# Good deeds, business, and social responsibility in a market experiment

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**Abstract**

We describe a market experiment in which profit maximization and socially-concerned behavior were both potential goals of producers. Our subject pool included two different types of students with different pro-social attitudes. We found that subjects in the treatment group, where producers could contribute to a positive externality, adopted significantly different strategies than the control group, where the only objective was profit maximization. Moreover, a trade-off between socially-concerned behavior and profit maximization emerged in our experiment. More pro-social subjects tried to contribute more to the positive externality and earned lower profits than their counterparts (whether they succeeded in having more social impact remains a moot point). We conclude that producers often intend to be socially responsible, even though good intentions do not necessarily ensure good results.

Keywords: social responsibility, market experiment, charitable giving, vertical differentiation

## 1 Introduction

Nowadays firms often try to persuade stakeholders that their goods and services are of high quality, while also trying to convince them that their business activities are becoming more socially-responsible.

How can we interpret this phenomenon? According to many scholars, standard strategic motives push firms towards more socially responsible actions. For instance, Arora and Gangopadhyay (1995) were the first to emphasize how corporate social responsibility (CSR henceforth) can help firms achieve new market niches of socially-aware consumers. Brekke and Nyborg (2010) argue that CSR can allow firms to reduce the wages of their socially-motivated workers. Maxwell et al. (2000) focus on the possibility of using CSR as a way to preempt stricter and more expensive regulations by public authorities. CSR activities are thus defined as voluntary actions that internalize socio-environmental externalities, taken without being forced to do so by laws or regulations, whatever the motivations behind these actions. As a consequence, CSR can act hand in hand with profit maximization and does not represent a real change in governance. For this reason, these types of activities are usually labeled as "strategic" CSR (Baron, 2001).

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However, just as consumers are willing to sacrifice part of their income in order to purchase more environmentally-friendly goods, a significant portion of entrepreneurs might be willing to sacrifice part of their profits for the greater (social) good.[1] In the theoretical literature there have only been a few instances where firms, or entrepreneurs, did not maximize their profit. Baron (2007) offers one of the first attempts to give a theoretical rationale for the behaviour of a social entrepreneur undertaking CSR activities at a financial loss. Doni and Ricchiuti (2013) have also developed a model in which firms can have different degrees of CSR, based on how they weigh profits and social objectives in their utility function.

Nevertheless, many of the authors who have studied this phenomenon are skeptical of the empirical relevance of these cases.[2] Indeed, a survey of the empirical literature by Kitzmuller and Shimschack (2012, p. 71) concludes that *"quantitative empirical data are not consistent with hypotheses suggesting that not-for-profit motivations systematically drive observed CSR."*. However, the evidence of strategic CSR is also weak because, as Margolis et al. (2007) have argued, empirical data shows low levels of correlation between CSR and profitability. Moreover, there is some evidence suggesting causality in the opposite direction: the more profitable a firm is, the more likely it is to engage in CSR activities.

Empirical analysis therefore, seems inconclusive with regard to the actual motivations of CSR behaviour. Moreover, the empirical literature is almost completely focused on the study of CSR in large corporations. Unfortunately no studies have been undertaken that look at the potential for socially-responsible behaviour among small business enterprises and single entrepreneurs, which is probably due to lack of data on CSR at that level. A further difficulty is that we cannot expect reliable answers from direct interviews of managers or entrepreneurs. Indeed, if there is a gap among consumers in terms of stated stated and actual purchasing decisions when there are socially related issues,[3] then producers have an extra incentive to overstate their social attitudes to improve their perceived reputation among consumers. For this reason, as suggested by Schmitz et al. (2015), incentivized experiments are better suited to examine the actual motivations behind CSR production. Most recent experimental papers dealing with CSR, however, are typically designed so that there is no way to determine whether producers' strategies are consistent with standard profit maximization, and CSR is only driven by consumer preferences, or rather if producers strategies show some willingness to sacrifice profits in the social interest.

To our knowledge, the present study is the first to focus exclusively on the social attitudes of producers when production entails some social externality and market shares depend, at least partially, on CSR activities. Our design focuses on the extent to which experimental subjects playing as producers behave as profit maximizers when their choices may have a social impact. In our experiment, the social impact of a subject is marked by a donation to a charity organization that is selected by the individual from a predetermined list before the start of the experiment. Furthermore, we study whether and how subjects with different pro-social attitudes adopt their strategies accordingly.

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[1]According to authors as Reinhardt et al. (2008), Benabou and Tirole (2010), we are dealing with genuine CSR behavior only in this case.

[2]According to Portney (2008, p. 262), *"if we confine our discussion of CSR only to those cases where a corporation knows it is sacrificing profits, then that discussion will be an awfully short one."*

[3]See Devinney et al. (2010) for both empirical and survey-based literature regarding social consumerism.

