Dictator monopolies and essential goods: experimental evidence[1]

Steven R. Beckman, Gregory DeAngelo, and W. James Smith

Abstract: Monopolists set prices and if the good is inessential this may place the consumer in an uncomfortable position. But if the good is essential the consumer faces a pay-to-live or die choice. Dictator and ultimatum games are superficially similar in that one game offers the right of refusal while the other does not. The dictator monopoly is, however, not a game, and behavior could be radically different in the market environment versus game environment. We recast the dictator game as a dictator monopoly experiment and find that the fairness characteristic of the game evaporates quickly as rounds progress.

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Steven Beckman, University of Colorado Denver,
*Steven.Beckman@ucdenver.edu**
Gregory DeAngelo, West Virginia University, gregory.deangelo@gmail.com
W. James Smith, University of Colorado Denver, Jim.Smith@ucdenver.edu

**Corresponding author, Department of Economics, University of Colorado Denver, Denver, CO 80217-173364*
Phone: 303 315 2035
Fax: 303 315 2048

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"I'm gonna make him an offer he can't refuse"

Don Corleone, The Godfather.

I. Introduction

The dictator game (DG) and monopolies of essentials present someone with an offer they cannot refuse. The purpose of this paper is to develop laboratory tools that will measure whether the generosity often found in DGs extends to experiments framed as a monopoly of an essential good. On the one hand, gross injustices in history, such as the provision of AIDS drugs in Africa, and current pricing strategies for pharmaceuticals in the US that present patients with a pay or die choice suggests monopolists of essentials are fully capable of pressing their power to the limit.[2] On the other hand, the DG game and supportive questionnaire research suggests that businesses often take fairness into account (Kahneman, Knetsch and Thaler, 1986). We are curious if the modest fairness in the DG carries over to a recurring market environment.

The DG is introduced by Kahneman, Knetsch and Thaler (1986), as a device to better understand behavior in ultimatum games. In the ultimatum game, the proposer offers a split of some monetary prize, often $10, and the responder accepts or rejects. If the offer is rejected, then both subjects receive nothing. Therefore any apparent fairness in the proposal may be fear of rejection and not generosity. In the DG the right of refusal is eliminated. The proposer offers some amount, perhaps zero, to the other subject who has no decision to make. Research has found a surprising number of positive offers by dictators and concludes that the experiments offer credence to the possibility "…that the

[2] According to Dr. Hagop Kantarjian "High cancer drug prices are harming patients because either you come up with the money, or you die." 60 minutes interview broadcasted Oct. 5, 2014 and downloadable from http://www.cbsnews.com/news/cost-of-cancer-drugs-60-minutes-lesley-stahl-health-care/.

owners and managers of firms have a preference for acting fairly." (Kahneman, Knetsche and Thaler. 1986, S291)

Kahneman et al. (1986) immediately spawned a wave of follow-up experiments demonstrating that behavior in dictator and ultimatum games is unusually sensitive to instructions, design differences and subjects' backgrounds. These are particularly relevant to us if they show the dependence of behavior on some aspect of a market. For example Hoffman, McCabe, Sachat and Smith (1994) show that phrasing the ultimatum game in terms of prices set by a monopolist reduces giving. In stark contrast Ensminger (2000) shows that experience with competitive markets increases giving among tribespeople in the African bush. This suggests context matters but must be carefully controlled as experience with competitive and monopoly markets could generate quite different responses. Henrich et al. (2005) conduct systematic ultimatum and DG experiments in a wide variety of cultures and find that giving increases in whaling cultures where cooperation is essential. This raises the possibility that impersonal market interactions increase social distance and thereby allow more selfish behavior. A large number of papers confirm that social distance reduces giving but that giving generally remains positive [Hoffman, McCabe and Smith (1996), Johanneson and Persson (2000),. Charness and Gneezy (2008), Aguiar et al. (2008), Branas-Garza (2007), Dana, Weber and Kuang (2007), and Matsui et al. (2008)]. Henrich et al. (2005 p. 814) also observe that context matters. They found that among the Orma contributions in public goods games were higher for the relatively wealthy as their cultural norm requires but wealth had no impact on giving in ultimatum games which seemed not to trigger the norm. If the norm in markets is to be selfish, then a marker frame may increase selfishness. The

