, they are excluded from the experiment, and thus are not paid. This is a measure we implemented with the intention of excluding bots, uninterested respondents, and respondents who failed to understand the given information.

3.5.4 Page 3: Manipulation Check

The participants who passes the attention check are met with a manipulation check on the third page, with the purpose of testing whether the cost focus manipulation worked. Thus, we conduct a manipulation check where the participants are asked to convert the fragmented word “__st” into a meaningful word. Our hypothesis is that there would be a higher share of the participants from the cost focus treatments that would write the word “cost” than for those who received the consistency treatment.

3.5.5 Page 4: Product Cost Estimation (YourKitchen)

Subsequently, the participants are presented with another snippet from YourKitchen’s website. This snippet is of the product page of a set of six glasses, which includes a manipulation of the price. Half of the participants (RN and RC) are presented with a price of \$20 for the set, while the other half (PN and PC) are presented with a price of \$20.17. The purpose of this manipulation is to investigate the extent to which precise prices influence consumers’ perception of a firm’s costs and pricing procedure.

On the same page as the snippet, the participants are asked to provide an estimation of the production costs of this product and indicate the level of confidence they have in their estimation. To incentivize the participants to increase their efforts when answering this question and to discourage frivolous responses, a reward of up to \$1 is offered for accurate cost estimates.

3.5.6 Page 5: Product Perceptions (YourKitchen)

On the following page, participants will rate to which degree they agree with three different statements about the product, which they answer on a scale from 1 (strongly disagree) to 7 (strongly agree). They are asked to which degree they believe the product was of high quality, to what degree they believe YourKitchen based the price on product costs and to what degree they perceive the price as being fair. We find it appropriate to investigate whether there will be significant differences across the different treatments. While we are mostly interested in the response of the two latter statements, we include the first one with the intention of not making it obvious what we were looking for, as this is can affect participants’ responses.

3.5.7 Page 6: CutleryHaven

Subsequently, a hypothetical competitor of YourKitchen, CutleryHaven, is introduced. This page includes a snippet of their online store, which features three products that are sold. Depending on the treatment group the participant belonged to, the price of each of these products was either rounded (PN & PC) or precise (RN & RC). For the treatments in which YourKitchen used rounded prices, CutleryHaven used precise prices, and vice versa. The participants were then asked to provide an estimation of CutleryHaven's profit for a given product (a set of six deep dishes), identify which of the two firms they believed to be the most profitable on average, and determine which of the firms they thought had the fairest prices. This study seeks to further explore the degree to which a precise price influences consumers' perception of costs and procedural fairness.

3.5.8 Page 7: Survey

On the next page, all participants are presented with the same snippet from Søstrene Grene's online store, which include three products with precise prices. They are then asked to rate to which degree they agreed with five different statements, such as "This is the highest possible price they believe they should charge" and "The price signals cost-based prices (costs plus a fixed markup)". We intentionally placed this page towards the end of the experiment with the purpose of avoiding creating participant bias. We also added one open-ended question, allowing the participants to write other possible reasons why firms use precise prices. We firmly believe that including this question is highly necessary, as it enables the participants to share thoughts and reflections about precise pricing that was not covered by the more quantitative questions.

3.5.9 Page 8: Demographics

Ultimately, the last page of the experiment consists of some demographic questions as well as some questions related to the participants' consumer habits. We found it interesting to include this section, as it allows us to perform a more comprehensive analysis when controlling for variables in regressions at a later point in this paper.

An overall structure of the experiment can be viewed in Figure 3.1 below.

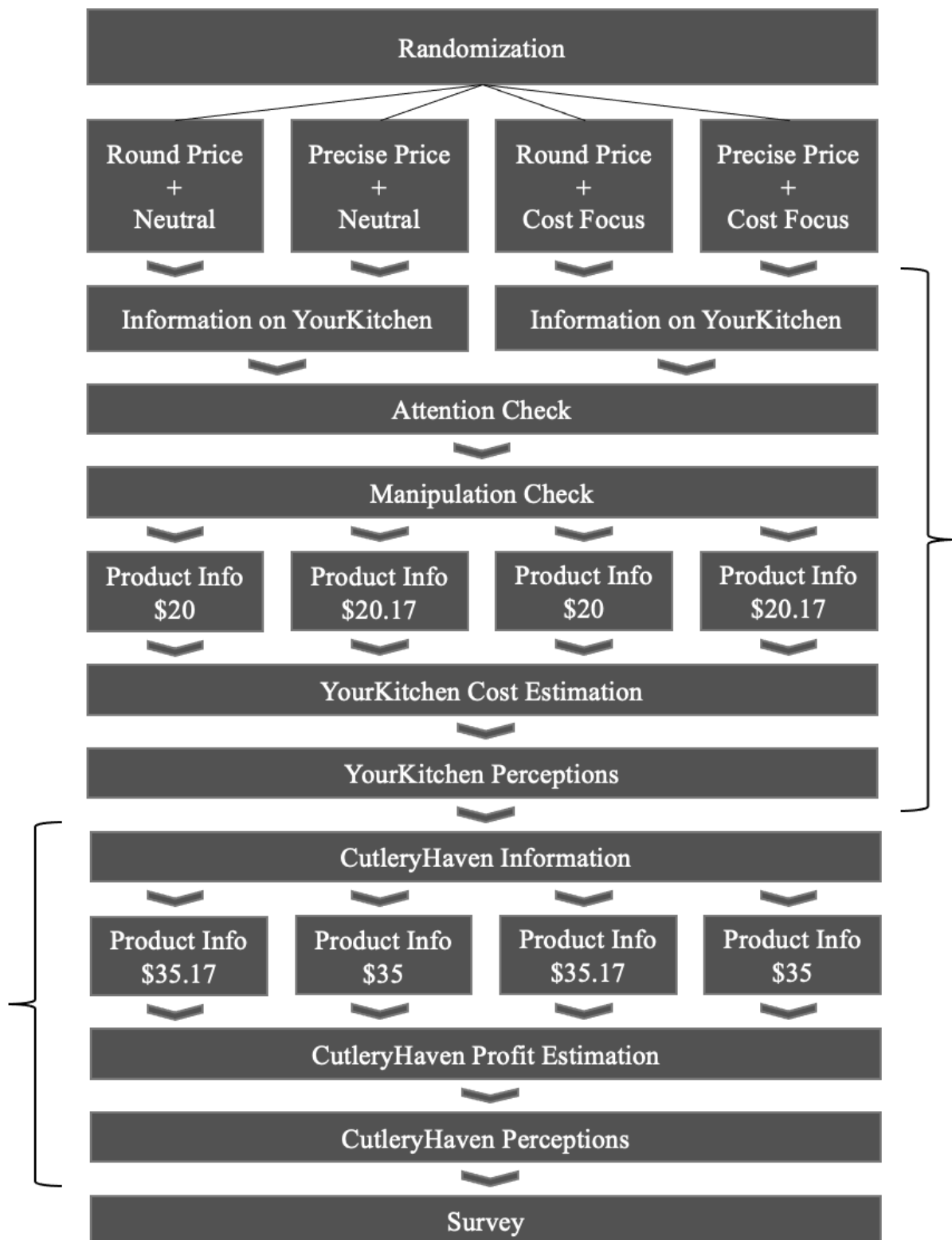


Figure 3.1: Experiment Structure

3.6 Description of the Selection

A sample of 537 individuals was recruited from online platforms MTurk and Prolific for our experimental study. Following data cleaning procedures to exclude individuals who did not pass attention checks and those exhibiting bot-like behavior, the final sample consisted of 448 participants. The sample is nationally representative of adults (18+) in the United States and United Kingdom, and is balanced across different groups. A summary of participants' distribution across different treatment groups can be found in Table 3.3:

	Control	Treat 1	Treat 2	Treat 3	Total
Count	113	113	110	112	448
%	25.22%	25.22%	24.56%	25.00%	100%

Table 3.3: Participants' distribution in the treatment groups

One would expect each treatment to consist of 25% of the participants. This is almost true here. The reason why the distribution is a little skewed is due to a higher number of respondents in certain treatments being rejected, for various reasons discussed above. However, as illustrated in the table below, the participants have been relatively evenly distributed across the treatments.

3.6.1 Manipulation Check

As displayed in our experimental structure, we included a manipulation check with the intention of testing whether our cost focus manipulation worked. The participants were asked to convert the word fragment “__st” into a meaningful word. We believed that those who were presented with a cost-focus would write the word “cost” at a higher rate than those who were presented with a consistency focus.

	Non Cost Focus	Cost Focus	Total
Selection	226	222	448
Wrote “cost”	6	47	53
%	2.66%	21.17%	11.83%

Table 3.4: Cost Manipulation results' distribution

The results from Table 3.4 show that 21.17% of the participants who received the cost focus manipulation wrote “cost”, compared to only 2.66% for the participants that were not subject to the self-claimed cost focus. This is almost a seven-fold difference, and the Mann Whitney t-test yield a P-value approximate to zero. We conclude that our manipulation is successful, and that it is fit for our purpose in deriving the perception effect of a firm stating a cost focus.

3.6.2 Data Transformation

In order to effectively manage the relatively minor difference in price between the treatment groups of \$20 and \$20.17, we have chosen to present both cost and profit estimates as a percentage of the selling price. Our empirical analysis will include both a monetary and relative section, with the monetary section displaying absolute monetary differences between groups and the relative section showing the cost or profit estimate divided by the selling price. This approach allows us to accurately represent the differences between the two groups, whilst still providing a comprehensive overview of the data.

3.6.3 Demographics

The selection consists of different demographic groups. These demographic groups can be represented through background variables. The variables that we use in our study is gender, age, income and education. Table 3.5 below aims to give insight to the demographic distributions of our participants.

Examining Table 3.5, it is evident that there is a greater proportion of female participants than male ones. However, they are relatively evenly distributed across the various groups. Furthermore, the table reveals that the majority of participants are aged 30 - 49, and that this is generally consistent across the different groups. The table additionally demonstrates a considerable range in the yearly income of the participants, wherein the majority of participants earn less than \$45,000 a year. Progressing, a majority of the participants have higher education, where the largest bundle are those with a Bachelors’ degree, and the smallest group are those with a PhD.³

³This table, Table 3.5, is divided into sub-sections and illustrated graphically in appendix 2 (A2).

		Control	Treat 1	Treat 2	Treat 3	Total
Gender	<i>Female</i>	61	59	66	54	240
	<i>Male</i>	52	54	44	56	208
Age	<i>18 - 29</i>	17	18	20	22	77
	<i>30 - 49</i>	76	66	57	63	262
	<i>50 - 69</i>	17	28	32	26	103
	<i>70 +</i>	3	1	1	1	6
Income	<i>\$0 - \$25K</i>	29	36	30	30	125
	<i>\$25K - \$45K</i>	37	32	37	41	147
	<i>\$45K - \$60K</i>	24	24	18	17	83
	<i>\$60K - \$75K</i>	11	9	13	11	44
	<i>\$75K - \$90K</i>	5	5	5	7	22
	<i>\$90K +</i>	7	7	7	6	27
Education	<i>High School</i>	27	21	26	24	98
	<i>Year-Study</i>	19	11	10	6	46
	<i>Bachelors</i>	50	65	55	60	230
	<i>Masters</i>	15	15	17	21	68
	<i>PhD</i>	2	1	2	1	6

Table 3.5: Distribution of different demographics on the treatment groups

3.7 Empirical Strategy

This section comprises our empirical strategy. To ensure a high level of reliability, we have decided to commit to a plan of analysis. We believe that our experimental study contains a high level of reliability as it should be possible to recreate and conduct at a late point in time. Moreover, as reliability is highly important, data processing has been of major concern to us. To easier allow for reenactment of our experiment, we have attached both our data and the Python code which has been used to create empirical models. We express that the data has been processed in a justifiable and objective manner. Nevertheless, human error may have incurred. Seen in total, we believe that the reliability

of our empirical strategy is strong.

When analyzing the data we gather from our experiment, we will utilize both descriptive statistics and inferential statistics.

3.7.1 Descriptive Statistics

The descriptive statistics we will incorporate in this paper include descriptive features of our participants, features within the various treatment groups, and descriptive summaries of their answers. While descriptive statistics alone will not be sufficient to determine statistical significance or answer our hypotheses, we find including this informative and appropriate.

3.7.2 Inferential Statistics

For our inferential statistics we will mainly use linear regression and t-tests, which of the latter is a tool used to evaluate the means of one or two populations using hypothesis testing (JMP, 2022).

There are different types of t-tests. A one-sample t-test is can be used to determine whether a single group differs from a known value, while a two-sample t-test can be used to determine whether two independent groups differ from each other. We will perform both one-sample and two-sample t-tests, depending on the data we are analyzing.

All t-tests we will perform will be one-tailed t-tests, as this is most appropriate with respect to our hypotheses; we want to study whether precise prices (and a self-proclaimed cost focus) will influence consumers into thinking that costs are higher and prices are fairer than with rounded prices.

