Market and welfare effects of quality misperception in food labels: an experimental analysis

Francisco Scott

Purdue University

Abstract

The size and distribution of surplus in markets where credence quality attributes of goods are conveyed through some informational mechanism (typically labels) crucially depend on 1) how information changes consumers' perception of quality and 2) producers' strategic choice of quality provision in response to changes in consumers' perception of quality. While there is a growing empirical literature on consumers' perception of quality, there is a dearth of empirical studies regarding firms' reactions to changes in consumers' perception of quality. A major reason underlying this dearth of empirical studies is that consumers' perceived, as opposed to actual–quality, is unobservable to the researcher. Based on previously derived theoretical predictions, I design an experiment in the laboratory where I emulate changes in consumers' perception of quality and examine their effects on producers' provision of quality and market surplus. The experiment indicates that overvaluation of high-quality products relative to their lower-quality competitors (e.g., 100% organic relative to organic or made with organic) and undervaluation of low-quality products (e.g., presence of GM inputs relative to GM-free) result in a significant increase in quality and prices at the higher end of the spectrum, increase in profit for the high-quality seller, and increase in total welfare. Misperception produces ambiguous changes at the lower quality end. Efficiency measures show that effective informational-based policies should focus on high-quality products, but distributional measures show that efficiency gains are at the expense of the low-quality segment of the market.

Information-based mechanisms identifying unobserved credence attributes (e.g., labels) have proliferated in the markets of food products. Their increasing popularity is based on the assumption that they help consumers making better choices by eliminating informational asymmetries (Roe and Sheldon, 2007; Bonroy and Constantatos, 2015; Lusk et al., 2018). However, evidence provided by choice experiments reveals that consumers often fail to understand the information conceived in labels (Kiesel and Villas-Boas, 2013; Lee et al., 2013; Liaukonyte et al., 2015; McFadden and Lusk, 2018), which implies that consumers can miss-perceive (over- or undervalue) the true quality of labeled products. Economic intuition suggests that misperception can distort consumers' choices and change sellers' strategic responses (e.g. quality choice, price charged), impacting the size and distribution of welfare in the market. However, there is a dearth of empirical studies examining sellers' strategic reactions to consumers' misperception. This is partly explained by the unobserved nature of consumers' misperception and the difficulty of finding data with observational variation to misperception (Dranove and Jin, 2010).

To circumvent these limitations, I report a laboratory experiment that analyzes the degree to which the intensity of consumers' misperception alters sellers' strategic responses. In this paper, I manipulate the intensity of consumer misperception in a laboratory experiment to test the direction and magnitude of the effects of misperception of quality on market outcomes (qualities and prices), and welfare outcomes (consumer surplus, profits, and total welfare). My experimental design is based on the comparative statics from Scott and Sesmero (2020) which modifies the canonical model of competition by vertical differentiation to include the effects of consumers' misperception of quality. They consider a market where two single-product sellers— one serving the high-quality segment of the market and the other the low-quality segment— imperfectly compete on quality and prices. The authors assume quality is determined by credence attributes that can be conveyed by some costly informational mechanism to be adopted by sellers (e.g., labels), but consumers may misperceive the information in those mechanisms.

This framework is relevant for several reasons. A few markets, such as food markets, use third-party certification in the form of labels to correct asymmetric information in credence products (Roe and Sheldon, 2007; Bonroy and Constantatos, 2015). The assumption is that consumers use labels to verify the quality of products and adjust premiums accordingly, avoiding rent-seeking behavior from sellers (Dulleck and Kerschbamer, 2006). Under these conditions, labels would increase market efficiency, conditional on competition and market structure remaining constant. However, consumers' misperception of a label's quality alters the marginal benefit of sellers to adopt such a label. This, in turn, allows firms to strategically adopt higher or lower quality labels to capture some extra market surplus. Such changes in quality adoption are important because standard economic theory suggests that markets where sellers vertically differentiate suffer from chronicle underprovision of quality (Buehler and Schuett, 2014; Scott and Sesmero, 2020). If firms are responsive to misperception, this implies that the intensity of misperception can be high (low) enough to incentivize firms to increase (decrease) quality provision and overcome (deepen) the underprovision of quality, increasing (decreasing) welfare as a result. Empirical results in this paper show the conditions in which misperception leads to quality choices that increase (decrease) total welfare and how this welfare is distributed.

My experimental framework is closely related to experiments examining quality commitment in markets of imperfect information. The experimental design of most of these studies either (1) exogenously varies the informational mechanism or (2) exogenously varies the quality signal that firms send to consumers. Cason and Gangadharan (2002) is an example of (1). Motivated by the introduction of green-labels in the market, the authors compare a green label certification scheme with other informational mechanisms (such as cheap talk and firm reputation). They find that, despite being costly, certification is a necessary condition to increase the number of green-labeled products in a market. Differently from my setting, the authors assumed complete adherence between the information given by the certification and consumer perception of quality.

Henze et al. (2015) is an example of (2). Using the primitives of a model of vertical differentiation, they vary the proportion of consumers informed about the quality of products—from full information to no information. Their full information treatment corresponds to the environment that I use as my benchmark, where misperception about the quality of a product is absent. However, their interest lies in the proportion of consumers that understand a quality signal, rather than the effects of the intensity of quality misperception, as in my study. The intensity of misperception is particularly important to food markets because the food industry uses several complex information mechanisms (e.g. labels and certification of credence attributes) that may magnify consumers' misperception and alter demand significantly (e.g., Villas-Boas et al. 2020).

Scott and Sesmero (2020) provides the ideal environment to test the strategic response of sellers to different intensities of misperception. While their study only considers a duopoly market, they are able to generate unambiguous comparative statics results from different intensities of consumers' misperception. Their comparative statics refers to market outcomes (equilibrium qualities, prices, and market share), as well as welfare outcomes (profits, consumer surplus, and total welfare) and how they relate. They find that firms' strategic reactions to misperception lead to higher efficiency under one of two conditions: (1) misperception incentivizes sellers to increase the average quality offered in the market which partly corrects the underprovision of quality that prevails in the absence of misperception (due to imperfect competition in quality and prices); or (2) misperception leads to a large enough expansion of the size of the market capable of offsetting reductions in average quality. The intuition behind these results is explained in the theoretical part of this paper.

The experiment reported in this paper compares the outcomes between a market where misperception is absent to the outcomes of four types of consumers' misperception: 1) overvaluation of the high-quality product; 2) undervaluation of the high-quality product; 3) overvaluation of the low-quality product; 4) undervaluation of the low-quality product. From a policy perspective, this is interesting because it informs the outcomes of informational-based policies that try to curb consumers' misperception, i.e. policies that bring consumers' perception close to the product's true quality. The experiment shows that the firm supplying for the high-quality segment of the market is highly responsive to misperception of quality (i.e., significantly changes its quality and prices when misperception changes), while the firm supplying for the low-quality segment remains largely unresponsive. This result is important because it shows that informational policies observes changes in market outcomes coming from the high-quality segment of the market only.

Efficiency and distribution are also impacted by changes in misperception. The experiment shows that, on average, sellers benefit from different types of misperception. The high-quality seller captures a large part of surplus when consumers overvalue the high-quality product or when they undervalue low-quality products; the low-quality seller captures surplus when consumers undervalue high-quality products or overvalue low-quality products. Consumer surplus from the high-quality segment is largely unresponsive to misperception of quality, while consumer surplus from the low-quality segment of the market largely moves in the same direction as the low-quality seller's profit. These results are explained by the magnitude of changes in quality and market size resulting from misperception. The distributional results are important because they reveal the winners and losers of different informational-based policies. Finally, decomposition of total welfare shows that changes in efficiency largely depend on the high-quality segment of the market (changes in high-quality profits and consumer surplus).

These results contribute to a body of economic experiments examining markets of credence goods. The existent research have investigated how liability and verifiability alter the incentives to overcharge or mislead consumers about their necessities (e.g., Dulleck et al.

2011); how competition and incentives can alter the incentives to overcharge (e.g., Mimra et al. 2016); and other incentive problems related to the market of credence goods, as described in Kerschbamer and Sutter (2017). My study expands the literature on such market experiments, particularly focused on the intensity of consumers' misperception of quality. From a policy perspective, it reveals that in an environment where consumers misperceive quality and competition is imperfect, correcting overvaluation of high-quality products or undervaluation of low-quality has a deleterious effect on efficiency, but can benefit sellers and consumers of the low-quality segment of the market, without an impact on consumers of the high-quality product.

