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AGE AND ANCHORING

On adolescents' susceptibility to the anchoring effect in a consumer goods purchasing situation

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ABSTRACT:
The assumption of rationality sits firmly at the center of most economic models and theories, in spite of frequently falling short of explaining human behavior. The cognitive bias called anchoring is such an instance. Although the relationship between age and several other biases has been scrutinized, research on how age affects anchoring is conspicuously absent. Hence, this study attempts to fill this gap by examining whether the strength of the effect varies with age as well as making a link to consumer protection policy. The analysis uses empirical data collected through four experiment sessions. In these sessions, valuations of common consumer goods were simulated using secondary school students as subjects. When analyzed econometrically, the results show a rich anchoring effect. On the other hand, no statistically significant results supporting that the strength of the effect varies with age can be detected. Nevertheless, further studies are endorsed, as the results arguably are economically significant.

KEY WORDS: anchoring, heuristics, cognitive bias, age, willingness to pay
JEL CLASSIFICATIONS: C91, D03, D12, D83

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Definitions

Anchoring: In a general sense, anchoring can be defined as a cognitive bias describing the event when an individual is overly reliant on an initial piece of information when making subsequent judgments. However, we will use a slightly narrower definition in this study and limit the use of the term to when an individual is affected by non-informative numerical information given a priori when making a decision, valuation or estimation.

Cognitive ability: In this thesis, cognitive ability is referred to in a very broad sense, comparable to the colloquial use of IQ.

Cognitive bias: In the context of this paper, a cognitive bias is defined as a replicable pattern of deviation in a cognitive process, such as reasoning, evaluating, remembering or decision making. One of the causes of cognitive biases are the use of heuristics. The colloquial meaning of the term "irrationality" is close to the academic definition of a cognitive bias.

Heuristic: A rule of thumb or a mental shortcut used in order to avoid impractical and time-consuming methods of solving a problem.

Participants and subjects: These terms were used interchangeably throughout the paper to provide ease of reading by variation.

Personal ID Number: A ten-digit Swedish national identification number issued by the National Tax Board of Sweden, comparable to the US social security number. A unique combination is given to each permanent resident in Sweden.

Secondary school: In this paper, secondary school refers to the Swedish term "gymnasieskola". It is a voluntary and very well attended form of secondary education that is free of charge.

Willingness to pay: The maximum amount a person would be willing to pay in order to receive a specific good.

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"In believing too much in rationality,
our contemporaries have lost something."
Krzysztof Kieslowski

Introduction

Anchoring is a cognitive bias made famous by Amos Tversky and Daniel Kahneman in a seminal study from 1974. In more technical terms, anchoring can be described as a bias occurring when an individual is affected by non-informative numerical information given a priori when making a decision, valuation or estimation. In their study, the authors rigged a wheel of fortune ranging from 0-100 so that it would stop only at 10 or 65. They then showed that estimations of what percentage of the countries in the United Nations are African could be altered considerably depending on which of the two numbers the participants were exposed to, even though this random number does not carry any informational value for the estimation (Tversky and Kahneman 1974).

Since its introduction, the field of study has developed significantly and continuously expands into new areas of research. By now, it is widely acknowledged that the anchoring effect in fact exists. However, there is still much to be learned with regard to the effect's prevalence in real world-situations, as the great majority of papers published are based on experimental data.

Thus, the field has in recent years seen ventures from more factual questions into new domains by using data from what is more similar to real world-settings. By examining legal judgments (Englich, Mussweiler and Strack 2005; Englich, Mussweiler and Strack 2006; Englich and Soder 2009), forecasting (Critcher and Gilovich 2010), valuation and buying decisions (Ariely, Loewenstein and Prelec 2003; Bergman et al. 2010) etc., it has been shown that the effect is more than just a curious phenomenon. In light of this development, the first goal of this thesis is to replicate a study performed by Daniel Ariely, George Loewenstein and Drazen Prelec in 2003 that studied valuations on consumer products in a purchasing decision with actual consequences. They found that the participants were highly susceptible to anchoring by a non-informative anchor. There have been other studies aiming to replicate the study by Ariely, Loewenstein and Prelec, some succeeding (see, e.g., Bergman et al. 2010) and some failing to achieve similar results (see, e.g., Fudenberg, Levine and Maniadis 2012).

However, a common denominator for all these studies is that they most often draw their sample from a pool of undergraduate students. In order to contribute further to the state of knowledge

regarding which situations the anchoring effect can be found, this replication of the experiment will be done using secondary school students.

The second goal of the thesis is to investigate whether age affects the strength of the anchoring effect. Results in this area might have interesting implications for consumer protection for minors, as argued by van Boom (2011). Additionally, the findings of Blankenship et al. (2009) and Mussweiler (2001) showing that the anchoring effect can be very persistent might even further highlight the need for this study. These findings might increase the effect that anchoring has in real purchasing decisions, as they show that the subject does not have to be anchored in direct connection to the actual purchasing decision. Since anchoring, once induced, has been shown to be very difficult to disengage from, even if the subjects are made aware of the effect (shown by, e.g., Tversky and Kahneman 1974; Wilson et al. 1996; Mussweiler 2001 Epley and Gilovich 2005; LeBoeuf and Shafir 2006), findings regarding the age effect on anchoring are especially noteworthy.

This leads us to the research questions posed in this thesis:

(1) Is it possible to replicate the anchoring effect established by Ariely, Loewenstein and Prelec (2003) using a very similar experiment in a non-university setting?

(2) In this setting, can the strength of the anchoring effect be shown to vary with age?

The remainder of this paper is organized as follows: After the introduction in the first section, section 2 presents the theoretical background of the topics touched upon in this thesis. Section 3 describes the method used to carry out the experiment and outlines our hypotheses. In section 4 our results are reported and analyzed. These results are discussed in section 5. Finally, section 6 gives concluding remarks in the form of possible policy implications and suggestions for future research.

