Standard Uncertainty in Socially Responsible Labeling Schemes: A Product Market Experiment

Standard Uncertainty in Socially Responsible Labeling Schemes: A Product Market Experiment

Ben Murphy-Schmehl

Department of Economics, Lehigh University

Advised by Professor Felipe Augusto de Araujo

May 8th, 2024

I. Introduction

There is societal demand for individual and corporate social responsibility (CSR) as a means to address negative externalities (e.g. pollution) due to government incapabilities. Across industries and location, CSR takes on different meanings, its most basic definition being that a corporation gives up certain amounts of profit in the interest of social good (Benabou & Tirole, 2010). Delegated philanthropy or shared social responsibility is an understanding of CSR in which the activities of firms reflect the preferences of stakeholders for socially responsible (SR) behavior. Social welfare is improved by the communication and shared efforts of buyers and sellers sacrificing lower prices or higher profits for SR investments (Benabou & Tirole, 2010).

Labeling schemes are utilized to reduce information asymmetries and allow firms to signal their SR investments to consumers by obtaining a certification that indicates a certain threshold of SR impact has been met (Harbaugh et al., 2011). Labels are mechanisms that allow the broader movement of shared social responsibility to function, as consumers must know what products to purchase to convey that they value SR investments to be made. Areas of SR that a firm may be able to acquire labels for may be anything from environmental impact (the most common), fair trade practices, or humane animal treatment, among others. Ecolabels emerged among firms in the 1970s and 1980s, ecolabelindex.com now tracking 456 different labels across 25 sectors.

The intent of labels to clear information asymmetries may be compromised to actually perpetuate more confusion to consumers of the damaging qualities of a product's production. In the case that a label does not have a clear standard declaring the degree of SR associated with the product, Harbaugh et al. (2011) explains that a consumer is faced with a joint estimation problem. Not only must the consumer estimate the true SR quality of the product (as it is

unobservable at the time of purchase), but also the quality that is guaranteed by the label. For example, for a canned good in a grocery store that is marked by a label that solely says "environmentally-friendly," does the production of this product prevent one kilogram of carbon from being emitted into the atmosphere, or just one gram? Product labels may also come from a variety of sources, such as for-profit certifiers, non-profit organizations, or government institutions. Because of this, it becomes questionable whether companies that label their products were certified because of a thorough evaluation process or rather just paid a for-profit certifier a sum of money. The Marine Stewardship Council (MSC) is the most prominent global non-profit organization providing label certifications for products sourced from fisheries, the certification indicating the sustainability of the operations of the fisheries. However, the MSC has come under widespread criticism after it was revealed that many of the products it has certified have been sourced from fisheries that impose notable harm to the ecosystems they are active in (McVeigh, 2021).

For our study, we are running a laboratory product market experiment involving a labeling scheme that allows sellers to label their product if their randomly-assigned product quality meets or exceeds a randomly-chosen label standard. The product quality of each seller indicates how large of a negative effect (representative of a negative externality) will be imposed on a third-party participant if their product is bought on the market. Buyers observe the label when making their purchasing decisions, but never a seller's actual quality. This action is representative of real-world firms signaling to consumers that their products are associated with a certain amount of SR behavior. Our treatments alter the certainty of the labeling standard, buyers understanding what product quality (and thus the level of externality imposed on a third-party participant) a label may certify when a part of the certainty treatment, but not under

the uncertainty treatment. The behavior we plan to observe is whether sellers take advantage of the uncertainty to charge higher prices for their products when buyers are naive to how much SR impact a labeled good makes, even when the label is meaningless and does not indicate that any negative effect on a third-party participant has been mitigated. We also plan to inspect the labeling rates of sellers to see if the cost of the label is worth it to firms under various standard and certainty conditions. We also want to observe the behavior of the buyers to see whether they internalize the meaning of the label and whether they use the uncertainty of labels to behave self-interestedly by purchasing non-labeled goods. And finally, we will be looking at the overall welfare associated with each experimental treatment, to see if society is broadly better-off under certain or uncertain labeling conditions.

At this point, we have conducted six out of ten sessions to come to preliminary results. First, the data has trended towards showing that sellers under the uncertainty treatment charge higher prices than sellers in the certainty treatment. Labeling rates have also been shown to be their highest when labeling standards are strict under the certainty treatment. Buyers, thus far, have paid more, on average, for labeled products in comparison with cheaper unlabeled products when standards are strict and certain. And finally, an initial total welfare calculation indicates that welfare is narrowly higher under the uncertainty treatment.

