

5-24-2019

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Reference-Dependence Performance: Managing and Meeting Expectations

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Abstract:

Reference-dependence has been a topic of interest in recent history for the field of economics. It's implications that utility is not solely based on outcomes, but rather how outcomes are interpreted from a previously set expectation has the potential to effect many aspects of incentive structures. In this research, subjects complete a real effort task in which they are provided with information that creates shocks in their expectations. These shocks make the individual readjust to the new information, impacting performance in the real-effort task. We conclude that reference-dependence performance is impacted by adjusting reference points that may have a positive or negative impact on the individual performance, dependent on the valence of the shock.

Introduction

The field of economics has a vested interest in the decisions and performance of individuals under different contexts and incentive structures. This interest is founded in the economists' attempts to understand the material world through mathematical, scientific and incentive structures. Due to individuals making decisions on a daily basis, understanding what affects these becomes increasingly salient. An insightful concept to consider is the setting of expectations by the individual prior to making a decision. Managing expectations is as much a life skill as managing a budget. The greater the development of the skill, the successful decisions may seem.

Managing expectations is crucial in interpersonal relationships and their success. When expectations are not met, individuals may have a "sour" experience that may have spillover effects. For example, imagine a worker receiving news at the start of the day that they will be receiving a 3% bonus to their salary. This is welcomed news to the worker, they are now 3% relatively wealthier. The next day the same worker is told they were given incorrect information: the bonus is in fact only an increase of 2%. This new change is now a loss relative to the previous day. The reference-point is now the larger of the two increases, not their base salary, even considering that they are still being paid at their original salary. Based on this new perception, one could expect behavior of the worker to be altered. This paper seeks to test this particular circumstance, where expectations, serving as reference points, affect performance. Due to the field not readily providing readily observable moments in which we can test these theories, we turn to the lab to a controlled setting where we conduct a real-effort task experiment that involves a shock to expectations in perceived and actual wage rates that will be earned.

This paper is organized in the following manner: Section II summarizes previous literature on the topic of reference-dependence theory. Section III explains the design and methodology of the experiment. Section IV addresses the hypothesis of the experiment. Section V presents the results obtained data analysis. Section VI concludes the research by providing an analysis on the implications of the results.

II - Literature Review

Reference-dependence research has seen a flourishing period of growth in economic literature with its foundation based on models stipulating that expectations can act as reference points (Abeler et al. 2011; Köszegi and Rabin 2006, 2007, 2009). This is a welcome addition to economic theory as it helps to further model the world we experience in mathematical terms, seeking a more concise understanding of ourselves in the world. Drawing inspiration from the same source as many behavioral economics concepts, reference-dependence is an expansion of Prospect Theory (Kahneman and Tversky, 1979). The understanding that gains, in the same magnitude, are not equal to losses has expanded the perspective and worldview of researchers in the field.

The field of reference-dependence must define the concept of a reference point: being those beliefs an individual held in the recent past about present outcomes (Koszegi and Rabin 2006; Ericson and Fuster 2011). Past experiences lived by an individual create a set of beliefs that will directly influence expectations of future outcomes. This can directly impact performance, or even the decision to perform (Farber 2005). If beliefs of the future are strong enough in one direction to impede progress, the individual will adopt a loss-averse standpoint and perhaps decide that the utility maximizing decision is to not participate.

In the case that individuals either slow down or stop completely in their activity, research has found that this is done to meet a reference point they have set previously (Koszegi and Rabin 2006; Abeler et al. 2011; Crawford and Meng, 2011). This rationalization of new beliefs to the current context and the decision made afterwards, is dependent on how this change is presented. If the change was unexpected, individuals are less likely to continue in their activity. The contrapositive is true as well; when changes are expected, and even accounted for in previous moments, individuals find themselves being more likely to continue in the activity (Koszegi and Rabin 2006, 2007; Chang and Gross 2014).