The paper is divided as follows. Section 1 describes the theory and experimental hypotheses. Section 2 describes the experimental design. Section 3 describes the results, and section 4 concludes.

1 Theory and hypotheses

1.1 Equilibrium and comparative statics

We heavily rely on the theoretical predictions of Scott and Sesmero (2020). We reproduce most of their model and intuition here. The model considers a market where consumers differ in their taste for quality and are distributed uniformly along a continuum of willingness-to-pay (given by θ) for quality (given by v). The parameters of the uniform distribution are $[\underline{\theta}, \bar{\theta}]$. Quality is a credence attribute and, hence, unobservable to consumers. Consumers rely on a credible, non-profit, third-party to certify quality grade v. The third-party uses a continuous grade program to certify quality. The model also considers a single-product duopoly in which firms have access to the same technology, which consists of a constant marginal cost, normalized to zero, for simplicity. The firms offer products with credence attributes that are certified through labels. Certification is costly, and I let cost be represented by $C(\cdot)$. For this study, I resort to a quadratic cost structure, following previous papers (e.g. Motta 1993; Aoki and Prusa 1997; Buehler and Schuett 2014).

The model assumes an honest and non-strategic third-party, but allows for misperception of certified grade quality v by consumers. For example, misperception can arise from imperfect disclosure or imperfect understanding of information of certified products, such that misperception creates a wedge between the actual quality offered by firms and the perceived quality by consumers. Since the model considers only two labeled products in the market, the quality of the product certified with the relatively higher quality grade is represented by v_h, and a relatively lower quality grade is represented by v_l, such that $v_h > v_l$. The model describes the two misperception parameters, k_h (misperception of the high-quality grade) and k_l (misperception of the low-quality grade). Perceived qualities are denoted by $k_h v_h$ and $k_l v_l$ for the high- and low-quality products, respectively. In the presence of overvaluation, the authors let $k_j > 1$ for product $j \in \{h, l\}$; in the presence of undervaluation $k_j < 1$; and in the absence of misperception, $k_j = 1$.

As in Scott and Sesmero (2020), I consider relative misperception of qualities and its implications. For example, consider a case in which consumers only overvalue the high-quality product, i.e. $k_h > 1$ and $k_l = 1$. This increases the perceived difference in quality between products while also increasing the perceived average quality of products in the market. Similarly, overvaluation of the low-quality product only, i.e. $k_h = 1$ and $k_l > 1$, reduces the perceived difference in quality between products while increasing the perceived average quality of products in the market. Undervaluation of the high-quality product, i.e. $k_h < 1$ and $k_l = 1$, reduces the perceived difference in quality between products while reducing the perceived average quality of products in the market. Undervaluation of the low-quality product, i.e. $k_h = 1$ and $k_l < 1$, raises the perceived difference in quality between products while also reducing the perceived average quality of products in the market.[1]

The model defines indirect utility of consumers that buy labeled quality grade j as $V_i(v_j, p_j, k_j) = \theta_i k_j v_j - p_j$, such that i index the consumer's position in the WTP distribution, θ_i is the consumer's valuation of quality, $k_j v_j$ is consumers' perceived quality of product $j \in \{h, l\}$, and p_j is the price of product j. The indirect utility of those consumers consuming the outside good is zero. This class of indirect utility is a modification of indirect utilities commonly found in the literature (e.g., Jean Tirole 1988; Lehmann Grube 1997; Bonroy and Constantatos 2015). Marginal consumers θ_{lh} (indifferent between low- and high quality), θ_{0l} (indifferet between outside good and low-quality), and aggregate demand functions (D_h, D_l) are derived as in the traditional vertical differentiate model (see Jean Tirole 1988).

Conditional on the aggregate demands, firms compete in two stages. First, a quality-competition stage, in which firms choose quality. Then, a price-competition stage in which, conditional on quality, they compete in prices. The solution of the two-stage game is computed by backward induction in the usual way (Ronnen, 1991; Aoki and Prusa, 1997; Lehmann Grube, 1997).

Firms' profits are given by equations 1 and 2:

$$\pi_h = R_h(v_h, v_l, p_h, p_l; k_h, k_l) - C(v_h) = p_h D_h(v_h, v_l, p_h, p_l; k_h, k_l) - C(v_h) \tag{1}$$

$$\pi_l = R_l(v_h, v_l, p_h, p_l; k_h, k_l) - C(v_l) = p_l D_h(v_h, v_l, p_h, p_l; k_h, k_l) - C(v_l), \tag{2}$$

where $R_j(v_h, v_l, p_h, p_l; k_h,\ k_l)$ is revenue of the firm offering product j.

In this paper, price-competition is simultaneous, while quality-competition is sequential.

[1] Scott and Sesmero (2020) also discusses the special case in which over-(under-)valuation of a product is offset by an under-(over-)valuation of the other product, such that average perceived quality is unaltered from a perfect information case. We do not discuss this case here, as it is not implemented as part of the experiment.

The timing of the game reflects empirical situations in which a firm can commit to a specific quality before the other, but it cannot do the same with prices. Such timing is associated with large switching costs between quality investments (Aoki and Kurz, 2003). In food markets, this reflects the empirical realities of industries in which producing technologies are asset-specific, as the cage-free egg industry (e.g., EggIndustry 2019). In food markets, many of these industries also rely on labels to communicate credence attributes.

Scott and Sesmero (2020) shows that a sufficient condition for a global solution of the sequential programming described above consists in restricting misperpcetion k_h to $[0.75, 1.75]$ when $k_l = 1$, and k_l to $[0.5, 1.3]$ when $k_h = 1$. Under these parameters, the leader always assume the high-quality spectrum of quality, while the follower becomes the low-quality firm. The optimal quality solution of the game is represented by $\{v_h^*, v_l^*(v_h)\}$, which consists of the equilibrium quality chosen by the high-quality firm and the follower's best-response to the high-quality grade. Optimal prices are represented by $\{p_h^*(v_h^*, v_l^*), p_l^*(v_h^*, v_l^*)\}$. Total welfare is the summation of profit of the high-quality firm (π_h), profit of the low-quality firm (π_l), surplus of the segment of consumers purchasing the high-quality product (CS_h), and surplus of the segment of consumers purchasing the low-quality product (CS_l). Therefore, I define welfare as $W\left(v_h, v_l, p_h, p_l; k_h, k_l\right) \ = CS_h + CS_l + \pi_h + \pi_l$.

Notice that under misperception there is a divergence between the actual utility, defined as the one the consumer derives from the actual quality of the good, and the perceived utility, defined as the one the consumer derives from the perceived quality of the good. The authors follow the approach implemented in the literature (e.g. Glaeser and Ujhelyi 2010; Brécard 2014; Baksi et al. 2017) and evaluate consumer surplus based on the actual levels of quality provided, v_j, instead of the augmented perceived quality, $k_j v_j$. Formally, consumer surplus is defined as in equations 3 and 4.

$$CS_h = \int_{\theta_{lh}}^{\bar{\theta}} \frac{\theta v_h - p_h}{\bar{\theta} - \underline{\theta}} d\theta. \tag{3}$$

$$CS_l = \int_{\theta_{0l}}^{\theta_{lh}} \frac{\theta v_l - p_l}{\bar{\theta} - \underline{\theta}} d\theta. \tag{4}$$

Armed with these definitions, we can explore the effects of shocks in misperception to market outcomes (qualities, prices, demanded quantity) and welfare (profits, consumer surplus). I now turn the attention to these comparative statics which are later tested in my experimental setting. Table 1 summarizes the direction of change for increases in misperception parameters (see Scott and Sesmero 2020 for a full derivation).