A vast literature indicates that the premise of this study is relevant to a broader field doing work to determine whether the current systems of SR signaling by firms is effective to alleviate asymmetric information associated with the genuineness of CSR. Harbaugh et al. (2011) is the most influential work to this study, as it presents a collection of theoretical models portraying the confusion that consumers experience when interacting with eco-focused labeling schemes that have uncertain standards. Various components of our design are derived from this

theory, as Harbaugh et al. (2011) shows that uncertain labeling standards are predicted to induce large inefficiencies in markets. Several studies analyze shared social responsibility more broadly, such as Bénabou & Tirole (2010), who discuss the economic behaviors that are embedded in multiple approaches to individual and corporate SR, then explain limitations that hinder these dynamics from being effective, such as information asymmetry and relative impact confusions with respect to shared social responsibility. Barboza et al. (2021) present models comparing the effectiveness of shared social responsibility and traditional government tax structures to combat negative externalities, emphasizing the role that stakeholders have in the SR decisions of firms. Gneezy et al. (2010) conduct a field experiment allowing consumers to pay an allocation of their choosing to charity with their purchases, in which they observe a model of shared social responsibility that raises firm profits while raising large amounts of donations for charity. The experimental influences for this study largely come from Bartling et al. (2015), an influential paper that consistently shows buyers and sellers portraying socially responsible behavior in laboratory product markets at high rates under various treatments (such as high firm competition, limited consumer information, and high production costs), Etilé & Teyssier (2015), who conduct a product market experiment to compare the effectiveness of various SR signaling techniques, including strict labeling schemes, labeling schemes that allow for dishonesty, and brand-building, and finally Harrs et al. (2021), who study sellers' decisions in disclosing the information of their SR when they have the option to and it is not an absolute that their SR will be shown to consumers. Fernandes & Valente (2021) alternatively focus on false advertising associated with ethical goods, in which they conduct laboratory market experiments allowing sellers to falsely advertise the quality of their products and determine its effects on alleviating negative externalities. We will be interpreting consumer behavior under uncertain labeling conditions

from our experiment based on findings from papers such as Dana et al. (2007), who present the concept of "moral wiggle room," which covers individuals using uncertain conditions to excuse self-interested behavior, and Data et al. (2006), who tested an alternative structure of the conventional dictator game to observe the lengths individuals will take to remove themselves from situations in which they may act prosocially for lesser payoffs.

The organization of this paper is as follows. Section II covers the experimental design and methods of the study. Contained in this section is an outline of the specifications of the structure and procedures of our experimental market, descriptions of our experimental treatments, our predictions, and the general procedures of how the experiment was physically run and conducted. Section III covers the results of the study, being split into parts inspecting seller pricing strategies, seller labeling rates, buyer purchasing behaviors, and finally welfare impacts of each treatment. The conclusion encapsulating final remarks is Section IV.

II. Experimental Design and Methods

Posted-Offer Product Market

To emulate a real-world product market inclusive of a labeling scheme with varying standards and the presence of certainty or uncertainty of these standards, we conducted an experimental posted-offer market with inspiration from the theory of Harbaugh et al. (2011) and certain specifications of the experimental design of Bartling et al. (2015).

Each session included 18 participants. Subjects were randomly assigned the roles of seller, buyer, or third party. To implement adequate competition, 8 participants were deemed as sellers and there were 5 of both buyers and third party subjects. At least 3 sellers would go without selling a product each round. The market game was conducted for 24 rounds for all

sessions. Each round, a product quality is exogenously assigned to each seller, 0 (high quality), 30 (moderate quality), or 60 (low quality). The seller's product quality corresponds to the number of units of negative externality imposed on a third party subject in the event that a buyer purchases the seller's product that round. A product quality of 0 imposes no negative externality on a third party subject (the most socially responsible), while a quality of 60 is the maximum externality that can be imposed (the least socially responsible). Additionally, a label standard is randomly declared each round, determining what the minimum social responsibility level is for a firm to label their product to signal their quality to buyers each round. So, the label standard can take the value of 0, 30, or 60. A label standard of 0 indicates that only sellers with a product quality of 0 can label their product that round, while a standard of 60 means that all sellers may label their product. When products are labeled, buyers do not observe the seller's exact quality, just the label standard. So, even if a seller has a quality that is higher than the label standard certifies, the buyer will still only see the standard.