The majority of the questions in our survey are Likert-style rating questions. Such questions allow the participants to indicate to what degree she or he agrees or disagrees with a statement. The participants answer these questions on a scale from 1 (strongly disagree) to 7 (strongly agree), so the data we gather here is ordinal data. In an ordinal scale, participants' responses can be ranked, but the distance between the responses is not really measurable (Artino & Sullivan, 2013). Therefore, there are disagreements whether the numerical responses can be treated as interval data, that is, whether one can

analyze the ordinal data by using means, standard deviations and parametric statistics. While there seems to be a growing trend of researchers arguing that Likert scales can be treated as interval data, there is a unison agreement that single Likert items should still be treated and analyzed as ordinal data. Consequently, instead of using parametric tests like t-tests we will look at the median and the most frequent responses when analyzing these responses.

To further test if there are significant differences between the different groups of study, we will use linear regression to gauge what effect a specific price has on the cost estimation of a product. After collecting our data, we will use the following multiple linear regression to estimate the effects of precise pricing:

$$E = Constant + \alpha_1 P + \alpha_2 C + \alpha_3 P \times C$$

Where the variables in the regression represent the following:

<i>E</i> :	Cost Estimation
<i>P</i> :	Precise Price
<i>C</i> :	Cost Focus

To best interpret this multiple regression, we present an explanation of the coefficients:

<i>Constant</i> :	Cost estimation when the price is round and no cost focus
<i>P</i> :	Shows the effect of an odd price and no cost focus
<i>C</i> :	Shows the effect of cost focus and a round price
<i>P</i> × <i>C</i> :	Shows the effect of cost focus and an odd price

This linear regression is used as an empirical tool enabling us to analyze the fundamental aspect regarding our thesis. Worded differently, possible differences in cost estimations between the different treatment groups will help us determine what effect odd pricing and cost focus manipulation have on consumers perception of the production costs. Earlier studies indicate what differences we are expected to see, and we have therefore used this a base for our hypotheses.

3.7.2.1 Hypotheses in regression model

The following will infer out hypotheses with a base in the linear multiple regression that we presented earlier:

$$E = Constant + \alpha_1 P + \alpha_2 C + \alpha_3 P \times C$$

In the process of deducing this linear multiple regression, the constant yields an estimated value to where the participant sees neither a specific price nor a cost focus manipulation, which corresponds to the control group of our experiment. We are interested in seeing how the effects of our created dummy-variables, with respect to the 2x2 experimental model, will affect the cost estimation coefficient.

The P-coefficient shows the effect of a participant seeing a precise price, which corresponds to treatment group 1 (non-cost focus and a precise price) and treatment group 3 (cost focus and a precise price) in our experiment. Interpreting the earlier literature review regarding precision effect (also known as the anchoring effect), we can expect that the P-coefficient will be significantly positive (i.e., a precise price will increase the cost estimate of participants).

The C-coefficient shows the effect when a participant has been exposed to a cost focus. This corresponds to treatment 2 (cost focus and a precise price) and treatment 3 (cost focus and an odd price) of our experiment. This is more intuitive as a firm that communicates that they have a cost-based focus may seem more fair as opposed to a firm that does not. We can expect that the C-coefficient will be positively statistically significant (i.e., a cost focus manipulation will yield higher cost estimations from a participant).

The $P \times C$ -coefficient show the effect by combining an odd price and a cost focus. In our experiment, this corresponds to treatment group 3 (cost focus and a precise price). Because these effects individually are believed to be significantly positive, we also believe this coefficient to be significantly positive. Our hypotheses therefore translate to:

H_1 : P -Coefficient is significantly positive

H_2 : $P \times C$ -Coefficient is significantly positive

To best avoid eliciting statistically significant results, we wish to state, in advance, what level of significance we will use. To verify our hypotheses, we presuppose that they are significant on a 95% confidence level. Since earlier studies show that a precise price can lead to higher purchasing cost estimates (Janiszewski & Uy, 2008), we have good reason to anticipate that production cost estimations will correlate strongly with this. Thus, we will apply a one-sided significance calculation on the P -coefficient. However, due to the lack of empirical evidence to support our initial assumption that the $P \times C$ -coefficient would be significantly positive, we will use a two-tailed significance test for the $P \times C$ -coefficient. This will allow us to accurately assess the direction of the coefficient, regardless of our initial assumptions.

After analyzing the fundamental aspects of our thesis, we also wish to map if the potential effects we observe are stronger in some demographic groups. In addition, we wish to see if those who type the word “cost” in the manipulation check have different results.

3.7.2.2 Control Variables

To test whether demographic groups behaves differently than others, we collect and analyze data regarding their gender, age, income, and education. The inclusion of these variables allows us to see if they have a significant effect on the estimations of our participants.

Dummy Variable	0 (Categories)	1 (Categories)
Gender	Female	Male
Age	18 - 29, 29 - 49	50 - 69, 70 +
Education	High School, Year Study	Bachelors, Masters, PhD
Income	0 - 25K USD, 25K - 45K USD, 45K - 60K USD	60K - 75K USD, 75K - 90K USD, 90K USD +

Table 3.6: Categorization of Variables

Each background category will be converted to a dummy variable. The categorization of the different variables is listed in Table 3.6.

Our paper has thus far uncovered the research needs within specific pricing, which is reflected in our thesis. We derived this thesis by mapping previous studies and literature on both this and similar topics. This literature has enabled us to develop an experimental study and form hypotheses related to our expected results. We have outlined an empirical strategy that will enable us to obtain statistical answers to our thesis, statistical answers that we will discuss in the upcoming section.

4 Results

The present chapter aims to examine the relationship between price structure and cost and its implications for both cost and profit estimation. Specifically, we test the hypothesis that participants exposed to precise prices will provide consistently higher cost estimates compared to those exposed to round prices. We also explore the relationship between price structure and profit, which can be considered as an inverted form of cost estimation. Finally, we investigate participants' perceptions of precise and rounded prices in relation to cost-based pricing strategies and fairness.

4.1 Hypothesis 1: Increased cost estimates

We hypothesize that a precise price will increase the cost estimate of a given product. With the intention of investigating this, the participants were asked to provide an estimate of the production costs for one of YourKitchen's products.

	Control (RN)	Treat 1 (PN)	Treat 2 (RC)	Treat 3 (PC)
Count	113	113	110	112
Mean (\$)	\$8.17	\$9.64	\$9.75	\$9.88
Std (\$)	\$4.41	\$5.31	\$5.43	\$5.12
Mean (% of price)	40.83%	47.78%	48.76%	48.97%
Std (% of price)	22.05%	26.35%	27.15%	25.38%

Table 4.1: Descriptive statistics of cost estimation experiment

In this part of our study we briefly explain the descriptive statistics on the cost estimation experiment before we move over to our sub-hypotheses. The structure of answering our hypothesis will be built up by answering the three sub-hypotheses.

Interpreting Table 4.1, we can infer that it supports our initial hypotheses of a precise price to increase the cost estimate, derivable from the fact that the precise price and neutral cost focus mean (treatment 1) is larger than the round price and cost focus mean (control group). This, combined with the precise price and cost focus (treatment 3) having a larger mean than the round price and cost focus (treatment 2), we infer that $PN > RN$

& PC > RC. However, to study the credibility of the descriptive data, we wish to conduct empirical methods to determine if these differences in means have statistical significance. To best account for the effect an extra 17 cents (\$0.17) have on the price (i.e., some groups see \$20 and others see \$20.17), we have transformed the estimation data to a percentage of the price. In Table 4.1 above, this information is procurable by the fact that \$9.64 divided by \$20.17 equals 47.78%.

The following will first examine the differences between the Control group (round price and consistency-focus) and treatment group 1 (precise price and consistency-focus), before progressing on to exploring the differences between treatment group 2 (round price and cost-focus) and treatment group 3 (precise price and cost-focus). In closing, we aggregate the results to see what effect the different coefficients have on cost estimates.

4.1.1 Sub-hypothesis 1.1: RN cost estimates < PN cost estimates

To view the precise pricing effect in isolation, we will first compare the control group, RN (round price and no cost focus) to treatment 1, PN (precise price and no cost focus). Here, we expect that the mean of PN will be larger than that of RN, verifying our sub-hypothesis of a precise price (in isolation) having a positive effect on the cost estimate.

As illustrated in Table 4.1, the average cost estimation in the control group (rounded price and consistency-focus) was \$8.17 (40.83% of selling price), while the average cost estimation in treatment 1 (precise price and consistency-focus) was \$9.64 (47.78% of selling price). With the intention of determining whether this difference is statistically significant we have, as illustrated in Table 4.2, performed two one-tailed two-sample t-tests, one with absolute monetary value, and one which adjusts for the 17 cent (\$.17) difference.

Cost Est.	Mean (RN)	Mean (PN)	Difference	t-value	p-value
Monetary	\$8.17	\$9.64	\$1.47 (18%)	2.264	0.012
% Adjusted	40.83%	47.78%	17.02%	2.150	0.016

Table 4.2: t-test on differences between RN & PN cost estimation means

The t-tests yield p-values of 0.012 and 0.016, for monetary and adjusted cost-estimation means, respectively. Hence, the t-tests verifies that there are indeed differences between

the groups' cost estimates. We can thus confirm our sub-hypothesis that the differences on the means between groups (RN & PN) are statistically significant.

4.1.1.1 Controlling for background variables

To further discuss these statistically significant results, we introduce background variables in a regression model to see if any of these variables can help substantiate or undermine our results.

	(1)	(2)	(3)	(4)	(5)	(6)
Precise Price	0.070** (0.032)	0.069** (0.032)	0.071** (0.040)	0.069** (0.032)	0.069** (0.033)	0.069** (0.033)
Gender		0.021 (0.033)				0.022 (0.033)
Age			-0.018 (0.039)			-0.016 (0.040)
Income				-0.033 (0.041)		-0.036 (0.042)
Education					0.002 (0.034)	0.008 (0.035)
Constant	0.408*** (0.023)	0.399*** (0.027)	0.412*** (0.024)	0.415*** (0.024)	0.407*** (0.031)	0.404*** (0.036)
Observations	226	226	226	226	226	226
Adjusted R ²	0.016	0.013	0.012	0.014	0.011	0.026

Note 1:

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4.3: Effect of precise price on cost estimates (incl. background variables)

Analyzing the regression results from Table 4.3, we see that there are six (6) different linear regression models, derived from the groups that have not been cost focus manipulated (RN & PN). Model (1) displays the effect a precise price has on the participants' cost estimate.

The models from model (2) through model (5) takes in account the cost estimates of each background variable in addition to the effect of precise pricing. The models include variables regarding gender, age, income and education. Model (6) combines all background variables and estimates their effect in the same regression model.

We see that the Precise Price coefficient is statistically significant with a p-value below 0.05 in all models. This aligns with the discovery in our initial t-tests, ref. Table 4.2. Interpreting this, the regression model show that those who are presented with a precise price will consistently estimate the product costs to account for 7%-points more of the selling price (17.02% increase)⁴ as opposed to those who see a round price.

In all of the models (2), (3), (4), (5) & (6), all background variables achieve a p-value above 0.05. This implies that we can not verify differences in cost estimates based on the background variables. This may stipulate that there are not large enough differences within the demographic groups and that our selection is too small to determine statistically significant differences. Consequently, it is not feasible to establish whether there is a divergence on cost estimates between females and males, those over and under 50 years old, those with and without higher education, and those who make more or less than \$60,000 a year.

In summary, we find that our first sub-hypothesis is verified as the Precise Price coefficient is significantly positive in all regressions with p-values less than 0.05, such as both the absolute and adjusted t-tests. In our analysis, we observe no obvious income effect, further substantiating our claim on precision pricing and psychology.

4.1.2 Sub-hypothesis 1.2: RC cost estimates < PC cost estimates

Moreover, the 2x2 factorial design allows us to view if there are differences in treatment groups 2 & 3 (RC & PC), where both groups are cost manipulated, with the only difference being whether the displayed price for a set of six glasses is rounded (RC) or precise (PC).

Figure 4.1 illustrates that the average cost estimation in treatment 2 (rounded price and cost-focus) is \$9.75 (48.76% of the selling price), while the average cost estimation in treatment 3 (precise price and cost-focus) was \$9.88 (48.97% of the selling price). To examine whether there is statistical significance between these means, we conducted two

⁴ $0.07 / 0.408 = 17.02\%$

additional one-tailed two-sample t-tests to examine whether the difference in estimations between the treatment groups.