impact of norms in DGs is explored further in Bolton, Katok and Zwick (1998) as well as Krupka and Webber (2008). Of course there may be other influences as well: gender (Eckel and Grossman 1998 and 2000), age (Benenson, Pascoeb and Radmoreb 2007), whether the proceeds are earned or unearned (Oxoby and Spraggon 2008 as well as Cherry, Frykblom and Shogren 2002) and the cost of altruism (Andreoni and Miller 2002).

More recent papers have shown the fragility of the DG to seemingly inconsequential design changes calling the interpretation of the DG into question. Bardsley (2008) finds that Player 1s that give to Player 2s will take from Player 2s if that opportunity is presented instead. This is confirmed by Engel (2011) in a metastudy that shows that Tobit regressions outperform OLS presumably because they allow for the possibility the subject would prefer to take money. Oberholzer and Eichenberger (2008) add an unattractive lottery to the dictator experiment and find that even if dictators do not play the lottery they take all the endowment. Nettle et al.(2013) find that it is being seen to give that matters. Winking and Mizer (2013) question whether the laboratory result has any relevance in the field. They conduct a field experiment where one experimenter drops off casino chips to an unwitting subject at a bus stop while another experimenter (unannounced and with their back turned) is present. The first experimenter suggests sharing with the second. No subject gave any of the chips away.

All of the above listed papers have significant merits, but we suspect the literature projects too much of the fairness, altruism and morality of subjects to the managers of firms. Ariely (2009, p. 68) makes a similar point "… we live simultaneously in different worlds – one where social norms prevail and one where market norms make the rules."

The DG and monopolies of essentials may well reside in these two separate worlds and invoke completely different behaviors. Our interest is whether owners and managers of monopolies of essential goods exhibit the same degree of fairness as subjects in DGs.

While we think the Kahneman *et al.* (1986) conclusion is somewhat overdrawn, the game itself is extremely useful. Reducing the environment to one buyer and one seller of a good that must be purchased dramatically simplifies the theory. For example, let there be a good that the consumer would pay all of their disposable income of $100 to obtain but costs $10 to produce. The profit maximizing price is clearly $100 with all gains going to the producer, leaving the consumer with no disposable income.

However the simplicity may have changed the frame of the problem. As Tversky and Kahneman (1981) note subtle changes in frame may have dramatic effects. For example Hoffman *et al.* (1994), find that framing the closely related ultimatum game as a monopoly alters behavior. Therefore we should be prepared to consider the proposition that the DG is also subject to a similar framing affect.

In a similar spirit to Hoffman et al. (1994) our experiments create a standard monopoly experiment with repeated rounds, a price setting monopolist and a consumer that must buy at least a single unit of the necessary good. This is a dictator monopoly. We find that in precisely the environment described with 100 points in disposable income and a cost of 10 points, the price typically begins at levels well below 100 but converges to 100 as rounds proceed. Even if we deliberately complicate the environment and reduce the cost of benevolence by allowing demand to increase as price falls, the basic pattern reemerges: prices start low but converge to absorb nearly all disposable income.

II. Introductory Theory and History

A Theoretical Sketch

Figure 1 presents the theory at about the same level of abstraction as the DG. Imagine a monopoly surgeon and a patient that needs a heart transplant. If the cost of the surgery is 10 (in thousands of $) and the patient has disposable wealth of 100 then the profit maximizing price is 100. The monopoly surgeon, of course, could choose to be generous and offer the surgery for less, leaving the patient not only alive but with some disposable wealth. The behavior in the DG suggests such kindness may, in fact, extend to this environment.

Figure 1. Profit Maximization for Life-Saving Surgery.