The procedures of a round are as follows. Each round, all subjects begin with 100 units of wealth. After sellers view the label standard and receive their product quality, they set the price of their product and choose whether to label their product in the case that they meet the standard. Labeling their product costs sellers 10 units of wealth. Buyers individually view the offers set by the sellers each round in a random order, having the option to accept an offer and purchase a product or reject all offers. An offer consists of the associated price and label status of the product. Sellers observe all offers made each round in addition to their own and the order in which they are purchased. Because buyers enter the market one after the other, as products are bought, the buyers that came after would only see the remaining offers. Purchasing a product grants buyers 50 units of wealth (a representation of utility gained) and makes them pay the price

of the product to the seller. Each buyer is matched with one third party subject each round for the event that a product is exchanged between a buyer and seller. The exchange will cause whatever the quality value of the seller's product is to be subtracted from the third party's 100 units of wealth. A buyer that purchases a product with the quality of 0 will result in the matched third party participant ending the round with 100 units, while a 30 or 60 quality product purchases will leave the third-party with 70 or 40 units of wealth, respectively. The round ends with each participant viewing their round payoff, sellers also viewing the payoffs of a buyer and a third party subject if their product was bought. The round payoffs of each subject type are expressed in functions below:

Seller Profit:

$$\pi^{seller} = \begin{cases} 100 + p - c & \textit{if firm sells its product at price } p \textit{ and purchases label at cost } c \\ 100 + p & \textit{if firm sells its product at price } p \\ 100 & \textit{if firm sells no product} \end{cases}$$

Where p is selected by the seller and c is always equal to 10.

Buyer Payoff:

$$\pi^{buyer} = \begin{cases} 100 + 50 - p & \textit{if consumer buys product at price } p \\ 100 & \textit{if consumer buys no product} \end{cases}$$

Where p is selected by the seller.

Third Party Payoff:

$$\pi^{TP} = \begin{cases} 100 - e & \text{if TP is matched with a buyer who makes purchase with externality } e \\ 100 & \text{if TP is matched with a buyer who does not make purchase} \end{cases}$$

Where e is the product quality with the product bought by the buyer matched to the third party subject.

Treatments

The study consists of two treatments. The certainty treatment captures the case in which buyers are aware of the standard a label certifies, meaning that buyers understand what the maximum externality a seller's product may impose on a matched third party is to be able to label their product. The uncertainty treatment tests for the opposite case in which buyers are unaware of the standard a label certifies, equivalent to the reality of a label such as one that reads "environmentally-friendly," indicating to a consumer that the product is certified for a certain amount of socially responsible action, yet is not specific on the actual amount.

Predictions

The main components of interest of this study are seller behavior, buyer behavior, and welfare effects related to the differences between the certainty and uncertainty treatments. First, related to seller behavior, we predict that sellers will choose higher prices for their products in the uncertainty treatment, especially low-quality products. This reflects the possibility for firms existing under uncertain labeling schemes to label their products even when their quality is low and charge higher prices to convey that their product is actually of high quality. Second, again related to seller behavior, we predict that labels are adopted less when label standards are less

strict and uncertain to buyers. As the standards of product labels lessen to become more accessible to low-quality products, firms may begin to see the label as meaningless and not worth the cost of labeling. Obtaining the label when it is of low standard only signals that the firm's product meets the minimum quality standard, not its actual quality. Sellers may see it as not worth-it to label when the standard is of low quality, as sellers with any quality can obtain the label and it does not actually guarantee that some externality has been alleviated. Under the uncertainty treatment, when buyers cannot even observe the standard, sellers may also see the label as worthless and not give up the wealth to obtain it. Signals such as price and number of labels in the market (less labels in the market may indicate that the standard is high, allowing for less firms to meet its standard) may become more critical to sellers attempting to signal their SR.

Third, with respect to consumer behavior, we expect that buyers pay higher prices for labeled goods when standards are certain, and purchase less labeled goods under uncertainty. This may occur because the buyers have to estimate both the standard and the product quality of the product under uncertainty for all labels. There never exists a minimum quality standard buyers can observe to differentiate between high and low-quality labels, so all labels appear the same, even if only high-quality goods can be labeled. Even if a consumer wants to act with a high degree of SR in the uncertainty treatment, they would always be risking that the standard is of low-quality when purchasing a labeled good. Buyers acting under this assumption may become confused by the label and purchase less products with its ambiguous signal. This result could also serve to support a case of the presence of "moral wiggle room" behavior being shown among buyers. In the absence of standard certainty with no way of telling whether labeled products are actually of high quality and will alleviate negative externalities, buyers may use this as an excuse to act self-interestedly and purchase unlabeled products for cheaper prices (Dana et

al., 2007). And finally, in regards to welfare, we predict that total welfare is the highest when label standards are certain rather than uncertain. This reflects the economic theory of markets being more efficient under less information asymmetry and the reality of consumers being able to more accurately purchase SR products when they intend to under certain labeling standards.

General Information and Procedures

All sessions have taken place at Lehigh University's Behavioral Research Lab in the Business Innovation Building throughout March and April 2024. Ten sessions are planned to be conducted for this research, 5 of the certainty treatment, and 5 of the uncertainty treatment. Due to start-up requirements and time constraints, 6 sessions (3 of each treatment) have taken place so far, the last 4 to be conducted in the Fall 2024 semester. The behavioral research lab is only set to open fully in Fall 2024, and has been operated at a limited capacity throughout early 2024.