The decision to not perform or work harder when facing higher prospects, relative to expectations, has been proven to hold over different settings (Farber 2005; Koszegi and Rabin 2006; Crawford and Meng 2011; Chang and Gross 2014). This is best explained in the research put forth by Chang and Gross (2014): in a pear packing farm, workers faced expected or unexpected shocks to their wages for most days of the week. They knew that they must work the entirety of their shifts but did not know the duration of it until the start of the day. If the daily shift exceeded 8 hours, they were paid overtime wages for every hour above the threshold. This is thus an unexpected change for which they must adapt and rationalize their decisions. Weekly hours were more predictable, as the week progressed workers are able to know how many hours are necessary to exceed the 40 hours before overtime pay would go into effect. When the shock was unexpected, workers decreased effort. When it was expected, they increased effort. This is in line with all previous theory on the matter where unexpected shocks alter held beliefs of outcomes, changing expectations which then influence effort and performance in a task. Individuals act in a loss averse manner when they are in a context of expected outcomes (Ericson

and Fuster 2011); they trend towards their established status quo which is easier to rationalize and requires little cognitive cost to establish.

Cognitive costs find themselves in the center of this theory. The science of heuristics, promulgated into academia through the many works of Daniel Kahneman, Amos Tversky and their many colleagues in the field, have helped to rationalize the irrational behavior we experience; relative to the homo economicus we assume operates the world. Gigerenzer and Brighton (2009) provide the term Homo Heuristicus which has a biased mind and is arbitrarily selective of which information they are interpreting. This specimen satisfices rather than maximize. This individual would rather work less under unexpected higher wages, minimizing costs and satisficing their utility. The theory of cognitive load explains the theoretical existence of an accuracy-effort trade-off that individuals are assumed to conduct.

There are many industries in which an accuracy-effort trade-off is made by the individual. This naturally leads to there being interest in many different fields on the behalf of researchers. Reference-dependence performance or effort provision has been widely studied in taxi cab drivers' decision to work more during higher implicit wage times (Farber 2005; Crawford and Meng 2011), effort exerted by pear packers (Chang and Gross 2014), live game attendance for athletic events (Coates et al. 2014), Major League team relocations and expansions (Humphreys and Zhou 2014), on the game of political communication transparency with constituents (Grillo 2016), supervisor leniency in performance appraisal (Marcheginani et al. 2016), marathon runners (Allen et al. 2017), investment speculation and speculative bubbles (Zhang and Zheng, 2017).

This research fits in the present literature by providing an analysis on how endogenously determined expectations affect performance when individuals undergo a shock to their beliefs. It contributes to the field of reference-dependence by measuring and comparing empirically the performance of individuals when their expectations of wage shocks are met or not. To the best knowledge of this researcher, this is the first paper to analyze the effects of reference-dependence on performance directly. Many previous studies deal with the matter of effort provision, this paper does not measure provision but rather focuses on performance and accuracy on a menial task.

This paper is organized in the following manner: Section II explains the design of the experiment as well as the methodology. Section III addresses the hypothesis of the experiment. Section IV discusses the results obtained through data analysis and its discussion. Section V concludes the research by providing an analysis on the implications of the results.

Section III - Experiment Design

The experiment involved a real effort task that had two parts. Each part was timed for 3 minutes in duration, totalling 6 minutes for the entire effort task. Subjects were informed by the sound of a bell that 30 seconds remained to complete the part. The task itself involved identifying how many times a given number in a 4x4 grid repeated itself. The grid had a string of randomly generated numbers and was limited to digits between 3-9 to ensure that the sought numbers would appear in non-arbitrary quantities. There were a total of 108 grids per page, in a total of 12 pages totalling 108 grids in each part. In order to obtain credit for identifying the correct number of times a number appears in a grid, subjects had to write the exact amount of times in the space provided below. A correct answer was true only if the number was accurate,

any other form of answering was counted as inaccurate and did count towards the subjects earnings.

To begin the experiment, the researcher read the instructions to the subjects after they had signed the consent form and decided to participate. They were informed that their payment would be dependent dependent on their performance during the session, and they would be receiving a participation payment of \$1.50. This might appear to be a low rate of compensation for the participants. However, the entirety of the session lasted 20 minutes maximum. Subjects, on average, would earn above \$15 per hour so it is the belief of the researcher that they were properly incentivized to perform and were compensated appropriately.

