Judgment and Decision Making, Vol. 6, No. 2, February 2011, pp. 176–185

Relative thinking in consumer choice between differentiated goods and services and its implications for business strategy

Ofer H. Azar*

Abstract

The article shows that when people consider differentiated goods or services that differ in price and quality, they exhibit a decision-making bias of "relative thinking": relative price differences affect them even when economic theory suggests that only absolute price differences matter. This result is obtained in four different consumption categories. Sometimes subjects are affected only by relative price differences ("full relative thinking") and sometimes also by absolute price differences ("partial relative thinking"). This behavior has implications for various disciplines, and it is particularly relevant in models dealing with horizontal or vertical differentiation, optimal pricing, competitive strategy, or advertising.

Keywords: relative thinking; consumer behavior; product differentiation; judgment and decision making.

1 Introduction

One of the most common decision problems that consumers face is choosing between differentiated goods or services that differ in their quality and price. Such situations exist in almost any category of goods or services, ranging from the choice of cheese or a hotel room to the choice of a car or a house. For almost any purchase decision we make, we have several alternatives, and usually these alternatives differ in their quality and price. This implies that understanding how consumers choose between differentiated goods is of great importance.

When a consumer wants to buy one unit of a good and he has to choose between two differentiated goods, economic theory suggests that the absolute price difference matters while the relative price difference does not. This is because the opportunity cost of obtaining the higher quality (by purchasing the more expensive good) comes from the reduced wealth that is left for other consumption. The reduction in wealth following the purchase of the high-quality good is related to the absolute price difference between the goods, and not to the relative price difference.

The result of this idea is that, absent wealth effects, the good's price should not affect the willingness to pay for a given quality improvement. The principle that only absolute price differences should matter in such consumer decisions follows from rational utility maximization and is an unchallenged assumption in the theoretical literature in economics on product differentiation (both vertical and horizontal). Tirole (1988, p. 96), for example, models vertical product differentiation (differentiation where one good is clearly better than the other—but is also more expensive) using a framework in which the consumer's surplus when buying a good with quality s at price p is $\theta s - p$. It follows that when the consumer faces two differentiated goods, he prefers good 1 if $\theta s_1 - p_1 > \theta s_2 - p_2$, or equivalently, if $\theta(s_1 - s_2) > p_1 - p_2$. It is easy to see that this expression involves the absolute price difference $(p_1 - p_2)$ but not the relative price difference (e.g., $(p_1 - p_2)/p_1$ or $(p_1 - p_2)/p_2$). Additional examples that illustrate that economics models assume that only absolute price differences matter are models of horizontal differentiation (horizontal differentiation exists when there is no clear advantage of one good over the other in terms of quality, and different customers have different preferences between them), such as the linear city (Hotelling, 1929) or the circular city (Salop, 1979). In these two seminal articles, and others that followed them, the absolute price difference between the differentiated goods is again crucial, but the relative price difference plays no role in consumer decision making.

I thank the Editor Jon Baron and two anonymous referees for their helpful comments. I am also grateful to David Balan, seminar participants at the University of Copenhagen, the Interdisciplinary Center Herzliya and the Hebrew University of Jerusalem, and conference participants in the 22nd Israel Economic Association Annual Conference, the 33rd EARIE Annual Conference, the 2006 ESA European Regional Meeting, the Affect, Motivation and Decision Making International Conference in the Dead Sea, the 2007 ESA Asia-Pacific Regional Meeting and the 2009 ESA European Regional Meeting for helpful comments. Financial support from the Russell Sage Foundation and the Phillipe Monaster Center for Economic Research at Ben-Gurion University of the Negev is gratefully acknowledged. I thank Michal Barry, Michal Baruch, Galit Dori, Tom Harel, and Tamar Kugler for valuable research assistance.

*Department of Business Administration, Guilford Glazer Faculty of Business and Management, Ben-Gurion University of the Negev, P.O.B. 653, Beer-Sheva 84105, Israel. Email: azar@som.bgu.ac.il.

Despite the widespread use of the assumption that only absolute price differences matter when choosing between differentiated goods, however, it is not clear whether people indeed behave according to this principle. A related issue is discussed in the literature that deals with how the trade-off between time and money changes as prices change. Thaler (1980), for example, conjectures that people exert more effort to save $5 on a $25 radio than to save $5 on a $500 TV.[1] Later, in line with Thaler's conjecture, several experimental studies found that people are more willing to invest a certain time in order to save a constant dollar amount when the good's price is lower. Tversky and Kahneman (1981), for example, asked subjects whether they would be willing to drive 20 minutes to save $5 on a calculator in a hypothetical scenario where they were told that they wanted to purchase a calculator and a jacket. 68% of the subjects were willing to drive 20 minutes to save $5 on a $15 calculator (when they also were hypothetically buying a $125 jacket), but only 29% chose to do so when the $5 saving was on a $125 calculator (and they also were hypothetically buying a $15 jacket).