Theoretical framework

Rationality, heuristics and behavioral economics

In its origins, the economic science was intimately associated with psychology, which had not yet been rewarded an own separate scientific field. For example, Adam Smith, who many consider to be the founder of modern economic thought, took a great interest in the overlap between economics and psychology. Today, he is best known for the concept of the invisible hand and his pivotal book The Wealth of Nations, which today serves as a cornerstone in economic science (Camerer and Loewenstein 2004). However, in his second major work, The Theory of Moral Sentiments, he provides deep insights into modern economic phenomena related to psychology, such as loss aversion and fairness, by using a framework eerily similar to what is used by modern psychologists (Smith 1998; Camerer and Loewenstein 2004).

Still, the ideas about human nature and psyche in the current mainstream paradigm of economic study are to a large extent based on the notion of the economic man, not taking any psychological factors into account. Broadly speaking, these theories state that humans are purely rational and egocentric actors who have the ability to make consistent and precise evaluations of their own preferences.[1] Even though Adam Smith is often credited as a main proponent of these concepts, the common fault of leaving out his complementary thoughts and understanding of the complex psychological issues and the moral structure of society have in some way simplified his legacy (Camerer and Loewenstein 2005).

Smith is not the only major economist to often have addressed psychological issues as a core part of his or her research. Another prominent example is Keynes and his theories of the animal spirits. However, a major shift occurred in the 1930s and 1940s. This was a time when the school of rational choice began to emulate the scientific approach of physics when dealing with economic concepts (Backhouse 2002, 258). With this desire came the necessity to reinforce the assumptions of the rational man even further, consequently leading to a close-to elimination of psychological concept in economics.

Nevertheless, a counter-movement was quickly gaining steam. Among its prominent thinkers was Nobel laureate Herbert A. Simon, who introduced the concept of heuristics into economic theory. A heuristic is a rule of thumb or a mental shortcut used in order to avoid impractical and time-consuming methods to solving a problem (Simon 1957). Oftentimes, the use of heuristics does not pose a problem for our decision making, but at times, they fail to provide us with

[1] For further definitions and discussions on the economic man, see: Persky (1995), Gintis (2000) and Thaler (2000)

accurate conclusions. Thus, biases such as anchoring arise. He also proposed the term of bounded rationality, stating that an individual is limited by certain factors, such as the available information and time, when making decisions. Simon's two pivotal discoveries result in a decision making environment with pragmatic agents often making decisions based on heuristics. This environment is far from the idea of rational agents meticulously computing and analyzing all possibilities and outcomes without cost in no time and consequently making a fully informed decision (Simon 1957).

Along with Simon, other prominent economists began to more resolutely question the paradigm of rational choice and counterarguments pointing out anomalies of foundational classic theories started to accumulate (Camerer and Loewenstein 2004). This set the stage for a reintegration of the fields of psychology and economics in the late 20th century. Psychologists such as Amos Tversky, Daniel Kahneman, Duncan Luce and Ward Edwards entered into the field of economics or started to, more directly, study questions of an economic nature. These initiatives laid ground to a new field of study within economics called behavioral economics (Camerer and Loewenstein 2004).

This new field purposefully draws on the methodological approaches of psychology as it, rather than working from a priori assumptions about rationality, forms its deductive approach around empirical observations of how humans actually behave (Bruni and Sugden 2007). These observations of behavior that deviates from assumptions or models within the mainstream science are then oftentimes subjected to experimental testing (Camerer and Loewenstein 2004). After the experiment, the data is often processed econometrically.

Properties of anchoring

Even though anchoring as a phenomenon was first described by Donald Robert Brown (1953), the term anchoring is often attributed to Tversky and Kahneman who presented it in a famous paper in 1974. In the aftermath of their influential publication, numerous studies have sought to expand the field by searching for new areas in which the anchoring effect could be present. The majority of them have been carried out in strictly laboratory-like settings (see, e.g., Plous 1989; Epley and Gilovich 2005; Mussweiler and Englich 2005; McElroy and Dowd 2007) and performed on university students.

Distinguishing features of the experiments that we choose to categorize as strictly laboratory are that they are carried out in enclosed environments and that the decisions or valuations made within in the compounds of the experiment have no effects beyond the experiment itself. As an

example, a well-cited study by Green et al. (1998) asked their participants to state a willingness to pay for public goods, but the respondents were aware that no money were actually spent. This type of experiment should be contrasted with experiments such as the one performed by Ariely, Loewenstein and Prelec (2003), in which the authors try to simulate real world-situations in a laboratory-like setting. They do so by allowing the valuation decision to have effects outside the experiment, as opposed to just being a hypothetical value. In their experiment, some of the participants are allowed to buy the products to a price dependent on their valuation of the product. A third path is to search for the effect in real world-settings, as done by, for instance, Beggs and Grady (2009) who examine the anchoring effect in the context of real art auctions.

Wansink, Kent and Hoch (1998) have also, apart from performing laboratory-like experiments, extended their tests to field studies. They proved that the anchoring effect could be extended to valuation tasks, particularly showing that the effect could be found in actual purchasing decisions when buying groceries. Their study consisted of four tests: two field studies and two lab experiments. In the first three of the experiments, they showed that anchoring can be found in multiple unit pricing (e.g., buy six cans of soda for a bundle price), purchase quantity limits (e.g., max 4 items per household) and suggestive selling (e.g., ”buy 18 Snickers bars for your freezer" as opposed to "buy Snickers bars for your freezer"). In their fourth and final experiment, they demonstrated that self-generated anchors could moderate the effects of an externally presented anchor.

Moreover, anchoring does not only occur when presented with irrelevant anchors such as in the initial Tversky and Kahneman (1974) experiment. There have been studies showing that information relevant to the task also can produce an anchoring effect (Strack and Mussweiler 1997; Englich, Hastie, Schkade and Payne 1999; Marti and Wissler 2000; Mussweiler and Strack 2005). For instance, Hastie, Schkade and Payne (1999) show that higher compensation claims in court may lead to higher compensation being awarded. In their experiment, jury-eligible citizens were shown videotape summarizing a lawsuit on environmental damage. The subjects were then asked to decide upon the liability for punitive damages and, if they found the defendant liable, asked to decide the amount of compensation to the victim. Hastie, Schkade and Payne found that the dollar amount rewarded was strongly correlated with the requested amount. Their findings are supported by a study performed by Marti and Wissler (2000).