The subjects were informed prior to the beginning of the first part that they would receive “slightly more/less” per correctly answered grid during the second part, depending on which treatment was presented. This was done to incite the creation of expectations regarding possible wages earned. They were reminded of this change in wage rate after part one was completed. They then completed a demographic survey that asked basic demographic information and some reference-dependence related questions. When beginning the second part, the subjects were told to carefully read the instructions as they may be searching for a different number, which was true for a majority of the treatments; this was done to ensure a randomization of the treatments. The second part also had information regarding the wage rate shock they were experiencing. The treatments involved informing the subject that they could have, or will be earning more/less than they were receiving in the second part. For example, it would have read that they could have earned up to \$0.08 but will be receiving \$0.07 per correct grid. Subjects in another positive

treatment would have only read that they will be receiving \$0.07 per correct grid. This is an intentional effort to create a shock in “status quo” wage rates that the subjects had internalized.

The entirety of the subjects that participated in the experiment were students from Portland State University. The students were informed that their participation was voluntary and had no bearing on their grades for their class, as well that they would be paid in cash at a later date. The treatments were presented in the second task and were the following:

Treatment Number	Explicitly Shown	Actual Payment
1	Could have earned \$0.04	Earned \$0.05
2	Will be earning \$0.05	Earned \$0.05
4	Will be earning \$0.07	Earned \$0.07
5	Could have earned \$0.08	Earned \$0.07
6	Will be earning \$0.04	Earned \$0.04
7	Will be earning \$0.08	Earned \$0.08

Section IV - Hypothesis

The principle hypothesis for this experiment is that subjects who experience the treatment that informs them of the possibility of having earned a different wage rate will perform at a different rate than those who are aware of only their wage rate; through the way of an example, subjects that are informed they could have earned \$0.08 but will be paid \$0.07 will perform differently than subjects that were only informed they will be paid \$0.07 This originates from the understanding that unexpected shocks to wage may affect performance in negative ways (Chang and Gross, 2014). Due to all subjects experiencing an identical first task, they all experience the

same expectation creation method when informed that the second part will vary. This ensures that differences in outcomes in the second part are properly controlled for and not biased in any significant way. At the moment that the participants are informed their wage rate will be altered in the second part of the experiment, they are generating expectations on what this could be. Due to the language used in informing them of this wage shock, they create a personal amount; having interpreted “slightly more/less” as they will.

Section V - Results

Over the course of two weeks, we were able to collect 172 data points, the breakdown of these for each treatment was the following: 34 observations for treatment 1; 34 observations for treatment 2; 34 observations for treatment 4; 28 observations for treatment 5; 21 observations for treatment 6; 22 observations for treatment 7. Because the experiment had both a positive and negative treatment, each one of these had a different outcome. But both failed to reject the hypothesis. In figure 1, the means of the outcomes are visualized and are statistically significant for treatment 1, 4 and 6. This is saying that when individuals saw they could have earned lower,

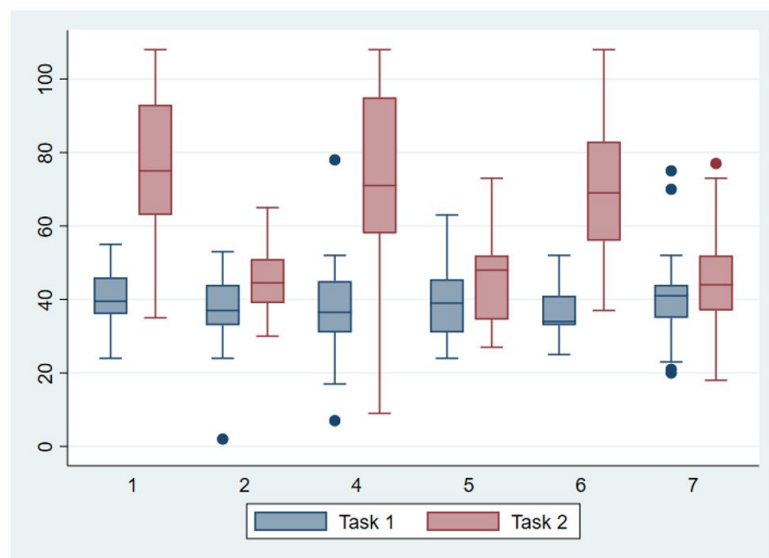


Figure 1. Means in Each Task per Treatment

as in the case of treatment 1, they performed better relative to the individuals who were just shown the same wage rate earnings (treatment 2).