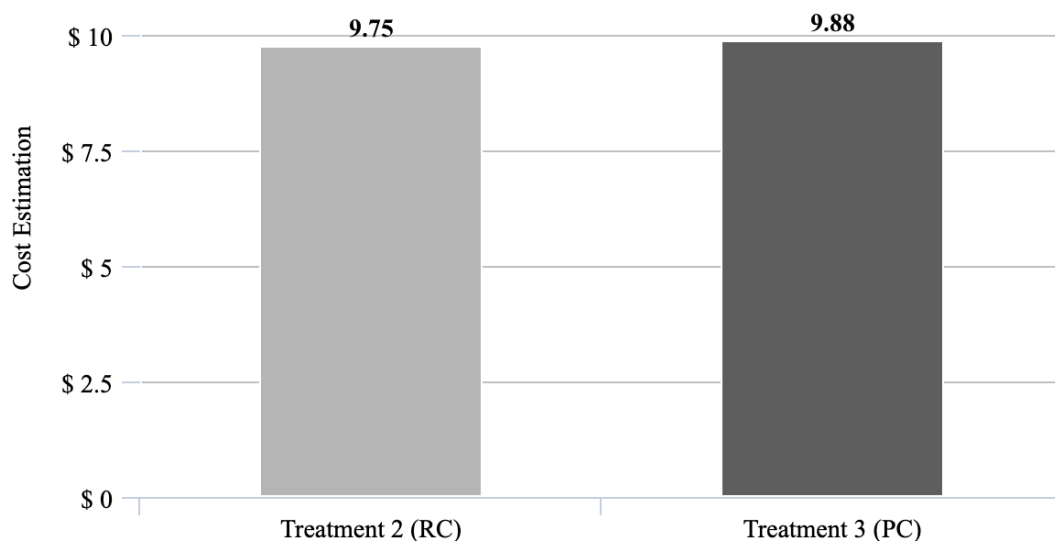


Figure 4.1: Treatment 2 & Treatment 3 participants' cost estimation means

From Table 4.4, we infer that the p-values of the t-tests are 0.427 and 0.476 for the monetary and adjusted cost estimation means, respectively. Consequently, we are far from being able to reject the null hypothesis that the means are equal. Thus, we conclude that the difference between the groups are statistically insignificant.

Cost Est.	Mean (RC)	Mean (PC)	Difference	t-value	p-value
Monetary	\$9.75	\$9.88	\$0.13 (1.33%)	0.184	0.427
% Adjusted	48.76%	48.97%	0.43%	0.056	0.476

Table 4.4: t-test on differences between RC & PC cost estimations

The results from the t-tests we have conducted seem to suggest that while precise prices are correlated with higher estimations of production costs, this effect seem to strongly diminish, or even vanish, when a firm has a self-proclaimed cost focus.

4.1.3 Sub-hypothesis 3: $(RN + RC) < (PN + PC)$

With our thesis, we wish to investigate how a cost focus manipulation affect the precise price effect that we have derived above. We found that a precise price has a significant

effect on cost estimations when participants were subject to no cost focus, whilst we did not infer this effect when the participants had been subject to cost focus manipulation. The following will investigate the aggregated result of the two previous findings.

	(1)	(2)	(3)	(4)	(5)	(6)
Precise Price	0.036*	0.032*	0.036*	0.032*	0.070**	0.066**
	(0.024)	(0.024)	(0.024)	(0.024)	(0.034)	(0.034)
Cost Focus			0.045**	0.045**	0.079***	0.080***
			(0.024)	(0.024)	(0.034)	(0.034)
P x C					-0.067	-0.068
					(0.048)	(0.048)
Constant	0.447***	0.429***	0.425***	0.409***	0.408***	0.393***
	(0.017)	(0.027)	(0.021)	(0.029)	(0.024)	(0.031)
Control Variables	(No)	(Yes)	(No)	(Yes)	(No)	(Yes)
Observations	448	448	448	448	448	448
Adjusted R ²	0.003	0.000	0.009	0.006	0.011	0.008

Note 1:

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4.5: Regressing to isolate effects

In Table 4.5, we see six different linear regression models, all on the entire data set (of 448 observations, ref. Table 4.1). Model (1) shows the effect of utilizing a precise price, model (2) includes the background variables, model (3) include cost focus in addition to a precise price, model (4) does the same, only difference is controlling for background variables. Progressing, model (5) has the same coefficients as model (3) combined with the cross-effect coefficient between a precise price and a cost focus. Lastly, model (6) controls model (5) for background variables. All models determine standard deviations by the Huber-White estimator, which is a common method for estimating robust standard errors.

Regarding model (1), this combines the earlier effects that we derived, namely the statistical significant difference between RN (round price and consistency-focus) & PN

(precise price and consistency-focus) and the insignificant difference between RC (round price and cost-focus) & PC (precise price and cost-focus) and explains the difference between these aggregated groups by only the precise price flag. Here, it is apparent that although the effect is not statistically significant on a 0.05 level, it is marginally significant with a p-value of 0.065. This implies that the precise price coefficient is a sub-par measure for estimating effects in the entirety of our data set, further indicating that the precise price effect diminishes as a firm claims a cost focus. Controlling for background variables in model (2) aggravates the statistical significance.

Progressing on to model (3) where we include a cost focus coefficient, we reason that this model is better at explaining changes on cost estimates as the adjusted R^2 increases and the cost focus coefficient is statistically significant, whilst there being no apparent changes to the precise price coefficient. In addition, this model substantiates our findings that cost focus dilutes the precise price effect. Controlling for background variables in model (4) decreases the R^2 , the p-value of the precise price coefficient and keeps the cost focus coefficient on the same p-value. Worded differently, controlling for background variables creates a worse model.

Model (5) also includes a combination of the two other coefficients (precise price and cost-focus) in addition to the individual coefficients. Both the coefficients for a precise price and cost focus have increased with 94.44%⁵ and 75.56%⁶ respectively, further strengthening the stand-alone effects of these coefficients. Not surprisingly, because we have already determined that both the effect of precise price and cost focus work in the same direction, with a diminishing effect, $P \times C$ must pull in the opposite direction, contrary to our initial beliefs. We infer that this is true as $P \times C$ affects the selling prices' share that is the cost estimate with a 6.7% reduction. This effect is, however, not statistically significant with a 95% confidence level with its p-value of 0.157. Interestingly, we find that a precise price and a cost-focus have eerily similar effect on the cost estimate with an increase of 7%- and 7.9%-points, yielding relative increases in cost estimates of 17.16% and 19.36% respectively. Controlling for background variables in model (6) indicates nothing notably different from model (5).

⁵ $0.07/0.036 = 94.44\%$

⁶ $0.079/0.045 = 75.56\%$

Summarizing our findings, we find that an isolated precise price (i.e., not claiming cost-focus) statistically significantly affects the average cost estimate with a 7% share increase of the selling price (17.16% increase). This is, however, not true when a precise price is seen in combination with a cost-focus, as we did not find statistical significance to support sub-hypothesis 1.2. The empiricism suggest that the precise pricing effect is diminished as a cost-focus is self-proclaimed. Interestingly, a precise price and a claimed cost-focus seem to have eerily similar effects when seen in isolation.

4.2 Hypothesis 2: Synergies of precise price and cost focus

We hypothesized that the deviation in cost estimations would be bigger between the control group, RN (round price and consistency-focus), and treatment 3, PC (precise price and a consistency-focus), than for any other pair of treatments. The control group (RN) were informed that YourKitchen has a consistency-focus, and were presented with a rounded price. On the other hand, treatment 3 (PC) included both the cost-focus and precise price manipulations. While we believed that both manipulations would have an individual effect on the participants' answers, we also believed that there would be positive synergies between the two manipulations. Nevertheless, interpreting regression model (3) from Table 4.5, one can intuitively infer that hypothesis 2 does not hold.

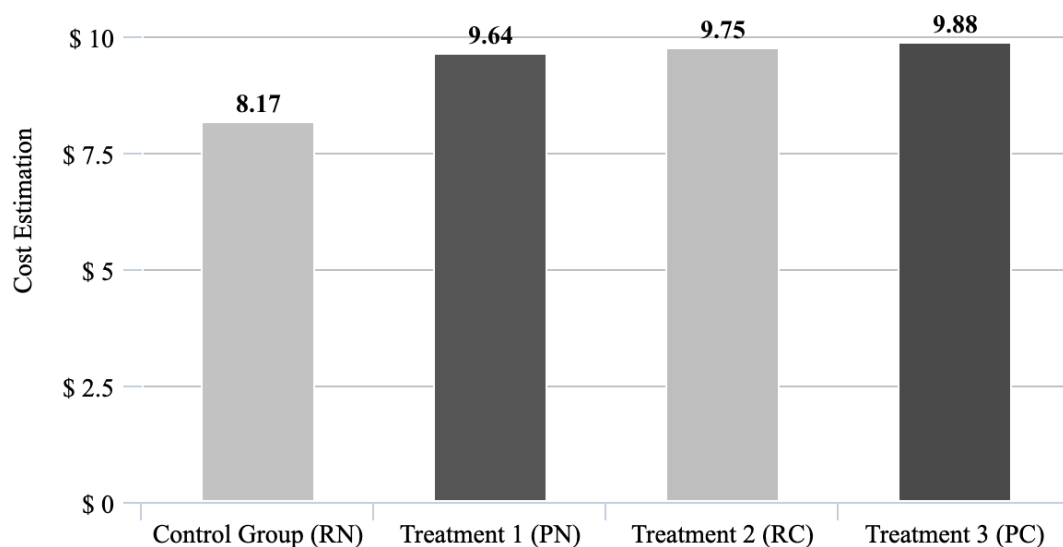


Figure 4.2: Means of cost estimates across treatments

Figure 4.2 illustrates the average cost estimates for all of the four treatments. The deviation between the control group and treatment 4 is clearly bigger than for any other pair of treatments, but what is also inferable is the indisputable fact is that the difference diminishes instead of increasing (i.e., the effects does not synergize).

Therefore, we cannot conclude that there are positive synergies between the two manipulations in our experiment. As shown under Hypothesis 1, the deviation between treatment 2 (RC) and treatment 3 (PC) is not statistically significant. We have also conducted a t-test with regards to the deviation between treatment 1 (PN) and treatment 3 (PC), which gave a p-value of 0.365. This is far from being below the significance level of 0.05, and is therefore not even remotely close to being statistically significant. Accordingly, we conclude that there are no statistically significant indications of positive synergies between precise prices and a proclaimed cost-focus, on the contrary, a rather strong indication of the opposite.

4.3 Hypothesis 3: Cost-based pricing

We hypothesized that the participants would believe that firms with precise prices uses a cost-based pricing strategy to a higher degree than firms with rounded prices. This was based on our hypothesis that consumers believe that precise prices are correlated with higher costs, as well as prior research showing that consumers tend to believe there must be a reason why precise numbers are so precise.

	Control (RN)	Treat 1 (PN)	Treat 2 (RC)	Treat 3 (PC)
Strongly Disagree	3.54%	0.88%	0.88%	2.68%
Disagree	23.08%	19.46%	11.82%	18.75%
Neutral	12.39%	11.50%	9.09%	15.18%
Agree	42.47%	47.78%	58.18%	47.32%
Strongly Agree	18.58%	20.35%	20.00%	16.07%
Total	113	113	110	112

Table 4.6: Cost-Based Pricing (agreeableness ranked by participants)

Following the production cost estimates of the product provided by participants, they were asked to which degree they agreed with three different statements, including whether they believed the price of YourKitchen's product was based on their costs. The response distribution to this statement is illustrated in Table 4.6.

The participants answered this question on a scale from 1 (strongly disagree) to 7 (strongly agree). To make the table easier to read, we have combined 2 and 3 to "Disagree" and 5 and 6 to "Agree". Whilst the median answer of treatment 2 is 6, the median answer of the other groups was 5. We also find it interesting to look at the percentage of participants having answered 5 or higher (meaning those who agree or strongly agree) in the different treatments. While treatment 2 has the highest share with a 78.18% share greater or equal to 5, the control group has the lowest share with 61.05%, marginally lower than treatment 3 with 63.39%. We find, as expected, that the treatment with neither a precise price nor a cost focus had the lowest share of participants agreeing with the cost-based statement. However, there are not much that differ the control group from the two treatments with precise pricing. It is rather surprising that the deviation in responses between the control group and treatment 3 is so small. Based on these answers, it seems that solely proclaiming a cost focus (treatment 2) has the biggest effect on this perception.

Towards the end of experiment, the participants were presented with a snippet from Søstrene Grene's (Appendix 1) website, showing three of their products with precise prices. They were then asked why they think some firms consistently use precise prices. We included five different statements, to which the participants rated to what degree they agreed with, as well as an open-ended question allowing them to provide any other reflections they had on the subject. Table 4.7 display the different statements that the participants were asked to rank on various degrees of agreeableness.

#	Statements
1	This is the lowest possible price they can charge
2	This is the highest possible price they should charge
3	The price signals cost-based prices (costs plus a fixed markup)
4	This price strengthens/differentiate their brand
5	This pricing strategy is used to be perceived as old fashioned

Table 4.7: Statements on the pricing strategy of Søstrene Grene

Using these statements and their results, we have, in Table 4.8, derived the distribution of the answers for the different statements. Although not illustrated in the table, the cost-based alternative has the highest median response together with the “To strengthen their brand” statement. This corresponds well with our hypothesis. Interpreting Table 4.8 only about 1 in 5 participants (20.53%) disagreed with the statement that precise prices signal cost-based prices, while almost 3 in 5 (56.70%) participants agree with the statement to some degree.

	Lowest	Highest	Cost Based	Branding	Old Fashioned
Strongly Disagree	53	66	24	33	66
Disagree	140	161	68	95	161
Neutral	86	94	102	70	94
Agree	140	113	221	204	113
Strongly Agree	29	14	33	46	14
Total	448	448	448	448	448

Table 4.8: Count of votes on different statements

When asked whether they could think of any other reasons why firms operate with precise prices, a great number of the participants provided some quite insightful responses. Some wrote reflections related to the cost-based pricing alternative, such as three participants who wrote “It might be based on the cost to produce each item, they’re not rounding anything up”, “they have a fixed profit margin”, and “I imagine it’s based on specific profit mark-up calculations, to me it feels like I’m being scammed”. Many (128) participants discussed various psychological reasons as to why firms use precise pricing, including trying to influence customers’ perceived fairness, to make customers believe there is no middleman, and to make customers believe that the products are cheaper than they actually are. Some (9) participants hypothesized that firms use precise pricing in order to appear more fair, while 23 participants believed it is a measure to stand out.