What is impressive in terms of the anchoring effect is that it has been shown to exist in many different settings and by many types of different experiments. There are, however, some studies

showing that the anchoring effect can be mitigated or disturbed by certain factors and circumstances.

Factors that have been shown to mitigate, but not eliminate, the anchoring effect are expertise regarding the topic of the experiment (Northcraft and Neale 1987), monetary incentives (Wilson et al. 1996) and forewarnings about the fact that the participants will be subdued to an anchoring experiment (Epley and Gilovich 2005; LeBoeuf and Shafir 2009). Also, a sad mood has been shown to increase the anchoring effect (Englich and Soder 2009).

Additionally, Strack and Mussweiler (1997) investigate whether the effect is larger or smaller for extreme or implausible anchors, arguing that the anchor moves the mental boundary of what we consider to be a plausible estimation. Hence, if the anchor is beyond the subject's current boundary, it will move the boundary in that direction. Consequently, according to this theory, extreme anchors will produce a larger effect than more modest anchoring values. On the contrary, Wegener et al. (2001) found that extreme anchors could produce a smaller anchoring effect than sensible anchors. In their study, the participants were given a randomly assigned number that ranged from a number close to the correct answer to clearly implausible values together with eight estimation questions – such as, what is the highest temperature ever recorded in Seattle, Washington? Wegener et al. found the anchoring effect to follow an inverse U-curve where an anchor close to the correct answer had little effect. However, an anchor further away, but still within a plausible range, had a high effect and, finally, the effect diminished when using an extreme anchor.

Also, Strack and Mussweiler (1997) studied the effects of consistency between the anchor value and the estimated value in terms of what dimension they were expressed along. The participants in their experiment were asked to determine the dimensions of various objects, such as the Brandenburg Gate in Berlin, by answering two questions – one of them relative and the other one absolute. Imagine a first, relative, question asking whether the Brandenburg Gate is taller or shorter than 150 meters. This was followed by an absolute question on how tall the Brandenburg Gate is. The researchers found that the answers to question number two correlated positively with the number that participants were presented with in the first question. They also found the anchoring effect to be stronger when the questions were along the same dimensions. Practically, this means that if the first question was regarding the height of the Brandenburg Gate, the anchoring effect was larger if the second question also was about the height rather than the width of the Brandenburg Gate.

Underlying mechanisms of anchoring

In order to gain a deeper understanding of the anchoring effect, it is necessary to state the different theories regarding how the anchoring effect works on a psychological level. The debate on the underlying psychological mechanisms of anchoring has not yet been settled and, currently, there are two main views on the subject.

Tversky and Kahneman (1974) offered an early theory, arguing that anchoring is due to a process of adjustment. According to this theory, we use the anchor as a starting point from where we adjust until we can no longer be sure that we are wrong. This means that if we are being anchored on a high value, we will start off by subconsciously asking ourselves if this value is plausible, if not, we will continue to incrementally adjust our estimation downwards. This adjustment continues until we can no longer be sure that the value is too high. This process typically ends prematurely, hence the anchoring effect (see, e.g., Epley and Gilovich 2001, 2005).

This view is supported empirically through experiments done by LeBoeuf and Shafir (2006). In one of their experiments the participants were divided into two groups and given two slightly different tasks. The first group was given a piece of paper with a short line on it and they were asked to extend the line until it was 3.5 inches long. The other group was also given piece of paper, but with a long line on it, and was inversely given the task to shorten it by placing a horizontal slash where they estimated the line to be 3.5 inches long. The results showed that the group with the short line as a starting point, on average, drew shorter lines than the group given a long line, providing support for the theory of incremental adjustment. On the other hand, there have been several studies indicating that if this theory carries any explanatory weight at all, it is only applicable in certain specific settings (Strack and Mussweiler 1997; Mussweiler and Englich 2005).

The second main theory focuses on how an anchor affects our judgment through confirmatory hypothesis testing. One branch of this theory, called selective accessibility, argues that anchors affect the selection and processing of information. If a person is given an anchor, he or she will look for information to confirm that the anchor is true, thus putting a stronger focus on information relevant to the anchor, even though the anchor is rejected as a plausible alternative on its own merit.

There is stronger empirical support for this second, and more recent, theory (Strack and Mussweiler 1997; Chapman and Johnson 1999; Mussweiler and Englich 2005; Englich, Mussweiler and Strack 2006). Wegener et al. (2001) suggest an alternate version of the

confirmatory hypothesis testing view, arguing that anchors can change our attitude. This will help explain why the amount of anchoring would not increase for extreme anchors. Instead, if the anchor changes the attitude of the subject, Wegener et al. suggest that the extreme anchor could trigger a search for counterarguments against the presented anchor value.

Along a very much similar path, Blankenship et al. (2008) argue that how we anchor depends on the level of thinking required when facing a problem. They divide the way we treat a problem into thoughtful and non-thoughtful processes, arguing that anchoring can occur with both types of thinking, but that the source of the effect differs. For a non-thoughtful process, we anchor on the anchor value itself. In a thoughtful process, the anchor affects the way we treat information presented to us.

Epley and Gilovich (2001, 2005) argue that the anchoring effect may be attributable to both the two main theories, i.e. anchoring as a process of adjustment and confirmatory hypothesis testing, depending on if the anchor is self-generated or externally provided. They found indications that the process of adjustment is at play when the anchor is self-generated and close to the answer, while the other theory better explains the anchoring effect when the anchor is externally provided.

Apart from the two most well established views, some other alternative takes have come forward. Tom Cunningham (2012) presents an a more recent model regarding biases as misapplied heuristics. The model is based on a two-step formation of judgment where information is dispersed between the two stages. The first stage being a pre-conscious process, while the second being a conscious process. According to his theory, the first stage has an established relationship between what we are trying to estimate and a set of cues. On the basis of these, it forms a signal and sends it to stage two. Even if stage two knows that we are being affected by uninformative information, it cannot "decontaminate" the signal from stage one because it does not know how stage one has treated the cues i.e. it does not know how the distortion has affected our automatic judgment. Thus, the bias remains.