Figure 2 extends the theory to multiple patients in an environment where resale is possible. Assume a monopoly provider of a lifesaving pharmaceutical with negative side effects so that one and only one course of the drug is useful. If there are two patients with disposable wealth of 100 and 80 then the profit maximizing price is 80 and profit is 140 = 2(80-10). The company would of course prefer to sell one unit at 100 and the other at 80, but if the drug is available at 80 an enterprising individual could buy at 80 and resell to the first patient for 90, pocketing 10 from the transaction. In an environment with mild inequality this is not a major problem though, as all survive and the profit of the drug company is still 140.

Figure 2. Drug prices with low inequality.

Circumstances are quite different given high inequality as Figure 3 illustrates. If the disposable wealth of the second patient is only 40 then serving both patients at a price of 40 generates profits of 60 = (2)(40-10) while serving one patient generates profits of 90. Given this degree of inequality it is profitable to serve both at prices of 100 and 40 only if resale can be prevented. If resale is possible, then profit maximization is consistent with serving only one patient.

It may seem the example above is nothing more than the familiar price discrimination model. However, given life-saving drugs, the patient is confronted with a pay or die decision. Presumably they would pay all disposable wealth to survive and disposable wealth then determines the elasticity of demand. Highly unequal wealth generates inelastic demand and rational dictator monopolies unable to prevent resale will not operate in the inelastic portion of demand. To put it even more sharply, if the wealthy consumer did not exist the poorer consumer would survive. This is clearly unfair.

Figure 3. Drug prices with high inequality.

Brief Historical and Contemporaneous Examples

Florence Nightengale attributes famines not to drought but the fact that "we do not care for the people of India." *The New York Times* (August 25, 1878, p.6) explains:

> "By this she means the British Government has put such burdens upon the people that they are crushed down by them. For instance, salt in India, which costs 12 shillings six pence a ton has a tax of £7 a ton. This restricts the preservation of food and absolutely forbids native manufactures. No man can live there without nine pounds of salt a year, and the cry for salt is only equaled by the cry for bread in ancient Rome. … There is little to show in the British rule of India that the government has had any higher idea than that of great returns for small outlays…the rural population … are placed in a position which … reduces them to such poverty that upon any light change in the success of the crops famine sweeps them away in great numbers."

This example illustrates that government is not necessarily the solution. The British government used their monopoly of salt to raise tax revenue.

The provision of AIDs drugs in Africa is a continuing source of examples beginning with South Africa confronting the drug companies and demanding compulsory licensing of generics and more recently as the US negotiates trade agreements to limit the spread of these generics to other countries. Joseph Stiglitz (2007 p. 104) writes "The US negotiators were mostly interested in having it their way – and they wanted the new agreement to protect US drug companies. It came down to a matter of life versus profits. The US … insisted that the agreement include provisions that would delay the introduction of generic drugs…It is not clear precisely how many people could die as a result."

Within the US, the orphan drug act highlights the benefits and costs of monopolies of life saving drugs. An orphan drug is one for which it is believed that the market is so small that the drug would not be produced without the provision of monopoly rights. In response to this argument, Congress passed the Orphan Drugs Act of 1983 which establishes a seven-year monopoly in life giving drugs. The framers of the act clearly considered a monopoly in this case to have the potential of being only marginally profitable with the benefit of providing a chance of life to a small group. Instead, fully 10 percent of pharmaceutical company profits come from orphan drugs, with one-half of all drugs produced by biotech firms targeted at orphan diseases.[3]

The drug for Gaucher's disease is just one example. The initial research was conducted by NIH and given to Genzyme. The market, though small in number of

[3] See articles in the *Wall Street Journal* Nov. 15, 16, Dec. 1 and Dec. 28, 2005 by Geeta Anand. These articles are the source for Guacher's disease as well. Downloaded from ProQuest, November 21, 2008.

patients, was profitable. Some consumers are charged $600,000 a year for treatment, often bankrupting small insurance carriers. One individual whose son suffered from the disease moved to larger companies to benefit from the deeper pockets of a broader employee base for insurance. Often, however, the copayment is prohibitive. In this case, the drug company at times donates to another entity that is set up to fund copayments, thereby, reaping the larger gain from the insurance company. The existence of insurance also allows drug companies to tap into a larger source of income from healthy workers and their firms.