In conclusion, it is difficult to determine, based on this statistical evidence, whether firms that use precise prices are consistently thought to have a cost-based pricing strategy. However, Table 4.8 indicate that a majority of the participants believe that precise pricing in general is a signal of a cost-based pricing procedure.

4.4 Hypothesis 4: Perceived Fairness

With our fourth hypothesis, we believed that the participants from the precise price treatments would have a higher perceived price fairness than the rounded price treatments. The intuition behind this hypothesis was based on our previous hypothesis, namely that the participants would believe precise prices to signal cost-based pricing. It follows from research that consumers find a cost-based pricing procedure being more fair than other widely used alternatives (Meng & Nguyen, 2012).

The participants were asked: "To what degree do you perceive this (\$20/\$20.17) as a fair price?". In Table 4.9, we have illustrated the response distributions for the different treatments. The participants answered this question on a scale from 1 (strongly disagree) to 7 (strongly agree). To make the table easier to read, we have combined 2 and 3 to "Disagree" and 5 and 6 to "Agree". The distribution is skewed towards the top ratings for all four groups, and they all have the same median response (5). The most frequent response for treatment 3 is 6, while the it is 5 for the rest of the groups. All groups are quite equally agreeable when it comes to rating the price fairness.

	Control (RN)	Treat 1 (PN)	Treat 2 (RC)	Treat 3 (PC)
Strongly Disagree	-	0.88%	-	0.89%
Disagree	15.04%	13.27%	6.37%	11.60%
Neutral	17.70%	22.12%	24.55%	20.54%
Agree	50.44%	51.32%	52.72%	55.36%
Strongly Agree	16.81%	12.39%	16.36%	11.61%
Total	113	113	110	112

Table 4.9: Price fairness (agreeableness ranked by participants)

These responses are somewhat surprising seen in light of the average cost estimates of the different groups. While the average production cost estimate in the control group was more than \$1.7 higher than the average estimate of treatment 3, this has seemingly not created a deviation in perceived price fairness between the groups. These results would suggest that the price itself is the sole factor influencing consumers perceived fairness, contrary to prior research.

4.5 Hypothesis 5: Decreased profit estimates

We hypothesize that a precise price will decrease participants' profit estimate of a given product. In the following part of our study, we present some descriptive statistics on the profit estimation experiment before we deduce the hypothesis by means of empirical methods.

Upon answering a variety of questions about YourKitchen, the participants were introduced to their fierce competitor, CutleryHaven. In treatments where YourKitchen used precise prices, CutleryHaven used rounded prices, and vice versa. This means that we now only have two treatment groups, those who see rounded prices and those who see precise prices. The participants were then asked to provide an estimation of their profit per unit on one of their products. The intention was once again to study whether a precise price would lead consumers to believe that costs accounted for a larger share of the price than with a rounded price. Worded differently, we expect the profits of a round price treatment to be higher than those with a precise price treatment.

	Precise Price	Rounded Price
Count	222	225
Mean (\$)	\$16.96	\$17.95
Std (\$)	\$7.27	\$7.51
Mean (% of price)	48.27%	51.29%
Std (% of price)	20.69%	21.48%

Table 4.10: Descriptive statistics of profit estimation experiment

Table 4.10 displays the average profit estimations of the two groups. As hypothesized, the participants who were presented with a precise price provided a lower average profit estimation. Nevertheless, the sample size could be larger (with only 448 observations) and the standard deviation is quite large for both groups. As illustrated in the t-test results in Table 4.11, the difference between the two groups' means are marginally significant with a p-values of 0.079 and 0.065 for the monetary and adjusted values, respectively.

Profit Est.	Precise Mean	Round Mean	Difference	t-value	p-value
\$ Monetary	\$16.96	\$17.95	\$0.99 (5.84%)	1.416	0.079
% Adjusted	48.27%	51.29%	6.26%	1.513	0.065

Table 4.11: t-test on differences between precise and round profit estimations

We believe that this marginal significance is a clear indicator of an effect, meaning this could be very interesting with a slightly increased sample size. A statistically significant result here would substantiate our suspicions of the cost estimations consisting of more than just an anchor effect. We do believe our results is an indication of so.

If there indeed is no effect of a precise price on the profit estimation, one can infer that there is little consistency between the results of hypothesis 1 and these results (i.e., statistical significance of an increased cost estimates due to a precise price should also translate into a decreased profit estimate, given that the effect is consistent, as the precise price effect is isolated here).

4.6 Supplementary analysis

The comprehensive nature of the experimental study allows for the examination of supplementary analyses. In this section, we will examine some results that are not directly related to our five main hypotheses, as well as present some cross-results. These results provide further insights into the phenomena under investigation and help to deepen our understanding of the study's findings.

4.6.1 Confidence of Cost Estimates

Upon giving a cost estimate on the set of six glasses sold by YourKitchen, participants were asked to state how confident they were with this answer. Here, there were participants who responded 0%, and others responded that they were 100% certain. We found it interesting to examine whether the mean and median confidence levels varied across the different treatment groups.

Viewing Table 4.12, it is apparent that the means are eerily similar, standard deviations are quite high, and that the median values are exactly the same for all treatments. With

this, we infer that there are no clear signs of any of these groups behaving with different confidence levels when estimating the cost of the product. Due to the sheer size of the means' standard deviations, further statistical measures seem redundant.

	Control Group	Treatment 1	Treatment 2	Treatment 3
Count	113	113	110	112
Mean	56.90%	57.66%	58.19%	57.39%
Std	28.40%	26.08%	23.62%	24.41%
Median	60%	60%	60%	60%

Table 4.12: Confidence level of cost estimates across treatments

The findings of our study suggest that precision of the price does not have a statistically significant effect on participants' confidence in their cost estimates. This implies that other factors may be influencing participants' confidence in their estimations. Further investigation of these potential factors may provide valuable insights into the processes underlying cost estimation.

4.6.2 Successful Cost Focus Manipulation

When participants were asked to convert the word fragment ' __st' into a meaningful word, approximately 21.17% of the participants that were subject to the cost focus manipulation wrote "cost". In this section, we look into whether their responses may differ from the remainders of those who were subject to the cost focus manipulation. To briefly reiterate over the statistics of the manipulation check, refer to Table 4.13 below.

	Non Cost Focus	Cost Focus	Total
Selection	226	222	448
Wrote 'cost'	6	47	53
%	2.66%	21.17%	11.83%

Table 4.13: Cost Manipulation results' distribution

4.6.2.1 Successful Cost Focus Manipulation & Cost Estimates

The following will be much like our initial hypothesis where we analyzed the difference in cost estimation means across the treatment groups. We aim to test whether there are statistically significant differences between those who wrote cost in treatment groups 2 & 3 and those who did not write cost (also treatment group 2 & 3). We focus here solely on these two treatment groups as these were the only ones who were subject to the cost focus manipulation.

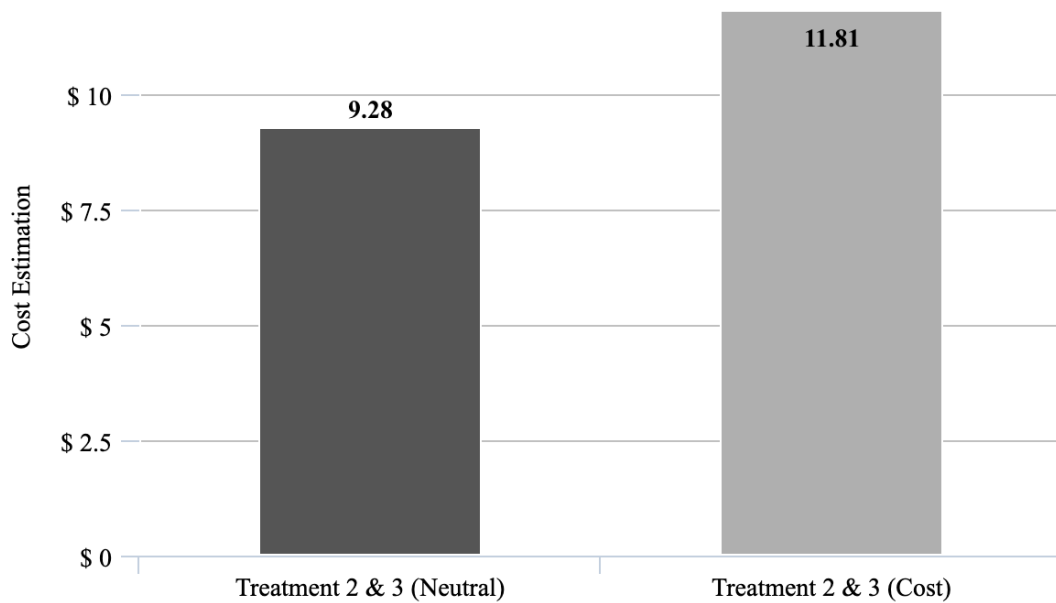


Figure 4.3: Means of cost estimates across 'successful' cost manipulation

Inferring Figure 4.3, it is apparent that there are clear differences in the means. Participants from treatment 2 & 3 who did not write cost have a mean of \$9.28 on their cost estimates, whereas those who wrote cost have a mean of \$11.81. Further, we are interested in examining if this is a statistically significant difference, have therefore conducted a one sided t-test on two different populations.

	Neutral	Cost	Difference	t-value	p-value
Cost Est.	\$9.28	\$11.81	\$2.53 (10.76%)	2.557	0.004

Table 4.14: t-test on differences between RC & PC cost estimations

Table 4.14 shows that the \$2.53 (10.76%) difference is indeed statistically significant with a p-value rather close to zero. Therefore, we must conclude that the cost estimates of

those who wrote cost in the manipulation check on the page before the cost estimation consistently have given a higher cost estimate opposed to those who wrote a more neutral word.

4.6.3 Comparing YourKitchen and CutleryHaven

In the last experimental section of our study, where participants are asked to estimate the profitability of CutleryHavens product "Deep Dish, 6 pieces", participants are also asked to compare YourKitchen and CutleryHaven on profitability and fairness. This section aim to derive and analyze these responses.

4.6.3.1 Profitability Comparison

Directly after giving a profit estimate, participants are asked who is more profitable (per product) of YourKitchen and CutleryHaven. When answering, they have three different options, namely: (1) CutleryHaven profits more on average, (2) they are equally as profitable on average, and (3) YourKitchen profits more on average. Primarily, this analysis will examine whether there are differences in those who see round prices at YourKitchen and precise prices at CutleryHaven, and vice versa. Our initial belief is that the participants will believe the precise precises to be relatively less profitable as opposed to the round prices.

	Round / Precise ($n = 223$)	Precise / Round ($n = 225$)
YourKitchen	13%	21%
Equal profits	38%	35%
CutleryHaven	49%	44%

Table 4.15: Profitability comparisons across two treatments

Interpreting Table 4.15, the 'Round / Precise ($n = 223$)' group consists of the control group and treatment 2. These groups both see a round price at YourKitchen and then precise prices at CutleryHaven. Moreover, the 'Precise / Round ($n = 225$)' group consists of treatment 2 & 3, where the participants experience the reverse order of prices. Of the participants that first saw a round price and then a precise price, only 13% believed that

YourKitchen (round price) profited more. Progressing, of those that first saw a precise price and then a round price, 21% believed that YourKitchen (precise price) profits more. This is not only contradictory to our initial beliefs, but this is also the opposite of what the results from hypotheses 1 and 5 indicate, implying inconsistency from the participants, or possibly a poorly framed question.

As previously demonstrated, the results of the precise price effect were not as statistically significant when analyzed on an aggregate level (i.e., without separating the cost focus treatments). To address this issue, we increase the granularity of the analysis by creating a table similar to Table 4.15, but with all four treatment groups included. This will allow for a more detailed examination of the data and may provide further insight.

	Control Group	Treatment 1	Treatment 2	Treatment 3
YourKitchen	16%	19%	9%	22%
Equal profits	40%	35%	36%	35%
CutleryHaven	44%	45%	55%	43%

Table 4.16: Profitability comparisons across all treatments

Viewing Table 4.16, it is apparent that Treatment 2 (participants have been exposed to cost focus, they see a round price at YourKitchen and a precise price at CutleryHaven) differ far more than the other groups. Inferring from this, only 9% in this treatment group believed YourKitchen to profit the more, whereas we initially hypothesized this to be larger than its precise / round counterpart (Treatment 3). While not as extreme, we see the same trend between the control group and treatment 1.

As these results are contradictory to earlier findings, we raise the issue of our question imposing the backfiring effect.

4.6.3.2 Fairness Comparison

In addition to a profitability comparison, the participants were asked to do a similar comparison, but this time for fairness. Like earlier, when the participants answered, they had three different options, namely: (1) CutleryHaven has more fair prices, (2) they are equally as fair, and (3) YourKitchen has more fair prices. Primarily, this analysis will

examine whether there are differences in those who see round prices at YourKitchen and precise prices at CutleryHaven, and vice versa. Our initial belief is that the participants will believe the precise prices to be relatively more fair than as opposed to the round prices.

