Do markets *reveal* preferences – or *shape* them?

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Abstract
Standard economic analysis assumes that preferences are independent of markets. However, there is evidence suggesting that price information can influence preferences. We investigate the hypothesis that markets do not simply allow agents to reveal their preferences, but actually help to shape them. Using a demand-revealing market institution, we find strong support for this shaping hypothesis. Monetary valuations are significantly affected by price feedback and divergent price expectations. These effects are not entirely eliminated by further market experience. Our results suggest that preferences may be characterised by considerable imprecision and may be influenced by market prices in predictable ways.

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Preferences and markets are central concepts in economics. Standard analyses of behaviour in markets assume that preferences are independent of the market institution in which they are revealed. In this respect, markets can be regarded as means to an end; agents use markets to achieve their preferred outcome amongst those they can afford. Thus preferences are *revealed* in markets, but markets are not supposed to *change* preferences.

This assumption has far-reaching implications. For instance, the interpretation of the equilibrium in a competitive market as a Pareto optimum is a conclusion which depends crucially on this assumption. Since welfare is defined in relation to preferences, the very concept of optimum would become ambiguous if preferences were co-determined by features of the market institution in which they were expressed.

Because of this supposed independence, markets provide the point of reference for economists who tackle the problem of eliciting preferences for public goods, for which actual markets do not exist. Many economists favour some form of *revealed*-preference method (e.g. hedonic pricing) for eliciting such preferences. Asking people for their *stated* preferences is regarded with greater scepticism, unless it can be argued that the researcher has produced contingent valuation scenarios which successfully mimic an appropriate market environment (see Bateman et al., 2002, for extensive discussions of these issues).

When stated preference methods elicit preferences which respond to theoretically irrelevant features of the context and/or fail to satisfy basic rationality assumptions, such 'anomalies' are often attributed to the hypothetical nature of the elicitation procedure and the lack of a credible market-like environment. Even when similar anomalies are replicated in the laboratory under incentive-compatible conditions (e.g. Camerer, 1995; Starmer, 2000), their significance is often downplayed on the grounds that what really matters is whether those forms of anomalous behaviour survive in markets where there are opportunities and incentives for learning from experience (e.g. Binmore, 1999). And indeed, the tendency for at least some of these anomalies to be less pronounced for traders with market experience (List, 2003, 2004), or to decay when experimental markets are repeated (e.g. Coursey et al., 1987; Camerer 1987; Camerer et al. 1989; Cox and Grether, 1996, Shogren et al. 1994, 2001), has sometimes been interpreted as suggesting that markets have some power to induce agents to behave in a consistent manner (e.g. Plott, 1996).

What could this power be? If agents have underlying market-independent preferences of some form, but do not have immediate mental access to those preferences or do not

immediately understand the trading institution in which they are acting, simply taking part in repeated market interactions might allow them to learn more about their preferences and about how best to satisfy them within the relevant institution (Braga and Starmer, 2005). Under this account, *any* kind of market experience could have sobering effects. A more tightly specified hypothesis, and the one on which this paper will focus, is that of *market discipline* (Loomes et al., 2003, 2010). According to this hypothesis, market experience works by exposing agents to losses incurred as a result of not correctly reporting their preferences. If agents change their behaviour in order to avoid similar losses in the future, market discipline can lead to a state in which both market prices and individual decisions about whether or not to trade are as implied by agents' underlying preferences, even though those preferences need not be fully revealed in non-marginal bids and asks. Under this interpretation, market forces have some tendency to remove the errors that agents make in reporting their preferences.

But markets also contain forces that are liable to interfere with the mere reporting of independently-existing preferences. Information about market prices can systematically affect individuals' valuations of the goods they trade. There are circumstances in which this may be interpreted as rational use of the information content of prices in the formation of private values for unfamiliar goods (e.g. List and Shogren, 1999) or in the assessment of alternative trading opportunities (e.g. Harrison et al., 2004), leading to 'affiliated' values. But there are also mechanisms by which non-informative prices can *shape* preferences. For instance, agents may enter a market without having well-formed preferences and may construct their preferences in the course of trading (e.g. Slovic, 1995; Lichtenstein and Slovic, 2006; Ariely et al., 2006), or they may treat prices as reference points (e.g. Thaler, 1985; Putler, 1992; Isoni, 2010). We will refer to the hypothesis that preferences are shaped by non-informative price cues as the *shaping hypothesis*.

To date, effects compatible with the shaping hypothesis have been found in experiments employing various versions of the Vickrey (1961) auction (e.g. Cox and Grether, 1996; Knetsch et al., 2001; Ariely et al., 2003; Braga et al., 2009; Tufano, 2009), the Becker-DeGroot-Marschak (1964) elicitation procedure (e.g. Bohm et al. 1997; Mazar et al., 2009), or posted-offer markets (e.g. Sitzia and Zizzo, 2010), and even in a study based on real market housing consumption data (Simonsohn and Loewenstein, 2006). A previous direct

experimental test has provided limited but broadly supportive evidence in favour of the hypothesis that preferences are shaped by prices (Loomes et al., 2003).[1]

In this paper, we report a new experiment with two main objectives. The first is to test the shaping hypothesis in a series of demand-revealing auctions in which market discipline is switched off and non-informative price cues have the potential to exert a powerful influence on valuations, so that shaping effects, were they to occur, could be substantial. The second is to test whether these effects persist when the manipulations that generate them are removed and agents are exposed to market discipline. This allows us to see if, and to what extent, preferences are market-dependent.

Consistently with the shaping hypothesis, we find that price cues, in the form of either expectations or feedback, have a large impact on valuations. When the initial source of shaping is removed and market discipline can operate, these shaping effects are partly eroded by market experience, but significant effects on market prices persist. Our results are compatible with the existence of underlying preferences of *some* form, but suggest that, contrary to conventional assumptions, these may be characterised by a substantial degree of imprecision which makes them susceptible to extraneous influences that may have some long term residual effect.

The paper is organised as follows. In Section 1, we derive the implications of shaping and market discipline in the particular market institution that we use. In Sections 2 and 3, we describe our treatments designed to test for shaping effects obtained through price expectations and price feedback. We give more details about the experimental procedures in Section 4. Our key results are presented in Section 5. In Sections 6 and 7, we discuss our findings and offer concluding remarks.

1. Shaping and market discipline in repeated selling auctions

All of our treatments employ median-price selling auctions for lottery tickets, with either five or seven traders in each auction group. In these auctions, each trader is endowed with a lottery ticket and is asked to record the smallest amount of money they would be willing to

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[1] In general, shaping effects are more likely to occur if the range over which valuations can vary is relatively wide, and are more likely to be detected if price cues vary sufficiently within that range. The nature of Loomes et al.'s experimental design was such that the absolute size of shaping effects was limited by a somewhat narrow range of prices.

accept in exchange for it – their *ask* – which also identifies the largest amount they would *not* be willing to accept.[2] After every trader has done this, the amounts that traders are just not willing to accept are ordered from lowest to highest. The median of these amounts is identified and announced as the market price for that round of trading: traders whose asks are lower than the announced price sell their lottery at that price; and if this round of trading is selected at random to be the basis of payment, they will each be paid that amount at the end of the experiment. The other traders keep their tickets: if this round is selected to be the basis of payment, they will each play out the corresponding lottery and be paid according to how that lottery turns out.

In the context of an investigation of shaping, lottery tickets (with monetary prizes) have several useful features. Because attitudes to risk can vary across individuals, a given lottery can have different private values for different individuals, and subjects can be expected to understand this. Since subjects are already familiar with money and with the concept of probability, an observed market price for a lottery provides very little information that is relevant for an individual's judgment of its private value *to her* (even though it is informative about *other people's* private values). Since the lotteries we use have no immediate substitutes outside the lab and are 'consumed' inside the lab (in the sense that lottery outcomes are resolved during the experiment), the value of a lottery to a subject cannot be affected by external trading opportunities. Thus, we are able to screen out the effects of informative price cues and affiliated values, isolating pure shaping effects. A further feature of lottery tickets, which we exploit in some of our experimental designs, is that the maximum and minimum private values of a lottery are given by the highest and lowest outcomes, and so are known in advance.

Each auction is repeated a number of times. After each repetition, traders receive feedback on the market price and on the trading implications that this has for them. Then the next auction round begins. If the shaping hypothesis is correct, traders should revise their asks in the direction of the observed prices. Regardless of whether shaping effects occur because preferences are constructed during the elicitation phase, or because prices are used as reference points, they manifest themselves as an empirical *tendency for asks to be pulled in the direction of price cues*. As we explain below, however, observing such tendencies is not conclusive evidence in favour of market-dependent preferences. Analogous tendencies may

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[2] For details about the elicitation procedure, see Section 4.

result from market discipline operating on underlying preferences that are market-independent. The first goal of the experimental design described in the next sections is to isolate shaping effects by switching off market discipline.

The market institution that we use is particularly convenient for the study of market discipline. For market discipline to operate, it is necessary that agents possess preferences of some form. For expositional convenience, here we assume that these satisfy conventional assumptions to the extent that each trader has a unique 'true' value for the traded object. As we will explain in Section 6, market discipline does not require that preferences are characterised by such a degree of precision, but can operate in an analogous way on imprecise preferences, as long as these are independent of the market.

Our market institution is a variant of the Vickrey auction. If traders have true (and market-independent) values, these can be safely assumed to be private. From the theoretical point of view, this means that it is a weakly dominant strategy for each trader to report an ask equal to their private value (Milgrom and Weber, 1982). If true values were readily accessible and the dominant strategy were easy to detect, then traders would report their true values each time they took part in the auction. Repetition would have no effect whatsoever, each round being an exact replica of the others. However, true values may not be readily accessible, or it may not be immediately obvious that reporting them is the best strategy, so that there may be circumstances in which traders deviate from this strategy in one way or another. As a result of such deviations, traders may incur losses, in which case market discipline can come into play.