We believe these examples illustrate that the presumption of fairness either on the part of managers of monopolies of essentials or their governmental regulators is misplaced. We turn now to experiments to see if providing a market frame for the monopoly of essentials results in behavior that is consistent with the social frame provided by the DG.

III. Experimental Methods

Overall Design

Our goal is to set the DG in the environment common to monopoly experiments to determine if the change in frame alters behavior. Monopoly experiments (Harrison and McKee, 1985) generally have downward sloping demand which creates a trade-off between profits and social efficiency. Reducing prices to the competitive level maximizes social efficiency but reduces profits to zero. Raising prices increases profits but reduces consumer surplus more than dollar for dollar. Theory suggests monopolists do not have other regarding preferences and focus on their own profits. Sellers set the price and must learn about demand by experimentation. Seller's costs and profits are private information

as are buyer's redemption values and consumer surplus. Whether the producer will consider social efficiency or simply their own profit is a core issue in these experiments that largely occurred before DGs were invented. While profits typically triumph, there are moderating influences. For example, Smith (1981) finds that posted prices and experienced subjects more reliably approach the monopoly price, while Reynolds (2000) finds lower prices for durable goods. The primacy of profits given monopolies of inessentials where the consumer has the right of refusal suggests similar behavior may apply to monopolies of essentials.

A monopoly frame implies a large number of changes from the traditional DG. Therefore, we make the changes in three steps. In the first step, demand is the vertical demand of Figure 1 with cost of 10 and disposable income of 100. Buyers and sellers know that the redemption value for the unit is 100 and that production cost is 10 and therefore producer and consumer surpluses are public information. The primary changes are the change in frame and repetition.

The second set of experiments includes the remaining elements of a monopoly experiment. We allow downward sloping demand, producers learn about demand through experimentation while both consumer and producer surpluses are private information. We incorporate these features through a CES utility function modified for a subsistence requirement. Blackorby et al. (1978) coin this the TCES utility function and describe its

properties.[4] Beckman and Smith (1993) and Primont and Primont (1995) link the TCES function to upward sloping marginal revenue.

The TCES function allows for a rather complex interaction of profit and consumer surplus. We will describe this is general terms here and present the numerical implications in the section on experimental procedures. The competitive solution is of course where marginal cost crosses demand (we assume constant marginal cost and no fixed costs for simplicity). As usual, the competitive solution maximizes social welfare but drives profit to zero. The subsistence solution is the opposite: it maximizes the producer's profit but drives the consumer surplus to zero. The reasons are straightforward. Given a pay or die choice consumers will part with all disposable income to survive and the monopolist's revenues are maximized. The monopolist's costs are minimized because production can be no lower. Maximizing revenue and minimizing costs maximizes profit. The consumer lives but has given away all they possibly can reducing their welfare to the minimum possible assuming life. A third solution is possible if the two goods in the utility function become close substitutes away from the subsistence minimum. The close substitution between them allows for elastic demand at higher levels of use and a more conventional monopoly solution where marginal revenue equals marginal cost. Profit is lower than at subsistence because consumption of the other good drains revenue. Therefore profit is only locally maximized and the subsistence solution remains the global profit maximum. However, this local profit maximum does

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[4] $U = \left((x_1 - s_1)^{\rho} + (x_2 - s_2)^{\rho}\right)^{\frac{1}{\rho}}$ where s_i is the subsistence requirement for each of two goods, x_i, $i=1,2$. Let p_i and y represent price and income. It is easily shown that the associated demand function is $x_i = \frac{\bar{y} p_i^{r-1}}{\sum_i p_i^r} + s_i$, where $\bar{y} = y - \sum_i p_i s_i$ and $r = \frac{\rho}{\rho - 1}$.

allow both for some monopoly profit and much improved consumer surplus. If producers do value other's welfare, it may have some appeal.