That is, their expectations were submitted to a shock that informed them they could have earned less than they did, triggering some internal process that rationalized a sense of positive gain making them perform better. We argue the contrapositive occurred in the positive treatment 4, relative to treatment 5 and 7. Individuals who were shown only the wage rate, rather than the possible wage rate performed at a higher rate due to not knowing they could have possibly earned more. Individuals in treatment 5 initialized some form of an endowment effect. This materialized as they felt they lost possible wages and thus performed worse than individuals who earned the same wage rate but whose expectations were met. Treatments 6 and 7 are, respectively, the negative and positive extremes. In these we see an income effect take hold in where individuals earning more performed less, as is the case of treatment 7. Treatment 6 did perform statistically significantly more in the second round, as predicted by the established theory.

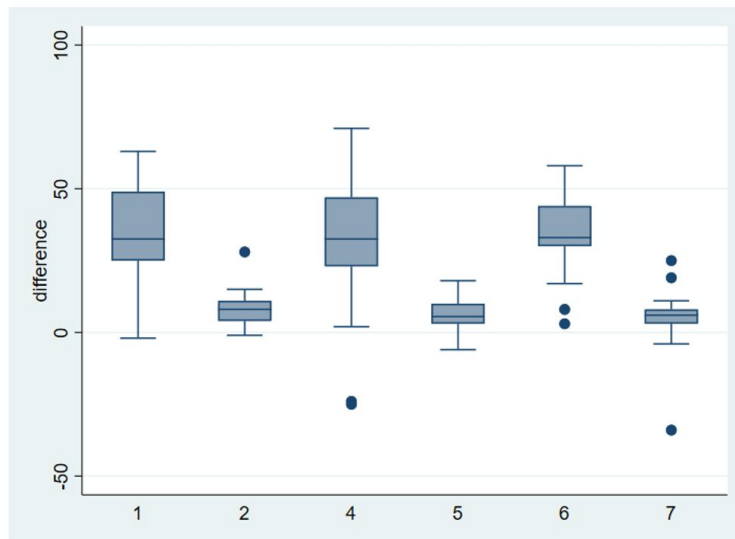


Figure 2. Difference between tasks per treatment

Figure 2 allows for an easier visualization of the differences between performance in the tasks. Specifically, treatments 1, 4 and 6 show larger differences between parts 1 and 2. A small difference is already expected due to learning effects in the subjects, which is presented as the small increases visible in treatments 2, 5 and 7.

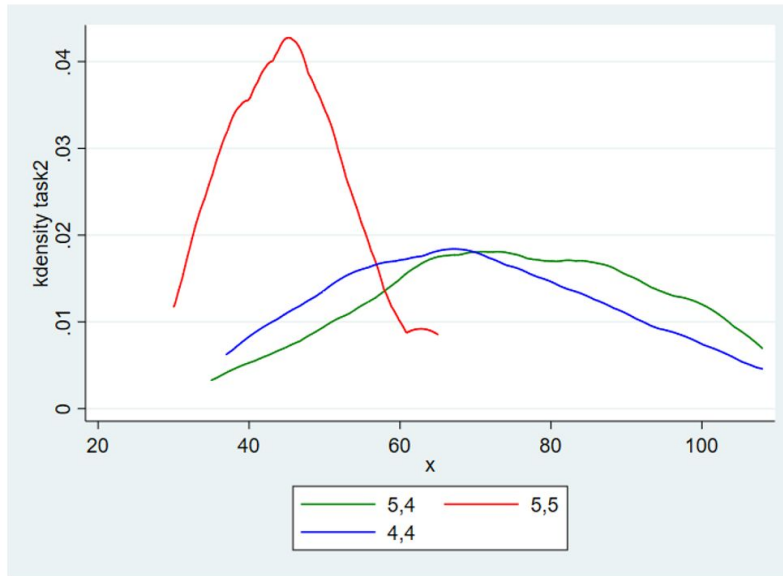


Figure 3. Distribution of Treatments (1)