To see what this means in our setting, consider a median-price auction with n traders (where n is an odd number), indexed by $i = 1, ..., n$. Assume each trader has a true value,[3] v^i, and reports an ask, a^i, which differs from v^i by some 'error' term (which may be random, or may reflect some systematic behavioural anomaly). Market discipline operates by exposing the cases in which deviating from the optimal strategy of reporting $a^i = v^i$ results in an undesired outcome. This happens whenever the market price, p, falls between a^i and v^i. Suppose $a^i > p > v^i$. In this case, the trader *over*-asks and fails to sell at p, which is more

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[3] In deriving testable implications from the market discipline hypothesis, we assume that each trader's 'true value' is precisely defined, and is independent of the market institution and of price feedback. However, we do not need to assume any other conventional properties of preferences. In particular, we do not assume that v^i can be derived from expected utility theory, or from any other theory of reference-independent preferences.

than their true valuation, thus foregoing a profit. If instead $v^i > p > a^i$, they *under*-ask and sell at p, which is less than their true valuation, losing money. In both of these situations, given the realised price, they would have experienced a better outcome had they reported $a^i = v^i$. To avoid incurring the same loss again, they should revise their a^i in the direction of v^i in subsequent rounds. Notice that, if they do so, they also revise their ask in the direction of the market price. That is, market discipline produces an empirical tendency analogous to a shaping effect, which is why, when market discipline is in operation, the shaping hypothesis cannot be tested in isolation.

However, this disciplining effect does not necessarily come to bear on *every* trader whose ask differs from their true value. There are situations in which traders over-ask or under-ask but still experience the same outcome as they would have received if they had reported $a^i = v^i$. This happens whenever $p > a^i > v^i$ or else $v^i > a^i > p$.

Since market discipline works only on traders for whom $a^i > p > v^i$ or $v^i > p > a^i$, the traders who are subject to discipline are likely to have true values that are relatively close to the market price. If the market is repeated, changes in behaviour will continue to be induced among such *marginal* traders until a stage is reached at which no trader is subject to market discipline. This is the case if and only if $p \geq v^i$ holds for all traders i who sell, and $v^j \geq p$ holds for all traders j who fail to sell. On the simplifying assumption that no two traders make exactly the same ask, the $(n-1)/2$ traders with the lowest asks sell, and the $(n+1)/2$ traders with the highest asks fail to sell. Thus, when no trader is subject to market discipline, the market price lies between the $[(n-1)/2]^{th}$ highest and the $[(n+1)/2]^{th}$ highest true valuations – just as conventional microeconomic theory would predict for a median-price market. In other words, if one defines the *true market price* as the price that would prevail if all traders reported $a^i = v^i$, market discipline produces a *tendency for the market price to converge to its true value*. This is the implication of the market discipline hypothesis that we will test.[4]

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[4] Isoni's (2010) theory of reference-dependent preferences, in which expected prices serve as reference points, predicts an observationally equivalent tendency. According to this theory, each ask a^i is the sum of a reference-independent valuation v^{i*} and a term which is positive, zero or negative depending on whether the expected price is greater than, equal to or less than v^{i*}. If price expectations are formed adaptively, the market price converges to the price that would prevail if every trader reported $a^i = v^{i*}$.

However, as noted earlier, there may be traders whose true values are far enough away from the prices generated by repeated markets that that their asks never fall between their true values and the realised price. Such traders never experience the losses that give rise to market discipline. Nevertheless, they *are* exposed to the shaping effects of price feedback. If traders with these characteristics can be identified, it is possible to test for the existence and strength of shaping effects while screening out the effects of market discipline. One of our experimental designs allows us to switch off market discipline for pre-selected groups of traders and to expose them to price feedback which, if shaping occurs, will tend to pull their asks away from their true values in a particular direction. Then, by setting up repeated markets in which all participants' asks have previously been shaped in the same way, we can switch market discipline back on and test whether prices in these markets converge towards a hypothesised true market price.

2. Study 1: Shaping through price expectations

In Study 1, we investigate whether asks can be shaped by divergent price expectations. We randomly divide a sample of traders into two groups, which we label the High Cue and Low Cue markets. Before the start of the first auction round, we ask them to report their expectation of what the market price will be in that round, and cue them to anchor either on a relatively high price or else on a relatively low price. If they have well-formed true values, these price cues will have little effect; but if their values are unformed or imprecise, and if the cues have the power to shape preferences, the first-round asks in the High Cue markets should be substantially bigger than the first-round asks in the Low Cue market. Since no feedback is provided until the end of the first round, the initial asks may be subject to shaping, but cannot have been affected by market discipline; that is, at this stage, market discipline is switched off. As the auction is repeated with feedback, market discipline is switched on and we can investigate its effects. Because traders have been randomised between the two treatments, any underlying true values should have similar distributions in the two subsamples. Therefore, market discipline should induce convergence of the prices prevailing in the two markets.

Study 1 is similar in spirit to Experiment 4 of Ariely et al. (2003). In that experiment, traders reported their minimum willingness to accept for listening to annoying sounds. Before the first auction round, participants listened to a sample of the sound and were asked

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if they would be willing to repeat the same experience in exchange for a payment of x, where x was \$0.10 for participants in some sessions and \$1 for participants in others. Ariely et al. report that this initial anchor had an effect on first round asks, which showed no tendency to fade away as the market was repeated. Our experiment differs in two significant ways. First, the traded good in our experiment is much less exotic than Ariely et al.'s. One might therefore expect valuations to be less malleable in our study, providing a tougher test of the shaping hypothesis. Second, our manipulation is a self-generated price expectation. Since our concern is with the shaping effects *of prices*, we want to know whether price expectations have similar effects to the arbitrary and externally generated cues investigated by Ariely et al. In this respect, Study 1 can be seen as a transition between Ariely et al.'s experiment and our Study 2, in which we explore shaping effects occurring via price feedback (see Section 3).

In order to allow room for shaping effects, we use a lottery whose variance is fairly high. Let K = (£x, p; £y, $1 - p$) denote a generic binary lottery offering £x with probability p, and £y with probability $1 - p$. Then, the lottery we employ in these treatments can be represented as:

$$E = (£1, 0.95; £50, 0.05)$$

Our manipulation of price expectations involves randomising half of the participants to be shown the list on the left of Table 1 below, while the other half are shown the list on the right. Participants have to choose a range from the table, and then report a point estimate within the selected range.

[Table 1 about here]

The lists in Table 1 differ in two important respects. First, the middle range contains much higher values for the High Cue market than for the Low Cue market. Second, the High Cue ranges are presented in decreasing order, while the Low Cue ranges are presented in increasing order. Both of these factors are expected to induce higher price estimates in the High Cue condition than in the Low Cue condition, on the grounds that the first and the middle ranges are more salient than the others. If shaping effects operate through price expectations, higher price estimates will translate into higher asks and prices in the High Cue market than in the Low Cue market. By repeating the auction a number of times, we can test whether these effects persist when market discipline can operate.

3. Study 2: Shaping through price feedback

Study 2 considers the effect of price feedback on valuations. The study involves two stages. In the first stage, participants are randomised between one of two market 'treatments'. Some are allocated to *control* markets, where they are all endowed with the same lottery and so price feedback reflects the median ask for that lottery. The others are allocated to *mixed* markets, where different people are endowed with different lotteries and the price feedback is constrained to enable shaping effects to be induced. In these markets, market discipline is switched off for some – probably most – traders. This allows us to study shaping effects in isolation, by comparing valuations in these markets with those generated for the same lotteries in the corresponding control markets.[5]

In the second stage, we study how far any such shaping effects persist once the mixed market manipulation is removed and market discipline is switched back on. In order to do this, we take traders whose valuations may have been shaped in mixed markets and reassign them to *homogeneous* markets so that they now trade exclusively with people who are endowed with exactly the same lottery as they are, and who have been subjected to the same shaping manipulation. Since homogeneous and control markets consist of traders who are all now endowed with the same lottery, we can judge the persistence of shaping effects by comparing the patterns of asks and prices in homogeneous markets with those in the corresponding control markets. We can test the market discipline hypothesis by investigating whether the market prices in the two treatments converge to the same value.

We now explain how we constrain the price feedback in mixed markets. In these markets, we endow the five (or seven) participants with one of three binary lotteries, a low-value lottery (L), a medium-value lottery (M), and a high-value lottery (H). In each mixed market, only one trader is endowed with M, while two (or three) traders are endowed with each of L and H. We use the following lotteries:

$$L = (£2, 0.8; £9, 0.2)$$

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[5] Relative to Study 1, in which the manipulation of price expectations occurs before participants report their first ask, Study 2 has the advantage of allowing us to check that the randomisation of subjects between the two treatments is successful. Since the two groups do not differ in any respect up to that point, the distributions of first period asks should not differ either.

$$M = (\pounds7, 0.5; \pounds9, 0.5)$$

$$H = (\pounds7, 0.2; \pounds14, 0.8)$$

If each trader's ask is constrained to be no greater than the higher lottery prize and no less than the lower, the market price in mixed markets must lie in the ($\pounds7$, $\pounds9$) interval. (Because of the constraint, only L traders can report asks below $\pounds7$, and only H traders can report asks above $\pounds9$. Since fewer than half of the traders in the market are selling L, and fewer than half are selling H, the median ask will be in the ($\pounds7$, $\pounds9$) interval.)

This manipulation involves no deception. The instructions (reproduced in the Appendix) never suggest that every trader is endowed with the same lottery, except when this is truly the case. And when we explain how to arrive at valuations (see Section 5 below), we stress that these are strictly personal and should reflect whether a certain sum of money is better or worse than playing out the lottery from the individual's perspective. Under these circumstances, from a conventional point of view, what other people do and what the actual market price turns out to be should be irrelevant.[6]

A key feature of mixed markets is that, since asks in the ($\pounds7$, $\pounds9$) interval are admissible for all lotteries, the price feedback is credible for all traders. However, the expected value of L ($\pounds3.40$) is much lower than the lowest possible price ($\pounds7$), while the expected value of H ($\pounds12.60$) is a good deal larger than the highest possible price ($\pounds9$). This makes the price feedback fairly high for L traders, and fairly low for H traders, creating the potential for sizeable shaping effects.