Our findings can be summarized as follows. When production may have positive externalities, players make different production decisions than they would otherwise make, with the underlying selfish incentives unchanged. Moreover, subjects with higher pro-social attitudes display greater willingness to contribute to such positive externalities and ended up earning significantly less. The evidence as to whether pro-social producers generate more positive social impact is ambiguous. Indeed market competition appeared to act as a countervailing force with respect to the intention to trigger positive social impacts.

## 2  Related Literature

A few experimental studies in recent years have dealt with the phenomena of ethical product differentiation and corporate social responsibility (see Rode, 2008; Bartling et al. 2015; Valente, 2015; Feicht et al., 2016; Etilé and Teyssier, 2016; Pigors and Rockenbach, 2016). All these papers share a very similar framework, oftentimes featuring markets with sellers and consumers interacting for a predetermined number of rounds. In each round, sellers must determine a price for a good that has a social attribute (i.e. a positive externality). Usually, the higher the social attribute of a good, the higher the donation will be to a charity organization once that good is sold.[4] Consumers observe the price and, in some cases, they have knowledge of the social quality of each good (and such information can be more or less credible). When all consumers have chosen which goods to buy, each agent is informed of the market outcome and the game is repeated for various rounds.

The market experiment in these papers serves the purpose of investigating how institutional framework and information setting can affect market outcomes and the behavior of individual actors. For instance, Rode (2008) studies the relevance of what buyers know about the additional costs related to a specific social attribute. Valente (2015) focuses on the effect of ethical differentiation on market outcomes, consumer behavior and profits. Bartling et al. (2015) analyze the influence of increased competitive pressure and the impact of the information about the social quality of each proposal. Both Bartling et al. (2015) and Feicht et al. (2016) consider cases in which a product's social attribute has varying efficiency in terms of external impact. Feicht et al. (2016), in particular, analyze the influence of the commitment power of sellers to donate the initially announced amount. Meanwhile, Etilé and Teyssier (2016) go into the issue of credibility in more depth by comparing treatments where sellers have different signaling devices in order to make the social aspects of their proposal credible for consumers.[5]

We have chosen a similar framework in order to analyze a variety of CSR strategies. However, our design differs in several respects. First, we chose to simulate the demand side of the market by means of an algorithm. Indeed, in all of the previously cited experiments, the outcome of every market is inextricably related to the interaction between the social attitudes of both producers and consumers. Since we only want to focus on the impact of sellers, we need to disentangle this aspect from the potential heterogeneity

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[4]In Bartling et al. (2015) the externality of a transaction does not involve a donation to a charity organization but rather a higher payoff for a third player who has no active role in the experiment. A similar design is also adopted in Danz et al. (2012) and Pigors and Rockenbach (2016) both of which focus on fair wages and feature a third player who plays the role of a seller's employee.

[5]Pigors and Rockenbach (2017) investigate the relevance of the kind of information buyers have on the wage received by workers involved in the production of goods sold on the market.

of buyers. Our algorithm is inspired by standard models of vertically-differentiated markets, where consumers are (heterogeneously) willing to pay for the quality of the goods (see Mussa and Rosen, 1978; Gabszewicz and Thisse, 1979). This framework has already been adopted by many authors investigating various issues related to CSR.[6] For example, Doni and Ricchiuti (2013) analyse the potential outcomes of a duopoly market in which firms have objective functions that depend on both the socio-environmental impact of their production and their profits. They found that that for any given configuration of consumer preferences the market outcome is strongly linked to the relative weight firms assign to their profits.

We also designed a control treatment where experimental subjects had to play the same game as the subjects in the main treatment, with the only exception being that the social dimension of quality was completely removed. In that case, the algorithm represents consumers interested in quality *per se* and market transactions have no external impact.

Finally, we selected an ad-hoc sample of economics majors, so that they would find it familiar to play the role of a seller in our experiment. More specifically, given our intention to investigate the impact of potentially heterogeneous attitudes toward CSR, we recruited students from two rather different areas of economic studies: Business and Management and Development Studies. Indeed, as we detail below, the two groups of students are quite different, on average, in terms of their pro-social attitudes.

# 3 Experimental Design and implementation

## 3.1 Design

The experiment consists of a simple incentivized duopolistic market environment over ten periods followed by a post-experiment questionnaire about the subject's demographic background and views on ethics. The subjects play the role of firms, offering a differentiated good by choosing its quality and price. At the same time, the demand side of the market is played by an algorithm.

We conducted two treatments: a main treatment and a control treatment. In the main treatment, the good's quality serves two different purposes. Firms can differentiate their products by choosing different quality levels. Besides, if market share is positive, then quality determines a donation to a charity (which is chosen by the subject during the registration phase). As a result the subjects can choose high quality levels in order to both obtain higher profits through product differentiation and/or contribute to the charitable cause. In the control treatment, there are no charities involved and only the product differentiation motive remains. In both treatments, each experimental market consists of two sellers and an artificial continuum of buyers. Each pair of randomly matched sellers stick together throughout the 10 periods (fixed matching). Earnings are expressed in experimental currency units (ECU).