	Round / Precise ($n = 223$)	Precise / Round ($n = 225$)
YourKitchen	49%	43%
Equally as Fair	45%	45%
CutleryHaven	6%	12%

Table 4.17: Fairness comparison across two treatments

Examining Table 4.17, it is apparent that it shows a different story than what was initially believed. We believed precise prices to be perceived as more fair than round prices, but our results indicate that a round price is more fair than a precise price. Of those who first saw a round price (YourKitchen) and then experienced precise prices (CutleryHaven), 49% perceived YourKitchen as more fair, whereas only 6% perceived CutleryHaven as more fair. Comparing this to the other treatment, we see that those who first were presented with a precise price (YourKitchen) and thereafter a round price (CutleryHaven) to a smaller degree perceive YourKitchen as more fair (43%) and to a larger degree perceive CutleryHaven as more fair (12%). As this is the opposite effect of what was initially believed, an argument for precise prices being *less* fair arises, the polar opposite of hypothesis 4. We do however see that the response distributions here are skewed towards YourKitchen being the most fair for all different treatments. This is a sign of some type of bias. Some participants may have suspected that YourKitchen was actually our firm, and may thus have responded that they were the most fair because they suspected that we sought those specific answers. If so, this would be an example of the Hawthorne effect. Despite the results showing the opposite of initial beliefs, we find it interesting to see if a more granular analysis (controlling for precise price and cost focus) will be consistent with the findings under profitability comparisons above (i.e., most profitable should be least fair).

	Control Group	Treatment 1	Treatment 2	Treatment 3
YourKitchen	43%	42%	54%	43%
Equally as fair	49%	44%	42%	46%
CutleryHaven	8%	13%	5%	12%

Table 4.18: Fairness comparison across all treatments

As shown in Table 4.18, there is a high level of consistency between the fairness and profitability comparisons, despite initial expectations. In the profitability comparison, a higher proportion of participants in treatment 2 believed CutleryHaven to be more profitable. In line with this, a larger proportion of participants in treatment 2 rated YourKitchen as more fair and CutleryHaven as less fair than the other groups. This trend is also present, to a lesser extent, in the other three treatment groups. Interestingly, a larger proportion of participants across all treatments rated the companies as equally fair as opposed to equally profitable, suggesting that factors other than profits may influence consumers' perceptions of fairness.

5 Conclusion and Discussions

The purpose of this paper has been to investigate the connection between precise prices and consumers' perception of costs and pricing procedure. By using a deductive approach, an explanatory study design and an experimental method, we have answered the thesis: *How does precise prices influence consumers' perception of a firm's product costs and pricing procedure?*

5.1 Hypotheses and main findings

In this part of the paper we will discuss our main findings and discuss it in light of existing and relevant research.

Prior research on the price precision effect has concluded that this is an anchor effect (Janiszewski & Uy, 2008), or been unable to reject that it is an anchor effect in its' entirety (Kadiyali et al., 2010). We believe that our results indicate that there is more to the price precision effect than just an anchor effect. The production cost estimates are statistically significantly higher in treatment 1 compared to the control group. At the same time, the profit estimates were very close (adjusted p-value of 0.065) to being statistically significantly lower at a 0.05 level for precise prices compared to rounded prices. We believe it would be interesting to conduct the same experiment with an even bigger sample size, to see if this could lower the p-value further. Nevertheless, we believe that these results indicate that the price precision effect consists of more than just an anchor effect. The anchor effect might even be the reason why the results from hypothesis 5 were only marginally significant.

The results from our experiment suggests that consumers believe that a firm's production costs of a product are higher when they operate with precise prices rather than rounded prices. These results correspond with previous research, which have shown that consumers believe that firms using precise prices have higher purchasing costs (Janiszewski & Uy, 2008). We find it quite interesting that precise prices and a proclaimed cost-focus, seen in isolation, seem to have approximately the same effect on consumers' cost estimations. We believed that both manipulations would have an effect on estimations, but that they would differ in strength.

Our results indicate that the effect precise prices have on cost estimations is diminished when the firm in question has a proclaimed cost-focus. This is contrary to our initial hypothesis that there would be positive synergies between the two, increasing participants' cost estimations further. While the group who received both these manipulations have the highest mean of cost estimations among the groups, the mean is only statistically significantly higher than that of the control group.

Whereas the interaction effect between a precise price and a cost focus is negative, this effect is not statistically significant (p-value of 0.157). However, we do believe this might indicate a backfiring effect of combining precise prices and a proclaimed cost-focus. This belief is further strengthened by the results from some of the Likert item questions, showing that relatively few of the participants in treatment 3 believes YourKitchen's prices were fair and based on underlying costs, compared to the other treatments. While our results indicate that precise pricing seen in isolation have a positive effect, this effect is diminished when combined with a self-proclaimed cost focus. We believe that one possible explanation to this is that while precise prices might have the desired effect when consumers are rather unconscious of it, it might lose its effect when they are nudged to think about the costs. They might become more skeptical and feel like the firm is trying to scam them, as some of our participants suggested. We are however far from being able to draw any conclusions on this subject based on our results.

Our results indicate that precise prices seem to be a useful tool for firms that would like to signal that they operate with a cost-based pricing procedure. Answers from the open-ended question do however show that quite a few consumers suspect that firms use precise prices due to psychological reasons.

While our analyses suggest that precise pricing and claiming that your firm is cost-focused have the same effect, one could argue which of the two would be of best use to a firm, if they were to choose one. Studies have shown that failing to be transparent about pricing may foster distrust (Ellen & Ferguson, 2013), and that costumers view secrecy about pricing practices as a layer of unfairness (Kimes, 2002). Thus, one would assume that claiming to have a cost-focus but failing to prove so could have negative consequences for a firm. On the other side, by simply operating with precise prices one could have the same positive effects, while reducing the negative consequences a firm risks by claiming

that they have a cost-focus.

While the price of a product has an undeniable effect on consumers' perceived price fairness, studies have shown that the firm's pricing procedure is just as, if not more important (Meng & Nguyen, 2012). Consumers tend to find market-based pricing procedures being unfair, as they prefer that firms operate with cost-based pricing. Therefore, it was surprising to observe that while the majority of our participants believed that precise prices signals cost-based pricing, their responses related to fairness did not reflect this. While the control group's average cost estimate was \$8.13, the average cost estimate of treatment 3 was \$9.88. This is more than \$1.70 higher, and indicates that the average participant in the control group believed the firm to take more than 20% higher profits compared to treatment 3. Nevertheless, the two groups did not differ in perceived fairness. These results were rather surprising. One would think that such a notable difference in estimated costs, as well as consumers tending to link precise prices with cost-based pricing, would have an influence on perceived fairness. However, our results indicate that only the price itself influenced the participants' perception of fairness. While this may indicate that they neglect other factors than the price, it might also be a result of their relatively limited information about the firm and product.

Moreover, the results from the fairness question show that responses are skewed towards the highest ratings for all four treatments. The price we had chosen for this product, \$20/\$20.17, was chosen after a careful review of similar products on Amazon. Our intention was to pick a price which was not among the cheapest, but not among the most expensive, as a preventive measure against skewness towards either side of the scale. Nonetheless, most participants opted for one of the highest scores of fairness, regardless of which treatment they belonged to. Another possible explanation to the response distribution of the fairness question might thus be the Hawthorne effect. This effect describes how participants of an experimental study change their behavior in response to being observed (Svartdal, 2021). We suspect that some participants might have altered their response with the intention of giving us the answers they believe we want them to.

We believe that this experimental study allows us to contribute with new and interesting insights to the field of study. Nevertheless, results from the profit estimation are not as conclusive as the results from the cost estimation, although one could call it an "inverse

cost estimation". While the profit estimates were notably lower with precise prices than with rounded prices, this deviation was not of statistical significance, in spite of almost doubling the sample size (448 observations as opposed to 226). While this inconsistency may imply irrational consumer behaviour, we cannot exclude the possibility of this being a result of weaknesses in our design, method and study.

6 Future Research

With regards to the reliability of our findings, it would be interesting to see our experiment being repeated on a later occasion, or on another platform. If we were not constrained by time and budget we would probably have repeated the experiment ourselves, but we would also like to see other researchers replicating our experiment.

The main limitation of our study is that we only compare the effects of precise prices (e.g., \$20.17) to round prices (e.g., \$20) and do not examine how these effects may be separated from prices ending in .99 (e.g., \$19.99). This is an important consideration since prices ending in .99 may be perceived differently than precise or round prices, and examining the separate effects of these types of prices could provide further insight into the relationship between price structure and outcomes of interest. Further research that expands upon this aspect of the study may be useful in providing a more comprehensive understanding of price structures.

Another potential limitation is that our analysis is restricted to a specific context (e.g., a set of six glasses in the US kitchen supply market), and the generalizability of our findings to other contexts may be limited. It would be informative to replicate the study in different contexts to determine the robustness of the results.

Another prospect is to conduct the experiment in Norway. Initially we wanted to do so, but realized that it would be challenging to conduct an equally comprehensive experiment in Norway budget wise. A factor that makes a country like Norway especially appealing for an experiment like ours is that a Norwegian 'øre' is of significantly lower value than an American cent, thus being even more fit to isolate the precise price's effect on consumers' perceptions on costs and fairness.

Although we did not find any clear indications on precise pricing having a significant influence on consumers' perceived fairness, we believe this is worth investigating further.

While we find our experimental design quite interesting, we see potential in a field experiment related to the same subject. Initially, we planned to complement our online experiment with a field experiment either at NHH or in the centre of Bergen, but unfortunately time did not allow us to carry it out.

Having investigated how precise prices and a proclaimed cost-focus influence consumers' production cost estimations, we also believe it would be interesting to conduct a field experiment studying whether these two manipulations also influence consumers' willingness to buy a product.

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Appendix

A1 Experiment

This appendix is intended to provide a comprehensive understanding of the experimental study conducted by the participants. To achieve this, the appendix begins by offering an overview of the study, which is also featured in Chapter 3 - Methodology. Following this, each page of the Qualtrics survey is described in detail, providing a full picture of the participant experience. The appendix covers all eight pages of the Qualtrics survey.

A1.1 Overview

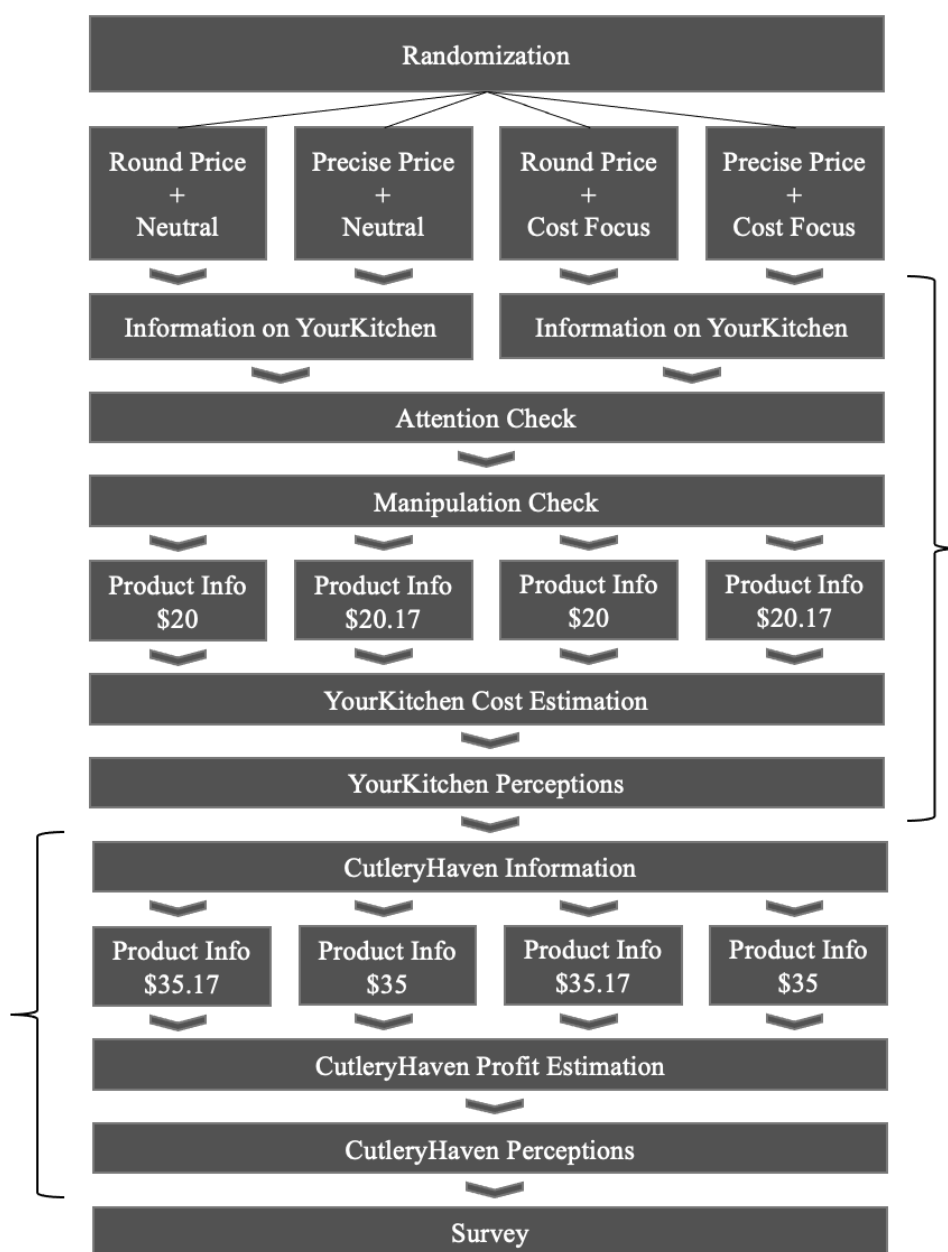


Figure A1.1: Experimental Structure

A1.2 Page 1; Control Group & Treatment 1

NHH



YourKitchen

It is around a table the good conversations transpire. We aim to provide your table with plates, glasses and cutlery. Let us help you create a table that fills you with joy.