Because the expected values of L and H lie well outside the range of possible prices, most L and H traders are unlikely to be subject to market discipline, even if there are strong shaping effects. Consider L traders (the case of H traders is a mirror image of this.) Since these traders are reporting asks for lotteries that are far inferior to those held by the majority of traders in the market, it is natural to expect that in the first auction round, the price will be

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[6] Although we do not know for sure whether subjects believe that everyone is trading the same object or not, this is not relevant for our hypotheses. What is important is whether the constrained feedback is able to affect valuations. If subjects believe everyone is trading the same lottery, then shaping effects might suggest that individuals are influenced by others' values. If subjects think that different lotteries are being traded, any effect might suggest that, even though the market price is an irrelevant piece of information, they are nevertheless influenced by it.

much higher than the true values and asks of almost all L traders. If this is the case, L traders will sell at an advantageous price, and so will not be subject to market discipline. Nevertheless, the high price still has the potential to exert an upward shaping effect on their asks. Over successive auction rounds this shaping effect might be quite strong without raising asks to a level at which any L traders fail to sell (and hence become subject to market discipline). This feature of our design allows us, in effect, to switch off market discipline while testing the shaping hypothesis.[7]

Market discipline is switched on again when traders are reassigned to homogeneous markets, in which it has the potential to erode any shaping effects that may have occurred. Suppose that a group of L traders whose asks have been shaped upwards in mixed markets take part in the same homogeneous market, and that each of them initially reports the same ask as in the last round of the mixed market. Then, the traders reporting the highest asks will no longer sell. For these traders, $a^i > p > v^i$: they over-ask and fail to sell at an advantageous price. According to the market discipline hypothesis, they will respond by lowering their asks in the next round. This will lead to a fall in the price. Again, the traders with the highest asks will fail to sell; if these traders have over-asked, market discipline will lead them to lower their asks in the following round, and the price will fall again; and so on. A mirror-image argument applies to homogeneous H markets.

As explained in Section 1, if agents have precise and market-independent true values, this process of adjustment will come to an end when the price reaches its true value. Since participants are randomised between homogeneous and control markets, the distributions of traders' true values should not differ systematically between them. Thus, according to the market discipline hypothesis, prices in homogeneous markets should converge to values that are not significantly different from those observed in the corresponding control markets. Conversely, if prices in homogeneous L markets were to remain above those of control markets, and if the opposite were true for H markets, that would be evidence that shaping can induce persistent effects on market prices.

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[7] The auxiliary hypothesis that L and H traders are rarely subject to market discipline can verified by considering the frequencies with which L traders fail to sell and H traders sell (see Section 5B).

4. Experimental procedures

The experiment was conducted in 18 sessions at the *[deleted for anonymity]*, and was implemented using the Zurich Toolbox for Readymade Economic Experiments (Fischbacher, 2007). The 204 participants were recruited via email shots from the general student population.

In each session subjects took part in three auctions, each repeated eight times, for a total of twenty-four auction periods. In each session, there were either ten or twelve subjects, split into two trading groups of either five or seven subjects. Subjects were re-matched to form different trading groups before the start of each auction.

One of the auctions always involved lottery E, i.e. it was either a High Cue or a Low Cue market. Whether this market came first or last was counterbalanced across sessions. The elicitation of price expectations was made incentive compatible as follows. Subjects were told that there were two trading groups in the room, and that everyone had the same lottery. Before the first auction round, they were asked to predict what the price would be in the other trading group, by selecting a range from a list and then reporting a point estimate as described above. They were rewarded for the accuracy of their predictions, with a maximum reward of £2. (Because predictions were made about the other group, there was no incentive for subjects to misreport valuations in an attempt to make their predictions come true.) The same procedure was repeated before the last auction round.

With respect to the other two auctions, the sessions were of two types, which we label *mixed-homogeneous* and *control*. In each mixed-homogeneous session, there were twelve subjects, who took part in a mixed market followed by a homogeneous market. In the mixed market, there was a trading group of seven traders (three L, one M and three H) and a trading group of five traders (two L, one M and two H). In the subsequent homogeneous market, each subject kept trading the same lottery as in the mixed market, except for the two M traders, who did not participate and completed an unrelated task. The new trading groups were formed so that, in homogeneous markets, the five L traders traded amongst themselves, as did the five H traders.

In each control session, there were ten subjects, split into two trading groups of five subjects each. They took part in a control market for L, and a control market for H. Whether the market for H came before or after the market for L was counterbalanced across sessions.

In order to maintain the symmetry with shaping sessions, the market for E always came first or last, never second.

In each round of each auction, subjects were told they owned the lottery ticket displayed on their screen and had the opportunity to sell it. They were presented with a list of prices and asked to say whether or not they would be willing to sell their ticket at each price. Only amounts between the two prizes of the lottery were admissible; why values outside that range would be inconsistent was carefully explained. Subjects were also told that if they agreed to sell for £x, they should also be willing to sell for any amount greater than £x. By this method, subjects arrived at valuations expressed as some multiple of 10 pence. Once entered, valuations could be changed by restarting the whole process, but this was only possible once. At the end of the process, the computer recorded the highest value that each trader was *not* willing to accept in exchange for their lottery. We refer to this value as the trader's not willing to accept (NWTA) valuation.

After a NWTA valuation was recorded for each trader in a group, the computer determined the market price by selecting the median of these values. The instructions carefully explained how the market price was obtained, and the possible trading implications. Before the beginning of the first auction, there was a practice round for subjects to familiarise themselves with the elicitation procedures. Their understanding of the basic rules was tested by means of a computerised questionnaire.

In order to reward subjects for their participation, at the end of each session the computer randomly selected one of the twenty-four auction rounds. If the subject sold their lottery in that round, they would get the market price. If they kept it, they would play it out and receive the outcome. Lotteries were resolved by drawing one of a hundred numbered discs from a bag. The outcome associated with each number was clearly indicated by the lottery display. If a round involving the E lottery was selected, subjects were also rewarded for their accuracy in predicting the market price in the other group. The average earning was £7.50.

5. Results

This Section reports our key results. We start with the shaping effects obtained through price expectations (Study 1), and then turn to the shaping effects caused by our manipulation of

price feedback (Study 2). We conclude the section with some additional analysis of our treatments, which confirms the impact of prices on asks.

A. Results of Study 1 – Shaping through price expectations

Table 2 reports the data of the High Cue and Low Cue markets considered in Study 1. For both treatments, the table reports the number of observations, mean, median and standard deviation of the predicted market prices, the actual NTWA asks and the actual market prices in round 1 (R1) and round 8 (R8).[8]

[Table 2 about here]

Our statistical tests are reported in Table 3. In the table, each test is coded by a letter indicating the corresponding lottery followed by a number. Non-parametric tests and regressions are used throughout.[9] Within-subject comparisons of individual asks are based on the Wilcoxon signed-rank test, and on the regression of the change in asks between R1 and R8 on a constant, with standard errors corrected for the lack of independence of the observations belonging to the same auction group. Between-subject comparisons of individual asks use the Mann-Whitney test, as well as the regression of asks on a constant and on a treatment dummy, with standard errors corrected to accommodate the lack of independence of the R8 asks.[10] The comparisons of the distributions of market prices

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[8] Our analysis focuses on NWTA valuations rather than asks, because this is the value recorded by the computer program. The results would be identical if the analysis were conducted on asks instead.

[9] Given that WTA distributions are typically skewed, we use non-parametric tests that do not assume normality. However, since NWTA valuations are not independent when the subjects in a group receive common feedback, for all comparisons involving individual valuations (whether between-subject or within-subject) in R8, we also test hypotheses using OLS regressions with cluster-robust standard errors. The results are the same in the vast majority of cases.

[10] The price prediction elicitation was repeated before R8. In principle, this could have reinforced the divergence between the High Cue and Low Cue markets in R8, increasing the likelihood that differences in R8 are still significant. In that event, however, one would expect the curves in Figure 1 to pull away from each other in R8. This is clearly not the case. And indeed, if the same statistical tests are conducted using the R7 data instead of the R8 data, the results are essentially the same.

between the various treatments are based on the Mann-Whitney test.[11] Significant

differences in one- or two-tailed tests are denoted by asterisks as appropriate.

[Table 3 about here]

We will analyse the data with reference to Figure 1, which uses the following conventions.
Solid markers refer to the High Cue group, while empty markers refer to the Low Cue group.
Mean NWTA asks are presented by squares joined by solid lines, while mean actual market
prices are shown by triangles joined by dashed lines. The mean price predictions are
represented by the diamonds.

[Figure 1 about here]

The first issue is to establish whether our manipulation has affected price expectations; and if
so, whether this in turn has influenced asks. We find evidence of both effects. In R1, the
mean prediction is £12.11 in the High Cue market and £6.72 in the Low Cue market, the
difference being strongly significant (see test E1 in Table 3). More importantly, these
different price expectations translate into different NWTA asks as the shaping hypothesis
would lead us to expect. The mean NWTA in the R1 is £12.11 in the High Cue market and
£10.21 in the Low Cue market. Test E3 in Table 3 shows that this difference is significant at
the 5% level. These findings can be summarised as Result 1.

Result 1 – Shaping through price expectations. *The manipulation of price expectations
results in pronounced shaping effects. Traders who have been cued to make high price
predictions report higher asks than those who have been cued to make low predictions.*

Having established the presence of shaping effects, we can now ask how far these
effects persist in the face of market discipline. As the markets are repeated, NWTA asks
decrease significantly in both treatments (tests E4 and E5), but remain significantly higher in
the High Cue market (test E6). To test for the effects of market discipline, we compare actual
market prices in the two treatments. For this test to be possible, the initial shaping

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[11] For the non-parametric tests used here, the null hypothesis is that the compared *distributions* are drawn from
the same population, against the alternative that the underlying populations are different. For regressions
involving within-subject comparisons, the null is that the *mean* change in valuations is zero, against the
alternative that there is either a positive or a negative change. For regressions involving between-subject
comparisons, the null is that the *mean* valuation is the same in the compared groups, against the alternative that
means are different.

mechanism must affect market prices (and not just mean NWTA). This indeed the case: in R1, the mean market price is significantly higher in the High Cue market than in Low Cue market (test E9).

If market discipline operates to reveal precise true preferences, market prices should converge to the same levels in the two groups. There is a tendency for prices in the two groups to decrease (tests E7 and E8), associated with *some* convergence between them, but the two distributions still differ significantly at the end of R8 (test E10). This is corroborated by the fact that, before the beginning of R8, subjects in the High Cue group report an average price prediction of £7.51, against the average of £4.94 in the Low Cue group, a difference which is also strongly significant (test E2). These results – summarised as Result 2 – seem to indicate that the initial shaping manipulation of prices is partly, but only partly, counteracted by market discipline.