Tversky and Kahneman's result was later replicated in several other studies. Mowen and Mowen (1986) showed that the effect holds similarly for student subjects and for business managers subjects. Frisch (1993) demonstrated that the effect holds also when only a calculator is being purchased, and Ranyard and Abdel-Nabi (1993) varied the price of the jacket and obtained similar results. Darke and Freedman (1993) found in one experiment that percentage off played no role on effort to save money, but in a second experiment with a greater range of percentages that could be saved they found that the percentage discount had an effect on consumer choice. Azar (in press) used nine different prices and five different goods and elicited the exact price for which the subject is indifferent between the two stores (one requiring him to spend 20 more minutes). This allowed him to estimate that the compensation people require for the effort of going to the remote other store is roughly proportional to the square root of the good's price.

Other studies that address related issues include Grewal and Marmorstein (1994), who test two possible explanations why consumers' willingness to engage in price search does not increase with the price dispersion. The first potential explanation was that consumers underestimate the market price dispersion, and it was not supported. The second explanation, which is based on Weber's law of psychophysics and Thaler's transaction utility theory, was supported. Grewal and Marmorstein suggest that the psychological utility that consumers derive from saving a certain amount is inversely related to the good's price. Darke et al. (1995) examine consumer price search and find that consumers used the percentage discount as a heuristic cue to help decide whether a better price was likely to be available elsewhere when the initial base price of the item was low, but not when it was high. Heath et al. (1995) are interested in how consumers perceive changes in a good's price. They examine the effects of percentage-based frames on price perceptions and preferences for multiple price changes (price increases on one good together with price reductions on a second good). They report that mental accounting principles generally prevailed in the absence of percentage-based frames, and that mental accounting principles, price perception and reference dependence are sensitive to how deviations from reference states are framed.

Baron (1997) reports that subjects were less willing to pay for government medical insurance for diseases when the number of people who could not be cured was higher, holding constant the number who could be cured. In another experiment he found that the description of risk in terms of percentage or the number of lives saved did not affect the willingness to pay for risk reduction, even though subjects knew that the risks differed in prevalence. Baron suggests that these results can be explained in terms of a general tendency to confuse proportions and differences. Fetherstonhaugh et al. (1997) find that an intervention saving a fixed number of lives was judged significantly more beneficial when fewer lives were at risk overall.

DelVecchio (2005) finds that deal-prone consumers are sensitive to the value of a promotion relative to other available promotions only in a condition of high absolute dollar savings. Bartel (2006) presents scenarios that include a tradeoff between absolute and relative savings, for example saving more human or animal lives versus saving a larger proportion of a population. Choices were driven by both the absolute and relative savings. Maximizing relative savings at the expense of absolute savings is non-normative, and most subjects agree with this argument upon reflection. Svenson (2008) shows that people consider ratios that are irrelevant also in decisions about which option can save more time (e.g., in saving travelling time in road traffic or saving doctors' time in reorganizing clinics). Kogut and Beyth-Marom (2008) ask subjects to rate the importance of two pieces of information, one stating the number of people that a certain program can save, and the other stating the percentage of people that can be saved. They find that when subjects are asked about their own judgment, they give more importance to the absolute number of people saved, but, when subjects are asked to predict how the average student rates the im-

[1] The corresponding principle in psychophysics, known as Weber's Law (or Weber-Fechner Law), states that people's ability to discriminate between physical stimuli depends on the relative difference between them and not on the absolute difference. However, this does not necessarily imply that the same is true when we consider numbers in decision problems, rather than physical stimuli.

https://doi.org/10.1017/S1930297500004125 Published online by Cambridge University Press

portance of each piece of information, they predict that the proportion of lives saved is more important. Homburg et al. (2010) study the impact of price increases on future purchase behavior and find that the framing of a price increase as a percentage leads to a lower likelihood of a future purchase compared to the framing in absolute terms.

The study reported in this article examines whether consumers consider relative or absolute price differences when choosing between differentiated products. The results show that people do not choose between differentiated goods by comparing their valuation of the quality difference to the absolute price difference, as economic theory prescribes. Instead, when people make purchase decisions, the relative price difference (measured here as the absolute price difference divided by the price of the high-quality good) plays a crucial role. Consequently, people are willing to pay more for the same quality difference, when the good's price is higher. This behavior represents a decision making bias that was recently denoted "relative thinking" (Azar, 2004). Because choosing between differentiated goods is so common in real life, this is an important finding about consumer behavior, with implications for research in marketing, decision science, psychology, economics and other related disciplines, as well as for businesses and managers.