Core Values

Consistency

We strive each and every day to provide great products. We do this by producing all components ourselves, constantly looking for ways to improve our products.

YourKitchen - Creating a home you are proud of

[Shop Now](#)



Figure A1.2: Page 1; Introduction; Neutral

A1.3 Page 1; Treatment 2 & Treatment 3

NHH

A screenshot of a website landing page for 'YourKitchen'. The background is a blurred image of a person in a kitchen. The page has a white semi-transparent overlay with the following text:

YourKitchen
We care about costs

It is around a table the good conversations transpire. We aim to provide your table with plates, glasses and cutlery. Let us help you create a table that fills you with joy.

Core Values

Cost Focus
We strive each and every day to provide great products at the lowest possible cost. We do this by producing all components ourselves, constantly looking for ways to reduce costs.

YourKitchen - Creating a home you are proud of

[Shop Now](#)



Figure A1.3: Page 1; Introduction; Cost Focus

A1.4 Page 2; All treatments

NHH



What items does YourKitchen sell?

Sheets, pillows and ear plugs

Knives, tables and chairs

Cooking pots, spatulas and forks

Plates, glasses and cutlery



Figure A1.4: Page 2; Attention Check

A1.5 Page 3; All treatments

NHH



Finish the missing letters to finish the word:

 S I



Figure A1.5: Page 3; Manipulation Check

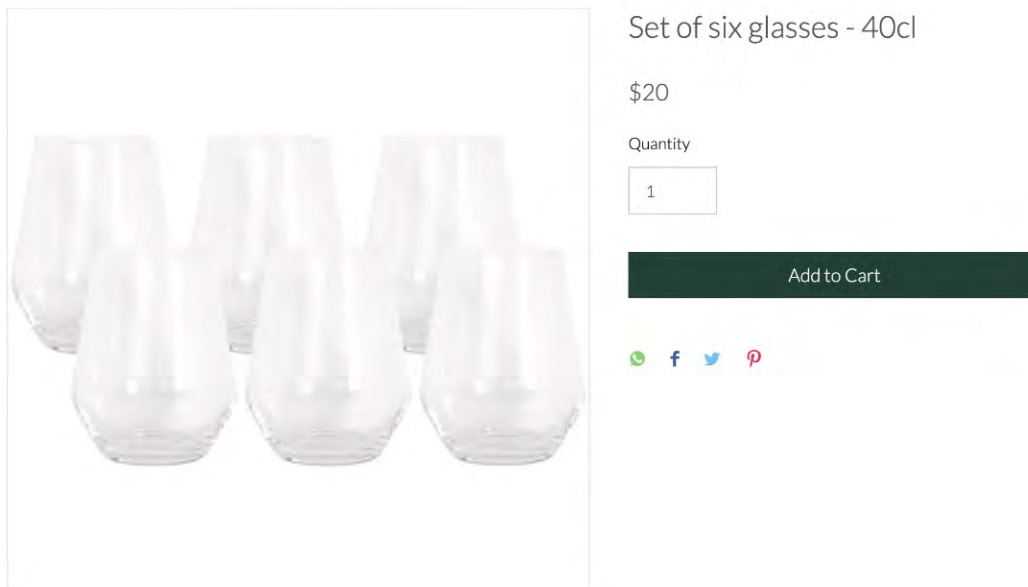
A1.6 Page 4; Control Group & Treatment 2

NHH



Please inspect the information below carefully

One of the products you can purchase at YourKitchen is a set of six glasses.



Set of six glasses - 40cl

\$20

Quantity

Add to Cart

[WhatsApp](#) [Facebook](#) [Twitter](#) [Pinterest](#)

Figure A1.6: Page 4; Product Information; \$20

(Accurate estimates are rewarded with up to \$1 extra)

Using only the information you have been presented, estimate how much it costs YourKitchen to produce and offer this product? (Set of six glasses)

On a scale from 0% - 100%, how confident are you that this estimate is within a +/- \$2 interval?

Figure A1.7: Page 4 - Continued; Product Cost Estimate; \$20

A1.7 Page 4; Treatment 1 & Treatment 3

NHH



Please inspect the information below carefully

One of the products you can purchase at YourKitchen is a set of six glasses.



Set of six glasses - 40cl

\$20.17

Quantity

Add to Cart



Figure A1.8: Page 4; Product Information; \$20.17

(Accurate estimates are rewarded with up to \$1 extra)

Using only the information you have been presented, estimate how much it costs YourKitchen to produce and offer this product? (Set of six glasses)

On a scale from 0% - 100%, how confident are you that this estimate is within a +/- \$2 interval?

Figure A1.9: Page 4 - Continued; Product Cost Estimate; \$20

A1.8 Page 5; Control Group & Treatment 2

NHH



Based on the information you have read regarding YourKitchen and their product 'set of six glasses' for \$20, please answer the following questions:

On a scale from 1 - 7, how do you perceive the quality of this product?

(1 = Very low quality, 7 = Very high quality)

1	2	3	4	5	6	7
---	---	---	---	---	---	---

To what degree do you think the price of the product is based on the costs to make it

(1 = Costs are not important in pricing, 7 = Costs are very important in pricing)

1	2	3	4	5	6	7
---	---	---	---	---	---	---

To what degree do you perceive this (\$20) as a fair price?

(1 = Very unfair price, 7 = Very fair price)

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Figure A1.10: Page 5; Product Perceptions; \$20

A1.9 Page 5; Treatment 1 & Treatment 3

NHH



Based on the information you have read regarding YourKitchen and their product "Set of six glasses" for \$20.17, please answer the following questions:

On a scale from 1 - 7, how do you perceive the quality of this product?

(1 = Very low quality, 7 = Very high quality)

1	2	3	4	5	6	7
---	---	---	---	---	---	---

To what degree do you think the price of the product is based on the costs to make it?

(1 = Costs are not important in pricing, 7 = Costs are very important in pricing)

1	2	3	4	5	6	7
---	---	---	---	---	---	---

To what degree do you perceive this (\$20.17) as a fair price?

(1 = Very unfair price, 7 = Very fair price)

1	2	3	4	5	6	7
---	---	---	---	---	---	---




Figure A1.11: Page 5; Product Perceptions; \$20.17

A1.10 Page 6; Control Group & Treatment 2

NHH



YourKitchens' fiercest competitor is CutleryHaven, which sells similar products. In many ways, the companies are very similar. Please view a snippet from their website.

	New 	
Deep Dish, 6 pieces \$35.14	Bowl, 6 Pieces \$30.64	Cup, 6 pieces \$20.17
<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="1"/>
<input type="button" value="Add to Cart"/>	<input type="button" value="Add to Cart"/>	<input type="button" value="Add to Cart"/>

(Accurate estimates earn up to \$1 extra)

How much **profit** in USD (\$) do you think CutleryHaven make by selling «Deep Dishes, 6 pieces», an item they sell on their website for \$35.14?

(Profit = Selling Price - Production Cost)




Figure A1.12: Page 6; Product Perceptions; Precise Prices

A1.11 Page 6; Treatment 1 & Treatment 3

NHH



YourKitchens' fiercest competitor is CutleryHaven, which sells similar products. In many ways, the companies are very similar. Please view a snippet from their website.

	New 	
Deep Dish, 6 pieces \$35	Bowl, 6 Pieces \$30	Cup, 6 pieces \$20
<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="1"/>
<input type="button" value="Add to Cart"/>	<input type="button" value="Add to Cart"/>	<input type="button" value="Add to Cart"/>

(Accurate estimates earn up to \$1 extra)

How much **profit** in USD (\$) do you think CutleryHaven make by selling «Deep Dishes, 6 pieces», an item they sell on their website for \$35?

(Profit = Selling Price - Production Cost)

Figure A1.13: Page 6; Product Perceptions; Round Prices

A1.12 Page 6 (2); All treatments

Between CutleryHaven and YourKitchen, who profits the most on average?

CutleryHaven
Equal profits
YourKitchen

Between CutleryHaven and YourKitchen, who has the most fair prices?
(A fair price can be viewed as an honest price)

CutleryHaven
Equally as fair
YourKitchen

Figure A1.14: Page 6 (2); Comparison

A1.13 Page 7; All treatments

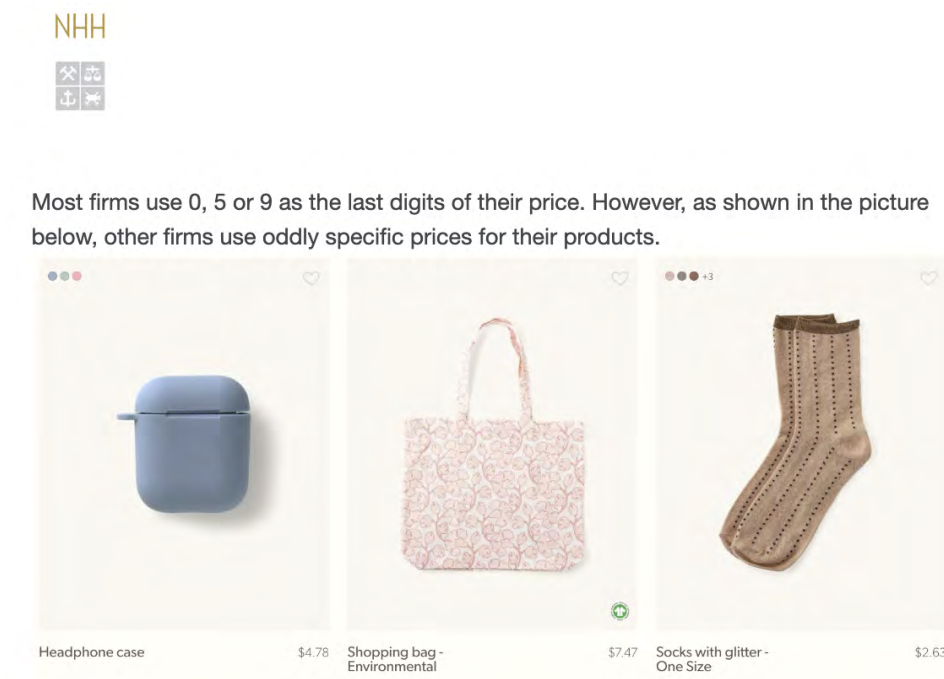


Figure A1.15: Page 7; Søstrene Grene

Why do you think some firms use such oddly specific prices? Rate each statement below between 1 and 7:

Disagree 1 2 3 Neutral 4 5 6 Agree 7

This is the lowest possible price they can charge based on their costs

This is the highest possible price they believe they should charge

This price signals cost-based prices (costs plus a fixed markup)

This price strengthen/differentiates their brand

This pricing strategy is used to be perceived as old-fashioned.

Can you think of any other reasons why firms might use such oddly specific prices?

Figure A1.16: Page 7; Søstrene Grene Perceptions

A1.14 Page 8; All treatments; Last page

Gender

What is your annual income? (Before taxes)

What age group do you belong to?

What is your highest level of education?

On a scale from 1 to 7, where 1 is highly unlikely and 7 is highly likely, how likely are you to:

Unlikely 1 2 3 Neutral 4 5 6 Likely 7

Buy a product if its price has been reduced

Compare prices between competitors for similar products

Figure A1.17: Page 8; Demographical and behavioural question

Thank you for participation note follows upon clicking through this page.