Result 2 – Persistence of shaping through price expectations. *The shaping effects on prices generated through manipulations of price expectations are somewhat reduced but not eliminated after eight auction rounds.*

B. Results of Study 2 – Shaping through price feedback

We now turn to the results of Study 2. As we explained in Section 1, this study proceeds in two stages. In the first stage, we use mixed markets to induce shaping effects. In the second phase, we test whether these effects are persistent by means of homogeneous markets. In each case, the corresponding control market serves as a benchmark.

Table 4 reports the data we gathered in the first and last round of the mixed, homogeneous and control markets. Each row reports the number of observations, mean, median and standard deviation of both the NTWA asks and market prices for either the H or L lottery. Table 5 reports the statistical tests, using the same conventions as in Study 1.

[Tables 4 and 5 about here]

The key results will be presented with the aid of Figure 2, which presents the evolution of asks and prices in mixed and control markets (on the left-hand side) and in homogeneous and control markets (on the right-hand side). The figure uses the following conventions. Data referring to the H lottery are denoted by solid markers, while data for the L lottery are shown using empty markers. Squares denote mean NWTA, triangles denote

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mean market prices. Solid diamonds are used to indicate prices in mixed markets. Finally, data for mixed and homogeneous markets are shown using solid lines (remember that the same participants took part in mixed markets followed by homogeneous markets), while dashed lines refer to control markets.

[Figure 2 about here]

We start by looking at mixed markets. One of our objectives with these markets was to provide price feedback without the potential for this feedback to trigger market discipline. In order to have a sense of whether we achieved this, we can look at the frequencies with which L traders (who were expected to trade) and H traders (who were expected to keep their lotteries) did actually sell. Over the first seven repetitions of the mixed markets (feedback received in the last round can have no effect on observed asks or prices), 68% of the L traders sold in every round, and 93% sold at least six times. 88% of the H traders never sold, and 97% sold at most once. Thus, although a small number of exceptionally high L asks and an even smaller number of exceptionally low H asks probably *were* subject to market discipline, it seems clear that market discipline could have had very little effect on any general trends in the asks reported by H and L traders. Such trends can safely be treated as isolating the effects of shaping.

By construction, the average market price is constrained to be between £7 and £9, as indicated by the two horizontal lines on the left-hand side of Figure 2. Throughout the eight repetitions the average price falls slightly from £7.93 in R1 to £7.57 in R8. As prices for L, these figures are quite high; as prices for H, they are rather low. Has this price feedback had any effect on asks? The answer is a clear yes.

In line with the shaping hypothesis, the mean NWTA ask for the L lottery rises from £4.64 in R1 to £5.67 in R8. The median reaches a high of £6.45 in R8. This increase is strongly significant in a within-subject test (test L1 in Table 5). The strength of these shaping effects is confirmed by the totally different pattern observed in control markets, in which the mean and median NWTA as well as the mean price show a tendency to decline significantly over repetitions (test L2). Mixed markets do not differ from control markets in R1, as one would expect from the random assignment of subjects to the two treatments (see test L3), but the difference between the two groups is strongly significant in R8 (test L4).

Strong shaping effects, although not as extreme as for L, also show up for lottery H. The mean NWTA ask is £10.91 (median £11.10) in the initial round, dropping to £9.91

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(£10.45) in R8. As test H1 in Table 5 shows, this decline is strongly significant. In the corresponding control market, asks vary very little between the first and the last round of the auction, possibly decreasing slightly, but not significantly (test H2). The between-subject comparisons with the control market confirm that these shaping effects are quite strong. NWTA asks are not significantly different in R1 (test H3), but differ strongly after eight repetitions of the auction (test H4).[12]

We can summarise these findings as Result 3:

Result 3 – Shaping through price feedback. *The price feedback provided in mixed markets has strong effects on asks. These shaping effects are larger when the feedback is high (i.e. when asks are being pulled up) than when it is low (i.e. when asks are being pulled down).*

It is interesting to ask to what extent this aggregate picture reflects *general* tendencies rather than being driven by a relatively small number of particularly malleable individual valuations. Table 6 reports information about the size and direction of shaping effects observed at the individual level for L and H in the eight rounds of the mixed markets.   The numbers in the table are the frequencies with which the absolute difference between the R8 and R1 NWTAs fell in particular ranges. The last two rows report, for each lottery, the total number of NWTA decreases and NWTA increases. Changes in the direction predicted by the shaping hypothesis are shown in bold.

[Table 6 about here]

For both lotteries, only a small fraction of subjects report identical NWTA in R1 and R8. Of those who report different valuations, a large majority do so in the predicted direction. 39 L traders (65% of the whole sample) increase their valuation, with 40% doing so by more than £1.50, while just 12 (20% of the sample) decrease it. 38 H traders (63% of the sample) decrease their valuation, with 33% doing so by more than £1.50, while just 11 (18% of the sample) increase it.

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[12] As explained in Section 4, in some sessions mixed markets came first, while in others they followed the market involving lottery E, in which all traders traded the same lottery. It is reasonable to ask whether shaping effects are stronger in the latter case. We addressed this issue in our analysis and found that there are no order effects of this kind. For both lotteries, the distributions of asks in R1 and R8 are not statistically different.

Result 4 – Shaping at the individual level. *The price feedback provided in mixed markets affects the valuations of a large majority of subjects in the direction predicted by the shaping hypothesis.*

We now turn to the homogeneous markets, displayed, together with the control markets, on the right-hand side of Figure 2. These are markets in which the shaping effects generated through the price feedback are exposed to the effect of market discipline. The first important aspect highlighted by the right-hand side of Figure 2 is that for each lottery there is a significant re-start effect that partly offsets the shaping effects generated in mixed markets (tests L5 and H5). That is, L traders (who have experienced consistently high prices in a mixed trading group and have responded by gradually increasing their asks) lower their asks on joining a new trading group, *prior to any price feedback*; there is a mirror-image effect for H traders. These effects are suggestive of some form of underlying true values.

At the start of the homogeneous markets, however, the NWTA asks of both L and H differ significantly from those of the corresponding control markets (tests L6 and H6).[13] As the auctions are repeated, the asks for L decrease significantly, while those for H remain approximately constant (tests L7 and H7). At the end of the last auction round, the asks for L are still significantly higher and those for H are still significantly lower than in the corresponding control groups (tests L8 and H8).

To test for the effects of market discipline, we examine market prices. For both L and H, the R1 prices in homogeneous markets are significantly different from those of the corresponding control markets, showing the continuing effects of the price feedback traders received in the mixed markets, despite the re-start effect (tests L9 and H9). Over the eight rounds of the homogeneous markets, the prices for L decrease significantly, while those for H remain more or less stationary (tests H9 and H10). At the end of the last auction round, prices are still significantly higher than in the control group for L, and still significantly lower for H (tests L11 and H11), indicating the persistence of shaping effects on prices. These results are summarised below.

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[13] Notice that tests L6 and H6 in Table 5 compare the R8 asks in control markets with the R1 asks in homogeneous markets. This is because the R8 asks in control markets are the best indicators of the level at which asks would have stabilised in an unconstrained environment. The same applies to tests L9 and H9. If the R1 asks in control markets were used instead, the results of the tests would be the same.

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Result 5 – Persistence of shaping through price feedback. *The shaping effects on prices generated through price feedback are somewhat eroded, but still significant after eight auction rounds.*

C. Shaping and group-specific effects

As we have seen, it is possible to generate strong and generally persistent shaping effects on asks in repeated markets through manipulations either of the price feedback subjects receive, or of their price expectations. These effects seem to operate through a widespread tendency for asks to move in the direction of observed prices. This suggests that shaping itself may be partly responsible for the persistence of changes in asks that are initially induced by manipulations of price expectations and price feedback. In this subsection, we analyse this aspect of our data. With the aid of Table 7, we look at whether in each of our treatments, including the control markets for L and H, we observe the tendency of asks to converge towards prices that the shaping hypothesis would lead us to expect.

[Table 7 about here]

Table 7 reports a series of tests of the hypothesis that, in each of our treatments, the distribution of asks is the same in all of the auction groups within that treatment. The underlying idea is that, given the initial random allocation of individuals to auction groups, these distributions should not differ systematically in the first auction round. However, if there is a generalised tendency of asks to converge towards prices as the auction is repeated, and if the distribution of prices is sufficiently dispersed to begin with, by the end of the last auction round the distributions of asks should differ between groups. We call these effects *group-specific*, and test for their presence using the Kruskall-Wallis (KW) non-parametric test. Group-specific effects are found if the KW tests do not reject the null of no difference in the distributions of asks in the first round, but the null is rejected in the last round. These effects should also be associated with a decrease of the *within-group* variance (also reported in Table 7).

It is easy to see that group-specific effects are a pervasive feature of our data. The KW tests go in the right direction in the Low Cue market for E (tests E11 and E12), in the High Cue market for E (tests E13 and E14), in the homogeneous market for L (tests L12 and L13), in the control market for L (tests L14 and L15), and in the homogeneous market for H (tests H12 and H13). The only case in which we do not find the expected significant

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difference in R8 is the control market for H (test H15), but this could be due to the very low initial variance *between* groups (1.40, the lowest in the dataset). The within-group variance decreases in all cases (including the control market for H), except the homogeneous market for L, in which it increases slightly. As summarised by the following Result, this implication of the shaping hypothesis is strongly supported by our data.

Result 6 – Group-specific effects. *Consistently with the shaping hypothesis, there is a generalised tendency of asks to converge towards group prices, which leads to strongly significant differences between auction groups.*

6. **Discussion**

In this section, we discuss two issues raised by our results.

The first concerns the explanation of shaping effects. As we have explained, the prices generated in our experiment do not provide information relevant for the formation of private values, or about opportunities for trading the experimental good outside the lab. Thus, any observed tendency for asks to be influenced by price cues must be due to something other than the rational use of the information conveyed by those cues. That is, it must be a genuine shaping effect. Although our experiment was not designed to discriminate between alternative explanations of these effects, our data show an interesting asymmetry which, were it to be replicated, might throw some light on the mechanism(s) that lie behind shaping: shaping effects seem to be stronger when asks are being pulled up by high prices than when they are being pulled down by low prices.