Subjects for these experiments were primarily recruited from large classes considered to be freshman or first-year classes at Lehigh University in the Spring 2024 semester. As of the writing of this paper, 108 subjects have participated in the study between the uncertainty and certainty treatments (54 each). The study was programmed and conducted utilizing z-Tree software for economic lab experiments (Fischbacher, 2007). Subjects received on-paper instructions in addition to an experimenter reading the instructions step-by-step to ensure information about experiment procedures and payoffs were clear. Subjects were then required to answer three comprehension questions about the instructions before the experiment began to ensure they were understood. Subjects were paid according to their decisions in the market experiment, customary of monetary incentives to induce role behavior in economic experiments (Voslinsky & Azar, 2021). Participants were randomly assigned a payment period to receive their

payoff in points from the corresponding round converted to US dollars by a multiplier. For each 10 points a subject earned in their round selected for payment, they were paid 1.75 US dollars plus a 10 dollar show-up fee. The average payout per participant was ~28 dollars.

III. Preliminary Results

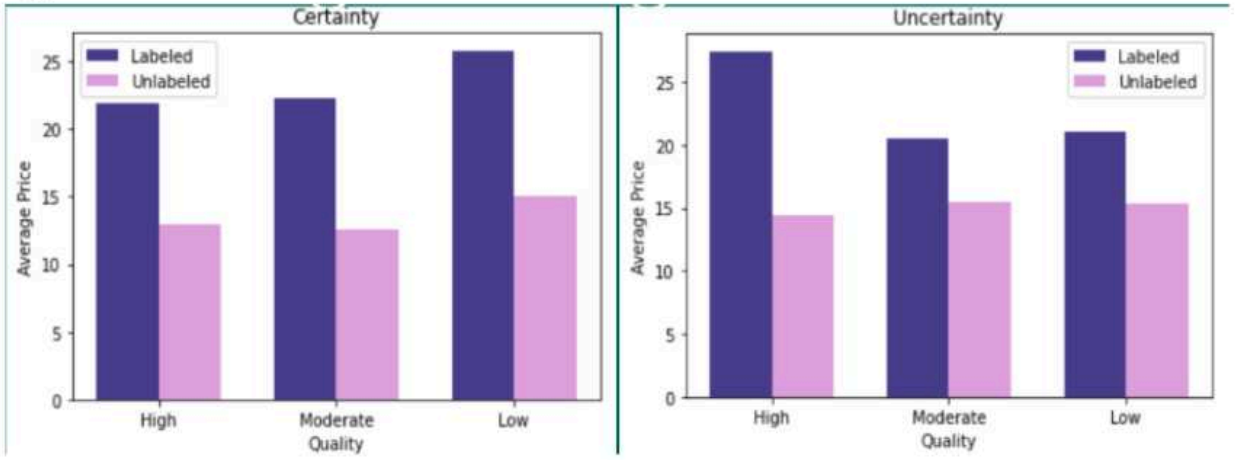
Although we have not yet completed data collection for the certainty and uncertainty treatments of the study, we have still conducted 6 out of 10 sessions with 108 subjects, yielding data that has begun to trend towards relevant initial findings and show some statistical significance. It must be stressed, however, that these results are preliminary in the context of this ongoing study. We will begin by presenting seller behavior regarding pricing strategies and labeling rates, then move to the difference in labeled and unlabeled purchase behavior exhibited by buyers, and finally to comparing welfare amounts between both treatments.

Seller Pricing Behavior

Our initial predictions related to seller behavior of charging higher prices during the uncertainty treatment and labeling products less as the standards weaken and under uncertainty will now be inspected. To begin, **Figure 1** was constructed to show trends of pricing between treatments among sellers of differing product qualities and label choices. The most obvious trend of the data thus far is that for both treatments, average prices are higher for labeled goods than unlabeled in every instance of product quality. Also, except for high-quality products, the gaps between average price for labeled and unlabeled goods become noticeably smaller in the uncertainty treatment. It is also important to note that in the certainty treatment, there is no stark

difference between the average prices for labeled or unlabeled goods by externality level, but labeled goods of low quality are priced the highest on average (25.8 points). For uncertainty, we see the opposite behavior, as average prices are highest for high-quality labeled goods (27.4 points), showing a difference larger than between the other quality levels. A key result from these average prices after 6 experimental sessions conducted is that the average price of products in the uncertainty treatment (19.02 points) is greater than that of the certainty treatment (18.42 points). So, when the label standard is unknown to buyers, by average prices, sellers in the uncertainty treatment are charging higher prices than sellers in the certainty treatment.