Each period involves the following two stages:

Stage 1 (sellers' proposals). Firms $i$, $j$ simultaneously and independently choose qualities, $q_i, q_j \in [0, 400]$, and prices, $p_i \in [q_i, 400]$, $p_j \in [q_j, 400]$ for the supplied good. An algorithm, representing the demand side, then determines the market share of each firm, $x_i$ and $x_j$.

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[6]See Arora and Gangopadhyay, 1995; Bansal and Gangopadhyay, 2003; Eriksson, 2004; Lombardini-Riipinen, 2005; Rodriguez-Ibeas, 2007; Garcia-Gallego and Georgantzis, 2009.

Stage 2 (information revelation). Each seller receives information about both sellers' posted prices and qualities as well as their own market share and resulting payoffs in the current period.

The algorithm defining the buyers' behaviour reproduces a vertically-differentiated market of consumers who are willing to pay within a given range. The idea is that there is a unit mass of consumers whose utility function is equal to $U_j(q_i, p_i) = v + \theta_j q_i - p_i$ (with $\theta_j$ uniformly distributed in $[0, \frac{3}{2}]$, the willingness to pay for the quality, and $v$ is a constant high enough to ensure that $U$ is always positive on the considered domain). Given a quadruple $(p_1, p_2, q_1 \leq q_2)$ there is a threshold $\hat{\theta} = \frac{p_2 - p_1}{q_2 - q_1}$ such that consumer $j$ prefers good 1 to good 2 if and only if $\theta_j < \hat{\theta}$. When both the prices and the qualities are equal, the market is equally split between the two firms and consequently their market share is exactly one half.[7] The two market shares add up to 1.[8] The profit is $\pi_i = (p_i - q_i)x_i$ i.e. it is markup (price minus quality which is seen as a cost) times market share.

In the main treatment, the instructions specify that each subject has to choose the social quality of a fictitious good, thus illustrating that this social aspect is a potential attribute of the production process (e.g. the use of less polluting material or the absence of child labor). In every round the choices of participant $i$ give rise to a positive social impact $I_i = 1.5 q_i x_i$.[9] Conversely, in the control treatment, quality is described as inherent to the intrinsic characteristics of the good, with no reference to any external impact.

Participants are aware that at the end of the market game one out of the 10 rounds is randomly drawn to determine the participants' earnings (equal to $\pi$ in that specific round) and, in the main treatment, the donations corresponding to $I$ in that round. This choice is meant to prevent possible wealth-effect and/or risk-related distortions of the incentive scheme (for more on the point see Healy et al., 2016). The ECUs are changed into Euros at the end of the experiment at a ratio of 1 Euro for every 20 ECUs.

## 3.2 Recruitment

Subjects have been recruited from the School of Economics at the University of Florence. We invited BSc and MSc students from either Business and Management (BM) or Development Studies (DS) because we were interested in selecting individuals whose pro-social attitudes where more likely to be heterogeneous. The AlmaLaurea Survey on Graduates

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[7]Formally, if $q_1 < q_2$

$$s_1(p_1, p_2, q_1, q_2) = \begin{cases} 0 & if \quad p_1 > p_2 \\ \frac{2}{3}\frac{p_2 - p_1}{q_2 - q_1} & if \quad \frac{p_2 - p_1}{q_2 - q_1} \in \left(0, \frac{3}{2}\right) \\ 1 & if \quad p_2 > p_1 + \frac{3}{2}(q_2 - q_1) \end{cases}$$

while if $q_1 = q_2$

$$s_1(p_1, p_2, q_1, q_2) = \begin{cases} 0 & if \quad p_1 > p_2 \\ \frac{1}{2} & if \quad p_1 = p_2 \\ 1 & if \quad p_1 < p_2 \end{cases}$$

[8]At the beginning of the session each subject is informed that their own market share is positively correlated to both the quality of their good and the price of their competitor's good, and negatively correlated to the price of their good and to the quality of the competitor's good. Instructions and screen-shots can be found in Appendix B.

[9]The use of a multiplicative factor, 1.5 in this case, is a standard way of making donations more appealing with respect to the option of maximizing earnings during the experiment and then donating part of them to a charity when the experiment is over.

Profiles[10] shows that these two populations hold diverse views along several dimensions[11]. The answers collected in our final questionnaire confirmed these differences.