A2 Demographic distributions across treatments

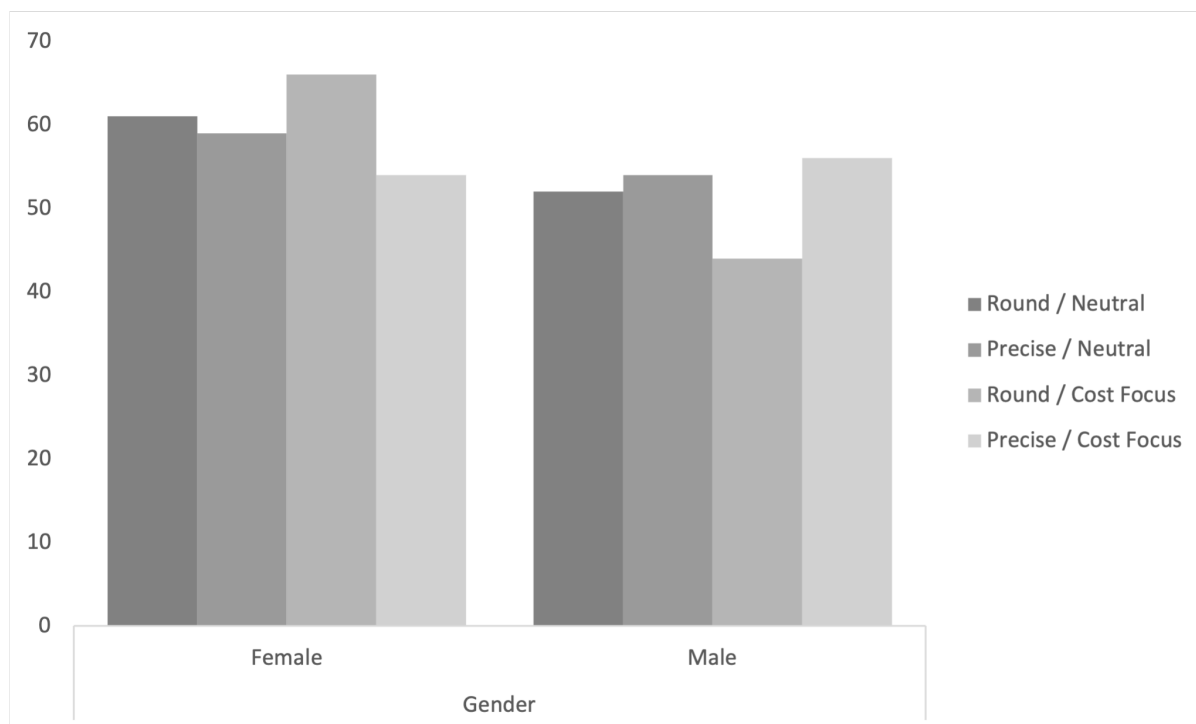


Figure A2.1: Participants by Gender and Treatment

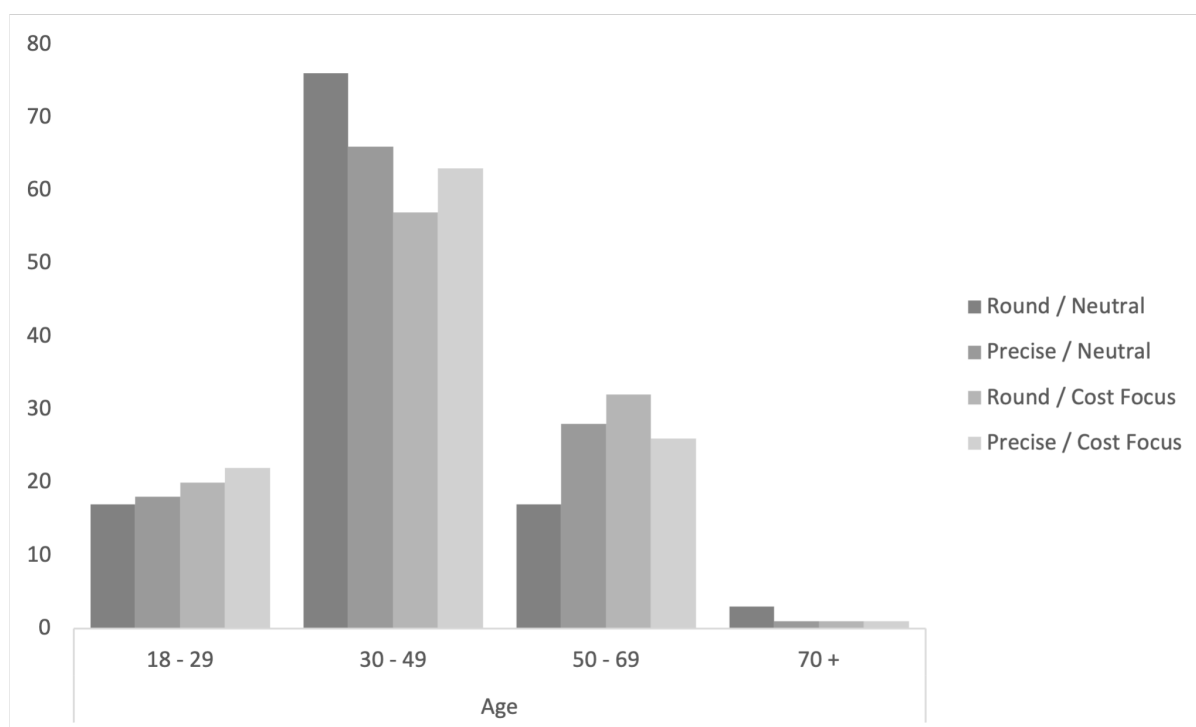


Figure A2.2: Participants by Age and Treatment

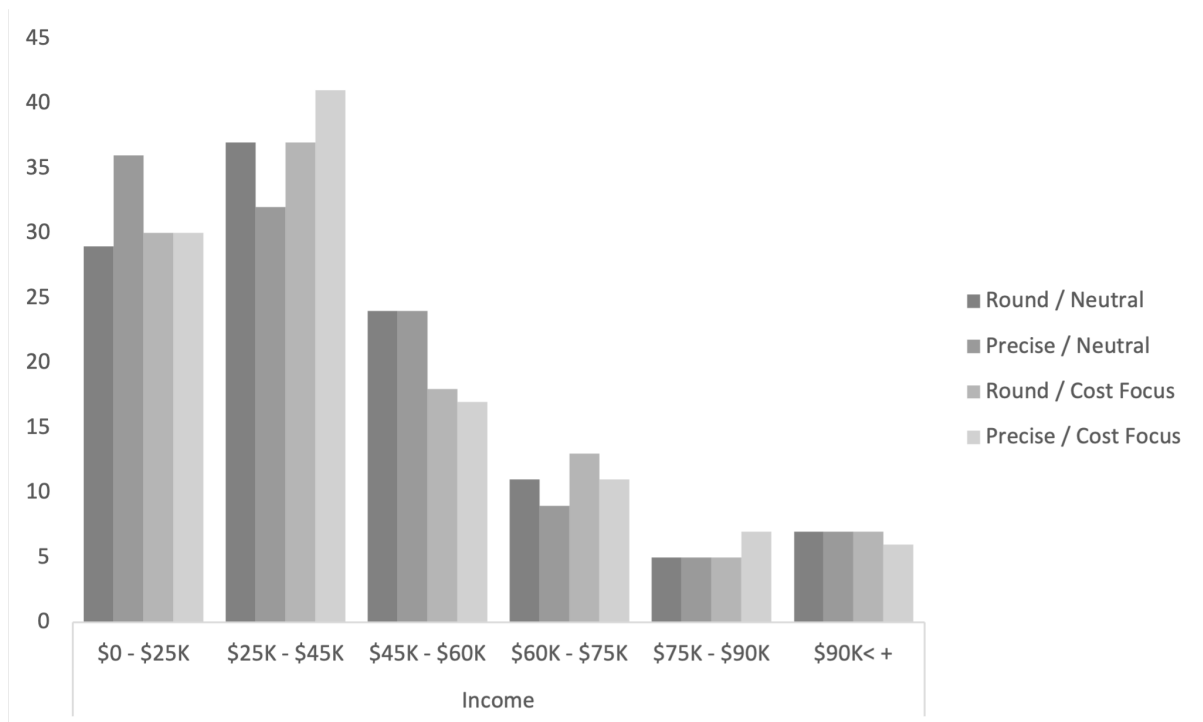


Figure A2.3: Participants by Income and Treatment

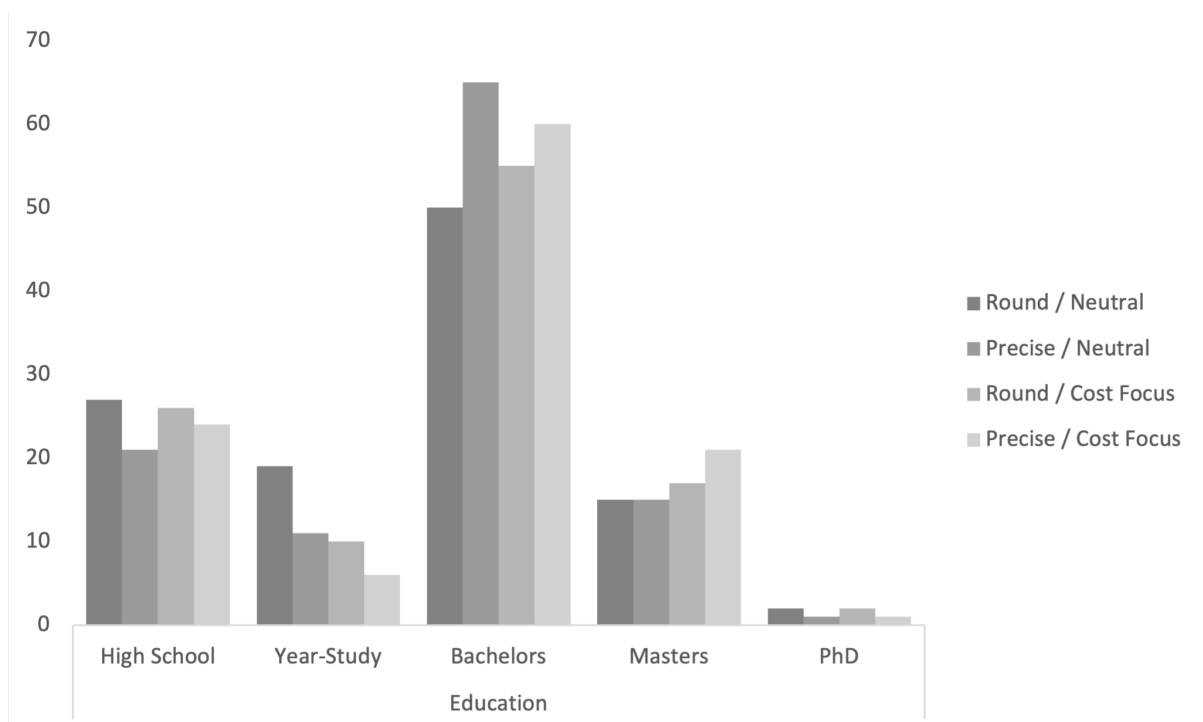
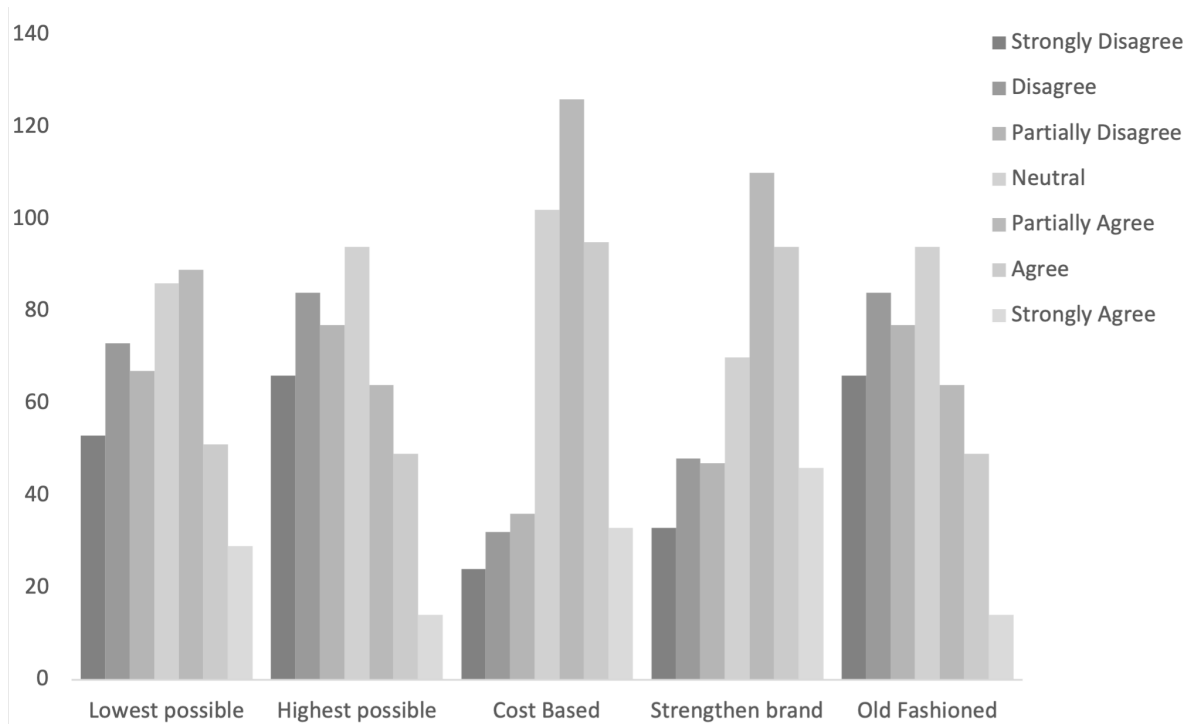


Figure A2.4: Participants by Education and Treatment

A3 Response distributions across treatments



⁷x-axis is what participants can choose on page 7, as shown in Figure A1.16

Figure A3.1: Participants on why firms use precise prices

A4 As Predicted & Pilot Study

This section contains both a pre-registration of our experimental study and a copy of the brief report that was made on our initial pilot. The first three pages is pre-registrations of the experiment, where we aim to briefly explain what we expect and how we will derive answers. Pages two and three are a more in-detail explanation of the pre-registration, but it is the first page that is our initial pre-registration on this experimental study. The six pages following this is merely a report on the results from a pilot study we held during a BUS401E lecture.