This regularity is consistent with the theory of 'bad deal aversion' (Isoni, 2010; for related ideas, see Thaler, 1985; Putler, 1992). In this theory, preferences are reference-dependent in a way that makes individuals' valuations of goods depend directly on price expectations. Specifically, individuals derive utility from making 'good deals' (buying at prices that are lower than expected, selling at prices that are higher than expected) and disutility from making 'bad deals' (the opposite). In the context of a selling auction, a trader for whom the expected price is *more* than their reference-independent valuation of the good will ask more than that valuation in order to avoid particularly bad deals; conversely, a trader for whom the expected price is *less* than their reference-independent valuation will ask less than that valuation in order to enjoy particularly good deals. If, other things being equal, the

pain of bad deals is stronger than the pleasure of good ones, the tendency for asks to be pulled up by high price expectations will be stronger than the tendency for them to be pulled down by low expectations.

An alternative explanation of this apparent asymmetry is the following. When asks are being pulled up by a high price, the traders whose preferences are being shaped are *trading at*, and *benefiting from*, that price. These features of the price may contribute to its psychological salience and may encourage further over-asking. Conversely, when asks are being pulled down by a low price, the traders whose preferences are being shaped are *not* trading at that price, and the low level of the price is a source of *disbenefit* to them.[14]

A more fundamental issue raised by our results is that of explaining why shaping effects are *partially* but *not wholly* eroded by market discipline. Had we found that shaping effects were completely resistant to market discipline, that would have been consistent with the hypothesis, advocated by some psychologists, that preferences do not exist prior to elicitation, and are *constructed* by individuals as and when they are needed (e.g. Payne et al. 1993; Slovic, 1995; Payne et al. 1999). This seems to be the preferred interpretation that Ariely et al. (2003) give of the 'coherent arbitrariness' they observe in their experiments. They explain the significant impact of arbitrary pieces of information on reported valuations as a form of *imprinting*. When values do not exist, these are constructed in the process of reporting them, but the construction process is not immune from arbitrary external influences. In the context of the markets that we and Ariely et al. study, the imprinting hypothesis seems to imply that initial arbitrary cues will have a permanent effect on individuals' valuations that is not subject to erosion by market discipline. But that is not what we found.[15]

Alternatively, suppose we had found that, when market discipline was switched on, market prices converged towards values that were independent of our shaping manipulations. That would have been consistent with an interpretation of Plott's (1996) *discovered preference* hypothesis in which the discovery mechanism is market discipline (Loomes et al,

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[14] This idea was suggested to us by *[deleted for anonymity]*.

[15] Given the similarities between our Study 1 and Ariely et al.'s market experiment, the dissimilarity of the results may be surprising. However, there are some differences between the two designs which may have led to different findings. As we have noted in Section 2, Ariely et al. elicit valuations for a much more exotic experience, which may result in more malleable valuations than those for lotteries involving sums of money. In addition, if subjects were trying to be coherent, the change of duration of the annoying sound from one round to the next may have led them to disregard the market feedback information. This aspect is absent in our design.

2003). According to this account, psychological mechanisms might be such that irrelevant cues have significant impacts on market behaviour, so long as that behaviour does not lead individuals to make losses; but when behaviour is subject to market discipline, true preferences are gradually discovered. But again, that is not what we found.

In broad-brush terms, what we seem to have found is the following. When our shaping manipulations have induced large changes in asks, the initial effect of switching on market discipline is that asks move in the direction that offsets this shaping. Indeed, a detectable move in this direction is induced merely by telling subjects that they have joined a new trading group. These effects suggest that subjects somehow 'know' or 'discover' that their shaping-induced asks do not reflect their underlying valuations. However, the initial effects of shaping are not completely reversed. After eight auction rounds in which market discipline has been switched on, market prices seem to have converged, or to be converging, to values which include components attributable to shaping (i.e. the difference between High Cue and Low Cue markets in Study 1, and the difference between homogenous and control markets for each lottery in Study 2). The implication is that subjects are not discovering *precise* underlying valuations.

One hypothesis that is consistent with this combination of observations is that each individual has preferences which exist prior to elicitation, but which are characterised by some degree of noise or imprecision (see, for example, Butler and Loomes, 2007). This idea can be applied to the case of a selling auction by generalising the model we presented in Section 1 in the following way. For each trader i, there is an *imprecision interval* of 'true' values $[v^i_{min}, v^i_{max}]$, with the interpretation that i 'knows' that their value lies in this interval, but cannot specify that value with any more precision. The rules of the auction mechanism require i to report a unique ask a^i in any given round. Because of random error and systematic behavioural anomalies, a^i need not lie within the imprecision interval. Market discipline comes into play when the market price p is such that i is *sure* that their chosen ask has led to a loss. This is the case if $a^i > p > v^i_{max}$ (unambiguous over-asking) or $v^i_{min} > p > a^i$ (unambiguous under-asking). In each of these cases, i responds by adjusting their next-round ask in the direction of their imprecision interval. If the market is repeated, changes in behaviour will continue to be induced among marginal traders until $p \geq v^i_{min}$ holds for each of the $(n-1)/2$ traders i who sell, and $v^j_{max} \geq p$ holds for each of the $(n+1)/2$ traders j who fail to sell. This result defines an interval of 'true' *preference-consistent* values to which the market price converges. If a shaping manipulation pulls the price outside this interval,

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market discipline will tend to pull it back; but once the price is within the interval, market discipline ceases to operate. Thus, shaping manipulations may have a persistent effect on the location of the market price *within the preference-consistent interval*.

7. Conclusion

Our results show that experimental manipulations that affect price expectations or price information can have a substantial and cumulative impact on the amount of money that people are willing to accept in exchange for items in their possession, even when values are entirely private and valuations are elicited using a demand-revealing market institution. We have found a systematic tendency for individuals' asks in such markets to be pulled towards the prices that have been observed in previous market rounds, and/or that individuals expect to observe in current and future rounds. By using experimental designs which allow the disciplining effects of markets to be 'switched off', we have been able to observe shaping effects in isolation, and we have found these effects to be significant. When individuals are exposed to market discipline, there is some tendency for the effects of previous shaping to be eroded, but this erosion is only partial. It seems that manipulations that induce shaping can have lasting effects on market prices.

These results raise doubts about a fundamental assumption of traditional economic analysis – that individuals have 'true' or 'underlying' preferences that are not subject to imprecision, and that are independent of the market institution in which they are revealed. In the title of this paper, we posed the question: Do markets reveal preferences – or shape them? Our findings suggest that markets can have systematic and long-lasting shaping effects on preferences.

References

Ariely, D., Loewenstein, G., and Prelec, D. (2003). "Coherent arbitrariness: Stable demand curves without stable preferences." *Quarterly Journal Of Economics*, 118(1), 73–105.

Ariely, D., Loewenstein, G., and Prelec, D. (2006). "Tom Sawyer and the construction of value." *Journal of Economic Behaviour and Organization*, 60, 1–10.

Bateman, I. J., Carson, R. T., Day, B., Hanemann, M. W., Hanley, N., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Özdemiroglu, E., Pearce, D. W., Sugden, R. and Swanson, J. (2002). *Economic valuation with stated preference techniques: a manual*. Edward Elgar, Cheltenham.

Becker, Gordon M., Morris H. DeGroot, and Jacob Marschak (1964). "Measuring utility by a single-response sequential method." *Behavioral Science*, 9(3), 226–232.

Binmore, K. (1999). "Why experiment in economics?" *The Economic Journal*, 109, F16–24.

Bohm, P., Linden, J. and Sonnegard, J. (1997). "Eliciting Reservation Prices: Becker-DeGroot-Marschak Mechanisms vs. Markets." *Economic Journal*, 107(443), 1079–1089.

Braga, J. and Starmer, C. (2005). "Preference anomalies, preference elicitation and the discovered preference hypothesis." *Environmental and Resource Economics*, 32(1), 55–89.

Braga, J., Humphrey, S. J., and Starmer, C. (2009). "Market experience eliminates some anomalies – and creates new ones." *European Economic Review*, 53(4), 401–416.

Butler, D. J. and Loomes, G. (2007). Imprecision as an account of the preference reversal phenomenon. *The American Economic Review*, 97(1), 277–297.

Camerer, C. (1987). "Do biases in probability judgement matter in markets? Experimental evidence." *The American Economic Review*, 77(5), 981–997.

Camerer, C., Loewenstein, G., and Weber, M. (1989). "The curse of knowledge in economic settings: An experimental analysis." *Journal of Political Economy*, 97(5), 1232–54.

Camerer, C. F. (1995). "Individual decision making." In J. H. Kagel and A. E. Roth, ditors, *The handbook of experimental economics*, pages 587–703. Princeton University Press, Princeton.

Coursey, D. L., Hovis, J. L., and Schulze, W. D. (1987). "The disparity between willingness to accept and willingness to pay measures of value." *Quarterly Journal of Economics*, 102(3), 679–690.

Cox, J. C. and Grether, D. M. (1996). "The preference reversal phenomenon: Response mode, markets and incentives." *Economic Theory*, 7(3), 381–405.

Fischbacher, U. (2007). "Z-tree: Zurich toolbox for ready-made economic experiments." *Experimental Economics*, 10(2), 171–178.

Harrison, G. W, Harstad, R. M., and Rustrom, E. E. (2004). "Experimental methods and elicitation of values." *Experimental Economics*, 7, 123–140.

Isoni, A. (2010). "The willingness-to-accept/willingness-to-pay disparity in repeated markets: loss aversion or 'bad-deal' aversion?." *Theory and Decision*, in press.

Knetsch, J. L., Tang, F. F., and Thaler, R. (2001). "The endowment effect and repeated market trials: is the vickrey auction demand revealing?" *Experimental Economics*, 4, 257–69.

Lichtenstein, S. and Slovic, P. eds. (2006). *The construction of preference*. Cambridge University Press, New York.

List, J. A. (2003). "Does market experience eliminate market anomalies?" *Quarterly Journal of Economics*, 118, 41–73.

List, J. A. (2004). "Neoclassical theory versus prospect theory: evidence from the market place." *Econometrica*, 72, 615–626.

List, J. A. and Shogren, J. F. (1999). "Price information and bidding behavior in repeated second-price auctions." *American Journal of Agricultural Economics*, 81, 942–949.

Loomes, G., Starmer, C., and Sugden, R. (2003). "Do anomalies disappear in repeated markets?" *Economic Journal*, 113(486), C153–C166.

Loomes, G., Starmer, C., and Sugden, R. (2010). "Preference reversals and disparities between willingness to pay and willingness to accept in repeated markets." *Journal of Economic Psychology*, in press.