This study is different from the previous literature described above in several ways. The context of choosing between differentiated goods is very different from the context of choosing between programs to save lives. Consumption of goods and services is different from saving lives. Comparing number of lives is different from comparing prices. Deciding which of two differentiated goods to buy is something that an average adult does on a daily basis; almost every time we buy lunch, toothpaste, bread, etc., we choose among several alternatives. On the other hand, deciding which program to adopt to save lives is a decision that most people do not make even once in a lifetime. Therefore the experience one has in making these decisions is vastly different. It could certainly be the case that in a decision to save lives, which the subject encounters for the first time in his life, he is biased and is affected by proportions, but in a decision on choosing between differentiated goods (something that he did many times), his experience can help him to do the rational thing and focus on the absolute price difference, ignoring the irrelevant relative price difference. Moreover, the desire to save lives is motivated by altruism; the lives saved are of hypothetical people that the subject does not know personally and saving them does not affect the subject's physical well-being. Therefore even if we believe that the relevant criterion for decisions about saving lives should be the absolute number of saved lives, an experimental subject who makes a biased decision by focusing on the proportion saved does not reduce his physical well-being.[2] On the other hand, making biased decisions about one's consumption alternatives does affect the decision maker's well-being. This is another reason that we may not observe relative thinking in choice between differentiated goods even if proportions play a role in decisions about saving lives. Consequently, it is important to examine whether relative thinking exists in the context of choosing between differentiated goods even though we already know that proportions matter in choosing between life-saving plans.

As the literature review above suggested, much of the literature discussed the context of saving lives, but another major context that was explored is that of deciding whether to spend time to find a cheaper price for the same good (either when it is known that such a cheaper store exists but requires travel, or in the context of price search where other prices are unknown). This context is significantly different from the context of choosing between differentiated goods. In the first case, the consumer buys the exact same good, but can buy it in different stores. In the differentiated goods context, the goods are different (and the store may or may not be the same one).[3] This difference results in substantially different decision and considerations. The choice between differentiated goods requires the consumer to consider to what extent the higher-quality good yields a higher utility for him, and how much money it is worth paying to obtain the better quality. The decision whether to spend time to find a cheaper price for the same good requires the decision maker to evaluate in monetary terms the value of his time and effort. Evaluating the value of increased quality is very different from estimating the value of one's time and effort, and it is not clear that a behavior of relative thinking in the domain of price search or travelling to a cheaper store necessarily implies that it will also exist in choices between differentiated goods. Moreover, even in the context of spending time to find a lower price some studies showed that relative thinking is not always present (e.g., Darke & Freedman, 1993; Darke et al., 1995).

This study is also different from the literature discussed above in additional ways. Instead of making a binary choice (e.g., between two life-saving programs or between driving 20 minutes and spending $5 more), sub-

[2] In addition, in some contexts, the proportion of lives saved is also highly relevant, and this can create a heuristic decision rule that is then applied also when it is irrelevant. For example, most people would agree that it is more important to save ten panda bears than ten cows, because the population of Panda bears is smaller and therefore the same number of lives represents a higher proportion, and this makes sense in the context of endangered species. Similarly, preferences that give more importance to saving 40 lives in an Amazonian tribe of 50 people than to saving 40 lives in a people of hundreds of millions would not be viewed as biased or irrational by most people.

[3] Also, the literature on comparing prices for the same good focused on goods, while this study explores both goods and services.

https://doi.org/10.1017/S1930297500004125 Published online by Cambridge University Press

jects are asked to provide a price that makes them indifferent between the two differentiated goods. Consequently, their responses are on a continuous scale and allow to compute the amount of money that the subjects view as equivalent to the quality difference. This allows to obtain not only qualitative conclusions (e.g., that people are affected by the relative price differences) but also quantitative measurements of relative thinking. For example, we can analyze whether multiplying the price by x also multiplies the valuation of the quality difference by x ("full relative thinking") or by less than x ("partial relative thinking"). In three scenarios used in the experiment the data is consistent with full relative thinking, and in one scenario with partial relative thinking.

Moreover, the four different scenarios used yielded different results and I discuss several ideas about the possible reasons for these differences. One idea is that relative thinking is weaker when the quality dimension is more separable from the good, because then the subject can more easily evaluate the value of the additional quality in isolation from the good and therefore also without being affected by the good's price. Another idea is that in two scenarios we possibly see not only relative thinking but also additional effects, which are denoted "perceived quality difference effect", "perceived wealth effect", and "perceived necessity effect", and are explained in detail below.

2 Method and design

To test experimentally how price levels affect consumer behavior regarding price differences between differentiated products, a questionnaire that includes four different decision scenarios was developed. In one treatment the good's price in the scenario was high and in the other it was low. This tests how price affects the evaluation of quality differences.[4] In total, 415 subjects participated in the study.[5] The subjects were recruited on the campuses of two large Israeli universities, Ben-Gurion University of the Negev and Tel Aviv University. The four scenarios that the subjects answered (translated from the original questionnaire that was in Hebrew) were as follows (differences between the low- and high-price treatments are in brackets):

1. Assume that you want to purchase a laptop. The model in which you are interested is offered with two screen sizes: 15" and 13". Assume that all other features (including external size and weight) are identical across the two models. Also assume that on an average day you work with the computer for about 5 hours, and that you intend to replace it 3 years from today. If the computer with the 15" screen size costs [3750; 11250] Shekels, what is the maximal price of the computer with the screen size of 13" such that you will prefer it to the computer with the larger screen? _____ Shekels

2. Assume that you can do your weekly grocery shopping in one of two stores, which are at the same distance from your home. In store A the products are conveniently organized on the shelves and the store is spacious, clean, and quiet. Store B is not conveniently organized and is congested, dirty, and noisy. Purchasing the products you want to buy takes you an hour in either store. If the products you want to purchase cost a total of [194; 582] Shekels in store A, what is the maximal amount you will be willing to pay in store B such that you will prefer to shop there instead of in store A? _____ Shekels