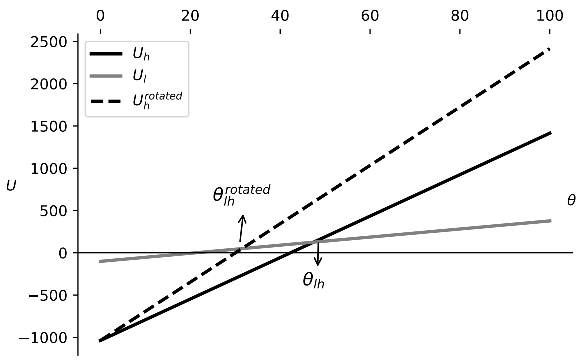
Table 1: Sign of the comparative statics under misperception shock $dk_j > 0$, $j \in \{h, l\}$

Effect	**Overvaluation of high-quality**	**Overvaluation of low-quality**
Quality		
High	+	-
Low	+	+
Price		
High	+	-
Low	+	+
Price per quality		
High	+	-
Low	+	+
Market-Share		
High	-	-
Low	-	-
Profit		
High	+	-
Low	+	+
Consumer Surplus		
High	-	+
Low	+	-
Total Welfare	+	+

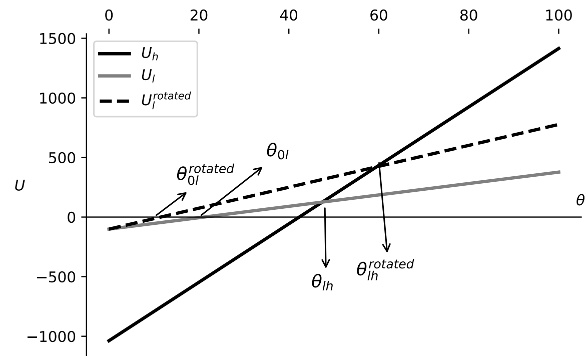
The reverse signs are found under misperception shocks leading to $dk_j < 0$

I discuss the intuition of the comparative statics now. Understanding the intuition behind the model's comparative statics will help later when I discuss the experimental results. I start with Figure 1. The horizontal axis represents the consumer's WTP index, θ_i, and the vertical axis represents utility as previously defined. The intercept of the utility curve represents equilibrium prices, and the curves' slope represents equilibrium quality. Relative to the case where misperception is absent, the model predicts that consumer's overvaluation (an increase in k_h, holding $k_l = 1$) increases the perceived utility of high-quality consumers, as indicated by the counterclockwise rotation of its utility curve (figure 1a). Also, overvaluation of the high-quality grade strengthens the incentives for the high-quality firm to offer more quality. Thus, the high-quality consumer's utility further rotates left, expanding the market for the high-quality product, all else constant. This can be seen by the left shift of the marginal consumer θ_{lh} (figure 1c).

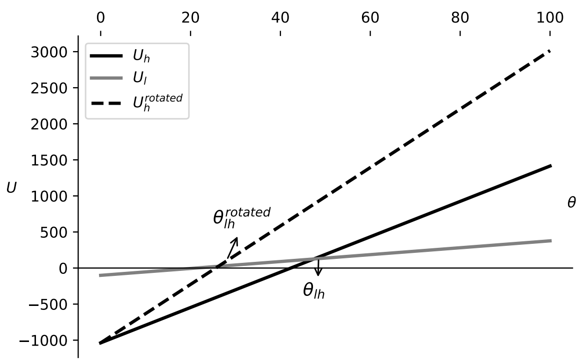
The increase in high-quality grade allows the follower to capture part of the consumers with higher WTP by increasing the quality of the low-quality product. This implies a counterclockwise rotation of the low-quality consumers, as indicated by figure 1d. With higher quality, both firms increase their prices (Figures 1e and 1f). This is done to increase margins until the marginal benefits (i.e., increase in markups) equates marginal costs (loss of market share). At equilibrium, firms are able to increase price more than they increase quality, which implies that quality-adjusted prices increase, and so do profits for both firms.



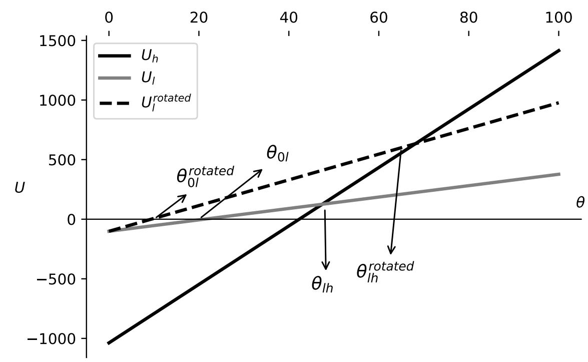
(a) Effect of overvaluation of high-quality product



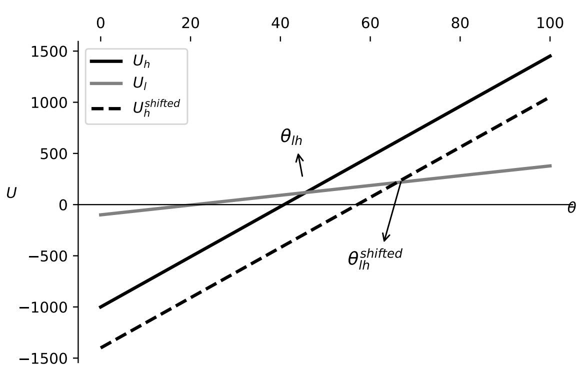
(b) Effect of overvaluation of low-quality product



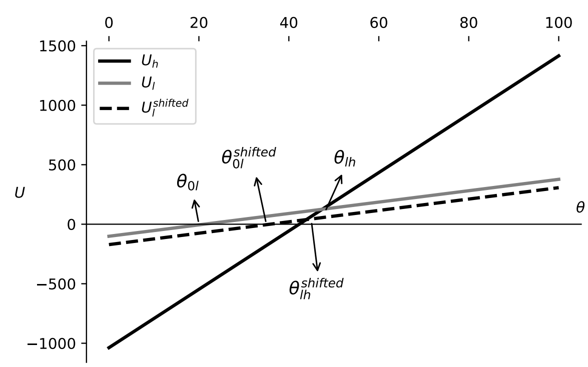
(c) Effect of quality increase in high-quality product



(d) Effect of quality increase in low-quality product



(e) Effect of price increase in high-quality product



(f) Effect of price increase in low-quality product

Figure 1: Effects of price and quality increase in the market of food labels. Each panel represents the effect of either prices or quality in marginal consumers, holding all else constant. Reproduced from Scott and Sesmero (2020) under different parameters.

Overvaluation of the low-quality grade (an increase in k_l, holding $k_h = 1$) rotates the low-quality consumer's utility counterclockwise (Figure 1b), which strengthens the return to quality for the low-quality firm. By offering higher quality, the low-quality firm expands the market for its product, all else constant. However, to prevent losses in market share, the leader pre-emptively decreases its quality and prices in order to retain market share. Additionally, the leader is able to decrease its fixed costs, as it only depends on the quality offered by the firm. In equilibrium, the model predicts that overvaluation of low-quality grade allows the low-quality firm to increase quality, price, and quality-adjusted price. This allows for higher profits for the low-quality firm. The high-quality firm decreases its quality and prices, in such magnitude that its quality-adjusted price decreases. As a result, its profits decrease.

The model predicts that consumer surplus decreases for the consumer segments incurring misperception. For example, high-(low-)quality consumers will overpay for quality in markets where there exists overvaluation of high-(low-)quality labels. This implies a decrease in consumer surplus for this segment, according to equations 3 and 4. Putting all together, misperception is predicted to produce multiple forces impacting total welfare. While overvaluation (undervaluation) of high-quality increases (decreases) surplus for firms and low-quality consumers, it decreases (increases) surplus of the high-quality consumer segment. Scott and Sesmero (2020) show that these movements are related to two main variables: average quality supplied by sellers and total size of the market. The authors show that information-based policies that decrease average quality decrease welfare; but lacking increases in average quality, they also show that welfare can still increase if the size of the market expands enough to offset the deleterious effects of lower qualities to welfare. Next, I summarize these effects in testable hypotheses.

1.2 Hypotheses

Based on the results of these comparative statics, I construct 6 hypotheses to be tested in an experiment. Hypotheses 1-3 refer to market outcomes: quality levels, and prices charged under different treatments of misperception of quality. Hypotheses 4-6 refer to welfare outcomes under the same treatments: firms' profits and consumer surplus of the high- and low-quality segments.

Hypothesis 1: Quality offered. In relation to the benchmark case in which misperception is absent (i.e., $k_h, k_l = 1$),

1. high- and low-quality increase (decrease) under overvaluation (undervaluation) of the high-quality product.
2. high-quality decreases (increases) and low-quality increases (decreases) under overvaluation of the low-quality product.