We canvassed every student from the School of Economics and received positive feedback from more than 400 students (158 from the Business and Management, 81 from the Development Studies and the remaining from Economics, Statistics and Finance).[12] We randomly chose and invited 124 students from the list of respondents - 64 from BM courses and 60 from DS - to take part in the experiment. Given our interest in studying how the outcome of the market game was influenced by the subjects' field of study, we planned a specific procedure in order to ensure a mixed composition of couples in each session. Table 1 reports the main data related to participation in the experiment with details about the groups' composition in each treatment.

| | Participants | BM | DS | BM-BM | BM-DS | DS-DS |
|---|---|---|---|---|---|---|
| Main treatment | 64 | 34 | 30 | 10 | 14 | 8 |
| Control treatment | 40 | 20 | 20 | 6 | 8 | 6 |
| Total | 104 | 54 | 50 | 16 | 22 | 14 |

Table 1: Subjects and groups composition

## 3.3  Implementation

All of the experimental sessions were computerized using oTree (Chen et al. 2016) and were conducted at the University of Florence's Behavioural and Experimental Economics Laboratory (BEELab) between November 2015 and May 2016. In the four main treatment sessions, students received general instructions upon arrival at the registration desk and were asked to choose a charity they wanted to support in case some additional money should emerge during the experiment as a consequence of their own choices. Participants were asked to choose one of six charities - be it international, national or local - with activities ranging from environmental protection to international cooperation and social intervention.[13] The two control sessions, by contrast, received only general instructions.

At the beginning of the experiment the market game instructions were shown to each participant on the computer screen. A researcher read them aloud and students could ask for clarification at any time. Each subject then had to answer three control questions in order to better understand the rules of the experiment. Each session began with the market game, the focus of this work, and was followed by one or more, unrelated experimental activities. The complete sessions lasted 80 to 100 minutes. At the end of each session students had to fill in a quick survey featuring questions on personal data and behavioural attitudes. The average donations made in the main treatment were €7.8 while the average private earnings for the complete sessions were €13.4. At the end of

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[10]See almalaurea.it/en/universita/profilo/.

[11]In a survey administered before they graduated,students were asked to reveal the most important aspects while searching for a job. BM students mainly focused on earnings and career possibilities (61% and 77% respectively), while the social utility of their future job is largely neglected (19%). The opposite happens with DS students, who pay greater attention to the social utility of their future job (68%), while placing less emphasis on earnings and career opportunities (20% and 36% respectively).

[12]The initial announcement was extended to all the students in the School of Economics. This was done in order to avoid revealing any unwanted and unnecessary pieces of information to the students - most notably the fact that their field of study was an important element of our research.

[13]The list included: "UNHCR", "Oxfam" "Greenpeace", "Manitese" (a national organization involved in international cooperation), "Fondazione ANT" and "Noi per voi Onlus" (associations supporting families coping with serious health problems).

each session, cash payments were made in a separate room by the administrative staff in order to preserve anonymity. The donations to the charities were made on-line and receipts for the bank transfers were e-mailed to all the participants.

# 4    Results and discussion

## 4.1    Theory predictions and expected results

Although the design of the experiment reproduces a duopoly with vertically differentiated firms, the theoretical results of the models related to vertical differentiation do not hold in this context. Indeed, competition is modeled in two stages in the standard literature: in the first stage firms simultaneously choose quality and in the second stage they set their price.[14] Conversely, players choose quality and price simultaneously in the experiment. It is well known that no Nash equilibria exist if firms are profit maximizers in this kind of setup. However, while it is reasonable to expect that subjects in the control treatment tend to maximize their own payoff, the strategies employed by subjects in the main treatment could be motivated by both the maximization of their own payoff and the desire to contribute to a charity. We cannot ignore the possibility that subjects have a preference in producing high quality goods *per se*. However a potential distortion in favour of high quality goods is equally present in both treatments, as the only difference is the existence of an external impact of quality. In order to further elaborate on how a different objective function could affect the players' strategies we characterize the best reply function of a profit-maximizing firm and the best reply function of a non-profit firm that is trying to maximize its positive impact on the social welfare (see Appendix A). In general, a non-profit firm would choose a null markup while a profit maximizing firm would always choose a strictly positive markup. Moreover, on the basis of their best reply strategies, no-profit firms always set a quality level within the interval $[200, 400]$ while profit maximizing firms always choose a quality level in $[0, 1000/3]$. Obviously, most of our experimental subjects probably are neither exclusively profit maximizers nor social impact maximizers. However, analyzing the strategic interaction between subjects who put some (possibly different) weight on both objectives is quite difficult,[15] and is certainly beyond the scope of this work. Nevertheless, we think that the characterization of the best replies for these extreme cases can help us predict the potential outcomes of our experiments. For instance, we can expect that individuals who tend to emphasize social impact over private earnings, are more likely to set a higher quality and a lower markup.

The previous analysis suggests the following hypotheses.

*H1*. *The average quality and impact should be higher in the main treatment than in the control treatment.*

Indeed, we expect that when quality has a social byproduct, the experimental subjects may put some weight on the potential impact of production when choosing price and quality. This should, in turn, increase the average quality of their proposals.

*H2*. *The main strategic variables (quality and markup) and the main actual outcomes (impact and profit), should not significantly differ on average among the two types of*

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[14]A further difference is that in the theoretical literature firms often know ex-ante consumer preferences and the game is one-shot. In our market experiment instead, sellers can only learn about consumer preferences as the game unfolds.