Figure 1:

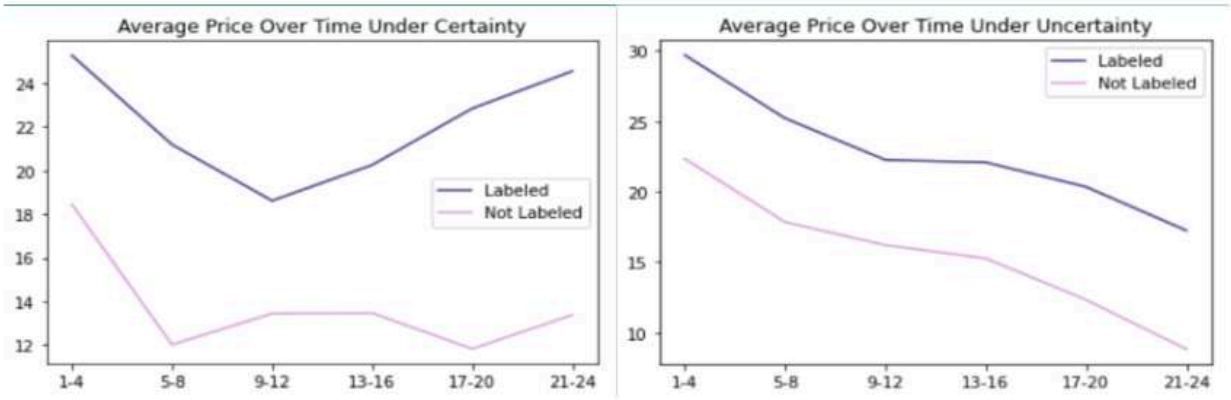


Both bar graphs show average prices on the y-axis and product quality on the x-axis. The leftmost graph is exclusively for data collected from the certainty treatment and the rightmost graph is exclusively made from uncertainty treatment data. The bars are split between the average prices of labeled and unlabeled goods. The purpose of these visualizations is to compare the average prices charged by sellers differing by product quality, labeling choice, and treatment to gain an understanding of firm pricing strategy trends in the data.

To observe whether there are any trends in how average prices changed over time and capture learning effects throughout the 24 periods of each session, we constructed the line graphs of **Figure 2**. While the figure shows average prices for the certainty treatment fluctuated throughout the sessions, the graph for the uncertainty treatment yields an interesting trend.

Average prices charged by sellers over the three sessions for both labeled and unlabeled products steadily decreased over time. While competitive pressures are likely directing average prices down in the uncertainty treatment, the same is not happening for the certainty treatment.

Figure 2:



Both bar graphs show average price on the y-axis and period on the x-axis. Average prices were averaged for every four periods to smooth the line for observation. The leftmost graph is exclusively for data collected from the certainty treatment and the rightmost graph is exclusively made from uncertainty treatment data. The darker lines indicate labeled goods and the lighter lines indicate unlabeled goods The purpose of these visualizations is to compare the average prices charged by sellers differing by labeling choice and treatment over time.

Model 1:

$$price = \beta_0 + \beta_1 dummy30 + \beta_2 dummy60 + u$$

This model depicts a simple multiple dummy variable OLS regression. Price charged by sellers is the dependent variable, with explanatory variables indicating whether the seller had a high (0), moderate (30), or low (60) product quality. The purpose of this model is to observe whether there are significant effects of a seller's product quality on what price they charge.

Next, we performed OLS dummy variable regressions, separately for the certainty and uncertainty treatments, to observe the effect that a seller's product quality has on the price they charge. **Model 1** shows this model visually and **Table 1** and **Table 2** indicate the results, for the certainty and uncertainty treatments, respectively.

For the certainty treatment, we do not observe that either coefficient estimate is statistically significant at the 10% level, but the coefficient indicating the effect that the seller was assigned a moderate quality is just under being statistically significant at the 10% level. This coefficient indicates that, on average, sellers with a moderate product quality (which means that they impose a negative externality of 30 points of wealth on a randomly selected third-party participant) price their products 2.23 points lower than sellers that are assigned a high product quality (which indicates no externality is imposed on a third party participant). For the

Table 1: Certainty Treatment

		(Std. err. adjusted for 24 clusters in i)			
price	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
d_30	-2.234365	1.327291	-1.68	0.106	-4.980076	.5113456
d_60	-1.353585	2.750252	-0.49	0.627	-7.042914	4.335744
_cons	16.94089	1.159825	14.61	0.000	14.54161	19.34017

This table presents the coefficient estimates for an OLS multiple dummy variable regression. The dependent variable is the price that sellers charge per round, and the explanatory variables are dummy variables indicating the seller's product quality that round. Variable d_30 indicates that the seller had a moderate quality, d_60 indicates a low quality, and the low quality indication was the base variable.