Hypothesis 2: Prices. In relation to the benchmark case in which misperception is absent (i.e., $k_h, k_l = 1$),

1. high- and low-quality prices increase (decrease) under overvaluation (undervaluation) of the high-quality product.
2. The price of the high-quality product decreases (increases) and the price of the low-quality product increases (decreases) under overvaluation (undervaluation) of the low-quality product.

Hypothesis 3: Quality-adjusted prices. In relation to the benchmark case in which misperception is absent (i.e., $k_h, k_l = 1$),

1. high- and low-quality quality-adjusted prices increase (decrease) under overvaluation (undervaluation) of the high-quality product.

2. Quality-adjusted price of the high-quality product decreases (increases) and the quality-adjusted price of the low-quality product increases (decreases) under overvaluation (undervaluation) of the low-quality product.

Hypothesis 4: Profits. In relation to the benchmark case in which misperception is absent (i.e., $k_h, k_l = 1$),

1. Profits of the high- and low-quality firms increase (decrease) under overvaluation (undervaluation) of the high-quality product.
2. The profit of the high-quality firm decreases (increases) and the profit of the low-quality firm increases (decreases) under overvaluation (undervaluation) of the low-quality product.

Hypothesis 5: Consumer Surplus. In relation to the benchmark case in which misperception is absent (i.e., $k_h, k_l = 1$),

1. Under overvaluation (undervaluation) of the high-quality product, the consumer surplus for the high- quality segment of the market decreases (increases), while consumer surplus of the low-quality segment of the market increases (decreases).
2. Under overvaluation (undervaluation) of the low-quality product, the consumer surplus for the high- quality segment of the market increases (decreases), while consumer surplus of the low-quality segment of the market increases (decreases).

Hypothesis 6: Total Welfare. In relation to the benchmark case in which misperception is absent (i.e., $k_h, k_l = 1$), total welfare increases (decreases) under overvaluation (undervaluation) of high- and low-quality products.

These 6 hypotheses are tested in a laboratory experiment. The next section describes the experimental design, the parameters used, and the theoretical equilibria of the treatments.

2 Experimental Design

We start by describing the experimental setting. I conduct a between-subjects experiment to investigate the role of consumers' misperception on market and welfare outcomes. I compare the results of 4 treatments under different intensities of consumers' misperception to a benchmark case under the absence of misperception. Subjects take the role of firms, while the role of consumers is automated. Automated consumers allow for better causal identification of market and welfare outcomes because we eliminate possible behavioral confoundings that may arise from the demand side of the market. It also allows for better traction between theory and the experimental setting, as both theory and experiment have demand curves arising from atomistic consumers distributed uniformly according to their willingness to pay for quality.

The treatments take the form of (1) overvaluation of high-quality grade, (2) undervaluation of high-quality grade, (3) overvaluation of low-quality grade, and (4) undervaluation of low-quality grade. The misperception parameters are summarized in table 2. The choice of parameters is discussed next. Notice that the misperception (k_j, $j \in \{h, l\}$) is a continuous variable. This implies that the experimenter can set the treatment level k_j anywhere in the interval where a global solution exists. To test the effects of undervaluation of the high-quality grade, k_h can be set anywhere in the interval $(0.75, 1]$. Likewise, the experimenter can choose any k_h between $(1, 1.75)$ to test outcomes under overvaluation of high-quality. To test undervaluation of low-quality, k_l can be set to any value in $[0.5, 1)$; overvaluation of low-quality needs k_l to be anywhere $(1, 1.3]$. To decide the appropriate levels of k_j, I follow List et al. (2011). The authors argue that, under continuous linear treatment effects, the experimenter should set the treatment variable to extreme values, such that it maximizes the difference between treatment outcomes. Therefore, I set $k_h = 1.5$, $k_h = 0.8$, $k_l = 1.3$, and $k_l = 0.65$ for treatments (1), (2), (3), and (4), respectively.

Table 2: Parameters and equilibrium solutions

	Parameter	Equilibrium	Surplus
Benchmark (BE)			
k_h	1	$v_h = 24.51$, $v_l = 4.78$	$\pi_h = 244.70$, $\pi_l = 15.15$
k_l	1	$p_h = 1037$, $p_l = 101$	$CS_h = 404.64$, $CS_l = 16.54$
		$p_h/v_h = 42.30$, $p_l/v_l = 21.12$	$TW = 681.01$
Overvaluation k_h (OH)			
k_h	1.5	$v_h = 37$, $v_l = 5.56$	$\pi_h = 628.66$, $\pi_l = 18.15$
k_l	1	$p_h = 2589$, $p_l = 128$	$CS_h = 80.57$, $CS_l = 19.16$
		$p_h/v_h = 69.67$, $p_l/v_l = 23.02$	$TW = 753.53$
Undervaluation k_h (UH)			
k_h	0.8	$v_h = 19$, $v_l = 4$	$\pi_h = 140.92$, $\pi_l = 13$
k_l	1	$p_h = 598$, $p_l = 80$	$CS_h = 425.62$, $CS_l = 13.78$
		$p_h/v_h = 31.47$, $p_l/v_l = 20$	$TW = 593.07$
Overvaluation k_l (OL)			
k_h	1	$v_h = 23.64$, $v_l = 5.12$	$\pi_h = 211.97$, $\pi_l = 21.47$
k_l	1.3	$p_h = 913$, $p_l = 128$	$CS_h = 438.29$, $CS_l = 10.49$
		$p_h/v_h = 38.63$, $p_l/v_l = 25.14$	$TW = 682.23$
Undervaluation k_l (UL)			
k_h	1	$v_h = 24.92$, $v_l = 3.64$	$\pi_h = 280.67$, $pi_l = 7.41$
k_l	0.65	$p_h = 1155$, $p_l = 54$	$CS_h = 357.90$, $CS_l = 19.85$
		$p_h/v_h = 48.81$, $p_l/v_l = 22.82$	$TW = 665.83$
Common parameters to treatments			
$\bar{\theta}$	100		
$\underline{\theta}$	0		

v stands for quality, p stands for price, p/v stands for quality-adjusted prices, π stands for profit, $C.S.$ stands for consumer surplus and TW stands for total welfare. Subscript h refers to high-quality, and l to low-quality.

The decision space for high quality was set to $[16, 50]$, while the decision space for the low quality was set to $[2, 15]$. This decision is informed by the conditions by which the comparative statics were derived, which requires $v_h > v_l$. The decision space for price is set to $[590, 2700]$ for the high-quality product, and $[50, 150]$ for the low-quality product. Again, we restrict the decision space for values $p_h > p_l$. The decision spaces track the theoretical results and are chosen to minimize out-of-the-path equilibria that may arise from behavioral aspects of the game. Next, I turn to the exact procedures of the experiment.

2.1 Procedures

I conducted experimental sessions during September 2020 using oTree (Chen et al., 2016). Subjects are mainly undergraduates from a large university located in the United States. Student recruitment was managed via ORSEE (Greiner, 2015). I conducted 16 sessions, with 8 students per session.[2] A session consisted of the following steps. First, the experimenter handled printed copies of the experimental instructions to subjects. The experimental instructions were read out loud. Second, subjects responded to a post-instruction quiz to check for their understanding of the rules of the game. Subjects were paid per every right question answered during the quiz. The experiment started after the post-instruction quiz. The experiment consisted of 2 phases: a training phase in which subjects played 4 rounds of the game (2 as leaders and 2 as followers) and an effective experiment that consisted of 10 rounds. Each round is described according to figure 2. Each round consists of 3 periods: a period in which the leader makes its quality choice, a period in which the follower makes its quality choice, and a period in which leader and follower choose prices simultaneously. For each treatment, subjects face different incentives to provide quality and charge prices that are consistent with over- or undervaluation of high- or low-quality grades, as described in the treatments in Table 2.

In practice, two subjects are randomly paired to play a round of the game. One of the players is randomly selected to play the leader (the high-quality seller), while the other plays the follower (the low-quality seller). The leader must select its own quality first; to facilitate the quality choice, the leader has access to a calculator that shows the revenue, costs, payoff, and the follower's payoff based on the qualities selected. To perform computations, the calculator requires the leader to guess the follower's quality and price choices, as well as a guess of its own price choices during the price period. Thus, the leader has 4 choices to make during its quality round: its quality, a guess for its own prices during the price period, and a guess for the follower's price and quality choices. After the leader choices, the follower sees the leader's quality and chooses its own quality level. Again, a calculator with information about the follower's revenue, cost, payoff, and leader's payoff is available to facilitate the

[2] A session under benchmark had 10 students, and 5 others (under different treatments) had 6 students due to last minute cancellations.