3. Assume that you want to purchase a bicycle for your daily commute to the university and back (the ride takes 10 minutes), and you predict that you will use the bicycles for 3 years. The model in which you are interested comes in either 15 speeds or 5 speeds, and except for the number of speeds the two models are identical. If the 15-speeds model costs [475; 1425] Shekels, what is the maximal price of the 5-speeds model such that you will prefer it to the 15-speeds model? _____ Shekels

4. Assume that you want to fly to New-York (one-way). You found two possible flights. One flight is direct from Tel-Aviv to New-York and it takes 11 hours. The second flight makes a connection stop of 3 hours in Europe, and the two flight segments take 11 hours together (so you will arrive in New-York 14 hours after the departure from Tel-Aviv). The suitcases continue directly to New-York and you do not need to take them out in Europe and check them in again during the connection stop. Other than the connection the flights are identical. If the direct flight costs [$274; $822], what is the maximal price of the flight with the connection such that you will prefer it to the direct flight? $_____

The four scenarios are in different consumption categories, in order to ascertain that if relative thinking is detected, it is a general and robust phenomenon. In addition, the scenarios chosen are related to products and services

[4] Another manipulation was the participation fee paid to subjects. Half of the subjects received 5 Shekels (about 1.10 US Dollars) for answering the questionnaire, while the other half received 15 Shekels. The goal of this manipulation was to examine whether a different participation fee affects the bias of relative thinking. The different participation fee did not have a statistically significant effect. Therefore in the rest of the article the participation fee treatments are combined.

[5] A few subjects did not answer all questions. Therefore the number of observations in each scenario is slightly less than 415.

https://doi.org/10.1017/S1930297500004125 Published online by Cambridge University Press

that students are familiar with, so that their responses are as informed as possible (asking them about a purchase of a house, for example, is less likely to relate to their life experience than asking about the purchase of a bike or grocery products). Subjects were generally in their mid-twenties (because of compulsory military service in Israel, people rarely start university before they are 20–21 years old, and many start a few years later). The ratio between the prices in the two price treatments was three in all scenarios in order to allow a comparison between the scenarios later on. This constant ratio was chosen to be three as a compromise between two opposite requirements. One is that the prices should be sufficiently different to allow to observe relative thinking if people indeed exhibit such a bias. This requires that the ratio between the two prices is not too small. The other requirement is that the prices are reasonable given the range of market prices for the relevant goods, which can encourage more accurate responses from the subjects. This limits the possible ratio between the prices. The ratio of three allowed the prices in the questions to be reasonable and yet it yielded a strong and statistically significant effect of relative thinking, so this ratio seems to have been a good choice.

3 Hypotheses, results and discussion

3.1 Relative thinking with differentiated goods and services

In each of the four questions in the experiment, the subject is given the price of the high-quality good, and is asked to provide the maximal price of the low-quality good for which he prefers the latter. This means that his response is the price of the low-quality good for which he is indifferent between the two goods, because up to this price he prefers the low-quality good, and for any higher price he prefers the high-quality good. Consequently, the difference between the subject's response and the price of the high-quality good represents the subject's monetary valuation of the quality difference between the goods. This valuation, denoted by VOQ (for "value of quality"), is the amount of money that gives the subject the same utility as the utility difference between the two goods, according to the subject's stated preferences (of course it is not the money per se that gives utility, but whatever the subject can purchase with it).

If people behave according to the principle implied by economic theory, comparing the absolute price difference to their increased utility from the better product, then the VOQ should be similar regardless of the treatment; the good's price should not affect the VOQ. The alternative hypothesis is that people consider also (or exclusively) relative price differences, and as a result are willing to pay more for the same quality difference when the goods' prices are higher. If this hypothesis is correct, the VOQ should be higher in the high-price treatment; this leads to Hypothesis 1:

Hypothesis 1: Relative price differences affect choices between differentiated goods; specifically, the amount people are willing to pay for a constant improvement in quality is increasing in the good's price.

Table 1 presents summary statistics of the VOQ in each scenario and price treatment, and the results of the t-test for difference in means and of the Mann-Whitney U test. The strong positive effect of the good's price on the VOQ is obvious: the VOQ is much higher in the high-price treatment, and the two statistical tests in all four scenarios provide p-values below 0.0001, suggesting that the difference between the two price treatments is statistically significant. This means that Hypothesis 1 is supported very strongly by the data in the experiment.

We may ask whether the VOQ in the responses reflects the real preferences of the subjects, or whether the true preferences are different but for some reason responses deviate systematically from them and reflect also some sort of a scaling bias. One reason for thinking that the responses reflect true preferences is that, when responses are affected by a scaling bias, they are likely to be sensitive to the elicitation method, but the literature documents behavior of relative thinking in studies that elicited responses in many ways. For example, Tversky and Kahneman (1981) asked subjects whether they would drive 20 minutes to another store for a $5 savings, and obtained results that show that subjects considered the percentage savings. Another reason to believe that subjects reveal their true preferences is the evidence that firms respond in their pricing decisions to relative thinking (Azar, 2010). If the findings on relative thinking were artifacts of experiments that do not reflect true preferences and therefore are not present in real markets, firms would not respond to relative thinking of consumers.