For instance, it is known that people in general overestimate the distance of an object when looking through fog (Cavallo, Colomb and Doré 2001), and even if we are aware of this, the bias still exists (Cunningham 2012). According to Cunningham's theory, people are not able to eliminate the bias because we do not know what cues our first stage uses, hence we cannot correct for any of them being faulty. The model can therefore explain why anchoring does not disappear when subjects are aware of the anchoring experiment or given incentives to avoid it.

The dual process model

Much of the research regarding heuristics and behavioral biases is centered around a dual process model. The model differentiates between two types of systems for reasoning, one heuristic and one analytical. The dual process model has been stated and used in various ways (see, e.g., Evans 1984; Epstein 1994; Evans 1996; Sloman 1996; Stanovich and West 1999), but there are some general properties that bind the different versions together.

The first type of system, based on heuristic processing, is often applied to problems where there is no need to think very much about the problem presented. Instead, the answer is of a more intuitive nature based on experience and stereotypes (Kokis et al. 2002). This system is commonly referred to as System 1. It does not require much thinking to recognize that someone walks into a room, identify an angry facial expression or determine from which direction a sudden sound originates. These responses occur naturally without requiring direct attention. As Epstein (1994) notes, a response from the heuristic system may often feel intuitive, but it cannot always be explained why it feels like the correct answer.

The second, more analytical, system is a conscious process relying on logic and active reasoning. This type of system is called System 2 and requires more attention and concentration to be directed towards the problem. A common example is performing a mathematical computation, say 54*23. Given some time the computation can surely be performed, but it will be difficult to do so without focusing on it. If interrupted, the process will halt until attention is redirected towards it (Kahneman 2011, 22).

However, the two systems are in most cases not used separately or without influence upon each other. Instead, there is almost always interaction and feedback between the two systems and the brain divides the total amount of attention between these two systems simultaneously (Kahneman 2011, 32-38). Although very much thinking would not be needed to recognize that someone makes an angry facial expression, System 2 may be triggered when trying to figure out what to do of the situation. Directing our attention towards a task, using System 2, pacifies System 1 (Kahneman 2011, 24). When deeply absorbed in a tough problem to solve we may even fail to notice someone trying to talk to us, something that usually System 1 would recognize with ease.

A test used in many of the studies on the subject, and that will be used in this paper, is the Cognitive Reflection Test (CRT) developed by Shane Frederick (2005). It is intended to differentiate between the two types of processes in the dual process model.

The CRT consists of three questions that the respondents are given two minutes in total to answer. The questions are constructed to have an intuitive, but incorrect, answer. Consider the following question:

"A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball.
How much does the ball cost?"

The intuitive answer would be 10 cents. If the problem is given some further thought and closer mathematical examination, the conclusion would be that the ball must cost 5 cents. This means that when using the heuristic system, the respondent will most likely answer incorrectly, and if the respondent uses the analytical system the answer is likely to be correct.

Frederick (2005) finds that the CRT can predict some, but not all, cognitive biases. He also tests the CRT against several measures of cognitive ability, finding that they correlate. Finally, the average score on the test is generally higher for men than for women.

Apart from Frederick (2005), several other researchers have used the CRT (see, e.g., Oechssler, Roider and Schmitz 2009; Bergman et al. 2010; Hoppe and Kusterer 2011; Toplak, West and Stanovich 2011; Brañas-Garza, Garcia-Muñoz and González 2012; Shenhav, Rand and Greene 2012). Oechssler, Roider and Schmitz (2009) found that the CRT score affects time inconsistency; risk preferences; conservatism and updating probabilities significantly. However, they do not find any statistically significant results for the anchoring effect. Their results are closer to suggesting that higher CRT score does seem to increase, rather than decrease, the anchoring effect. The results of Bergman et al. (2010) suggest that a higher score on the CRT would decrease the anchoring effect, but their results are not statistically significant either.

Cognitive biases, cognitive ability and age

Due to the close relationship between age and cognitive ability (see, e.g., Kokis et al. 2002), we will also discuss the effects of cognitive ability on the use of heuristics and biases. However, many of these studies use age and cognitive ability interchangeably, as the development of cognitive skills is related to aging. Still, there have been a fair amount of studies devoted to how age may affect our use of heuristics (Klaczynski and Gordon 1996; Klaczynski 1997, 2001a, 2001b; Kokis et al. 2002).

Our analytical system is often regarded as something that develops with age, making our reasoning more analytical, complex and abstract. This will in turn allow the analytical system to override the heuristic system with greater success (Stanovich and West 2000; Klaczynski 2001a).

Furthermore, it is often assumed that the engagement of the analytical system makes us less susceptible to cognitive biases. While there have been findings supporting the view that the analytical system develops as we age (see, e.g., Byrnes and Overton 1986; Markovits and Vachon 1989; Klahr, Fay and Dunbar 1993; Bara, Bucciarelli and Johnson-Laird 1995; Janveau-Brennan and Markovits 1999), the second postulation of decreased bias with increased development of the analytical system lack the empirical underpinnings of the former one. Some studies have shown that an increased reliance on the analytical system decreases certain cognitive biases (see, e.g., Jepson, Krantz and Nisbett 1983; Kahneman and Tversky 1983; Stanovich and West 1998). On the contrary, it has also been shown that increased cognitive ability increases other cognitive biases (see, e.g., Jacobs and Potenza 1991; Reyna and Ellis 1994; Davidson 1995).

A famous example is the conjunction fallacy, where the subject estimates p(AB) as more probable than p(A) and p(B). Kahneman and Tversky (1983) found that the likelihood of committing this fallacy is suppressed for individuals with higher intelligence. Therefore, the likelihood of committing this fallacy should also decrease with age, as higher age is generally associated with higher intelligence. Oppositely, Davidson (1995) found that the tendency to commit the conjunction fallacy was greater for older children than for younger ones.

Kokis et al. (2002) study the relationship between age, heuristics and cognitive biases. The effect of age and cognitive ability is tested on three types of tasks: inductive reasoning; deductive reasoning under conditions of belief bias as well as probabilistic reasoning. They find that increased age is associated with an increase in performance of the first two tasks, and that higher cognitive ability implies a more analytical answer in all three tasks.