While this allows us to learn if social efficiency will moderate behavior, it also complicates the experiment substantially. A complex demand function requires a sophisticated computer interface. The complexity raises the possibility that producers will never learn the properties of demand and may rely on the subsistence solution due to simplicity. Two features are introduced to counter this possibility. A five round tutorial uses linear demand to teach the standard monopoly theory (and teach the computer interface). For the last 3 of 16 rounds producers are shown what profit would be at different prices so that they see the entire profit surface indicating both a local profit max away from subsistence and higher profits at subsistence. Both the tutorial and the revelation of the price-profit correspondence are intended to show that if the experiment ends at the subsistence solution then the producer has consciously rejected both the local profit maximum and the competitive solution in favor of the subsistence solution.

While both features are designed to lead subjects away from the subsistence solution, it is not standard to deliberately lead subjects. Therefore, a third set of experiments is conducted as a robustness test. These experiments alter the subject pool, replace the five round tutorial with a single practice round and remove the end of experiment revelation of the price-profit correspondence. Furthermore, experiments randomly end at 13, 14 or 15 rounds and half the sellers are told the consumer surplus while the other half are not. Finally, sellers are re-matched with different buyers after the 7^{th} round to see if re-matching has an effect.[5] While this is a large number of changes,

[5] We link the seller to a different buyer about half way through the experiment to see if social norms, other-regarding behavior or philanthropy require some sort of gift to a contact that is new to a particular seller.

this third set is intended to show the robustness of our results to these changes rather than evaluate each change independently. Table 1 summarizes the features for all three sets of experiments.

Table 1. Design Elements of Experiments by Set

Experimental Procedures

The initial experiments were conducted at the University of Colorado Denver with 120 subjects and at Rensselaer Polytechnic Institute (RPI) in Troy, New York with 36 subjects. In Denver, 59 subjects were recruited by visits to classes in mathematics, ethnic studies and sociology with 61 recruited in principles of economics courses. Of these 120 subjects, 60 participate in a vertical demand experiment with 60 using TCES demand. In short, there are 30 buyers and sellers in each demand setting. At RPI, all 36 subjects were recruited via ORSEE (Greiner, 2004) and TCES demand experiments were conducted. The follow-up subjects at RPI were less likely to be minorities and more likely to be engineering majors. All subjects were promised a minimum pay of $5 in addition to what they earn in the experiment.

In Denver, subjects were in one large computer room with portable partitions that preserve a degree of privacy. At RPI, subjects congregate in a hallway and sellers are placed in one room and buyers in another. The RPI subjects are told the experiment will last at least 12 rounds. In fact, the three sessions have 14, 15 and 13 rounds, respectively, and not even the laboratory assistants know the true number of rounds. This serves to

mitigate any end of experiment effects. The Denver subjects know that the experiment has 16 rounds. Aspects of the experiments by location are summarized in Table 1.

We employ a graphical user interface that allows the consumer to buy any fraction of a unit down to 1/100 of a cent. Each round begins with the seller selecting a price.[6] This price is conveyed by z-Tree (Fishbacher 2007) to the associated buyer. Figure 5 displays the buyer's screen. The computer draws a line whose length is equal to demand at every integer price. Note that demand is downward sloping throughout and is unusual only in that at least one unit must be purchased. The computer also draws two horizontal lines; one at the price previously selected by the seller and one at the cost of 10. The buyer selects the quantity by clicking his/her mouse on a quantity, and the computer draws a vertical blue line at that quantity. The implications of the choice are then presented by color coding demand. Demand above the price and to the left of quantity is displayed in green and represents consumer surplus. Demand between cost and price is shown in blue as profit. Demand and surplus below the selected price are displayed in grey.[7]

The buyer is allowed to click any number of quantities and the program updates the graph and creates a table to report the associated pay to the buyer. The buyer must buy at least one unit and cannot buy any more units than indicated by the demand function at that price. Any click outside the allowable range is recorded as the nearest limit. Once a final decision is made, the buyer clicks a red button to end the stage.