[15]See Doni and Ricchiuti (2013) for a similar study involving a standard two stage model of a vertically differentiate duopoly in the presence of an environmental externality.

*students in the control treatment.*

The idea is that both groups of students in the control treatment should attempt to maximize their private earnings and hence display similar behaviour.

***H3***. *When compared to the BM students, DS students, in the main treatment should opt for higher quality and lower markup, and achieve lower profit and a higher social impact.*

We expect that individuals who are more concerned with the social impact of their activities will offer comparatively more quality and require less markup, thus sacrificing part of their profits to increase their positive social impact.

We chose not to put forth any hypothesis that involve comparing average profits in the main treatment and in the control treatment. Indeed, in the main treatment two countervailing effects must be taken into consideration. On the one hand, individuals with certain pro-social attitudes might want to reduce their markup to increase their impact by lowering their profits. On the other hand, the existence of heterogeneous objectives could relax the competitive pressure. Among individuals with different objective functions there are higher incentives to quality differentiation and in this situation profit maximizing individuals can achieve higher profits.

***H4***. *The main treatment groups that feature two DS students should result in a higher overall social impact than those with one or zero DS students.*

We have seen above that profit maximizing individuals should set lower quality on average than impact maximizing ones. For this reason, we expect that more pro-social individuals will result in greater social impact.

The next subsection shows the results of some standard Wilcoxon Rank Sum tests in order to check whether our hypotheses are borne out by our experimental data. All subsequent analyses were carried out dropping the first observation, given that in the experiment participants did not have actual trial periods.

## 4.2   Test Results

The following tables show mean values for the most relevant variables and p-values for the Wilcoxon Rank Sum test with a null hypothesis of no difference.

Table 2: Control vs Treatment

|           | Quality  | Markup | Profit | Impact  |
|-----------|----------|--------|--------|---------|
| Control   | 179.983  | 66.753 | 23.297 | 135.122 |
| Treatment | 206.175  | 66.903 | 25.904 | 155.031 |
| p-value   | 0.0001   | 0.917  | 0.361  | 0.041   |

Table 2 shows that important differences arise between Control and Treatment: the quality was significantly higher in the Treatment, where quality could command a positive impact on the donation to charity. The actual impact for the charities was indeed higher than the impact that would have been generated if the mechanism operating in the Treatment had also been in place in the Control. This result is in line with ***H1*** and supports the existence of a certain degree of altruistic CSR among our experimental subjects. Figure 1 shows this result in terms of averages at each round. It is worth noting that the quality and the impact have no relevant trend in the Treatment, while the same variables are slightly decreasing in the control. On the other hand, the markup

decreases in both Treatment and Control (while the profit is slightly decreasing only in Treatment).[16]

Table 3: Differences between DS and BM in the Control

|  | Quality | Markup | Profit | Impact |
|---|---|---|---|---|
| DS | 184.078 | 73.428 | 22.411 | 148.012 |
| BM | 175.889 | 60.078 | 24.183 | 122.233 |
| p-value | 0.367 | 0.437 | 0.514 | 0.127 |

Table 3 shows that the two groups of individuals behaved similarly in the Control. Indeed, there is no significant difference in terms of their main strategic variables, i.e. quality and markup, or their actual outcomes i.e. profits and impact. This result supports **H2** and constitutes evidence that the two groups of experimental subjects follow similar strategies when the only reasonable objectives is the maximization of earnings.

Table 4: Differences between DS and BM in the Treatment

|  | Quality | Markup | Profit | Impact |
|---|---|---|---|---|
| DS | 220.330 | 65.144 | 23.070 | 159.796 |
| BM | 193.686 | 68.454 | 28.405 | 150.827 |
| p-value | 0.004 | 0.182 | 0.021 | 0.562 |

Table 4 on the contrary, shows that the two groups of individuals behave differently in Treatment. Indeed, DS students on average set a higher quality than BM students. However, the difference in terms of social impact is not statistically significant. The former result is consistent with **H3**, while the latter is probably due to the strategic abilities of BM students who tend to grab larger market shares. As a consequence, the two groups of students are clearly different in their intentions with respect to the social impact, but not so much in terms of their actual outcomes. A similar pattern can be observed in the other two variables: the markup does not differ significantly between the two groups of students, but the profits are higher among BM students than they are among DS students. One again, this result can be explained by noting that BM students are better at obtaining larger market shares than their peers in DS. As a consequence, even though the markup is on average only 3 points higher for BM than DS, BM profits are 5 points higher. In this case the two groups of students do note seem distinguishable in their intentions, but they are in their actual outcomes. A round by round perspective of this phenomenon is illustrated in Figure 2.[17]

Finally, further insights with respect to **H3** can be obtained by looking at the influence of the types of counterparts with which our subjects happened to be matched. Indeed,

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[16]Random-effects generalized least squares (GLS) regressions on period with robust standard errors clustered by player ID, coefficient for period: i) Quality: Treatment: 0.658 (p=0.661); Control -5.106 (p=0.041). ii) Markup: Treatment: -2.848 (p=0.001); Control: -2.324 (p=0.074); iii) Profit : Treatment -0.914 (p=0.042); Control 0.162 (p=0.787); iv) Impact: Treatment: 1.341 (p=0.523); Control -4.793 (p=0.038).