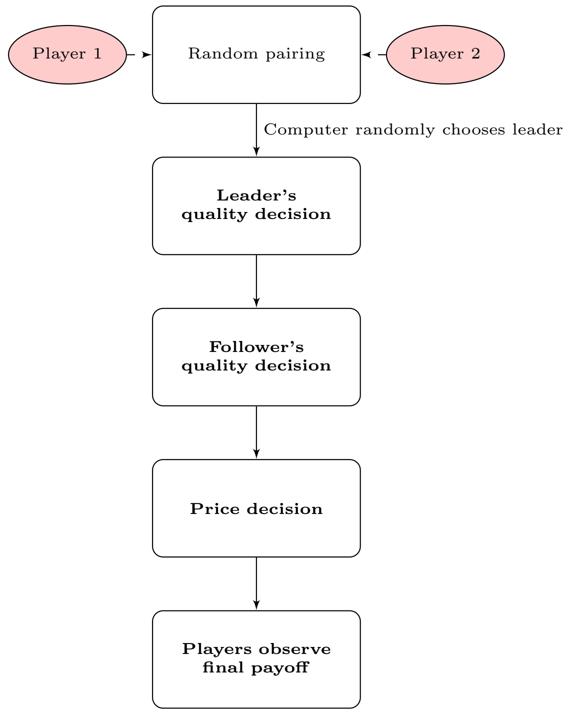


Figure 2: Description of a round

player's quality choice. The calculator uses the quality previously chosen by the leader to make its computations. To use the calculator, the follower has to choose its own quality, make a guess for its own price, as well as a guess the leader's price during the price period. Finally, during the price period, both players observe their quality choices and must choose prices for their product. Similarly to previous periods, a calculator is available. Players must choose their price and make a guess for the other player's price during the price period to use the calculator. After the price period, players observe their payoff and a new round starts. To make choices, subjects move a handle or type the quality/price values they wish to choose.

Finally, I use a payment schedule based on a random selection of rounds to be paid within a session. Out of the 10 effective rounds of each experimental session, the experiment randomly selects 4 to be paid. During the experiment, payoff values are named points, such that points are converted to U.S. dollars by a conversion rate. Subjects' average payment during the sessions, including the \$5 show-up fee, was \$16.92 for a 1-hour session. The observed outcomes of the experiment are discussed next.

3 Results

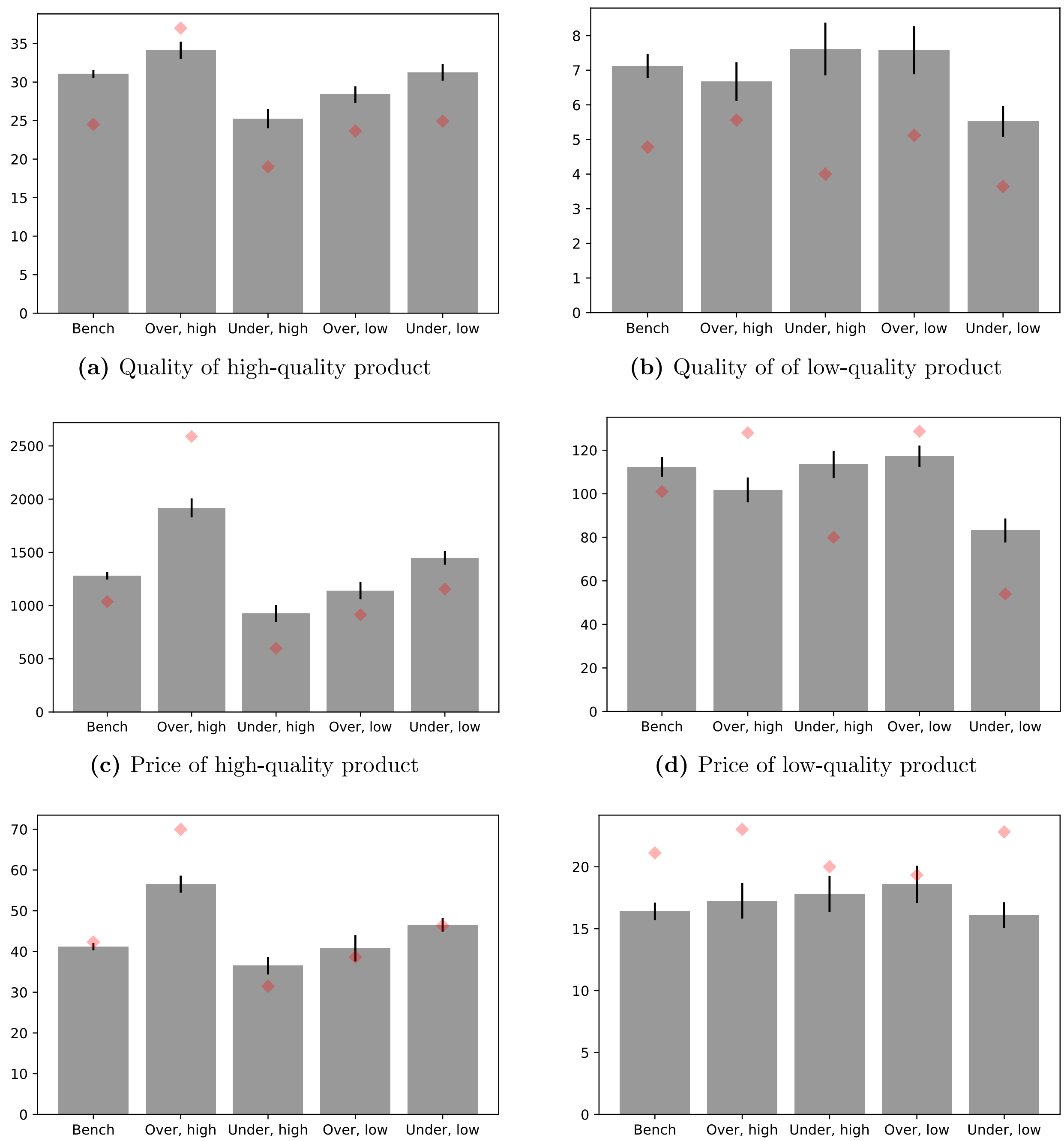
3.1 Market outcomes

I discuss market outcomes first. Figure 3 summarizes the experimental results by looking at the means of different market outcomes.[3] Hypothesis 1 predicts that quality levels offered by sellers increase under overvaluation of the high-quality product; Hypothesis 2 predicts the same for prices. Undervaluation of high-quality has the opposite effects.

Notice that both the quality offered and the price charged by high-quality sellers under the benchmark experiment are higher than what the theory predicts (Figure 3a and 3b). This was observed previously in the literature in experiments that discussed quality competition (e.g., Henze et al. 2015). The data confirms that the high-quality seller substantially increases quality and prices under overvaluation of the high-quality product relative to the benchmark case. However, on average, these choices fell below theoretical predictions (Figure 3a and 3b). The opposite is true under most of the other treatments; qualities and prices for the high-quality seller tend to be higher than the theory predicts. Interestingly, observed quality-adjusted prices (prices over quality) for the high-quality seller were much closer to the theoretical predictions (Figure 3e) than quality or prices taken separately. This is important because quality-adjusted prices largely drive the size of profits. Recall that profits

[3] While the figures in this paper show means and confidence intervals, I also computed significance levels for the difference in means between benchmark and treatment, for all treatments. During these calculations, I corrected p-values for family-wise error rate (FWER) as described in List et al. (2019). Qualitatively, results are largely the same as presented here and, thus, not reported. However, such calculations are available upon request.

are determined by the markup (price over marginal costs), but also by the seller's market share, which is positively affected by qualities and negatively affected by prices. Quality-adjusted prices show how well sellers were able to balance the opposing forces enacted by changes in markup and market share. The closer quality-adjusted prices are to the theoretical predictions, the closer to the optimal profit sellers become, even if quality and prices are individually away from predictions.