Given the strong positive effect of the good's price on the VOQ, it is interesting to examine whether multiplying the price by three (in all four scenarios this is the ratio between the two price treatments) also multiplies the VOQ by three. If consumer decisions are affected only by relative price differences ("full relative thinking"), then the VOQ in the high-price treatment should be about three times the VOQ in the low-price treatment. If both relative and absolute price differences affect consumer decisions ("partial relative thinking"), then the VOQ should increase less than the price increase (because of the moderating effect of the absolute price difference), i.e., the

https://doi.org/10.1017/S1930297500004125 Published online by Cambridge University Press

Table 1: Value of quality (VOQ) in the various scenarios.

Scenario and price treatment	N	25th Perc.	Median	75th Perc.	Mean	Std. dev.	p-value t-test	p-value MW test
1-Laptop (3750 Sh.)	206	550	750	1250	903.2	686.4		
1-Laptop (11250 Sh.)	202	1250	2250	3250	2938.7	2530.8		
Comparison of laptop price treatments							<0.0001	<0.0001
2-Grocery (194 Sh.)	197	19.4	44	50	44.0	35.8		
2-Grocery (582 Sh.)	201	42	82	182	117.3	105.1		
Comparison of grocery price treatments							<0.0001	<0.0001
3-Bike (475 Sh.)	206	75	125	195	149.6	96.4		
3-Bike (1425 Sh.)	201	225	425	675	487.3	297.3		
Comparison of bike price treatments							<0.0001	<0.0001
4-Flight ($274)	207	24	49	74	54.5	40.3		
4-Flight ($822)	204	42	100	172	119.4	121.0		
Comparison of flight price treatments							<0.0001	<0.0001

The p-values reported are the two-tailed p-values of the t-test for difference in means (allowing for unequal variance) and of the Mann-Whitney U test between the low-price and the high-price treatments in each scenario.

VOQ should increase by a factor of less than three. From Table 1 we can compute the ratio between the means in the high-price and low-price treatments. This ratio is equal to 3.25 in the laptop scenario, 2.67 in the grocery scenario, 3.26 in the bike scenario and 2.19 in the flight scenario.

To test formally whether the VOQ increases by the same factor as the price, a variable denoted REL-VOQ (REL for "relative") was computed as the ratio between the VOQ provided by the subject and the price included in the scenario. For example, if a subject in the low-price flight scenario (where the direct flight costs $274) answers that he prefers the flight with the connection up to a price of $250, then REL-VOQ = $24/$274 = 0.088. If people exhibit full relative thinking, the value of REL-VOQ should be the same in the low-price and high-price treatments. This equality is tested for each scenario separately using both a t-test for difference in means and a Mann-Whitney U test. The results of these tests are reported in Table 2.

In scenarios 1, 2, and 3 we cannot reject at the 5% significance level the hypothesis that the variable REL-VOQ has the same mean in both price treatments. This means that in these scenarios the data are consistent with full relative thinking—i.e., people consider only relative price differences. In scenario 4 (the flight scenario), on the other hand, we can reject the hypothesis that the mean of REL-VOQ is the same in the two price treatments. REL-VOQ is higher in the low-price treatment there, which means that multiplying the price by three increases the VOQ on average by a factor of less than three. This pattern is consistent with partial relative thinking—people being affected by both absolute and relative price differences. The results in the flight scenario being different from the other scenarios suggest that some contexts encourage relative thinking more than others. Consequently, in contexts that are highly susceptible to relative thinking, we may observe full relative thinking, but in other contexts relative thinking may be weaker, leading to partial relative thinking.

It should be emphasized, however, that even partial relative thinking is inconsistent with the traditional assumptions of economic theory, because when choosing between differentiated goods one should consider only absolute price differences, as explained in more detail in the introduction. The results in the three scenarios that are consistent with full relative thinking are even more striking. While economic theory suggests that only absolute price differences should matter, in these scenarios we cannot reject the hypothesis that absolute differences have no effect at all and only relative price differences affect consumer behavior.

3.2 Comparison of relative thinking between the scenarios

A closer look at the data shows that also the grocery store scenario exhibits less relative thinking than the laptop and

https://doi.org/10.1017/S1930297500004125 Published online by Cambridge University Press

Table 2: Full or partial relative thinking?