Table 2: Uncertainty Treatment

		(Std. err. adjusted for 24 clusters in i)			
price	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
d_30	-2.010629	1.072742	-1.87	0.074	-4.229764	.2085073
d_60	-2.68181	1.136951	-2.36	0.027	-5.033773	-.3298468
_cons	18.58128	1.175759	15.80	0.000	16.14904	21.01352

This table presents the coefficient estimates for an OLS multiple dummy variable regression. The dependent variable is the price that sellers charge per round, and the explanatory variables are dummy variables indicating the seller's product quality that round. Variable d_30 indicates that the seller had a moderate quality, d_60 indicates a low quality, and the low quality indication was the base variable.

uncertainty treatment, we observe greater statistical significance. The coefficient estimate for sellers with a moderate product quality is statistically significant at the 10% level, indicating that when a seller is assigned a moderate product quality in the uncertainty treatment, on average, they charge 2.01 points less for their product than a seller with high product quality. The coefficient estimate that indicates a seller that had a low product quality, on average, charges 2.68 points less for their product than a seller with high product quality. This result is statistically significant at the 5% level.

We also ran simple OLS regressions with price again as the dependent variable and a dummy explanatory variable indicating what treatment the seller was in. The model is represented as **Model 2**. Three of these regressions were run, one for each product quality. The purpose of this model is to observe whether there are significant effects of certainty or uncertainty of the labeling standard on the price that a seller charges. The only model in which

Model 2:

$$price = \beta_0 + \beta_1 dummyUNC + u$$

This model depicts a dummy variable OLS regression. Price charged by sellers is the dependent variable, with explanatory variables indicating which treatment the seller was in. This model was run for each product quality.

we observed close-to statistical significance at this point in the study was the model for sellers that had a moderate product quality, shown in **Table 3**. The regression output shows that for sellers assigned a moderate-quality product in the uncertainty treatment, on average, they charge 2.15 more points for their products than sellers with moderate quality products do in the certainty

treatment. This result is just-under being statistically significant at the 10% level.

Key takeaways from analyzing the preliminary results of seller pricing strategies include: first, the data is trending in the direction that sellers charge higher prices for their products under uncertain labeling standard conditions, in-line with our initial prediction. We also observe that sellers who label their products consistently charge higher prices than those that do not label their products, for all product qualities. Although, the gaps in price become smaller between labeled and unlabeled goods under uncertainty. It could also be seen that there was a steady trend of decreasing prices under the uncertainty treatment. Regression analyses illustrated that statistical significance is beginning to be established between a seller's product quality and the price they charge. Sellers with lower product qualities seem to, on average, charge lower prices than sellers with high qualities under both treatments.

Table 3: Moderate Quality Sellers

					(Std. Err. adjusted for 48 clusters in i)	
price	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
d_uncertainty	2.147727	1.294893	1.66	0.104	-.4572623	4.752717
_cons	15.20455	1.129557	13.46	0.000	12.93217	17.47692

This table presents the coefficient estimates for a simple OLS regression. The dependent variable is the price that sellers charge per round, and the explanatory variable (d_uncertainty) is a dummy variable indicating the treatment that the seller was a part of. The base variable of the regression is that the seller was in the certainty treatment. This table uses data of sellers that had a moderate product quality only.

Seller Labeling Behavior

Through our study, we also focused on the behavior of sellers regarding their decisions surrounding the label. Etilé & Teyssier (2015) use the formation of a separating equilibrium in a

market with product labels as a measure of market efficiency. Their two conditions for a separating equilibrium being met are that labeled and unlabeled products are present each in the market, and that the quality of a product is clearly shown by the label (Etilé & Teyssier, 2015). Harbaugh et al. (2011) defines a similar concept as a "labeling equilibrium," which indicates that "a firm whose product meets or exceeds the labeling standard always obtains a label, so the lack of a label implies failure to meet the standard" (p. 1515). We inspected the labeling rates of our product market experiment to observe whether a labeling equilibrium was produced under the treatments or under the conditions of certain product qualities or standards.

Figure 3 depicts the labeling rates of each treatment by the label standard. Clearly, a perfect labeling equilibrium based on the definitions of Harbaugh et al. (2011) or Etilé & Teyssier (2015) is not produced under any labeling standard under either treatment. The closest there is to a case in which all the sellers that are eligible to label their product actually do so is when the labeling standard is high in the certainty treatment, at 66%. Under the certainty treatment, as the labeling standard weakens, the labeling rate is shown to decrease as well: from 66% under high standards, to 44% under moderate standards, to just 22% under low standards. The uncertainty treatment also reveals decreases in labeling rates as the standard weakens, but they are smaller and more ambiguous. The rate starts decently high at 49%, experiences a noticeable drop to 31% under a moderate standard, and then only drops one percentage point to 30% under low labeling standards. This trend corresponds with our predictions.