Figure 4. The Buyer's Screen

[6] The instructions for the experiments in Denver and RPI are in the appendix.
[7] This is the RPI color scheme. In Denver, the monopolist profit is yellow and the unclaimed consumer surplus is red. See the tutorial instructions for Denver.

In the second round, sellers begin to see historical information. A table on the left of the screen shows the round number, price, marginal cost, sales to two decimal points and profit. On the right of the screen, a graph with profit on the vertical axis and price on the horizontal axis displays the price/profit combination as a small green box. Half the sellers at RPI also see a table of buyer's points and buyer's pay displayed in the graph as a blue triangle to see if this format, common in DGs, but not monopoly experiments, has any effect.

Figure 5. The Seller's Screen.

The prices shown in Figure 5 have been selected to give the reader an overall sense of the tradeoffs possible in the experiment. The numbers are presented in a table on the left of the screen and as points on a graph on the right of the screen. Look at these now and observe that a price of 10, the profit surface (shown in green) begins at zero, the competitive solution. Higher prices allow profits to rise and peak locally at a price of 22 and profit of 47. As prices rise further, profit initially falls but then begins to rise to ever higher heights as the subsistence minimum is approached. At a price of 100, one unit is consumed, and profit is 90.

The table and graph also show consumer surpluses. At a price of 10 and profit of zero consumer surplus is 173. This is the socially efficient solution. At a price of 22, profit is 47 and 101 points accrue to the buyer. While this solution is somewhat less efficient than the competitive solution with total welfare gains of 148, the efficiency is still 85% of the competitive level. At a price of 100, profit is 90 and consumer surplus is

zero generating an efficiency of 52% (= 90/173) of the competitive level, indicating that the corner solution, while globally profit maximizing, is far less economically efficient than the interior monopoly solution

Sellers never see all this information. However they always know that the buyer can pay at most 100 for the first unit and they know consumer surplus is at least 100-price. They also know their own profit for the prices they charge. They see the full profit function for the last three rounds of the Denver TCES experiments and half the sellers at RPI see the buyer's consumer surplus for whatever prices are charged. The baseline of limited information is consistent with the standard in monopoly experiments where profit and consumer surplus are private information. The variations in information check robustness.

After completing the rounds associated with the monopoly dictator, subjects are asked how much of an additional five dollar payment they would like.[8] Subjects are paid whatever they request. There are no ramifications from taking the entire $5, nor are there additional benefits to leaving some amount of the $5 behind. This is a DG where the dictator takes from the experimenter rather than gives to another subject. This allows us to test the conjecture that some subjects are too polite to take all that is offered (Camerer and Thaler, 1995). Hoffman et al. (1994) speculate that subjects may attempt to increase the odds of being asked to participate in later experiments by not taking all in dictator games. Additionally, the amount that a subject takes could be their way of accounting for how much they believe that they should have made from participating in the monopoly experiment. In any case, some of these same motivations - politeness, an aversion to the

[8] The program displays: "Enter the pay you want. This may range from $0 to $5.00." Following the entry, the display reads: "Your pay will be_____ " [The subject's entry is displayed] "If this is not what you want, reenter the number at left. If this is your final choice, press the button below."

appearance of greed, doubts about later consequences in future experiments or a sense that they have already been well compensated - may also explain giving in the DG – a conjecture we want to address.