While cognitive ability arguably differs with age, it is not the only feature changing as we age. Apart from cognitive ability, there is also a need to take other factors such as experience into account when considering how age affects the way we make decisions. The possibility that younger people's inexperience in purchasing decisions may make them more susceptible to various cognitive biases, including anchoring, was raised by van Boom (2011), who relates this to European consumer law.

Moreover, Bettman and Park (1980) find some differences in the consumer decision process depending on how experienced the customer was with the product. This may have interesting implications for the anchoring bias, suggesting that the strength of the effect may be dependent on how experienced we are with buying decisions. Park and Parker (1981) find that the less familiar we are with a product, the more we rely on heuristics and the more susceptible we are to

biases in the purchasing situation. They find a greater tendency to rely on price when forming a buying decision if we are less familiar with a product. This may be both due to an intentional focus on price as informative of the product's quality, but perhaps also a stronger anchoring effect. On a similar note, van Exel et al. (2006) find that the anchoring effect seems to increase with higher ambiguity, lower familiarity, relevance or personal involvement in a decision.

The difficulties of predicting biases with the dual process theory may stem from the theory being too simple to accurately capture the intended relationship. Therefore, a slightly more advanced theory, the fuzzy trace theory, may prove a better predictor. The theory builds on the dual process model, but expands the set of assumptions to also include memory (Reyna and Brainerd 1995). According to one variant of the fuzzy trace theory, both heuristic and analytic reasoning improve with age. This may explain some variation in the empirical findings.

Method and experimental design

One of the goals with this paper was to replicate an experiment conducted by Ariely, Loewenstein and Prelec (2003) and consequently we adopted a very similar experimental design. The thought behind the design was, in short, to anchor valuations of regular consumer products by asking the subjects two questions for each of the six different products used in the experiment. The first question was of a simple yes or no character, asking if the respondent was willing to buy the product at a random price. The second question asked for the respondent's highest willingness to pay for the product. These two questions were repeated for all of the six products. According to our expectations, the two values submitted should be correlated. Practically, a high random number in the first question should lead to a higher willingness to pay in the second question. If this would be the case, then an anchoring effect is observed.

We carried out a specific transaction procedure in order to make sure that the participants had the incentive to submit truthful valuations. However, before the transaction procedure, a Cognitive Reflection Test (CRT) was performed. This resulted in a chronological flow of the experiment starting with the valuation procedure, followed by a CRT test and ending with the transaction procedure. Throughout this section more specific details of and considerations on the experimental structure are provided.

Sample

Our experiment was conducted in four different sessions at Tibble Gymnasium in Täby, Sweden on Tuesday the 19th of March 2013. The total sample of 88 secondary school students consisted of 43 first year students and 45 third year students and was sampled from four different classes. This design was chosen with the second goal of our thesis in mind, namely to investigate whether the anchoring effect varies with age.

The sample consisted of 67 females and 21 males, all pursuing the Social Science Program. The age in the sample ranged from 16 to 19 years old, with the exception of one student being 21 years of age. As all participants were fluent in Swedish, the experiment was conducted in Swedish in order to reduce the risk of misinterpretation. In order to be able to engage in the purchasing procedure, the students were given a reward of 100 SEK. for participating.[2]

[2] At the time of the experiment, this amount was equal to approximately 15.50 USD.

Products

Six different objects were used for valuation. The students were asked to evaluate the following products: A set of portable speakers for smartphones; an organic juice of regular size; a luxurious handmade chocolate bar; an Easter egg filled with penny candy; a DVD copy of the comedy-drama film "50/50" and a book on smartphone photography.

The products were chosen to appeal to an audience as wide as possible within our sample in order to avoid zero-bids. Altering the product assortment was necessary as this study was performed with younger respondents than the original study. Ariely, Loewenstein and Prelec (2003) use two types of wine in their study, but selling wine to minors would be illegal. Furthermore, it was decided that teenagers would prefer an Easter egg and book on smartphone photography to expensive chocolate truffles and a book on design. Other important factors to consider when selecting products were that they should be easy to value in a relatively short period of time and that the price ranges of the products would be coherent with the participation reward of 100 SEK.

Valuation procedure

Before the valuation procedure begun, the participants read the instructions by themselves. Thereafter, we did a short recap of the instructions with the whole class in order to make sure that everyone had understood the valuation procedure and the implications of the transaction procedure.

The valuation procedure itself consists of two questions for each product. The form used in the valuation procedure can be found in Appendix II. The first question was supposed to serve as the anchor in this experiment by introducing a random number, asking whether the participants were willing to buy the product at that specific price. A practical example would be: Would you buy this item for 50 SEK? In our study, the participants' personal ID number was used to generate this random price, a method first introduced by Chapman and Johnson (1999). Instead of providing the subjects with an external anchor, they retrieved a self-generated anchor using their own memory. Practically, each student put down the last two digits of his or hers personal ID number as the random price by which all products would be judged. This value will henceforth be referred to as the anchor or the anchor value. Using this number was beneficial as it gave us a random distribution of anchor values ranging from 0-99, that was easily compatible with the value of the products in the experiment as well as with the participation reward of 100 SEK.

After answering yes or no to the first question, the subjects were asked to state their maximum willingness to pay for the specific product. This procedure was repeated six times and the participants had to fill in their anchor value in the questionnaire for every product. That is, by answering the first question for each and every product, the anchor was reinforced before stating a maximum willingness to pay. This measure was taken in order to avoid the stated maximum willingness to pay in the previous question to serve as a competing anchor to the following product.

We were very careful not to give any detailed descriptions of any of the products. Providing the students with too much oral information about the products could possibly affect their valuations. This was especially important since the experiment was conducted in four separate sessions and any variation could distort the comparability of our results.

To simulate a real purchasing decision, the participants were given the opportunity to inspect the products. They were brought forward in groups of 5-7 students as to avoid being distracted by one another. No time specific limit for the inspection was set. Instead, it was made sure that the students carried out the valuation properly and in their own time without feeling any time or peer pressure.