Buyer Purchasing Behavior

To move on from analyzing seller behavior, we also focused on how buyers responded to products on the market that are labeled under certainty or uncertainty. To generally obtain

Figure 3:

% of Sellers that Labeled their Product that Could		
	Treatment	
Label Standard	**Certainty**	**Uncertainty**
High	66%	49%
Moderate	44%	31%
Low	22%	30%

This table depicts the percentage of sellers that labeled their products that had the option to, determined by whether their quality matched or exceeded the label standard that round.

willingness-to-pay measures for labeled products by buyers with preliminary data, we calculated the average difference between what buyers that purchased labeled products paid for their product and the price of the cheapest unlabeled product available under each treatment. Under the certainty treatment, buyers were willing to pay, on average, 5.50 points more for a labeled product when there was a cheaper unlabeled product being sold. For uncertainty, this number drops to 3.58. There was also a gap in the number of instances when a buyer purchased a labeled good between the certainty and uncertainty treatments, buyers purchasing a labeled good when there was a cheaper unlabeled product for sale 70 times in the certainty treatment and 58 times in the uncertainty treatment. Interestingly, for buyers in the certainty treatment when the label guarantees a high product quality, meaning the corresponding third-party participant matched with the purchase will not be negatively affected, the average difference between the price the buyers pay for a labeled product and cheapest unlabeled product grows to 10.6 points. These trends show that the label is being considered from the perspectives of both sellers and buyers,

impacting buyer decision making differently under the two treatments.

Welfare Effects

The final attribute of the preliminary results we took interest in was the welfare amounts between the certainty and uncertainty treatments. We calculated total welfare from each experimental treatment by summing the seller profit, consumer surplus, and third-party payoffs from every round. The difference is not extreme, but total welfare under certain labeling standards is higher at 136,180 points, while the welfare under the uncertainty treatment is 135,350 points.

This difference between these values is not statistically significant based on preliminary results, but can be more closely understood by looking at the components of the welfare calculations. **Table 4** shows the seller profit, consumer surplus, and third-party payoffs under both the certainty and certainty treatment. The table indicates that sellers made more profit under

Table 4:

	Seller Profit	Consumer Surplus	Third-Party Payoff
Certainty	61,082	49,508	25,590
Uncertainty	62,156	48,324	24,870

This table depicts the separate total welfare calculations for sellers, buyers, and third party participants under both treatments.

uncertain labeling conditions, and consumers made more surplus under the certainty treatment. This result seems to be due to our initial finding that higher average prices were charged in the uncertainty treatment, so sellers were able to extract more profit, and consumers had more savings in the certainty treatment. The piece of the calculation that seems to ultimately push welfare to be slightly higher under the certainty treatment is the difference in third-party payoff

between the two treatments. At this point in data collection, third-party participants fare better under certain labeling conditions.

IV. Conclusion

This study has involved an investigation of how labeling schemes in product markets with uncertain standards impact seller behavior, consumer behavior, and overall welfare. Although, only 6 sessions of the laboratory posted-offer product market have been conducted at this point. The study will be continued under the discretion of Professor Felipe Augusto de Araujo in Fall 2024 to collect the remaining four sessions of data and perform an analysis of the full results.

Although we do not yet have the full dataset, the preliminary results have yielded interesting initial findings about the study. First, an analysis of the seller pricing behavior is trending to match our prediction that sellers charge higher prices when label standards are uncertain to buyers, as average prices so far are higher under the uncertainty treatment. Statistical significance is also close to being established for sellers with moderate quality products charging higher prices. This evidence would support an argument that firms exploit uncertainty of label standards to extract higher profits, as buyers, even when products are truly labeled, never know of the product or standard's true quality. An interesting result however, is that firms seem to price their products relatively fairly depending on their product qualities, as in both treatments, statistical significance is being shown that sellers with lower qualities price their products, on average, lower than products with high-quality products. Additionally, the low labeling rates that were observed, especially for when label standards were weak, are moving in a direction of supporting a view that when label standards are low, they are perceived to be not worth the cost

of a label to the sellers. The smaller decreases in labeling rates under uncertainty, however, reflect that when the label standard cannot be observed, it is even harder for firms to differentiate themselves, their decision not depending on the label standard, but rather their own perception of the uncertain label's effectiveness. Trends in buyer behavior thus far in the study show that buyers do internalize the meaning of the label, shown by different willingness-to-pay rates under the different treatments and label standards. This behavior may also be able to partially explain low labeling rates of firms, as when buyers internalize that a low-quality label is meaningless, they are less likely to buy more expensive labeled products, thus lessening the value of a label for firms under uncertainty or weak labeling conditions. And finally, the greater total welfare we observed under certain labeling conditions by a small margin showed that this improvement is due to the fact that third-party subjects fared better under certain labeling conditions. This likely supports an argument that buyers who would like to act more socially responsible in their purchasing decisions can only do so accurately under certain conditions with strict standards, as under uncertainty, even if a buyer would like to purchase products from firms that label their product depicting that they act with social responsibility, they have to take a chance, as there is always the chance that they purchase a product from a low-quality seller when the label is really meaningless.