Mazar, N., Kőszegi, B. and Ariely, D. (2009). "Price-sensitive preferences." Working paper.

Milgrom, P. R. and Weber, R. J. (1982). A theory of auctions and competitive bidding. Econometrica, 50(5), 1089–1122.

Payne, J. W., Bettman, J. R. and Johnson, E. J. (1993). *The Adaptive Decision Maker*. Cambridge University Press.

Payne, J. W., Bettman, J. R. and Schkade, D. A. (1999) "Measuring constructed preferences: towards a building code." *Journal of Risk and Uncertainty*, 19, 243–70.

Plott, C. R. (1996). "Rational individual behaviour in markets and social choice processes: the discovered preference hypothesis." In K. Arrow, E. Colombatto, M. Perleman, and C. Schmidt, editors, *Rational Foundations of Economic Behavior*, pages 225–250. Macmillan, London.

Putler, D. S. (1992). "Incorporating Reference Price Effects into a Theory of Consumer Choice." *Marketing Science*, 11, 287–309.

Shogren, J. F., Shin, S. Y., Hayes, D. J., and Kliebenstein, J. B. (1994). "Resolving differences in willingness-to-pay and willingness to accept." *American Economic Review*, 84(1), 255–270.

Shogren, J. F., Cho, S., Koo, C., List, J., Park, C., Polo, P., and Wilhelmi, R. (2001). "Auction mechanisms and the measurement of wtp and wta." *Resource and Energy Economics*, 23, 97–109.

Simonsohn, U. and Loewenstein, G. (2006). "Mistake #37: The effect of previously encountered prices on current housing demand." *Economic Journal*, 116, 175–199.

Sitzia, S. and Zizzo, D. J. (2010). "Price low and then price high or price high and then price low?", *Social Science Research Network Discussion paper*, February 2010.

Slovic, P. (1995) "The construction of preference." *American Psychologist*, 50(5), 364–371.

Starmer, C. (2000). "Developments in non-expected utility theory: The hunt for a descriptive theory of choice under risk." *Journal of Economic Literature*, 38, 332–82.

Thaler, R. (1985). "Mental Accounting and Consumer Choice." *Marketing Science*, 4, 199–214.

Tufano, F. (2009). "Are 'true' preferences revealed in repeated markets? An experimental demonstration of context-dependent valuations." *Experimental Economics*, 13, 1–13.

Vickrey, W. (1961). "Counterspeculation, auctions, and competitive sealed tenders." *Journal of Finance*, 16(1), 8–37.

Table 1 - Ranges for Cue manipulation

High Cue	Low Cue
£20 or more	£1.00 to £2.00
£19.90 to £15.00	£2.10 to £3.00
£14.90 to £10.00	£3.10 to £4.00
£9.90 to £5.00	£4.10 to £5.00
£4.90 to £1.00	£5.10 or more

Table 2 - Experimental results: shaping through price expectations

	NWTA				Market prices			
	Obs.	Mean	Median	St. dev.	Obs.	Mean	Median	St. dev.
E Low Cue Predictions R1					102	6.72	4.05	7.23
E Low Cue Predictions R8					102	4.94	4.35	3.18
E Low Cue R1	102	10.21	5.40	10.46	18	6.90	6.30	3.26
E Low Cue R8	102	6.73	4.20	7.92	18	4.38	4.20	1.98
E High Cue Predictions R1					102	12.11	12.25	7.99
E High Cue Predictions R8					102	7.51	6.05	4.82
E High Cue R1	102	12.11	10.05	9.97	18	10.19	10.00	4.17
E High Cue R8	102	8.08	5.15	8.96	18	6.33	5.70	2.71

E = (£1, 0.05; £50, 0.95)

Table 3 Statistical tests: shaping through price expectations

A) Shaping through price expectations

	BS/WS[a]	Price prediction		Price prediction		Non-parametric tests				Regressions		
		Market	Obs.	Market	Obs.	Test[b]	Z	p-value	Sig.[c]	Coeff.	p-value	Sig.[d]
E1	BS	LOW R1	102	HIGH R1	102	M-W 1t	-6.436	0.0000	***	5.393	0.0000	***
E2	BS	LOW R8	102	HIGH R8	102	M-W 1t	-6.224	0.0000	***	2.566	0.0020	***

	BS/WS[a]	NWTA		NWTA		Non-parametric tests				Regressions		
		Market	Obs.	Market	Obs.	Test[b]	Z	p-value	Sig.[c]	Coeff.	p-value	Sig.[d]
E3	BS	LOW R1	102	HIGH R1	102	M-W 1t	-2.171	0.0150	**	1.906	0.0920	*

a - BS = between subjects; WS = within subject.

b - W = Wilcoxon sign rank test; M-W = Mann-Whitney rank sum test; K-W = Kruskal-Wallis test; 1t = one-tail test.

c - * = significant at the 10% level; ** = significant at the 5% level; *** = significant at the 1% level.

d - Significance level in OLS regressions. For WS comparisons: H_0: constant = 0. For BS comparisons: H_0: coefficient of treatment dummy = 0. Cluster-robust standard errors computed for comparisons involving round 8.

Table 3 *(continued)*

B) Persistence of shaping through price expectations

	BS/WS[a]	NWTA		NWTA		Non-parametric tests				Regressions		
		Market	**Obs.**	**Market**	**Obs.**	**Test**[b]	**Z**	**p-value**	**Sig.**[c]	**Coeff.**	**p-value**	**Sig.**[d]
E4	WS	LOW R1	102	LOW R8	102	W	4.750	0.0000	***	-3.477	0.0020	***
E5	WS	HIGH R1	102	HIGH R8	102	W	4.581	0.0000	***	-4.029	0.0000	***
E6	BS	LOW R8	102	HIGH R8	102	M-W 1t	-2.974	0.0015	***	1.354	0.1565	

		Market price		Market price		Non-parametric tests			
		Market	**Obs.**	**Market**	**Obs.**	**Test**[b]	**Z**	**p-value**	**Sig.**[c]
E7	WS	LOW R1	18	LOW R8	18	W	3.071	0.0021	***
E8	WS	HIGH R1	18	HIGH R8	18	W	3.724	0.0002	***
E9	BS	LOW R1	18	HIGH R1	18	M-W 1t	-2.361	0.0182	**
E10	BS	LOW R8	18	HIGH R8	18	M-W 1t	-2.659	0.0078	***

a - BS = between subjects; WS = within subject.

b - W = Wilcoxon sign rank test; M-W = Mann-Whitney rank sum test; K-W = Kruskal-Wallis test; 1t = one-tail test.

c - * = significant at the 10% level; ** = significant at the 5% level; *** = significant at the 1% level.

d - Significance level in OLS regressions. For WS comparisons: H_0: constant = 0. For BS comparisons: H_0: coefficient of treatment dummy = 0. Cluster-robust standard errors computed for comparisons involving round 8.

Table 4 - Experimental results: shaping through price feedback

	NWTA				Market prices			
	Obs.	**Mean**	**Median**	**St. dev.**	**Obs.**	**Mean**	**Median**	**St. dev.**
L CTRL R1	60	4.25	4.00	1.10	12	4.15	3.95	0.72
L CTRL R8	60	3.83	3.70	0.93	12	3.68	3.55	0.55
L MIX R1	60	4.64	4.40	1.62	24	7.93	7.90	0.55
L MIX R8	60	5.67	6.45	1.82	24	7.57	7.50	0.50
L HOM R1	60	5.35	5.40	1.49	12	5.53	5.40	0.88
L HOM R8	60	4.60	4.25	1.72	12	4.42	4.20	1.15
H CTRL R1	60	11.17	11.45	1.66	12	11.46	11.45	0.71
H CTRL R8	60	10.97	11.20	1.32	12	10.93	11.30	1.11
H MIX R1	60	10.91	11.10	1.66	24	7.93	7.90	0.55
H MIX R8	60	9.91	10.45	2.01	24	7.57	7.50	0.50
H HOM R1	60	10.26	10.40	1.81	12	10.55	10.35	1.05
H HOM R8	60	10.56	10.55	1.28	12	10.33	10.45	0.94

L = (£2, 0.8; £9, 0.2); H = (£7, 0.2; £14, 0.8)

Table 5 - Statistical tests: shaping through price feedback

A) Shaping through price feedback

BS/WS[a]		NWTA		NWTA		Non-parametric tests			Regressions	
		Market	Obs.	Market	Obs.	Test[b]	Z	Sig.[c]	Coeff.	Sig.[d]
L1	WS	MIX R1	60	MIX R8	60	W	-4.02	***	1.028	***
L2	WS	CTRL R1	60	CTRL R8	60	W	3.40	***	-0.422	***
L3	BS	MIX R1	60	CTRL R1	60	M-W	-1.32		0.389	
L4	BS	MIX R8	60	CTRL R8	60	M-W 1t	-5.39	***	1.839	***
H1	WS	MIX R1	60	MIX R8	60	W	4.16	***	-0.995	***
H2	WS	CTRL R1	60	CTRL R8	60	W	0.79		-0.195	
H3	BS	MIX R1	60	CTRL R1	60	M-W	0.87		-0.260	
H4	BS	MIX R8	60	CTRL R8	60	M-W 1t	2.78	***	-1.060	***

a - BS = between subjects; WS = within subject.

b - W = Wilcoxon sign rank test; M-W = Mann-Whitney rank sum test; K-W = Kruskal-Wallis test; 1t = one-tail test.

c - * = significant at the 10% level; ** = significant at the 5% level; *** = significant at the 1% level.

d - Significance level in OLS regressions. For WS comparisons: H_0: constant = 0. For BS comparisons: H_0: coefficient of treatment dummy = 0. Cluster-robust standard errors computed for comparisons involving round 8.