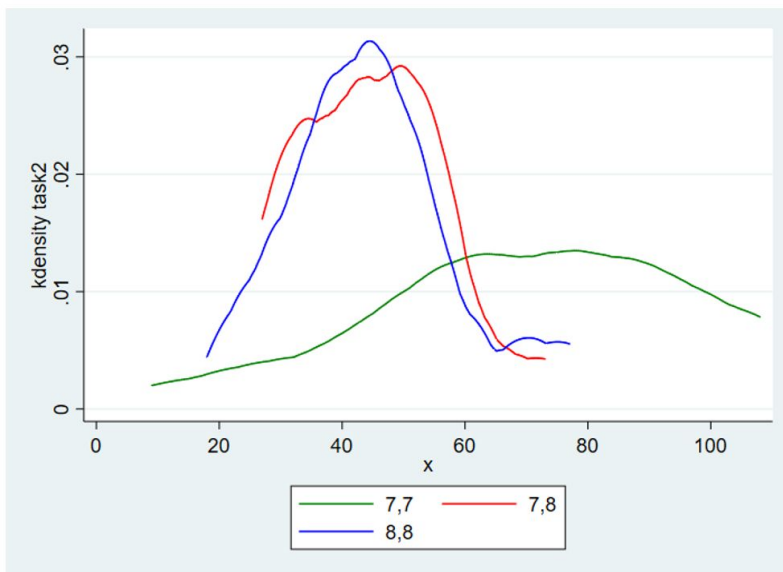


Figure 4. Distribution of Treatments (2)

Figures 3 and 4 provide the distributions for each treatment. Figure 3 has the distributions for the negative treatments, and Figure 4 shows the distributions of the positive treatments. Most notably, we see that in Figure 3, treatments 1 and 6 (in green and blue respectively) have very similar distributions. The potential and actual loss experience there produces an equal performance in subjects, where they both perform more. In Figure 4, the inverse is true, where treatments 5 and 7 have similar distributions but show less performance than treatment 4. This can be largely attributed to an income effect (for treatment 7) and loss aversion taking hold of performance (for treatment 5). Treatment 4 only saw an increase, with no other information affecting their perceived expectations on their earnings.

The results above provides us with results stipulating that it is better for performance to under-promise under positive changes. That is to say, if employers are able to increase wages, it is better to provide accurate information that will set expectations correctly. If changes are made that will be perceived as positive, it appears that individuals seek accurate gains rather than possibly inaccurate promises, where not meeting expectations is harmful for performance. If changes are perceived as negative, it appears that it is more beneficial for performance when individuals see a larger loss than they are incurring, perhaps internalizing some sort of survivor bias or heuristic. In essence, informing individuals that their reality is better off.

Section VI - Conclusion

This research sought to understand how presenting individuals with possible wage rate changes and submitting these to shocks that make them differ, can affect performance in a real effort task. Having conducted an effort-task that extended two parts, in which the second part had different possible wages only being explicitly known once beginning the task, we conclude

that individuals performance can be positively/negatively affected by expectation shocks, dependent on the direction of the shock. When individuals were shown they could have earned less than they were being compensated, they showed better performance relative to those individuals who only saw the actual loss in wages. In the positive realm, individuals who saw they were earning less than was possible performed worse than those who were only made aware of how much they will effectively be earning. These results are attributed to loss-aversion and reference-dependence theory seeing as how they fall in line with expected behavior for loss-averse individuals, as they favor or performed better in treatments in which they could have experienced more losses or were not made aware they could have earned more (which is still a loss through an endowment effect). Those who saw minor losses relative to possible ones, internalized that they are actually gaining, even though holistically it was a net loss. Those who saw minor gains, underwent an endowment effect that made them feel losses when they were in fact net gaining.

This is important in the realm of labor markets as employers may affect the performance of workers if they do not properly understand incentive structures and the expectations that are inherent in these. It may not always be prudent to over promise a gain if the expectations of this will not be met.

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