[17]When we ran the same regression described in the previous footnote we found that the trend of quality, impact and profit are not statistically significant for both the group of students. Conversely, the trend in markup is negative and statistically significant. Moreover, markup among BM students decreases more than the markup among DS students.

there is evidence of variable behavior depending on whether subjects were facing someone from the same field of study (Homogeneous) or a different field of study (Mixed).

Table 5: Differences between DS and BM in the Various Groups

|  | Homogeneous | Mixed | p-value |
|---|---|---|---|
| *Quality* |  |  |  |
| DS | 215.368 | 226 | 0.203 |
| BM | 198.667 | 186.571 | 0.062 |
| p-value | 0.363 | 0.001 |  |
| *Markup* |  |  |  |
| DS | 56.528 | 74.992 | 0.389 |
| BM | 65.228 | 73.063 | 0.224 |
| p-value | 0.033 | 0.843 |  |
| *Profit* |  |  |  |
| DS | 21.438 | 24.937 | 0.661 |
| BM | 25.528 | 32.516 | 0.614 |
| p-value | 0.072 | 0.140 |  |
| *Impact* |  |  |  |
| DS | 158 | 161.849 | 0.607 |
| BM | 153.417 | 147.127 | 0.768 |
| p-value | 0.790 | 0.691 |  |

Table 5 shows that quality is strikingly different between DS and BM whenever our attention our is focused solely on mixed groups. However, markup and profits are similar between different subjects in mixed groups and statistically different between homogeneous groups (DS-DS and BM-BM). These results seem to suggest that the heterogeneity of objective functions in mixed groups causes high differentiation of quality and allows both subjects to achieve high profits. On the other hand, the different weight assigned to private earnings is key in homogeneous groups and likely explains the lower average markup and profit in DS groups than in BM groups. Finally, and perhaps surprisingly, the social impact is not statistically different in groups with a different number of DS students (test of difference between DS-DS and BM-BM: p-value = 0.7897; between DS-DS and DS-BM: p-value = 0.7429; between BM-BM and DS-BM: p-value = 0.4552). This is evidence that **H4** does not hold. This result seems to suggest that good intentions are not sufficient to ensure good outcomes. However these findings might not be robust to a different choice of the algorithm simulating the demand side of the market. In the following subsection we use data from the final survey in order to validate the distinction between BM and DS students as a meaningful proxy of our subjects pool pro-sociality.

## 4.3   Stated attitudes and experimental behavior

In the previous sections we have investigated whether subjects from different fields of study related to economics behave differently in our experimental setting. On the basis of an existing survey on the Graduate profile, we maintained that the kind of courses students are enrolled in could be a good proxy of their pro-social attitudes. In order to check the robustness of this assumption with regard to our specific sample, we included several questions in our post-experiment survey.

Table 6: Working aspirations

| Where would you like to work in 10 years? | DS | BM |
|---|---|---|
| In the public administration (health or social sector) | 14.8% | 1.9% |
| In the public administration (other sectors) | 9.3% | 7.4% |
| As a freelance | 11.1% | 9.3% |
| In a private enterprise | 7.45 | 74.1% |
| In a non-profit organization | 48.1% | 3.7% |
| I do not wish to answer | 14.8% | 7.4% |

*Note: larger than 100% sum due to multiple selections allowed.*

Table 7: Behavioural preference survey module

| Questions: | mean DS-BM | p-value |
|---|---|---|
| In general, how willing or unwilling are you to take risks? | 0.0176 | 0.8560 |
| How well does the statement "I tend to postpone tasks even if I know it would be better to do them right away," describe you as a person? | 1.3892 | 0.0412 |
| How well does the statement "As long as I am not convinced otherwise I always assume that people have only the best intentions" describe you as a person? | 0.9792 | 0.0939 |
| How willing are you to give to good causes without expecting anything in return? | 0.9575 | 0.0044 |
| How would you rate your willingness to return a favour to a stranger? | 0.9678 | 0.0028 |
| How well does the following statement describe you as a person: "If I am treated very unjustly, I will take revenge at the first opportunity, even if there is a cost to do so"? | -0.8403 | 0.0590 |
| A critical consumer makes consumption choices based on predefined criteria, such as environmental and social sustainability, which have the same importance of price and quality of the products/services. | 0.4265 | 0.3614 |

Table 6 shows that the two groups of participants have different working aspirations: while BM students mainly hope to work in the private sector, DS students tend to be interested in working for non-profit organizations and public administration (especially health and social sectors). We have also determined that DS students are more involved in volunteer work in social organizations or cultural associations (36% of DS participants versus 18.5% of BM participants). Finally our survey included 7 questions related to relevant behavioural traits, six of which were inspired by the work of Falk et al. (2016) regarding preference survey modules to measure risk, time, and social preferences. We formulated an additional question that sought to measure the extent to which our participants thought of themselves as critical consumers. Each question was based on a scale of 0 to 10. Table 7 reports the exact text of these specific questions and the test on the differences between the two groups of students. According to the results of the Wilcoxon Rank Sum Test, DS students are more likely than BM students to donate to good causes, return a favour for a stranger (both p-values < 0.01) and trust other people (p-value < 0.1). All of these behavioural traits are good proxies of pro-social attitudes.