(a) Quality of high-quality product

(b) Quality of of low-quality product

(c) Price of high-quality product

(d) Price of low-quality product

(e) Quality-adjusted prices of the high-quality product

(f) Quality-adjusted prices of the low-quality product

Figure 3: Market outcomes under different treatments. The height of the columns represent average observed outcomes, the red marks represent theoretical equilibria, and the bars are the 95% C.I.

While high-quality sellers' quality-adjusted prices are close to the theoretical predictions, low-quality sellers' quality-adjusted prices are consistently below (Figure 3f). Particularly, low-quality sellers tend to offer qualities above what theory predicts (Figure 3b). Prices charged by the low-quality seller are below what theory predicts for overvaluation of both products and above what theory predicts for undervaluation of both high- and low-quality products (Figure 3d). According to the 95% confidence intervals, the means for low-quality seller's quality, prices, and quality-adjusted prices are not different from the benchmark means, except for prices under low-quality undervaluation. I explore two possible explanations. From Table 2, we notice that the difference between equilibria for low quality is small. The small difference in equilibria increases the likelihood of finding a null effect if the variability of quality choices during the experiment is large. This is true even with enough ex-ante statistical power to detect differences in means. This explanation could be valid for qualities of the low-quality seller, but less likely for prices and quality-adjusted prices because of larger differences in equilibria between treatments for these outcomes. A second explanation is behavioral. Higher-than-expected low quality reveals a failure of backward induction because low-quality sellers were adamant about decreasing quality significantly, as it could impact their market share (as explained in Figure 1). This resulted in qualities around 7 for all treatments. However, low-quality quality-adjusted prices have the right direction sign for almost all treatments (although the difference in means exhibits a high degree of uncertainty as revealed by the overlapping C.I. of the treatments). Notice that for undervaluation of high-quality, the difference between predicted and observed low quality is the largest of the whole experiment. This explains the wrong treatment sign.

Tables 3 and 4 present regression results that further confirm the difference in means discussed above. Different regression models use the observed level of high quality, low quality, high-quality price, and low-quality price as the dependent variable. These models compare the different treatments with the observed qualities and prices obtained in the benchmark (no misperception of qualities). The independent variables include a dummy taking the value of one if the observation belongs to treatment and zero otherwise, a conditional mean (intercept), and a time trend indicating the round during which subjects were making the choice. Subjects' demographic characteristics were added to balance the samples, but suppressed from the table as they offer no particular insight. The sign of the treatment dummy indicates the direction of the misperception treatment over the dependent variable, and the magnitude indicates the impact of quality supply or price charged under each treatment.

I start discussing the treatment effects of overvaluation of the high-quality product. The sign of the treatment effect on quality and price of the high-quality seller is as expected by theory, but the magnitude is lower. This is most likely due to the higher-than-expected quality offered under the benchmark case. Sign and magnitude of the treatment effect on high-quality prices have the expected sign and magnitude. Overvaluation of the higher quality has no significant impact on either quality offered or price charged by the low-quality seller. Similarly, undervaluation of the high-quality product produces the expected sign and magnitude of the treatment effect on quality and price of the high-quality seller, but no significant effect on the low-quality seller's choices.

Misperception of the low-quality product produces multiple forces. When consumers overvalue the low-quality product, the high-quality seller lower quality supplied (as expected), but at a higher magnitude than predicted by the theory. While no effect was detected on supply of the lower quality (which is already higher than theory would predict, as discussed), overvaluation of the low-quality product allowed low-quality sellers to increase prices charged, with expected magnitude, as shown by the significantly positive treatment effect coefficient. Finally, the treatment effect of undervaluation of low-quality has no effect on the higher quality, but it increases the high-quality price in the expected magnitude; it also decreases the lower quality at the expected magnitude and sign. Finally, the treatment effect on low-quality prices is not as negative as expected by theory.

Table 3: Treatment effects under misperception of the high-quality product

	Overvaluation of high-quality			
	Quality, high	Price, high	Quality, low	Price, low
Const	29.59***	1393.6***	6.180***	123.0***
	(10.49)	(9.68)	(4.09)	(4.30)
Treat	3.003***	603.4***	-0.312	-10.99
	(4.00)	(25.18)	(-0.88)	(-1.75)
Round	0.106	17.82*	-0.0479	0.235
	(1.23)	(2.07)	(-1.00)	(0.41)
N	240	240	240	240

	Undervaluation of high-quality			
Const	35.45***	1637.4***	8.281***	139.0***
	(10.49)	(10.33)	(6.37)	(5.64)
Treat	-5.830***	-372.0***	0.402	-0.325
	(-3.88)	(-6.34)	(0.67)	(-0.06)
Round	-0.00380	0.0278	-0.0647	0.0420
	(-0.03)	(0.00)	(-0.54)	(0.08)
N	230	230	230	230

*** prob. < 0.01, ** prob. < 0.05. Models estimated using hierarchical random effects (at the session level). Standard errors clustered at the session level. Subjects' demographic characteristics included in all specifications.

Table 4: Treatment effects under misperception of the low-quality product

	Overvaluation of low-quality			
	Quality, high	Price, high	Quality, low	Price, low
Const	33.57***	1408.0***	5.336***	108.4***
	(12.55)	(7.73)	(3.52)	(4.64)
Treat	-3.124**	-137.2***	0.690	7.311**
	(-3.13)	(-4.69)	(0.69)	(2.10)
Round	0.0422	4.756	-0.0145	0.0647
	(0.30)	(0.82)	(-0.33)	(0.46)
N	250	250	250	250

	Undervaluation of low-quality			
Const	33.21***	1576.3***	5.386***	105.9***
	(17.76)	(9.21)	(5.28)	(4.32)
Treat	0.0517	152.3***	-1.522***	-28.82***
	(0.09)	(5.70)	(-5.81)	(-6.72)
Round	-0.0745	-10.02	0.0196	0.0360
	(-0.88)	(-1.39)	(0.55)	(0.15)
N	230	230	230	230

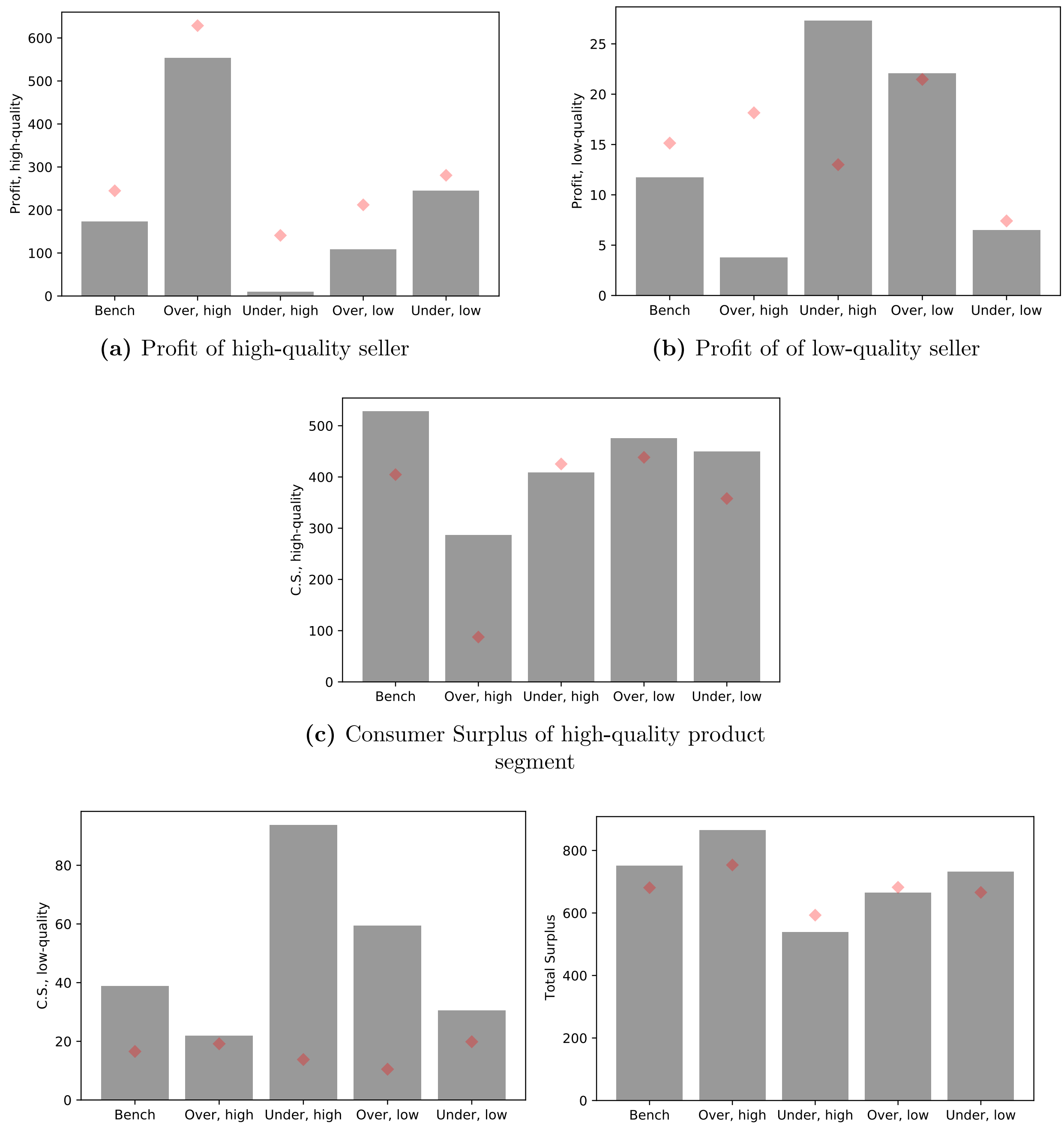
*** prob. < 0.01, ** prob. < 0.05. Models estimated using hierarchical random effects (at the session level). Standard errors clustered at the session level. Subjects' demographic characteristics included in all specifications.