Further work surrounding this subject may take a variety of forms. Harbaugh et al. (2011) incorporate various theoretical ideas that prove relevant for future study. First of all, the concept of label proliferation, which involves multiple labels being available on the market, closely mirrors the real-word situation of the markets for certain products being saturated with many labels. Multiple labels available with different standards also minimizes ambiguity of a seller's product under weak standards, especially relevant in a certainty case (Harbaugh et al., 2011).

This is because when label standards are low, even under the certainty treatment, low-quality labels indicate that any firm can label their product. Multiple labels would allow for high-quality sellers to still label their products and provide signals closer to their true values. It is also of interest to study markets that incorporate the reputation effects of firms. Harbaugh et al. (2011) explain that even if a firm has a high product quality, previous records of them not acting socially responsible may induce buyers to believe that labels they are able to acquire in the future are meaningless. Etilé & Teyssier (2015) incorporate reputation effects into a treatment of their study, but not in the context of standard uncertainty that our study is centered around.

Even from the preliminary results of this study, it is clear that the uncertainty of labeling schemes has a great impact on the behavior of the actors within these markets and outside of these markets. The findings pose further questions on whether product labels are the most efficient method for firms to signal their SR behavior to customers in a greater dynamic of shared social responsibility. Upon completion of data collection and further analysis, policy implications may be recommended to suggest more efficient frameworks and strategies to mitigate asymmetric information in these markets and improve the capacity of CSR to assist government endeavors in alleviating negative externalities on vulnerable communities.

References

Barboza, G., Pede, V., & Madero, S. (2021). Shared social responsibility. Dual role of consumers as stakeholders in firm strategy. *Social Responsibility Journal*, 17(1), 48-68.

Bartling, B., Weber, R. A., & Yao, L. (2015). Do markets erode social responsibility?. *The Quarterly Journal of Economics*, 130(1), 219-266.

Bénabou, R., & Tirole, J. (2010). Individual and corporate social responsibility. *Economica*, 77(305), 1-19.

Dana, J., Cain, D. M., & Dawes, R. M. (2006). What you don't know won't hurt me: Costly (but quiet) exit in dictator games. *Organizational Behavior and human decision Processes*, 100(2), 193-201.

Dana, J., Weber, R. A., & Kuang, J. X. (2007). Exploiting moral wiggle room: experiments demonstrating an illusory preference for fairness. *Economic Theory*, 33, 67-80.

Ecolabel Index. (n.d.). *Who's deciding what's green?* https://www.ecolabelindex.com/

Etilé, F., & Teyssier, S. (2016). Signaling corporate social responsibility: Third‐party certification versus brands. *The Scandinavian Journal of Economics*, 118(3), 397-432.

Fernandes, M. E., & Valente, M. (2021). What you get is not what you paid for: New evidence from a lab experiment on negative externalities and information asymmetries. *Journal of Behavioral and Experimental Economics*, 93, 101712.

Fischbacher, U. (2007). z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental economics*, 10(2), 171-178.

Gneezy, A., Gneezy, U., Nelson, L. D., & Brown, A. (2010). Shared social responsibility: A field experiment in pay-what-you-want pricing and charitable giving. *Science*, 329(5989), 325-327.

Harbaugh, R., Maxwell, J. W., & Roussillon, B. (2011). Label confusion: The Groucho effect of uncertain standards. *Management science*, 57(9), 1512-1527.

Harrs, S., Rockenbach, B., & Wenner, L. M. (2022). Revealing good deeds: disclosure of social responsibility in competitive markets. *Experimental Economics*, 25(5), 1349-1373.

McVeigh, K. (2021, July 26). Blue ticked off: the controversy over the MSC fish "ecolabel." *The Guardian*. https://www.theguardian.com/environment/2021/jul/26/blue-ticked-off-the-controversy-over-the-msc-fish-ecolabel

Vatter, B., Barahona, N., Ortero, C., Ortero, S., & Kim, J. (2021, June). Equilibrium Effects of Food Labeling Policies. In *10th Annual Conference of the American Society of Health Economists*. ASHECON.

Voslinsky, A., & Azar, O. H. (2021). Incentives in experimental economics. *Journal of Behavioral and Experimental Economics*, 93, 101706.