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Odd pricing (#107718)

Created: 09/23/2022 12:58 AM (PT)

This is an anonymized copy (without author names) of the pre-registration. It was created by the author(s) to use during peer-review.
A non-anonymized version (containing author names) should be made available by the authors when the work it supports is made public.

1) Have any data been collected for this study already?

No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?

People often think that prices reflect underlying production costs or quality. However, prices are often based on market factors (supply and demand) or customers' willingness to pay. This study investigates whether having oddly specific prices might be perceived as signals of cost-based pricing and whether this effect interacts with the company's business strategy (i.e., cost leadership).

In particular, we hypothesize that:

1. People perceive precisely priced products (__.46) to have a lower relevant production cost compared to rounded prices (e.g., __.00)
 - a. People perceive precisely priced products to be of higher quality (because of higher cost)
 - b) People perceive precisely priced as an indicator of cost-leadership
 - c) People believe that a precise price is more fair than rounded prices (as it is based on costs)
 - d) Participants will, on average, assume that __.46 priced products have lower margins than __.00 products (i.e., better deal)
2. Firm with a cost-leadership strategy will increase the effect of precisely priced products compared to rounded prices.

3) Describe the key dependent variable(s) specifying how they will be measured.

EST_COST = cost estimations of relevant cost of production (from 0 and up)

MAR_CHOICE = participants' choice of a higher or lower margin between products (indicator variable)

4) How many and which conditions will participants be assigned to?

In total, four conditions:

1. Round price -- no cost leadership
2. Precise price -- no cost leadership
3. Round price -- cost leadership
4. Precise price -- cost leadership

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

Linear regressions and standard statistical tests

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

In principle, we include all observations in our analyses -- except for non-sensical answers (like, estimated costs are much higher than price)

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.

We will run multiple experiments where we aim for 60 in each cell.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

We use lottery tickets for gift cards as incentives in the experiment

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Master Thesis, Precise Prices - an experimental study deducing its effects (#114563)

Created: 11/29/2022 06:21 AM (PT)

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A non-anonymized version (containing author names) should be made available by the authors when the work it supports is made public.

1) Have any data been collected for this study already?

It's complicated. We have already collected some data but explain in Question 8 why readers may consider this a valid pre-registration nevertheless.

2) What's the main question being asked or hypothesis being tested in this study?

How do precise prices influence consumers' perception of a firm's product costs and pricing procedure?

This thesis question is answered by reviewing five different hypotheses.

Hypotheses (1,2) referencing the regression model, $E = \alpha_1P + \alpha_2C + \alpha_3P \times C$ (and t-tests)

H1: The P coefficient is significantly positive (precise price has an effect on cost estimates)

H2: The P x C coefficient is significantly positive (precise price- and cost focus effects synergize)

Hypotheses (3,4) referencing interpretation of frequency tables:

H3: Participants perceive precise prices to more likely have a cost-based pricing strategy

H4: Participants perceive precise prices to be more fair than round prices

Hypothesis (5) referencing t-test study:

H5: Participants believe products with a precise price to be less profitable opposed to one with a rounded price

3) Describe the key dependent variable(s) specifying how they will be measured.

Key dependent variable for hypotheses (1,2) have the key dependent variable Cost Estimate (i.e., identified as the mean cost estimate in the different treatment groups).

Key dependent variable for hypotheses (3,4) have the key dependent variable statement ratings (i.e., identified as the median and frequency of different ratings on rankings of different statements).

Key dependent variable for hypothesis (5) have the key dependent variable Profit Estimate (i.e., identified as the mean profit estimate in the different treatment groups).

4) How many and which conditions will participants be assigned to?

This study is conducted as an experimental survey where the participants are asked to consider a hypothetical situation.

The participants will be assigned randomly into one of four different treatments.

All groups will be informed with some information on a hypothetical firm. Half of the participants will be informed that the firm has a cost focus, and the other half will not. Further, half of each half will again either see a round or precise price for a set of six glasses, sold by this hypothetical firm.

The participants will also rank these statements from 1 - 7:

To what degree do you think YourKitchen use costs to set their prices?

How fair do you perceive the price (set of six glasses)?

Following this, half of the total pool will see another firm that sells similar products, but now they see the opposite price structure (i.e., round sees precise and vice versa).

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

By using OLS, we can estimate the extent of the effect on cost estimates. After collecting the results of the experiment, we will use the following multiple regression to estimate the effects: $E = \alpha_1P + \alpha_2C + \alpha_3P \times C$ Where:

E: Cost Estimate

P: Precise price - Dummy if precise price = True for treatment group

C: Cost Focus - Dummy if cost focus = True for treatment group

Interpreting OLS:

- P: Precise price - Shows effect of having a precise price
- C: Cost Focus - Shows the effect of having a cost focus
- P x C: Shows the effect of having both a precise price and a cost focus at the same time

Model is also used to understand more about different demographic information.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

We will exclude all data that contain bot-like answers in our Qualtrics responses. The rules are as following:

Profit Estimation > Selling price

Cost Estimation < \$1

Numerical answers in text fields and vice versa

Less than 120 seconds completion time (mean completion time is 8 minutes & 11 seconds)

Failed Attention Checks

Duplicate Responses (we do not want the same participant twice as they may try to game the experiment)

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.

Using a power calculation with an expected mean difference of approximately \$1 (20%), we would need at least 208 participants, but will gather 288 participants and discard those who are not eligible. At least 52 in each treatment.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

Nothing else to pre-register.

SleepBetter Survey Results

The following is a simple report on the results that we have retrieved from the survey that took place at the BUS401E lecture on the 23rd of September 2022.

Executive summary

The 23rd of September 2022 during a BUS401E lecture, a survey was issued to the students of the class. The goal was to gain some initial insight to how we perceive oddly specific prices. The hypotheses¹ included that odd prices would have a higher perception of fairness, cost-led, quality, popularity, have lower margins and higher a production cost. Some of these questions also yield lottery tickets for a gift card worth NOK 500. Contradictory to our initial beliefs, none of these hypotheses were supported, according to the collected data. However, we raise some main concerns. These concerns are the sample size, where group 1 consists of 18 entries, and group two has 26. This is a total of 44 respondents. In addition to this, the degree of control during the experiment was not sufficient as we saw several students collaborating and comparing answers. Further, some answers are strange at best, and serve as outliers, which greatly skews our data.

Building upon this research in the future, it would be interesting to see how informing the participants that a firm is cost-focused would affect the results. In addition, we are very interested to also see how the results will differ if we are able to obtain a larger sample size with a larger degree of control (eliminating collaboration).

¹ 'Odd pricing', (AsPredicted #107718)

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SleepBetter is a firm that sells everything from beds to mosquito nets for windows in the US market. They produce everything themselves and have an online store where consumers can order and have their products shipped to them.

Their SleepFeather pillow, which they state is “a pillow that dreams are made of (and on)”, can be purchased for \$30 / \$30.42.

Section 1

Using only the snippet above², please answer the following questions (on a scale of 1-10):

Q1: How do you perceive the quality of this product?

Group 1, seeing a price of \$30, appear to perceive the quality of the product as slightly higher. Having a mean of 5.61 points compared to mean of group 2 at 5.46 points. This is contradictory to our initial hypothesis, where we believed that people would perceive odd pricing to have a higher quality product.

Q2: To what degree do you think SleepBetter is a cost leader in their industry?

Group 1 appear to perceive SleepBetter as a cost-leader far more than what does group 2, comparing the mean of group 1 of 5.72 points to the mean of group 2 at 4.15 points. This is contradictory to our initial hypothesis, where we believed that people would perceive odd prices to be an indicator of a cost-leader in its industry.

Q3: How popular do you think their SleepFeather product is?

Group 1 has a higher mean (6.28 points) compared to that of group 2 (5.42), indicating that an odd price creates the perception of a less popular product than a round price. This is contradictory to our initial hypothesis where we believed that an odd price would make the popular perception to be higher.

² This is the snippet where group 1 sees a price of \$30 and group 2 sees a price of \$30.42

Q4: To what degree do you perceive this as a fair price?

Group 1 has a higher mean of the products' fairness with a mean of 6.28 points compared to the 6.08 points of group 2. This indicates that a rounded price is precepted as more fair than that of an odd price. This is contradictory to our initial hypothesis where we believed the opposite to be true.

Descriptive statistics summary for page 1 section 1

	Group	Minimum	Maximum	Mean	Std Deviation	Variance	Count
How do you percieve the quality of this product?	1	4.00	8.00	5.61	1.38	1.90	18
	2	2.00	8.00	5.46	1.62	2.63	26
To what degree is this a cost leader in its industry	1	3.00	8.00	5.72	1.82	3.31	18
	2	1.00	9.00	4.15	1.90	3.59	26
How popular do you think the product is?	1	3.00	8.00	6.28	1.41	1.98	18
	2	1.00	8.00	5.42	2.19	4.78	26
How fair do you percieve this price?	1	4.00	9.00	6.28	1.45	2.09	18
	2	1.00	10.00	6.08	2.25	5.07	26

1 Descriptive statistisc of Page 1, Section 1

According to the data that we have gathered, albeit a small sample and under a low degree of control, none of our initial hypothesis are supported.

Section 2

Q5: Based on the information above, provide your best estimate of the (relevant) cost of producing the SleepFeather pillow.

Based on the descriptive statistics from the survey regarding this estimation question, it would appear that people tend to, on average, believe that a rounded price has a higher production cost than an odd price. However, looking at the median and maximum numbers, there are indicators that points towards observations skewing the results. Substantiating this, the confidence interval of group 1 is much larger than that of group 2, indicating that the results are not very convincing. The average and mean differ by more than \$4 in group 1 and less than \$2 in group 2. We believe the main issues to be lack of control on the survey and small sample.

Based on the information above, provide your best estimate of the (relevant) cost of producing the SleepFeather pillow.							
Group	Sample Size	Median	Average	Confidence Interval of Average	Standard Deviation	Minimum	Maximum
1	18	8.7	12.9	8.34 to 17.38	9.1	4	35
2	26	10.5	12.1	9.33 to 14.97	7.0	2	26

2 Descriptive statistics of Page 1, Section 2

SleepBetter's largest competitor, eightHours, sells pillows to a varying degree of quality and price. One of these pillows is their product, the "EightDeep" pillow model. For this product, the numbers before the decimal point are missing.

Section 1

Based on only the snippet, and information above³, please answer the following questions: (Profit margin estimates within a +/- 3% of the actual profit margin will yield a lottery ticket)

Q6: What do you believe the profit margin of eightDeep to be?

Group 1, seeing \$__.76, has a higher profit-margin mean than that of group two, seeing \$__.00. This is contradictory to our initial hypothesis where we believed that \$__.76 priced products would yield a perception of lower margins. Again, we wish to raise our main concerns regarding this survey, namely that the size is very small and that it was a very small degree of control regarding cooperation on the answers.

What do you believe the profit margin of EightDeep to be?						
Group	Minimum	Maximum	Mean	Std	Variance	Count
1	0.10	0.50	0.29	0.10	0.01	18
2	0.03	0.50	0.23	0.11	0.01	26

³ Descriptive statistics of page 2, section 1

Q7: Regarding this profit margin, do you believe it is higher, lower or the same as the SleepFeather pillow sold by SleepBetter?

Participants seeing \$__.76 do believe, on average, that the margins are higher than a product that has a rounded (\$__.00) price. Interestingly, no participants seeing \$__.76 believed the margins to be the same as on the \$30 product, but some participants seeing \$__.00 believed the product to have same margins as the \$30.42 priced product. However, none of the results are statistically significant.

³ Group 1 saw a price of \$__.76 and group 2 saw a price of \$__.00

Regarding this profit margin, do you believe it is higher, lower or the same as the SleepFeather pillow sold by SleepBetter?				
Group	Higher	Lower	Same	Count
1	55.56%	44.44%	0%	18
2	42.31%	46.15%	11.54%	26

4 Descriptive statistics of page 2, section 1, Q2

Conclusions

According to the data that we have collected during this class, none of our hypotheses are supported. This meaning that the survey supports that rounded prices are perceived as more fair, higher quality products, more popular products, and an indicator of the company of being a cost-leader in the industry. Substantiating the weakness of these results, no result is statistically significant on a 90% confidence level.

Main concerns regarding this survey

The following is a list of what we deem as the main concerns and drivers for invalidating the current results.

1. *Sample size*

The sample size is too small, and to get more granularity to our analysis, it would be interesting to increase this at a later time. Now, we had only 44 respondents, 18 in group 1 and 26 in group 2.

2. *Lack of control on survey answers*

The lack of control was another factor invalidating the results. During the period of which the survey was conducted in the classroom, it was easy to spot several students collaborating. This is especially a problem if they realize that they have different numbers. i.e., in the event of collaboration across group 1 and group 2, the participants that sees a higher number will likely respond that this product has a higher margin than that of the product with the lower price, regardless of what their initial beliefs were when seeing a price. We could probably mitigate this risk to some extent by merely informing that it is important the survey would be answered individually.