Table 5 *(continued)*

B) Persistence of shaping through price feedback

	BS/WS[a]	NWTA Market	Obs.	NWTA Market	Obs.	Non-parametric tests Test[b]	Z	Sig.[c]	Regressions Coeff.	Sig.[d]
L5	WS	MIX R8	60	HOM R1	60	W 1t	1.93	**	-0.315	*
L6	BS	HOM R1	60	CTRL R8	60	M-W 1t	-5.88	***	1.523	***
L7	WS	HOM R1	60	HOM R8	60	W	4.48	***	-0.753	***
L8	BS	HOM R8	60	CTRL R8	60	M-W 1t	-2.55	**	0.770	**
H5	WS	MIX R8	60	HOM R1	60	W 1t	-2.68	***	0.348	**
H6	BS	HOM R1	60	CTRL R8	60	M-W 1t	2.07	**	-0.712	**
H7	WS	HOM R1	60	HOM R8	60	W	-1.24		0.297	*
H8	BS	HOM R8	60	CTRL R8	60	M-W 1t	2.79	***	-0.415	*

	BS/WS	Market price Market	Obs.	Market price Market	Obs.	Non-parametric tests Test[b]	Z	Sig.[c]
L9	BS	CTRL R8	12	HOM R1	12	M-W 1t	-4.847	***
L10	WS	HOM R1	12	HOM R8	12	W	2.436	**
L11	BS	CTRL R8	12	HOM R8	12	M-W 1t	-1.679	**
H9	BS	CTRL R8	12	HOM R1	12	M-W 1t	4.611	***
H10	WS	HOM R1	12	HOM R8	12	W	1.626	
H11	BS	CTRL R8	12	HOM R8	12	M-W 1t	1.676	**

a - BS = between subjects; WS = within subject.

b - W = Wilcoxon sign rank test; M-W = Mann-Whitney rank sum test; K-W = Kruskal-Wallis test; 1t = one-tail test.

c - * = significant at the 10% level; ** = significant at the 5% level; *** = significant at the 1% level.

d - Significance level in OLS regressions. For WS comparisons: H_0: constant = 0. For BS comparisons: H_0: coefficient of treatment dummy = 0. Cluster-robust standard errors computed for comparisons involving round 8.

Table 6 - Shaping at the Individual Level

Change in NWTA R8-R1	No. subjects	
	L	H
–2.60 or less	1	**9**
–2.10 to –2.50	1	**4**
–1.60 to –2.00	3	**7**
–1.10 to –1.50	2	**6**
–0.60 to –1.00	1	**8**
–0.10 to –0.50	4	**4**
0	9	11
0.10 to 0.50	**6**	5
0.60 to 1.00	**4**	2
1.10 to 1.50	**5**	1
1.60 to 2.00	**4**	1
2.10 to 2.50	**8**	0
2.60 or more	**12**	2
NWTA decreases	12	**38**
NWTA increases	**39**	11

Table 7 - Group-specific effects

| | | NWTA | | | | | BG[c] | WG[c] |
	Lottery	Market	Obs.	Test[a]	X^2	Sig.[b]	var.	var.
D1	E	Auction groups LOW R1	18	K-W	16.94		113.44	108.72
D2	E	Auction groups LOW R8	18	K-W	38.81	***	69.29	61.35
D3	E	Auction groups HIGH R1	18	K-W	11.68		71.53	105.03
D4	E	Auction groups HIGH R8	18	K-W	45.9	***	117.96	72.72
D5	L	Auction groups HOM markets R1	12	K-W	13.77		2.77	2.09
D6	L	Auction groups HOM markets R8	12	K-W	26.68	***	6.34	2.19
D7	L	Auction groups CTRL markets R1	12	K-W	11.68		1.67	1.12
D8	L	Auction groups CTRL markets R8	12	K-W	38.24	***	2.51	0.50
D9	H	Auction groups HOM markets R1	12	K-W	15.12		4.18	3.07
D10	H	Auction groups HOM markets R8	12	K-W	20.67	**	3.21	1.27
D11	H	Auction groups CTRL markets R1	12	K-W	6.208		1.40	3.08
D12	H	Auction groups CTRL markets R8	12	K-W	16.39		2.74	1.51

a - W = Wilcoxon sign rank test; M-W = Mann-Whitney rank sum test; K-W = Kruskal-Wallis test; 1t = one-tail test.

b - * = significant at the 10% level; ** = significant at the 5% level; *** = significant at the 1% level.

c - BG var. = between-group variance; WG var. = within-group variance.

Figure 1 – Shaping through price expectations
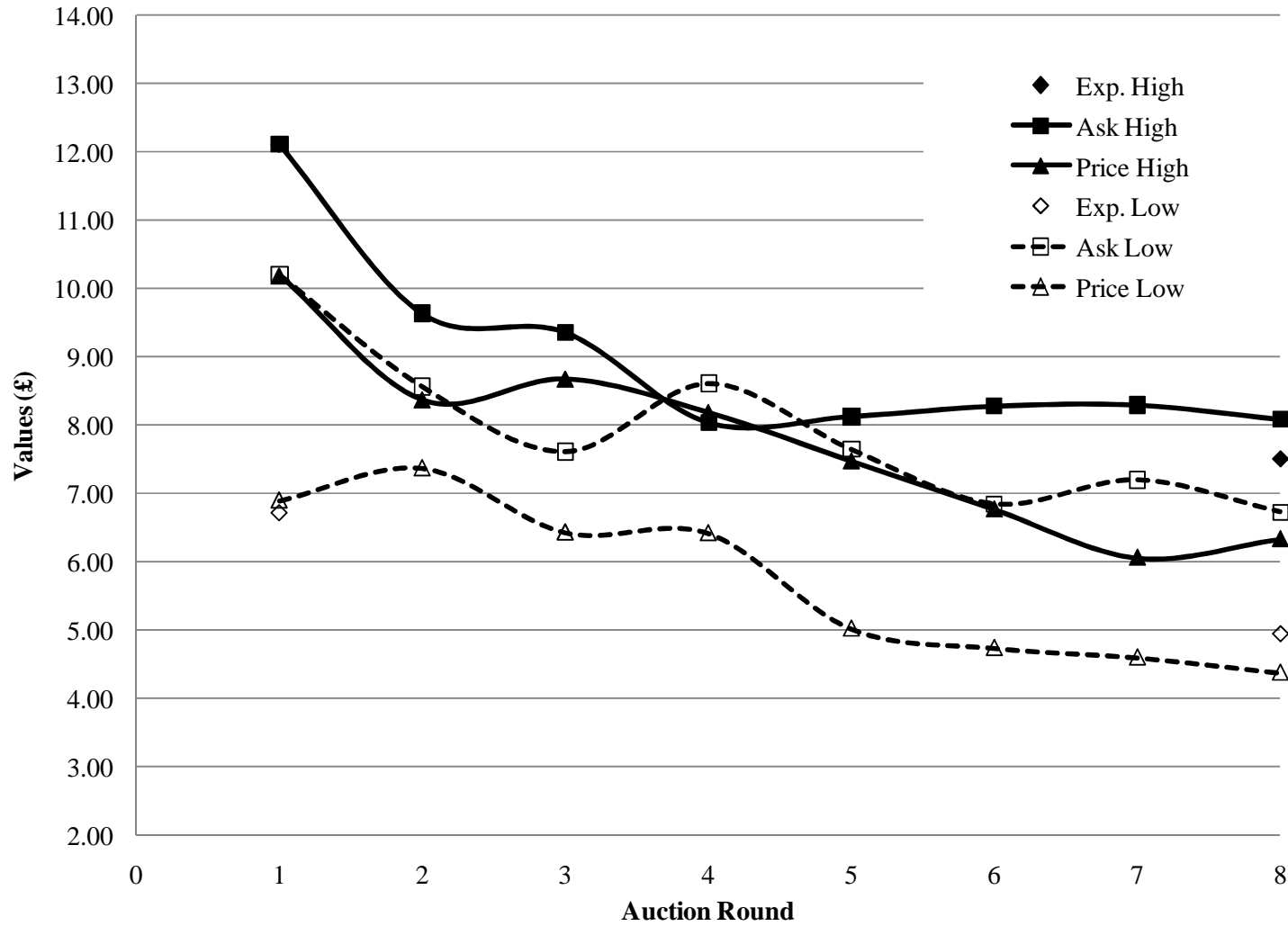
Note: High Cue denoted by solid markers joined by solid lines. Low Cue denoted by empty markers joined by dashed lines; squares are mean asks; triangles are mean actual market prices; solid (empty) diamonds are mean price predictions for High (Low) Cue.

Figure 2 – Shaping through price feedback
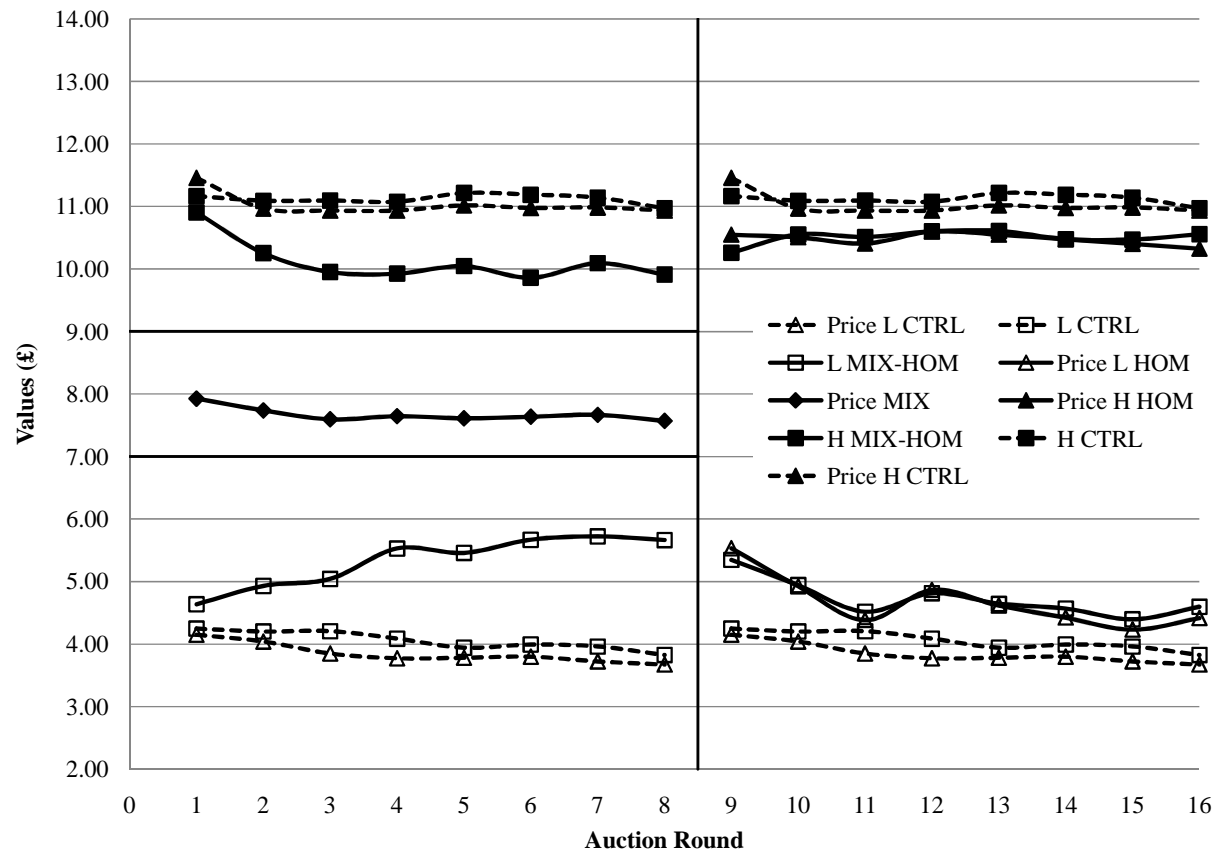
Note: Markers are as follows: solid markers refer to H; empty markers refer to L. Squares are mean NWTA, triangles are mean market prices.