Once the $5 experiment is completed, all subjects fill out a questionnaire that includes information on age, gender, method of recruitment and whether or not they were a seller. They are also asked to use a seven-point scale to record their degree of irritation, contempt, anger, surprise, envy, sadness, happiness, joy and shame. This allows us to investigate whether confronting a dictator monopolist who can press the consumer to her absolute limit triggers an emotional response. On average, the experiments last 40 to 60 minutes with payments typically in the range of $10 to $25.[9]

IV. Results

Figure 7 shows median prices for the vertical and TCES demand experiments in Denver and the TCES demand experiments at RPI. Several points are worth emphasizing. In the initial rounds sellers at both RPI and Denver are quite generous. A price of 55 reflects an even split with 45 cents going to both monopolist and buyer (55-10 for seller and 100-55 for buyer). The RPI TCES and Denver vertical demand experiments begin with roughly equal splits of the surplus. The Denver TCES demand produces prices that initially offer a super-fair split of the surplus with consumers earning more than sellers.

Figure 6. Median prices by location and demand

[9] Points are converted to cash at the rate 1 point = $0.01 and all rounds are paid. Rounds are repeated to allow convergence to an equilibrium.

As rounds progress, median prices begin to rise toward the global maximum of 100 in both locations and in both demand conditions. They rise more slowly in Denver but quite rapidly at RPI where no tutorial was provided. By the final rounds, profit maximization comes to dominate for all demand functions and locations, underscoring our main point.

It is unlikely that path dependence or signaling explains the results as the Denver subjects remain at the global maximum extracting all of the surplus even after being informed of the location and profit of the local maximum through revelation of the price – profit graph. Supporting this contention is the fact that at RPI the convergence to profit maximization is even more rapid than in Denver. Apparently the 5 round tutorial increases searching for a local maximum as intended and strengthens the conclusion that subjects knowingly select the subsistence solution.

The broad pattern is consistent whether or not subjects are provided with data on buyer surplus. In the first paid round, the median prices posted by sellers at RPI with and without access to buyer data are 53 and 50, respectively, and in the 13th paid round both median prices are 98. However, connecting the seller with a new buyer may result in a small gift to the buyer. To test this, we re-connected the buyers and sellers with new matches at RPI between rounds 7 and 8, leading the median price to fall from 97 to 92 (Mann Whitney p-value for equal medians is 0.60) and the mean price falls from 83 to 74 (p-value for t-test of equal means 0.36). Thus, there does appear to be a gesture of a lowered price of about five to ten cents to the new buyer, but this is not statistically significant. And the effect is transitory, rapidly dissipating in the next several rounds. By round 10, the median price rises to 99.

It is traditional to analyze DGs with histograms. These are presented for the first and last rounds, vertical and TCES demand in Figure 7. The RPI and Denver data are merged. There is some clustering around an equal split of revenue in the first round but any preference for equality vanishes by the last round. There is also evidence of searching in the neighborhood of the local maximum of 23 in the first round in the case of TCES demand. This, too, all but vanishes by the last round.

Figure 7. Histograms of prices for the first and last rounds.

While the above figures show convincing evidence that the generosity typically observed in the DG disappears when the game is framed in a market environment, we will further examine the data using regression analysis. Table 2 presents three panels of summary statistics for all three sets of experiments. The first panel covers average prices for the first three rounds, last three rounds, and the overall experiment. While the different experimental conditions produce different initial and average prices, by the end of the experiment prices are not significantly different from each other. The next two panels report average emotional responses collected in the exit survey and amounts taken in the $5 experiment. The overall impression is that the different procedures and subject pools generate remarkably similar emotional responses and behavior in the $5 experiment. The number of significant differences is roughly what one would expect given that we tested 24 different items. However, there are significant differences according to whether the subject is a buyer or seller.[10] Therefore, when we discuss

[10] Buyers report higher levels of irritation, anger, envy and jealousy (p-values are 0.000, 0.000, 0.018, 0.000) while sellers report higher levels of happiness and joy (p-values are 0.000 and 0.001). The averages (by set) are reported in Table 2.

emotions and the $5 experiment we will pool the three sets of experiments but present separate results for buyers and sellers. For regressions on the prices set by sellers we will include variables for the experimental conditions and reported emotions of sellers.