Since some studies have shown that the anchoring effect may decrease with awareness, great care was taken to make sure that the students were not aware of the objective of the experiment (Wilson et al. 1996; Epley and Gilovich 2005; LeBoeuf and Shafir 2009). This was of particular importance in our case as this probably was, unlike many other similar studies, the first time that any of the students participated in this type of study. If the participants were made aware of the structure, content or the objective behind the experiment, one of the main advantages with our chosen sample would no longer be present. This was also why the participants were not informed regarding these matters after the conclusion of the experiment, as this would present a risk that they would communicate this information to students scheduled to be part of the experiment in a later session.

Transaction procedure

As established earlier, we wanted to simulate a real buying decision, as this would obviously carry more explanatory weight than a purely hypothetical experimental study with counterfeit money or a valuation exercise with no actual transaction. In order to do this, it had to be made sure that participants were actually presented with a real buying decision. Presenting each and every student with the possibility to purchase all of the six products was nevertheless not feasible.

Consequently, it was made clear that each product used in the experiment was to be randomly coupled, by the way of a draw, to a student who would be given the possibility to buy that product.

As to make the entire valuation matter, it was made clear that both questions could be the basis for a potential transaction. After all the products had been coupled to a random student, six separate coin tosses were performed to decide whether it would be the first or the second question determining the outcome for the different products.

If the first question (the yes or no question) was drawn, the individual anchor value determined the price of the product. A transaction would take place if the respondent coupled to that specific product had answered YES on whether he or she would be willing to purchase the product in question to the SEK price equal to their anchor value. Conversely, a transaction would not take place if the answer was NO.

If the second question (maximum willingness to pay) was drawn, the randomization stated in Becker, DeGroot and Marschak (1964) (BDM) was used. To determine what price the product was to be sold at, a random number in intervals of five was drawn from zero and up to the highest possible price of that product. If the stated maximum willingness to pay was equal to or higher than the randomly drawn number, the product was sold at the randomly drawn number. If the maximum willingness to pay was lower than the random number, no transaction took place. What was considered the highest possible price was determined separately for each of the six products by us and was not disclosed to the participants.

The point of applying this fairly complicated method was to not give the students any incentives to post a lower value than they would actually be willing to purchase the product for. In the absence of this method, it would be beneficial to post zero as the maximum willingness to pay in hope that the second question would be drawn as the determinant. Anticipating that the implication of this method might be hard to grasp, we addressed the issue specifically during the short recap of the instructions. The participants were told that it was in their own interest to be as truthful as possible due to the design of this method.

As mentioned earlier, the students were paid 100 SEK each for participating. The reward was given in conjunction to the transaction procedure, in order to be certain that no students would anchor on the amount of the fee, which had not been revealed earlier. Another factor considered was that people might unconsciously give less effort to make truthful valuations if they already had received payment for participating.

Cognitive Reflection Test

A CRT was included in order to give us some way of controlling for cognitive ability. The test was performed directly following the valuation procedure, but before the transaction procedure. The reason for this chronological structure was two-fold. Firstly, it was due to logistical reasons, as it was easier to collect the valuation questionnaire and the CRT form simultaneously. Secondly, it made sure that the students did not anchor on any of the values presented in the CRT. A full version of the test is included in the Appendix III.

As stated earlier, the time given for completing the three questions included in the CRT was two minutes. A separate piece of paper was used as the form for the CRT and the participants were not allowed to examine the questions beforehand, as this would constitute a breach of the regulated time spent on the test. The subjects were not given any information regarding the structure or the reason for the inclusion of the CRT, instead the form was referred to as "control questions".

Comparison to the original experiment

Knowing that others (see discussions in Simonson and Drolet 2004; Alevy, Landry and List 2010; Tufano 2010; Maniadis, Tufano and List 2012) have tried to replicate the findings by Ariely, Loewenstein and Prelec with varying success, there was a need to study the experimental design of the original study closely. To compare the experimental design of this study, the paper itself was consulted. However, helpful contact was made with Oscar Bergman regarding the Swedish translation of the experimental instructions and e-mail correspondence between Magnus Johannesson, co-author of the Bergman et al. (2010) study, and Drazen Prelec regarding the method of original test was received.

One main difference between the Ariely, Loewenstein and Prelec study and its replications is related to how the BDM method was applied in the transaction procedure. In the original experiment, all the possible values that could be used to determine the price if the second question was drawn as the determinant were displayed throughout the experiment via an overhead projector. Even if this should not affect the valuations of the participants, it has been shown that specifying the possible range of prices can influence the bids (Bohm, Lindén and Sonnegård 1997). In the dilemma of staying true to the original study or running the risk of introducing anchors, we chose to err on the side of caution and keep the highest possible prices to ourselves in order to not introduce any unwanted anchors. Bergman et al. (2010) took the same measure of caution.

Another difference as compared to the study by Ariely, Loewenstein and Prelec (2003), apart from the alteration of language, is that the experiment was conducted with another currency. As this test, similarly to the experiment carried out by Bergman et al. (2010), was performed in Swedish, we made sure to use the same questionnaire as Bergman et al. However, one minor change was made to in order to further illuminate the transaction processes and make sure that the younger and more inexperienced participants understood the experiment. Each session took roughly 40 minutes to complete.

Statistical hypotheses

In order to test the two research questions outlined in the introduction, we decided to test our experimental data econometrically, as is universally done within the field of behavioral economics. To achieve this, standard OLS regressions were performed using the statistical analytics software Stata.

To answer the first research question, to see if it was possible to replicate the study by Ariely, Loewenstein and Prelec on a sample of secondary school students, a separate regression for each of the six products was run. Additionally, we ran a regression on the average willingness to pay in order to examine the general anchoring effect in our product sample. All the seven regressions use the same structure in that the measurement for willingness to pay (WTP) in SEK is used as the dependent Y variable and therefore varies between the different regressions. Meanwhile, the only explanatory variable in this regression, X_1, is a measure of the two last digits in the respondents personal ID number, i.e. the anchor value. This results in the following expression:

$$WTP = \beta_0 + \beta_1 * anchorval + u. \quad (1)$$

In order to operationalize our first research questions, we will state the following hypothesis:

Hypothesis 1: The anchoring effect will be found in our sample of secondary school students.