We have also examined the correlations between a participant's field of study or the

Table 8: Correlations between proxies of pro-sociality and experimental data

|  | Quality | Markup | Profit | Impact |
|---|---|---|---|---|
| DS student | 0.1145*** | -0.0006 | $-0.0710$* | 0.0167 |
| membership | 0.2481*** | $-0.0953$** | $-0.0784$* | 0.1431*** |
| critical consumer | 0.1759*** | $-0.1614$*** | $-0.0731$* | 0.1152*** |
| good actions | 0.1777*** | $-0.0809$* | $-0.0669$* | 0.0855** |

*Note: Pearson's correlation Test* *p<0.1; **p<0.05; ***p<0.01

main proxies of their pro-sociality emerging from the survey (e.g. membership of a social organization, critical consumerism and willingness to donate to good causes) and their choices/outcomes in the experiment. Table 8 suggests that the correlations are very close. Furthermore, all of the correlations associated with the alternative proxies are also meaningful.

In order to check the robustness of the analysis of the previous section, and to examine how these different proxies of pro-sociality explain the main choices of our subjects we ran more Wilcoxon Rank Sum tests (for Treatment only). The tests assume the null of no difference between median values of the relevant experimental variables among subjects that have different values for the binary[18] proxies. It turns out that subjects who are more pro-social tend to choose higher quality (p-value < 0.01 for all the proxies) and lower markup, regardless of the proxy. The tests regarding profit and impact are consistent in sign in all cases, while the statistical significance depends on the specific proxy. Membership in a social organization is the proxy that best distinguishes the experimental choices of subjects on the basis of their pro-sociality.[19]

In conclusion, subjects from the Treatment group who are more pro-social tend to choose higher quality and lower markup, thereby achieving lower profit and higher social impact. This fully supports **H3**.

Meanwhile, focusing on membership in a social organization, i.e. the best proxy from the survey based on the previous analysis, allows us to reassess our previous results regarding **H4**. These additional tests show that groups of subjects that are comprised of two members of social organizations indeed generated significantly higher social impact than those that included no members (p-value = 0.02). Therefore, our previous results pertaining to **H4** based on the subjects' field of study falter when we consider a different proxy of pro-sociality.

Overall, the above analyses validate our use of the field of study as a proxy of pro-sociality.

We build upon our analysis in the following section in order to better understand the behaviour of individuals and determine its relationship to pro-social attitudes.

## 4.4 Regression results

This section centers on the strategy patterns used by our subjects to revise their choice variables (i.e. price and quality) during the experiment. It seems that three variables contribute the most to explaining the adjustment of the choice variables, namely the difference, at $t-1$, between the subject's and the competitor's price (Price $\text{gap}_{t-1}$) and

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[18]For both critical consumerism and willingness to donate we consider pro-social the subjects answering a value above the mean.

[19]The statistical results are available upon request.

quality (Quality gap$_{t-1}$), and the market share at $t-1$ (Share$_{t-1}$). However there is significant correlation between these three variables. Since Quality gap$_{t-1}$ and Share$_{t-1}$ are sufficiently orthogonal and retain significant explanatory power, they were used for our OLS estimates. Tables 9 and 10 show the results.

The first result stemming from the regression analysis is that players adapted their strategy round after round mainly by adjusting their price: all things being equal, a higher market share in a given round gives players an incentive to increase their price in the subsequent round. At the same time, *ceteris paribus*, a larger quality gap in a given period gives players an incentive to decrease their price in the subsequent round. Interestingly enough, DS students have a tendency to increase their price more than BM students.

Concerning quality adjustment, all of the participants show, on average, a tendency to match the quality of their rival. Indeed, the higher the quality gap in one round, the lower the quality offered in the subsequent round. Moreover, BM students converge "faster" (their coefficient is higher in absolute value) than their peers in DS. At the same time, DS students seem to increase quality in subsequent rounds whenever they have a high market share. Conversely, BM students do not follow any apparent pattern when this situation arises.

These simple regressions suggest, perhaps unsurprisingly, that players adjust their strategy through the game on the basis of the information they receive after each round. The patterns of these adjustments are similar among the entire sample. However, the intensity of these adjustments is quite different between students from different fields, as DS students tend to increase more (or decrease less) their price and quality round after round. Therefore the adjustment strategies among different type of students are coherent with the potential heterogeneity of their objective functions.