In sum, these results suggest that treatment effects (misperception of the high- or low-quality product) on low-quality choices (quality and price) are only strong enough when misperception direct affects the low-quality product. But misperception of both high- and low-quality products produce strong enough incentives to alter the high-quality seller's choices. Expected treatment effects for high-quality sellers aligned with unexpected magnitudes of treatment effects for low-quality sellers are likely to produce unexpected welfare results. We turn our attention to welfare outcomes next.

3.2 Welfare outcomes

Hypothesis 4 predicts that overvaluation of either product increases the profits of firms. Undervaluation is predicted to have the opposite effect on profitability. Hypothesis 5 predicts decreases in the surplus of the consumer segment that suffers from overvaluation of quality. For example, high-quality consumers are predicted to be worse off as they overvalue the high-quality product because they would be mistakenly overpaying for each unit of quality acquired. Hypothesis 6 states that overvaluation increases total welfare in the market, as overvaluation provides enough incentives to overcome underprovision of quality in the market.

The previous sections showed that most market outcomes under one of the treatments are, on average, different from the benchmark in the expected direction. However, welfare outcomes are a result not only of the direction of the treatment effect, but also of its magnitude. I start by showing welfare outcomes calculated via a central tendency of the choices made during the experimental sessions. Specifically, I plug the averages of the qualities and prices of the high- and low-quality products on equations 1, 2, 3, and 4 to evaluate surplus measures before discussing treatment effects. Figure 4 shows the results.



(a) Profit of high-quality seller

(b) Profit of of low-quality seller

(c) Consumer Surplus of high-quality product segment

(d) Consumer Surplus of low-quality product segment

(e) Total Welfare

Figure 4: Welfare outcomes under different treatments. The height of the columns represent observed outcomes under average qualities and prices for each treatment, and the red marks represent theoretical equilibria

Holding prices and qualities on their observed averages produces total welfare outcomes close to the theoretical predictions, as shown by Figure 4e. But the distribution of surplus follows predictions only under some treatments. First, notice that high-quality profits and surplus of the high-quality segment are close to theoretical predictions (Figures 4a and 4c). Under overvaluation of high-quality, the profit of the low-quality seller is way below the predicted value; for undervaluation of high-quality, the profit of the low-quality seller is substantially above the prediction (Figures 4b). Surplus of the low-quality consumer is way above prediction, as shown in Figure 4d.

The average treatment effects are discussed next. Tables 5 and 6 show regression models much like those described in Tables 3 and 4, but in which the dependent variable is (1) the profit for high-quality seller, (2) profit for the low-quality sellers, (3) the consumer surplus for the high-quality seller segment, (4) the consumer surplus for the low-quality segment, and (5) total welfare. These welfare measures are obtained during a given round of the experiment, i.e. they use the observed qualities and prices of a given round during the experiment and not a central tendency measured as in Figure 4. The variable "Treat" captures the sign and magnitude of the treatment effect.

The treatment effect for high-quality profits has the expected sign for all treatments. Compared to theoretical results, it underestimates the magnitude of the effect under overvaluation of high-quality, and it overestimates the magnitude under the other treatments. On the other hand, treatment effects for the low-quality profits have the expected sign for over- and undervaluation of the low-quality product, but the wrong sign for over- and undervaluation of the high-quality product. These results are a direct outcome of (1) the lower-than-expected low-quality prices charged under overvaluation of high-quality, and (2) higher-than-expected low-quality prices for undervaluation of high-quality associated with higher-than-expected observed qualities under all treatments. The failure to adjust for incentives provided by misperception often led some low-quality sellers to obtain negative payoffs

Table 5: Treatment effects of welfare measures under misperception of the high-quality product

	Overvaluation of high-quality				
	Profit, high	C.S., high	Profit, low	C.S., low	Welfare
Const	162.6***	417.5***	9.277	31.12	679.2***
	(9.06)	(6.73)	(1.21)	(1.09)	(15.11)
Treat	252.8***	6.069	-19.68***	-47.23***	189.3***
	(33.79)	(0.47)	(-12.24)	(-7.81)	(37.42)
Round	-0.882	-2.017	0.174	3.070	0.258
	(-0.74)	(-0.54)	(0.47)	(0.86)	(0.20)
N	240	240	240	240	240

	Undervaluation of high-quality				
Const	118.6***	411.7***	5.843	42.09	655.2***
	(3.92)	(6.33)	(1.21)	(1.38)	(13.48)
Treat	-218.6***	-87.77***	17.29***	55.37***	-237.0***
	(-26.20)	(-5.72)	(11.09)	(6.67)	(-28.84)
Round	-0.671	-1.395	0.143	2.653	0.758
	(-0.54)	(-0.33)	(0.39)	(0.74)	(0.40)
N	230	230	230	230	230

*** prob. < 0.01, ** prob. < 0.05. Models estimated using hierarchical random effects (at the session level). Standard errors clustered at the session level. Subjects' demographic characteristics included in all specifications.

during rounds.

Table 6: Treatment effects of welfare measures under misperception of the low-quality product

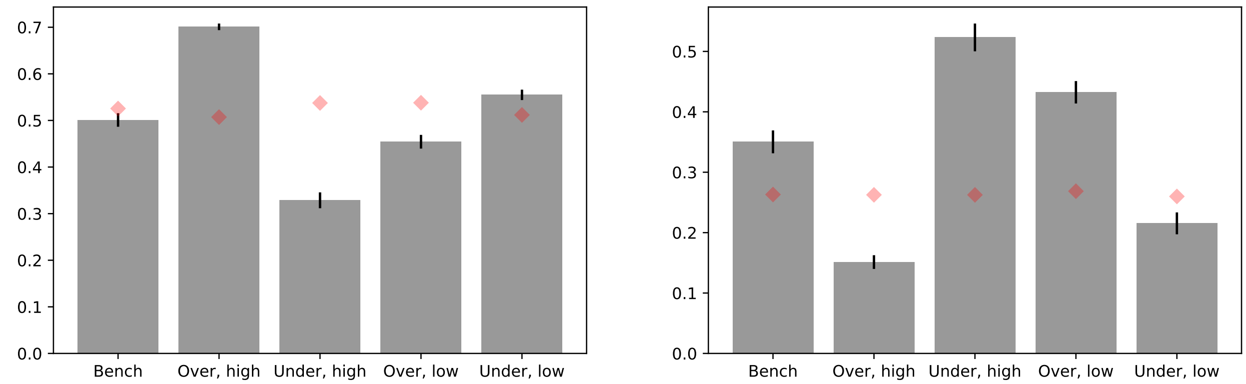
	Overvaluation of low-quality				
	Profit, high	C.S., high	Profit, low	C.S., low	Welfare
Const	184.3***	471.3***	5.250	14.61	717.1***
	(5.76)	(5.99)	(0.83)	(0.39)	(11.42)
Treat	-66.83***	-7.427	8.938***	7.045	-58.14***
	(-6.03)	(-0.65)	(6.66)	(0.91)	(-6.16)
Round	-0.923	-4.247	0.460	3.745	-1.111
	(-0.70)	(-1.11)	(1.79)	(1.08)	(-0.59)
N	250	250	250	250	250
	Undervaluation of low-quality				
Const	149.4***	458.9***	6.964	30.21	699.7***
	(8.89)	(7.60)	(1.02)	(1.05)	(13.98)
Treat	61.35***	23.43	-14.76***	-28.13**	45.31***
	(14.17)	(1.74)	(-8.78)	(-2.91)	(5.93)
Round	-0.206	-1.398	0.0238	2.789	1.030
	(-0.19)	(-0.35)	(0.06)	(0.77)	(0.66)
N	230	230	230	230	230