In order to test this hypothesis for the different regressions, the following test will be used:[3]

$$H_0: \beta_1 = 0$$

To answer the second research question and see whether the anchoring effect varies with age, we build on the regression stated above. We begin by using the willingness to pay as the dependent Y variable and the anchor as the first explanatory variable.

[3] In order to facilitate the econometrical testing and interpretation of our hypotheses, we choose to pose reverse null hypotheses.

In order to investigate whether age is a significant factor, an age variable has to be added to the regression. This is the second explanatory variable. The age variable was calculated as the age of the participants at the date of experiment rounded down to the closest integer. The variable uses 0 as the base value, resulting in that the possible values are arranged in the pattern of 0=16 years, 1=17 years, 2=18 years etc.

However, the age variable only indicates if there is a difference in willingness to pay between the age groups. In order to study the effect of age on anchoring, an interaction variable between age and the anchor is added. This interaction variable has the coefficient β_5.

A third explanatory variable stating the score on the CRT is also added. The lowest and highest possible scores, and consequently also the values of the variable, are 0 and 3 respectively. The purpose for including a CRT score variable in this stage is to allow us to study the part of the age effect that is not due to a higher cognitive ability. As stated earlier in this paper, it seems like a reasonable assumption that third graders will have a higher cognitive ability than first year students and, as the study by Bergman et al. (2010) indicates, a higher degree of cognitive ability may reduce the anchoring effect. If this would be true, an artificially high variation of the anchoring effect due to age would be detected unless we control for cognitive ability. However, it should be stressed once again that the CRT is not a perfect measure of cognitive ability.

The sample is uneven in terms of gender distribution. As there have been signs that some cognitive biases differ depending on gender (see, e.g., Kudryavtsev and Cohen 2011), we also included a gender variable to control for possible differences. The dummy variable where 0=female and 1=male, is added as a fourth explanatory variable accordingly.

Subsequently, two interaction variables between the anchor and the CRT score as well as the gender variable are added respectively. These interaction variables are given the coefficients β_6 and β_7 respectively. This gives us the following expression:

$$WTP = \beta_0 + \beta_1 * \ anchorval + \beta_2 * age + \beta_3 * crtscore + \beta_4 * gender + \beta_5 * (anchorval * age) + \ \beta_6 * (anchorval \ * \ crtscore) + \beta_7 * (anchorval * gender) + u_{i.} \quad (2)$$

In order to operationalize our second research questions, we will state the following hypothesis:

Hypothesis 2: The anchoring effect varies with age.

In order to test this hypothesis for the different regressions, the following test will be used:

$$H_0: \beta_5 \ = \ 0$$

To perform analysis regarding the economic significance of the results from the second expression, some slight alterations had to be made. We replaced the *age* variable with a new dummy variable called *highage*. In terms of this new explanatory variable, which is known as X_2, a value of 0 indicates that the person is 16 or 17 years old and a value of 1 is equal to the person older than 18 years old. Consequently, an interaction variable between *highage* and *anchorval* will be created and this variable uses β_5 as its parameter. This gives us the following expression:

$$WTP = \beta_0 + \beta_1 * anchorval + \beta_2 * highage + \beta_3 * crtscore + \beta_4 * gender + \beta_5 * (anchorval * highage) + \beta_6 * (anchorval * crtscore) + \beta_7 * (anchorval * gender) + u_i \quad (3)$$

This expression is used solely to perform analysis on the economic significance of results from the previous regression. Therefore, no specific hypothesis was formulated.

Variations of these stated regressions excluding one or both of the two control variables will also be performed in order to test the robustness of our results.

Results

The dataset collected via the experiment consisted of a total of 89 respondents. One of the participants chose not to value three of the products. However, the responses provided by this individual were complete and reasonable except for these omissions. We therefore decided to keep the observation, even though this resulted in a slightly unbalanced sample in terms of the amount of observations for the six different products. In the second incomplete observation, the respondent had not stated his age. As one of the main points of this paper is to examine the effects of age on anchoring, this observation had to be omitted. Disregarding these two observations, all answers were considered valid and were used in the analysis.

It is important to note that a few participants left questions on the CRT sheet blank. This was interpreted as being unable to come up with a suitable answer in the required time frame, rather than misunderstanding the test. The vast majority managed to provide their answers in due time.

The regressions below are performed with robust standard errors. This was due to signs of heteroskedasticity found in the data set as well as to comply with the norm of using robust standard errors applied in the field of behavioral economics. Complementary analysis with regular standard errors was performed for comparison's sake, the results of which will be detailed later in this section.

Replication of the original study

Table 1 was produced performing regression (1) outlined in the previous chapter in order to test Hypothesis 1:

Table 1

VARIABLES	(1) book	(2) movie	(3) eastegg	(4) choc	(5) juice	(6) speakers	(7) averagewtp
anchorval	0.599***	0.445***	0.291***	0.191***	0.178***	1.120***	0.466***
	(0.205)	(0.155)	(0.0686)	(0.0529)	(0.0555)	(0.336)	(0.105)
Constant	54.05***	54.55***	29.33***	19.86***	16.02***	82.24***	42.98***
	(10.96)	(9.004)	(2.992)	(2.714)	(2.509)	(14.85)	(5.209)
Observations	87	88	88	87	88	87	87
R-squared	0.086	0.073	0.185	0.157	0.147	0.114	0.181

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As can be seen in Table 1, these regressions provide positive results favoring the existence of an anchoring effect, which can be seen by examining the coefficient *anchorval*. We can reject H_0 at 1% level of significance in all seven cases. Comparing our results with Ariely, Loewenstein and Prelec (2003), we can see that although our results are statistically strong, our effects are not as strong as theirs. Practically, the results can be interpreted as that the willingness to pay for the book increases by circa 0.60 SEK per increase in the two last digits, which amounts to a high degree of economic significance beyond the statistical significance.

The results are also presented in a less technical manner in Table 2, also illustrating the economic significance of the results. This facilitates comparison between our study and the Ariely, Loewenstein and Prelec (2003) study, for which a similar output is enclosed in Appendix V. This table presents the average stated willingness to pay organized by quintiles of the anchor value used in the experiment. Also, added in the last row is the Pearson correlation between the anchor values and the willingness to pay as well as the p-value of the correlation. Table 2 shows that the difference in willingness to pay is close to two times as large between the quintile containing the participants with the lowest anchor values and the top quintile for all products, as well as the average.