Scenario	N	Mean of REL-VOQ in the low-price treatment	Mean of REL-VOQ in the high-price treatment	p-value of t-test for difference in means (2-tailed)*	p-value of Mann-Whitney U test (2-tailed)
1-Laptop	408	0.241	0.261	0.3167	0.2289
2-Grocery	398	0.227	0.202	0.1651	0.0532
3-Bike	407	0.315	0.342	0.1869	0.1685
4-Flight	411	0.199	0.145	0.0003	<0.0001

* Allowing for unequal variance.

bike scenarios. As mentioned earlier, the ratio between the mean VOQ in the high-price treatment and the low-price treatment is equal to 3.25 in the laptop scenario, 2.67 in the grocery scenario, 3.26 in the bike scenario and 2.19 in the flight scenario. The ratios of the medians of the two treatments are 3.00 in the laptop scenario, 1.86 in the grocery scenario, 3.40 in the bike scenario and 2.04 in the flight scenario. We can see that the ratio in the laptop and bike scenarios is at least three in all cases, whereas in the grocery and flight scenario it is always less than three. That is, in the laptop and bike scenarios the ratio in VOQ exceeds the price ratio between the treatments (which is three), whereas in the grocery and flight scenarios the opposite is true.

Why is the effect of the price treatment stronger in the laptop and bike scenarios than in the grocery and flight scenarios? Several potential reasons might contribute to these results. First, when the quality dimension is more easily separable from the good, this may trigger relative thinking less, because the subject can more easily evaluate the value of the additional quality in isolation from the good. When he can think about the quality separately from the good, the subject may tend less to determine the value of quality based on the good's price, which is the source of relative thinking here. We can think about the value of wasting three hours of our time in an airport and separate this characteristic of the flight more easily than we can separate screen size from a laptop or the number of speeds from a bike. We are more used to considering the value of our time in isolation from a flight than we are used to considering the value of speeds in isolation from a bike, for example. This may be the reason that in the flight scenario we observe a weaker relative thinking than in the laptop and bike scenarios. In the grocery store scenario, the store's organization and cleanliness are clearly an inherent part of the shopping experience, but they are not part of the goods themselves. Once we finished our shopping trip and we are driving back home, we have the same goods in our baskets, regardless of the conditions that were present in the grocery store. This is not the case with a laptop screen or a bike's speeds. Therefore also in the grocery scenario the quality dimension is more separable from the good than in the laptop and bike scenarios, which may be the reason why relative thinking is weaker in the grocery store scenario.

Second, in the laptop and bike scenarios we possibly see additional effects on top of relative thinking. This can also explain why the ratio of VOQ in these scenarios is even larger than the ratio of the prices (three). Let us call the effects "perceived quality difference effect", "perceived wealth effect", and "perceived necessity effect". The "perceived quality difference effect" means that the subject perceives a higher quality difference between the low-quality and high-quality goods (e.g., 13" and 15" screen laptops) when the good's price is higher, because he infers from a higher price that the good's quality is higher (even though the experiment is between subjects), and then he attributes a higher value to the difference between the low-quality and high-quality goods.[6] For example, a subject who considers the expensive laptop may assume that it is of a very high quality and attributes a high value to the difference between 13" and 15" screens, whereas a subject who considers the cheaper laptop assumes a lower quality of the laptop and therefore also of the screen, and consequently he also values the difference between 13" and 15" by a smaller amount. A similar argument can be made about the quality of the speeds in the bike.[7] However, a similar logic is irrelevant in the grocery store and flight scenarios. The value of

[6] See for example Hamilton and Chernev (2010) on the impact of price image on consumer evaluation of products.

[7] An important reason why a higher perceived quality may result in a higher value for a certain improvement (e.g., in screen size) is that a subject may think that he will use the good more often and for a longer period when its quality is higher. To mitigate this possibility, the wording of the scenarios states clearly how much time the subject should expect to use the good (e.g., five hours a day for three years in the laptop scenario, and a ten-minute ride twice a day for three years in the bike scenario).

https://doi.org/10.1017/S1930297500004125 Published online by Cambridge University Press

avoiding a connection is not higher when you pay more for the flight ticket.[8] The value of spending an hour in a more pleasant store is unrelated to how much you pay in the cashier.

The "perceived wealth effect" captures the idea that a subject who is told to imagine spending a lot of money on a good may say to himself something along the lines of "if I am so wealthy that I can spend so much on a good, then I can also spend a lot on getting the better version of that good". That is, the higher the price the subject is asked to consider, the more wealthy the subject imagines himself. This is more relevant in these situations where the prices that people pay for a good are more closely related to their wealth. People who buy more expensive laptops and bikes are probably wealthier on average than those who buy the cheaper versions.[9] Therefore telling a subject to imagine buying a 11250-Shekels laptop may result in him viewing himself as richer than someone who considers buying a 3750-Shekels laptop. Consequently, the former subject may also be willing to pay more for the upgrade from 13" to 15". In the case of flights, on the other hand, what someone pays is usually determined mostly by the question to which destination he wants to fly and in which dates; his wealth does not have the same effect that it has in other consumption categories. Similarly, in the grocery shopping scenario making a larger purchase can result from many different reasons that are unrelated to the consumer's wealth. For example, a wealthier consumer may eat in restaurants more often and therefore purchase less in the grocery store. The amount spent can also reflect the quantity of food that one consumes, which vary significantly between people in a manner that is unrelated to wealth. Some students go to their parents' house every weekend (this is common for Israeli students) and then they do not need as much food so they can purchase less. Some consumers buy in the grocery store also non-food items such as toothpaste and soap, while others purchase such items in other stores. Some people may purchase also for their roommate, or shop less frequently, resulting in larger amounts per shopping trip. Consequently, the amount the subject is told to imagine spending in the grocery store should not affect how rich the subject views himself. Therefore in the flight and grocery store scenarios the possible effect of perceived wealth is irrelevant.