*** prob. < 0.01, ** prob. < 0.05. Models estimated using hierarchical random effects (at the session level). Standard errors clustered at the session level. Subjects' demographic characteristics included in all specifications.

I find no significant treatment effect for consumer surplus for the high-quality segment, except for undervaluation of the high-quality product. These results, which are contrary to the signs predicted by theory, arises from the much lower-than-expected prices charged by the high-quality seller. As a result, consumers were able to enjoy higher quality (Figure 3a), at a relative lower price (Figure 3c). The combination of qualities and prices for undervaluation of high-quality grade left the share of the market consuming the low-quality product way below what was predicted (Figure 5b). In combination with a higher-than-expected surplus under the benchmark, this explains the negative treatment effect on consumer surplus of the low-quality segment. A low market share for the low-quality product was also observed for the treatment effect under low-quality undervaluation, such that the treatment effect was significantly lower than the benchmark. The opposite happens under undervaluation of high-quality. Under this treatment, the share of consumers buying the low-quality product was above what theory predicts, resulting in a significant and positive treatment effect, as seen in Table 6.

Finally, total welfare is significantly higher when consumer overvalues high-quality, and significantly lower when consumers undervalue high-quality products. This is in line with the theory. However, contrary to predictions, welfare decreases under overvaluation of low-quality, driven by the large decrease in high-quality profits. This large drop in profits is not compensated by any significant increase in high-quality consumer surplus, as predicted, leading to an overall drop in total welfare. The exact opposite happens under undervaluation of low-quality: the sharp increase in high-quality profits is large enough to offset the decrease in low-quality profit and consumer surplus.

In sum, much like the market outcomes, the welfare outcomes for the high-quality seller support the theoretical predictions. Low-quality profits had the expected sign of the treatment effects only under over- and undervaluation of low-quality. Measures of consumer surplus, which are a function of market shares and, because of that, much sensitive to the magnitude of quality and price choices, do not track theoretical predictions well. Surplus outcomes are direct corollaries of quality and price choices by the sellers. The heterogeneity of the choices of sellers during each round of the experiment translates into significant heterogeneity in welfare outcomes. However, if one takes a central measure of those choices under each treatment (average high- and low-quality, and average high and low prices) to



(a) Market share of high-quality product

(b) Market hare of of low-quality product

Figure 5: Market outcomes under different treatments. The height of the columns represent average observed outcomes, the red marks represent theoretical equilibria, and the bars are the 95% C.I.

calculate welfare measures, total welfare outcomes during the experimental setting track well to what theory predicts (Figure 4). The treatment effects of total welfare follow the sign of high-quality profits because of the magnitude of the impact of high-quality profits in total welfare.

4 Conclusion and policy implications

There is little empirical evidence about how sellers' decisions vary when consumers misperceive quality, particularly in food markets. As a consequence, researchers still do not fully grasp the efficiency and distributional effects of misperception. This makes policy that tries to curb misperception unpredictable from an efficiency and distributional point of view. The challenge for empirical studies lies in the fact that misperception is the difference between a consumer's perceived quality of a product, and the quality the consumer would perceive had they had full understanding of the product's credence attributes. This measure is not readily observable by the researcher, which limits identification strategies. To circumvent this limitation, I report results from a laboratory experiment that leverages on predictions about consumers' misperception on welfare and distribution under an empirical prevalent market structure, i.e. oligopoly markets in which sellers commit to quality of a product (via certification and labels, for example) and compete in prices.

Using different misperception intensities for different products (high- or low-quality), I tested the theoretical predictions of Scott and Sesmero (2020). I summarized these predictions under 6 hypotheses that describe how market and welfare outcomes under different intensities of misperception vary in comparison to when misperception is absent. I summarize the treatment effects obtained from the experiment below in Table 7. All market and welfare effects for the high-quality seller are aligned with the theory, which implies that the high-quality seller tends to offer more (less) quality and charge higher (lower) prices under overvaluation (undervaluation) of high-quality products. Also, the high-quality seller tends to decrease (increase) quality and price to preserve (expand) market share under overvaluation (undervaluation) of the low-quality product. The experiment found no significant effects on market outcomes for the low-quality seller in most of the treatments. This impacts distributional outcomes such that most of the theoretical predictions for the low-quality seller are either null (lack of significant treatment effect), or with the reversed signed as predicted by theory.

Table 7: Theoretical prediction vs. observed outcomes of market and welfare results. The sign to the left of the dash shows the theoretical predictions while the the sign to the right of the dash shows estimated treatment effect during the experiment

Effect	**Overvaluation of high-quality**	**Undervaluation of high-quality**	**Overvaluation of low-quality**	**Undervaluation of low-quality**
Quality				
High	+/ +	-/-	-/-	+/Null
Low	+/Null	-/Null	+/Null	-/-
Price				
High	+/ +	-/-	-/-	+/+
Low	+/Null	-/Null	+/+	-/-
Profit				
High	+/ +	-/-	-/-	+/+
Low	+/-	-/+	+/+	-/-
Consumer Surplus				
High	-/Null	+/-	+/Null	-/Null
Low	+/-	-/+	-/Null	+/-
Welfare	+/+	-/-	+/-	-/+

This paper shows that welfare outcomes under different misperception treatments can substantially differ from theoretical predictions even if the majority of market outcomes (qualities and prices) agrees with the sign of theoretical comparative statics. The magnitudes of the changes in quality and price under different misperception intensities directly impact the distribution of surplus, rendering most of the theoretical predictions on consumer surplus either null or with treatment effects with the reversed sign. These unexpected effects on distribution show that policies that try to curb misperception need to be explicit about which segment of the market the policy is targeting, so that different parts of society can evaluate the policy.

Additionally, and for the same reasons, policymakers need to be attentive of the magnitude of the changes in sellers' choices after a policy to curb misperception is implemented. For example, overvaluation of the high-quality product seems to affect supply of quality of the high-quality only, with no serious consequences for surplus of the high-quality consumer segment, as was initially suggested by theory. Most of the interventions to curb misperception would lead to a combination of qualities and prices that would produce a null effect on high-quality consumer surplus. Undervaluation of either product does not seem to impact the surplus of the low-quality segment in the direction suggested by theory. However, the experiment suggests that high-quality seller benefits from overvaluation of high-quality product or undervaluation of the low-quality product, as predicted by theory.

The most deleterious effect for efficiency would be a correction of overvaluation of the high-quality product. However, correcting undervaluation of high-quality products would be advised, as high-quality profits and consumer surplus are lower under this condition, impacting total welfare negatively. More generally, if policymakers are interested in the total size of welfare, focusing on policies that target high-quality sellers and the segment of high-quality consumers would be best, as the size of those market segments is way above the size of surplus from low-quality segment of the market.

Finally, it is important to emphasize that the usual limitations of the insights of laboratory experiments to policy implementation apply to this study, particularly its possible limited external validity. However, I believe that this paper sheds important light on features that can be explored by further field experiments and observational studies. First, the higher capacity of high-quality sellers to influence the size of total surplus in markets under consumer's misperception of quality; second, the necessity to consider a wide range of misperception treatments to assess distributional effects; and third, the necessity to focus on size and magnitude of the effects of a policy that tries to curb misperception.

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