Table 9

|  | *Dependent variable:* | | |
|---|---|---|---|
|  | Price adjustment | | |
|  | (1) | (2) | (3) |
| Quality gap$_{t-1}$ | −0.294*** | −0.235*** | −0.351*** |
|  | (0.027) | (0.040) | (0.037) |
| Share$_{t-1}$ | 66.431*** | 83.341*** | 55.392*** |
|  | (8.916) | (12.537) | (12.584) |
| Constant | −36.218*** | −39.055*** | −37.000*** |
|  | (5.434) | (7.510) | (7.903) |
| Observations | 512 | 240 | 272 |
| R$^2$ | 0.254 | 0.263 | 0.275 |
| Adjusted R$^2$ | 0.251 | 0.257 | 0.269 |
| Residual Std. Error | 70.299 (df = 509) | 68.494 (df = 237) | 70.870 (df = 269) |
| F Statistic | 86.624*** (df = 2; 509) | 42.289*** (df = 2; 237) | 50.931*** (df = 2; 269) |

*Note:* *p<0.1; **p<0.05; ***p<0.01

Table 10

| | Dependent variable: | | |
|---|---|---|---|
| | Quality adjustment | | |
| | (1) | (2) | (3) |
| Quality gap$_{t-1}$ | −0.372*** | −0.304*** | −0.433*** |
| | (0.029) | (0.039) | (0.044) |
| | | | |
| Share$_{t-1}$ | 8.218 | 28.521** | −6.125 |
| | (9.660) | (12.179) | (14.708) |
| | | | |
| Constant | −3.777 | −9.533 | −1.889 |
| | (5.887) | (7.295) | (9.236) |
| | | | |
| Observations | 512 | 240 | 272 |
| R$^2$ | 0.240 | 0.227 | 0.270 |
| Adjusted R$^2$ | 0.237 | 0.220 | 0.264 |
| Residual Std. Error | 76.158 (df = 509) | 66.536 (df = 237) | 82.826 (df = 269) |
| F Statistic | 80.413*** (df = 2; 509) | 34.737*** (df = 2; 237) | 49.640*** (df = 2; 269) |

*Note:* $^*$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01

# 5    Conclusions

Consumer social responsibility is currently the focus of both empirical and experimental research that studies how individuals behave when they can weigh private and public considerations in deciding what to consume. Conversely, producer social responsibility is more difficult to understand. The extent to which CSR involves strategies that are different from those that arise in pursuit of simple profit maximization is still a bone of contention among scholars. Indeed, much of the empirical literature is inconclusive in terms of delineating the relationship between CSR activities and profits. In their review of the microeconomic literature related to CSR, Schmitz and Schrader (2015) call for an experimental approach that can better determine how social preferences impact the strategy of decision makers on the supply side.

Experimental literature meanwhile does not help us understand whether producers are solely driven by consumer preferences and profit maximization, or if they pursue genuine altruistic CSR. We tried to address this issue by designing an experimental market game where producers have to choose the quality and the price of their goods. In the control treatment quality is related to the intrinsic characteristics of the good, which does not have any external impact. In such a context, it is reasonable to expect that producers follow profit maximization strategies exclusively. In the main treatment, quality is related to the socio-environmental characteristics of the good, and subjects know that they can contribute to a charitable organization in proportion to the social impact of their production. Therefore, producers may consider both profit-oriented and social concerns when choosing their strategies. Finally, we recruited a sample of students who are enrolled in two different areas of economic studies that are characterized by markedly different pro-social attitudes. This allowed us to investigate how social concerns

can influence a producer's business strategies.

We found evidence that producers give a significant weight to social considerations when choosing their strategies, while pro-social individuals are more willing to sacrifice their profits in the social interest. At the same time, the strategic interactions between subjects who have different degrees of pro-sociality is quite complex. The evidence is mixed in terms of determining the extent to which the presence of more producers with a higher degree of pro-sociality tend to generate more positive social impact.

This paper's focus on the behavioural traits of individuals on the supply side of markets with social externalities could greatly benefit from the involvement of real entrepreneurs, instead of students, in the lab. Further attempts to understand how different demand conditions could drive different results could also produce interesting results.

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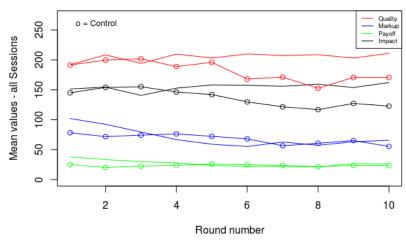## Main variables averages: Treatment vs Control
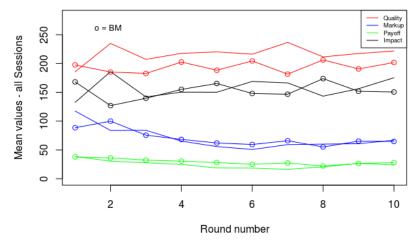


Figure 1

## Main variables averages: DS vs BM



Figure 2