[8]First, the price of a flight ticket is not so much a signal about the airline quality as a laptop or bike price is about the good's quality; quality differences between airlines are not as big as differences between computers or bikes, and price variation for airline tickets is often more a function of demand and supply conditions, the time of the year and similar consideration than of the airline quality. Second, even if the subject does associate a higher flight price with a higher quality, it is not clear why the airline quality should have any impact on the value of avoiding spending three hours in a connection stop.

[9]It should be pointed out, however, that in the bike scenario even the more expensive bike, which was slightly above $300, is relatively inexpensive.

The "perceived necessity effect" is the idea that, when a subject is being told that he wants to spend a lot of money on a good, he may interpret it to mean that the good is very important for him, and as a result also be willing to spend more money to upgrade the good to its high-quality version. For example, a subject may think "If I spend a large amount of 11250 Shekels on a laptop, then it must be very important to me, in which case it also worth a lot to get the 15" screen". The wording of the laptop and bike scenarios that includes how often and for how many years the subject should expect to use the good are supposed to mitigate this effect, but possibly it still exists, at least for some subjects. In the flight scenario this perceived necessity effect is irrelevant. First, similar to the argument made earlier, the flight's price may be a result of issues other than the flight's importance. Second, even if one views a certain flight as important, it still does not mean that avoiding a connection becomes important as well. In the grocery store scenario, spending more does not mean more important purchases (for similar reasons to those discussed earlier), and even if one purchases important goods it does not imply that the convenience of shopping becomes more important.

4 Conclusion and implications for business strategy

The article examines decision making in a very common consumer problem, in which a consumer is faced with differentiated goods or services that differ in price and quality. Indeed, almost any time we want to purchase something we can choose from several alternatives with different prices and quality levels. The study finds a strong decision making bias: when people consider differentiated goods or services they are affected by relative price differences even in situations where economic theory suggests that only absolute price differences matter, a behavior that was denoted "relative thinking". This result is documented in four different scenarios taken from different consumption categories. In three of the four scenarios, the hypothesis that people exhibit "full relative thinking" (they consider only relative price differences and pay no attention at all to absolute price differences) cannot be rejected. In one scenario there is evidence that people exhibit "partial relative thinking"—being affected by both relative and absolute price differences. Some ideas about the possible reasons for differences between the scenarios are discussed. One idea is that relative thinking is weaker when the quality dimension is more separable from the good, because then the subject can more easily evaluate the value of the additional quality in isolation from the good and therefore also without being affected by the good's price. Another idea is that in

https://doi.org/10.1017/S1930297500004125 Published online by Cambridge University Press

the laptop and bike scenarios we possibly see additional effects in addition to relative thinking; these effects are denoted "perceived quality difference effect", "perceived wealth effect", and "perceived necessity effect", and are explained in detail above.

The results thus challenge the common assumptions in economic theory about how people choose between differentiated goods. Consequently, this study improves our understanding of consumer decision making and offers important implications for research in marketing, decision science, psychology and economics, and to businesses and managers. Economic models, for example, might yield better predictions if they account for this behavior and not assume that consumers only consider absolute price differences. This is particularly relevant in models dealing with horizontal or vertical differentiation, optimal pricing, competitive strategy, or advertising.

Azar (2008a), for example, uses a two-period game-theoretic model of location differentiation in which he incorporates relative thinking of consumers. Relative thinking in this framework causes consumers to make less effort to save a constant amount when they buy more expensive goods. This is modeled by assuming that consumers behave as if their transportation costs are increasing in the good's price. As a result, the firms raise prices in order to increase the perceived transportation costs of consumers, which consequently softens competition, allows higher profits, and reduces consumer surplus.

Another implication of relative thinking applies to multi-product retailers. Azar (2008b) analyzes the pricing decisions of multi-product retailers who respond to relative thinking of consumers. In his model, some consumers buy only one good and others purchase two different goods. He finds that the markup on the good with the lower reference price may be negative (consistent with the idea of loss-leader pricing), but the markup on the good with the higher reference price is always positive. The model shows that when consumers buy several goods, the seller can benefit from reducing the prices of the cheaper goods—possibly even below cost—and raising the prices of the expensive items, compared to the optimal prices without relative thinking.

Various studies (e.g., Aalto-Setälä, 2003; Xing, in press) show that price dispersion is strongly correlated with the good's price. Azar (2004) shows that search and location differentiation models suggest that price dispersion is a function of search and transportation costs. Because these costs are independent of the good's price, price dispersion is supposed to be uncorrelated with the good's price as well—in contradiction with the empirical evidence. Azar explains why relative thinking can explain the discrepancy between theory and evidence on price dispersion. Relative thinking causes people to make more effort to save when the percentage saved is higher even if the absolute amount saved is the same. Consequently, they behave as if their search or transportation costs are an increasing function of the good's price. Once firms respond to this behavior, price dispersion indeed becomes positively correlated with the good's price.