Table 2. Summary Statistics by Set

The regression results in Table 3 identify a very clear impact from subject's who participated in the curved demand treatment on the prices charged. Across all three prices, we find that being a part of the curved demand treatment reduces the price charged by sellers. For example, the average price charged by sellers in the curved demand was approximately $0.21 or 24 percent lower than subjects in the linear demand treatments. This is likely due to the difficulty associated with learning the actual shape of the demand curve. Subjects in Denver also behave significantly different from subjects in RPI, perhaps due to more minorities in Denver or the tutorial that encourages searching for an interior maximum. On average, Denver subjects charge $0.11 less than RPI subjects, but the behavior of Denver subjects changes dramatically throughout the course of the experiment, as they are initially quite generous (charging $0.25 less than RPI subjects) but by the end of the experiment they are not only less generous, they actually charge approximately $0.11 more than RPI subjects. Perhaps most interestingly, we find that by the end of the experiment, when subjects can observe data about the consumer surplus (Buyer Data), they use this information to squeeze out even more profits by charging, on average, approximately $0.23 more in the final three periods.

Table 3. Determinants of prices charged by sellers

The components of the emotional survey are included in the regressions in order to determine how these feelings impact pricing behavior. Initially, we find that a few emotions appear to impact behavior; being envious appears to increase the price by approximately $0.13 while jealousy and fear are associated with lower prices. Averaging prices over the course of the experiment, we still find that envy and jealousy impact behavior. Interestingly, however, by the end of the experiment only a single emotional variable appears to matter, which is sadness. Specifically, we find that subjects who experienced sadness from participating in the experiment are inclined to reduce their price by $0.06.

In addition to explaining the components of sellers that resulted in the prices charged, we examine the impact of these prices on buyer behavior. Specifically, we make use of the $5 game that is played at the end of the experiment to examine how the imposition of prices by sellers impact the buyer's willingness to be more or less greedy. In Table 4 we examine the same three measures of prices reported in Table 3 on the amount of money taken in the $5 game. Additionally, we include the curved demand, Denver and male indicator variables as well as the variables from the emotion exit survey. Again, standard errors are clustered at the session level.

Table 4. Effect of Prices on Behavior in the $5 Game

In columns I-III, we find that higher average prices lead buyers to take a larger sum of the $5. If buyers are charged $0.01 more, on average, they take approximately $0.02 more from the $5 pot. We also find strong evidence that subjects from Denver take

a smaller fraction of the $5 and weak evidence that being male and feeling more contempt or envy during the experiment impacts the amount that a buyer takes. In columns IV-VI we examine seller behavior in the $5 game, finding that none of the explanatory variables appear to significantly impact their choices. We do, however, find that although sellers have extracted a significant amount of the surplus from the buyers throughout the duration of the experiment, they still take a larger fraction of the $5, showing even higher levels of greed. Across all three specifications that we run, the intercept for the sellers range from $0.2 – $1.25 more than the buyers.

While the amount of money taken in the $5 game could be a measure of greed, it could also be a measure of the subject's expectation about the amount of time that they expected the experiment to last, the amount of money they intended to make from participating in the experiment and a variety of other explanations.

V. Conclusion

The DG has proven to be a particularly important and informative innovation in experimental economics. The game is typically associated with pro-social behavior, as dictators give to receivers even though there are no direct ramifications from being greedy. However, in order to achieve its fullest potential we believe the DG must be linked to and framed as a monopoly of essential goods. Once this is done, the vast differences in social versus business behavior become apparent.

We capitalize on the extreme simplicity of the game to provide an overview of the theory of essentials. If the good is essential, then people will part with all wealth (beyond other subsistence needs) to acquire the good while inequality produces inelastic demand.

Given such monopoly power, the very lives of the poor may be forfeited in an effort to extract income from the relatively rich.

One might hope that in these extreme circumstances the modest generosity exhibited in DG's would be magnified and that the histories would reveal that we are indeed our brother's keeper. The experiments we report, the famines of India and US pharmaceutical policies all suggest otherwise and illustrate how dangerous monopolies of essentials combined with a high degree of inequality can be in practice.

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