Solid diamonds are mean prices in mixed markets. Lines are as follows: solid for Mixed and Homogeneous markets; dashed for control markets.

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Experimental instructions

Welcome to the experiment and thank you for coming. (Introduce Experimenters)

In this experiment you will be making a series of decisions. These decisions will be about selling in markets. Everybody that takes part will earn some money at the end of the experiment but the amount may vary a lot. We have cash with us, so you will be paid before you leave today.

I will say more about what will be involved in the experiment soon. Before we do this, I would like to set some ground rules, which you must all observe. There must be no talking during the experiment unless you want to ask us a question – in which case, simply raise your hand and one of the experimenters will come to you. You must not attempt to look at what other people are doing.

Also, please follow all instructions on your computer screen. There will be times during the experiment when you will be required to wait for others. Please wait patiently and please do not attempt to open any other application on your computer.

Please keep to these simple rules, because anyone breaking them may be asked to leave the experiment without any reward.

On the desk in front of you, you will see a consent form and a receipt form. Please fill in your personal details on each and sign the consent form. DO NOT sign the receipt. You will sign the receipt form only once you have been paid.

We are now ready to describe the nature of the tasks within the experiment.

Lotteries

All of the tasks in the experiment require you to make simple decisions about what we will call "lotteries". So let me first explain what a lottery is:

£10	£5

1   60   61   100

This box describes a lottery. The numbers inside the box are amounts of money that you could win. In this case £10 or £5. The numbers along the bottom of the box (1, 60, 61 and 100) refer to the numbers on a set of plastic disks inside this bag (show the participants the bag). There are 100 disks in the bag, one with each of the numbers from 1 to 100.

At the end of the experiment, you might end up owning a lottery like this. Suppose it was exactly this one and you draw a disk from the bag: if you drew a number from 1 to 60 you would win £10, if you drew a number from 61 to 100, you would win £5. So owning this lottery gives you 60 chances out of 100 of getting £10 and 40 chances of getting £5.

All of the tasks involve decisions about lotteries like this, though the amounts you win, and chances of winning will differ from task to task.

Any questions?

Tasks

There are two types of task in the experiment:

In some tasks we will give you a lottery, similar to the one we have just shown you. You will then have the opportunity to sell this lottery in a market. You will be shown a range of possible prices and, for each one, you will be asked whether or not you are willing to sell the lottery at this price – that is, whether or not you are willing to take that amount of money for sure rather than playing the lottery.

In some tasks we will ask you to predict the price of the lottery in the market. I shall explain how the price is determined shortly.

In each task, we want you to give an honest and considered response. For example, when you are selling your lottery, we would ask you to accept any offer which, FROM YOUR PERSONAL PERSPECTIVE, exceeds the value TO YOU of playing out the lottery. You should turn down any offer which YOU think is worth less to YOU than playing out the lottery.

So let me stress that there are no tricks involved in our tasks, neither are there right or wrong answers. We simply want you to give honest and considered responses; and it is in your interests to do so.

One of the tasks you face is for real. In the task that is for real, we will carry out any decisions that you made in that task. So, if you sell your lottery, we will pay you the market price for that lottery in that task. If you do not sell the lottery, you will draw a disk from the bag and we will pay you the amount that corresponds to the number on the disk.

The task that is real for you is determined at random. Each task is equally likely to be the one that you face for real, but you won't know which task is for real until the end of the experiment. So the best you can do is simply give honest and considered responses to each task.

Before we move to a practice task, are there any questions?

Lottery practice – selling

Please close the browser window by clicking on the red box in the top right corner of the screen. The screen that you can now see is part of the experiment.

The first task that you see is a practice. That means that this is not one of the tasks that could be for real. Nevertheless, let's proceed as if this were a task which might be for real.

This task is a market where you are have the opportunity to sell the lottery on your screen. The screen tells you how many people are participating in this market. For the purposes of this practice, we have split the group into two markets. This will happen throughout the experiment and you will not know which other participants you are grouped with. Each market will trade simultaneously and these different markets will be entirely independent of each other. Please click OK.

Now, let's see how you enter your valuation into the computer. Underneath your lottery, the computer shows a series of money amounts between the lowest amount in the lottery and the highest amount.

Notice that you would not sell the lottery for any less than the lowest amount you could receive if you have to play out this lottery for real. Also note that nobody would pay more than the highest amount offered by the lottery in order to buy the lottery off you.

To enter a valuation, you click whether or not you would accept the amounts offered. Importantly, you must do this for every value listed on your screen. When you have done this you can click OK.

The computer will check for errors in your responses – for instance, it is illogical to accept a low price and yet to refuse to accept a higher price. If your responses do this, you will be asked to revise them before continuing. If your responses are fine, you will see another screen that asks you to confirm the choices that you have just made. If you want to change your responses, you can click on NO and then OK to repeat the previous stage. If you are happy with your responses, you can click YES and then OK and you will see another screen of values.

The screen shows amounts of money between the amounts that you said that you would and would not accept in smaller intervals. You follow the same procedure on this screen as before. When you click OK the computer again checks to see whether there are any illogical errors in your responses and you will be given the opportunity to revise your responses.

You will now be asked to wait until everyone in your group has entered their valuation. The screen will then automatically change to show you the market price.

This screen reminds you what you decided you wanted to do and will tell you whether or not you have sold your lottery. You only sell your lottery if you were prepared to accept the market price (or something less). If you asked for more than the market price, you keep your lottery.

Any Questions? Please click OK.

Market Price

You may be wondering where the market price comes from. We determine the market price from your valuations in the following manner.

The valuations from the participants in a market are collected and the middle value is found. This forms the market price. Please look at the example on your screen.

Think about a market in which five people have recorded their valuations for their lotteries. Suppose we ranked them according to the amounts at which the participants are just not willing to sell their lotteries and now suppose we observe the following valuations. Person 1 said that they would be willing to sell at £1.60 but not at £1.50; person 2 said that they would be willing to sell at £2.10 but not at £2.00; and so on to person 5 who said that they would be willing to sell at £3.60 but not at £3.50.

The "no" column here shows the highest price at which each person would not be willing to sell their lottery. The computer's rule is to take the middle value of these "no"s and set this as the market price. So the market price is always the price at which the person with the middle valuation is not willing to sell their lottery.

In this case, the market price would be £2.50 and persons 1 and 2 WILL sell their lotteries and receive £2.50. Persons 3, 4 and 5 will keep their lotteries.

This rule is our attempt to simulate the way that prices get determined in real markets. In any market the price is determined by the valuations of the people who participate in it. In this experiment, the price approximately reflects the valuation of the average participant.

Please click on OK.

Price Expectation Task Practice

In the second type of task you are asked to forecast the price within a market. For this task the people in the room will be split into two groups. It is your job to forecast the market price for the group other than the one in which you belong. Both groups will be trading the same lottery.

You will be rewarded based upon the accuracy of your forecast, BUT only if a task from this stage of the experiment is selected to be played out for real, i.e. a task, which relates to selling the lottery that you are forecasting the market price for.

A forecast which is EXACTLY correct will be rewarded with £2 and this will reduce by one penny for every penny your forecast is different from the actual price (whether higher or lower). If your forecast is more that £2 away from the actual market price, you will receive no reward.

The reason you are asked to forecast the price in the OTHER market is so that you cannot attempt to influence the price towards your forecast.

You enter your forecast of the market price in the following way:

The screen displays a series of ranges of money that the market price for the displayed lottery could fall into. You select which of these ranges you believe the price will fall into by clicking on the button to the left of the price. You then click OK. The next screen asks you to enter a value for your forecast to the nearest ten pence.

The screen now shows you a hypothetical market price and reminds you of your estimate. The screen also shows you the accuracy reward you would receive if this task were for real.

Any questions?

The Quiz

Before we start the experiment for real, we would like to check your understanding of the instructions. Please attempt to answer the questions that will appear on your screen. If you have any questions or would like one of the experimenters to clarify an answer, please raise your hand.

The Experiment

We are now ready to start the experiment. You are reminded that people work at different speeds and there may be times during the experiment when the computer asks you to wait. Please follow this instruction and be patient.

You will take part in several 'markets'. Most of you will take part in three markets, but a few of you will take part in only two [All of you will take part in three markets]. We are about to start the first market.

Previous experiments have shown that it can take some people a little while to get used to the market mechanism. For this reason, each market will be run eight times in succession. Each of these runs is called a 'period'. In each of these eight periods, you will be given a lottery – the same lottery in each period – and you will have the opportunity to sell it. You will be grouped with the same other participants in all eight periods. It is entirely up to you whether you give the same response, or a different response, in each period: on each occasion please just state what you believe at that time to be the value of the lottery to you.

We have told you that one of the 'tasks' you face in the experiment is for real. We will treat each of the eight periods of the market as a separate task. So, in each period, you should just think about the decisions you have to make *in that period*.

Please click OK to start the experiment. At the top of your screen, it now says that you are in Period 1 of Market 1. Now just carry on, following the prompts on the screen.

[Some oral prompts are needed between markets, to remind participants that they are moving to a new market, with a different group of participants (or are sitting out and doing the questionnaire.]

Tasks for Real and Payout

That completes all of the tasks in the experiment. We will now come around to each of you individually and you will find out which task is real for you.

Please don't do anything until one of the organizers comes to you.

End of instructions.