One additional example for how businesses may respond to relative thinking is in the context of the optimal set of products to offer to customers. Suppose that a firm can enhance the variety of colors in which its good (e.g., a car or an eyeglasses frame) is offered, but it is not sure whether to increase the variety of a cheap model or a more expensive one. According to relative thinking, it is likely that consumers will be willing to add more money to get their favorite color when the good's price is higher. Consequently, relative thinking suggests that increasing the color variety for the more expensive model might be more attractive than if we ignore relative thinking. Of course, there are other factors at play as well; the income of the average consumer of the more expensive model might be higher, for example, also leading to a higher willingness to pay for a desired color in the more expensive model. The quantity sold of each model is also an important consideration, and possibly the cheaper models are sold more often. Relative thinking is not the only consideration, but it can also have an effect on the optimal set of products the firm should choose to manufacture, and therefore it should be taken into account.

References

Aalto-Setälä, V. (2003). Price dispersion and search costs in grocery retailing. Working paper, National Consumer Research Centre, Helsinki, Finland.

Azar, O. H. (2004). *Psychological motivations and biases in economic behavior and their effects on markets and firm strategy*. Ph.D. Dissertation, Northwestern University, Evanston, Illinois.

Azar, O. H. (2008a). The effect of relative thinking on firm strategy and market outcomes: A location differentiation model with endogenous transportation costs. *Journal of Economic Psychology*, *29*, 684–697.

Azar, O. H. (2008b). Optimal strategy of multi-product retailers with relative thinking and reference prices. Working paper, Ben-Gurion University of the Negev.

Azar, O. H. (2010). Firm strategy and biased decision making: The price dispersion puzzle. Working paper, Ben-Gurion University of the Negev.

Azar, O. H. (in press). Do consumers make too much effort to save on cheap items and too little to save on expensive items? Experimental results and implications for business strategy. *American Behavioral Scientist*.

Baron, J. (1997). Confusion of relative and absolute risk in valuation. *Journal of Risk and Uncertainty*, *14*, 301–

309.

Bartels, D. M. (2006). Proportion dominance: The generality and variability of favoring relative savings over absolute savings. *Organizational Behavior and Human Decision Processes*, *100*, 76–95.

Darke, P. R., & Freedman, J. L. (1993). Deciding whether to seek a bargain: Effects of both amount and percentage off. *Journal of Applied Psychology, 78*, 960–965.

Darke, P. R., Freedman, J. L., & Chaiken, S. (1995). Percentage discounts, initial price, and bargain hunting: A heuristic-systematic approach to price search behavior. *Journal of Applied Psychology*, *80*, 580–586.

DelVecchio, D. (2005). Deal-prone consumers' response to promotion: The effects of relative and absolute promotion value. *Psychology & Marketing*, *22*, 373–391.

Fetherstonhaugh, D., Slovic, P., Johnson, S. M., & Friedrich, J. (1997). Insensitivity to the value of human life: A study of psychophysical numbing. *Journal of Risk and Uncertainty, 14*, 283–300.

Frisch, D. (1993). Reasons for framing effects. *Organizational Behavior and Human Decision Processes*, *54*, 399–429.

Grewal, D., & Marmorstein, H. (1994). Market price variation, perceived price variation, and consumers' price search decisions for durable goods. *Journal of Consumer Research*, *21*, 453–460.

Hamilton, R., & Chernev, A. (2010). Price image in retail management, Working paper.

Heath, T. B., Chatterjee, S., & Russo France, K. (1995). Mental accounting and changes in price: The frame dependence of reference dependence, *Journal of Consumer Research*, *22*, 90–97.

Homburg, C., Koschate, N., & Totzek, D. (2010). How price increases affect future purchases: the role of mental budgeting, income, and framing. *Psychology & Marketing*, *27*, 36–53.

Hotelling, H. (1929). Stability in competition. *The Economic Journal*, *39*, 41–57.

Kogut, T., & Beyth-Marom, R. (2008). Who helps more? How self-other discrepancies influence decisions in helping situations. *Judgment and Decision Making*, *3*, 595–606.

Mowen, M. M., & Mowen, J. C. (1986). An empirical examination of the biasing effects of framing on business decisions. *Decision Sciences*, *17*, 596–602.

Ranyard, R., & Abdel-Nabi, D. (1993). Mental accounting and the process of multiattribute choice. *Acta Psychologica*, *84*, 161–177.

Salop, S. C. (1979). Monopolistic competition with outside goods. *The Bell Journal of Economics*, *10*, 141–156.

Svenson, O. (2008). Decisions among time saving options: When intuition is strong and wrong. *Acta Psychologica*, *127*, 501–509.

Thaler, R. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behavior and Organization*, *1*, 39–60.

Tirole, J. (1988). *The Theory of industrial organization*. Cambridge, MA: The MIT Press.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211*, 453–458.

Xing, X. (in press). Can price dispersion be persistent in the internet markets? *Applied Economics*.