Table 2

VARIABLES	(1) book	(2) movie	(3) eastegg	(4) choc	(5) juice	(6) speakers	(7) averagewtp
Quintile 1	56.2	57.7	31.9	23.7	20.3	98.2	47.0
Quintile 2	76.6	68.9	38.8	24.4	22.9	119.8	58.6
Quintile 3	77.9	81.3	40.7	27.1	21.9	136.9	64.3
Quintile 4	91.9	83.1	48.6	27.8	22.1	160.7	72.3
Quintile 5	109.2	95.4	56.5	42.0	36.8	182.8	87.1
Pearson correlation	0.294	0.270	0.430	0.397	0.384	0.337	0.425
p-value of correlation	0.0058	0.0111	<0.0001	0.0001	0.0002	0.0014	<0.0001

The Pearson correlation coefficients are sizeable, ranging from 0.27 to 0.40 for the products, with an even higher value recorded for the average willingness to pay. These correlations are also highly significant, as the movie is the only product that is not significant at the 1 % level. These findings are similar to the ones presented by the original study where the correlations ranged from 0.32 to 0.52 and were also highly significant.

The results are also similar to Ariely, Loewenstein and Prelec (2003) in the sense that it records a significant "jump" when looking at the difference between the first quintile and second quintile as well as between the fourth quintile and the top quintile. Looking at the chocolate and the

juice, the effect in terms of a late increase in willingness to pay can be seen most clearly, as the anchoring effect in these cases is very sparse until the fifth quintile. However, the effect is still evident for the other products as well, even if it becomes less obvious as many other products also have a noticeable increase in willingness to pay in earlier stages, such as is the case for the movie and the book. Bergman et al. (2010) also recorded a similar pattern.

Does the strength of the anchoring effect vary with age?

Table 3 was produced performing regression (2) outlined in the previous chapter in order to test Hypothesis 2:

Table 3

VARIABLES	(1) book	(2) movie	(3) eastegg	(4) choc	(5) juice	(6) speakers	(7) averagewtp
age	12.49	2.396	0.401	4.853**	1.247	-5.915	2.310
	(8.223)	(8.039)	(2.534)	(2.383)	(1.954)	(13.56)	(4.600)
anchorval_age	-0.328**	0.00467	-0.0584	-0.0969**	-0.0632	-0.328	-0.141
	(0.155)	(0.149)	(0.0587)	(0.0426)	(0.0416)	(0.358)	(0.0996)
anchorval	1.392***	0.557**	0.427***	0.357***	0.190**	1.693*	0.761***
	(0.295)	(0.212)	(0.108)	(0.0803)	(0.0800)	(0.875)	(0.215)
gender	-27.35	27.24	-9.233	10.03	-6.210	2.412	1.580
	(26.08)	(30.49)	(5.588)	(8.359)	(7.936)	(40.73)	(15.47)
gender_anchorval	-0.0804	-0.680	0.00644	-0.295*	0.106	-0.934	-0.345
	(0.414)	(0.485)	(0.129)	(0.151)	(0.139)	(0.815)	(0.256)
crtscore	27.36*	10.90	-3.023	-1.244	-0.280	5.437	5.844
	(16.40)	(13.62)	(3.287)	(2.683)	(2.693)	(28.61)	(9.115)
crtscore_anchorval	-0.435*	-0.0388	-0.0113	0.0587	0.0807**	0.352	0.0115
	(0.234)	(0.216)	(0.0643)	(0.0602)	(0.0400)	(0.440)	(0.130)
Constant	28.64*	43.37***	30.24***	12.52***	16.46***	84.93***	36.53***
	(15.08)	(12.25)	(4.148)	(3.629)	(3.586)	(28.76)	(8.030)
Observations	87	88	88	87	88	87	87
R-squared	0.217	0.123	0.305	0.271	0.277	0.222	0.269

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Judging from the significance of the interaction variable *anchorval_age*, no clear-cut evidence can be found supporting that the anchoring effect varies with age. H_0 can be rejected at the 5% level of significance in case of the chocolate and the book, but none of the other regressions yield statistically significant results enough the reject H_0. The anchoring effect in itself is still evident after adding our control variables and interaction terms. However, the *anchorval* variable is now only significant at the 5% level in the case of the movie and the juice and at the 10 % level in the case of the speakers.

However, it is important to note that in all cases except the movie, the beta values of the interaction terms indicate a negative correlation between the anchoring effect and age. Thus, our results give us some indication that the anchoring effect may be reduced by age. This leads us to examine the economic significance of the results as it helps in exploring the potential need for further studies.

In order to ease the interpretation of the interaction term, we decided to perform additional analysis with a slight modification of the regression model. When interpreting an interaction variable consisting of two continuous variables it is necessary to decide a relevant span of values to look at for the interaction variable. An often used alternative is to center the variables by subtracting the mean from each observation. However, this does not facilitate our interpretation of the economic significance and therefore we were forced to take other measures.

In order to work around the difficulties interpreting the interaction variable, a new variable was created, namely a dummy variable called *highage*. A value of 0 indicates that the person is 16 or 17 years old and a value of 1 is equal to the person being older than 18. All students in the high age category were 18 or 19, with the exception of one student being 21. Therefore, in order to ease the interpretation of the economic significance, we performed regression (2) substituting *age* with *highage*. This regression was specified as (3). The results can be found in Table 4.

Table 4

VARIABLES	(1) book	(2) movie	(3) eastegg	(4) choc	(5) juice	(6) speakers	(7) averagewtp
highage	21.19	-1.207	-2.109	8.804	3.669	-40.76	-2.414
	(20.02)	(18.41)	(6.185)	(5.545)	(5.202)	(33.79)	(11.14)
highage_anchorval	-0.394	0.130	-0.0322	-0.147	-0.0993	-0.0979	-0.0956
	(0.422)	(0.323)	(0.150)	(0.114)	(0.113)	(0.899)	(0.259)
anchorval	1.129***	0.499**	0.361***	0.299***	0.148*	1.300	0.614***
	(0.297)	(0.196)	(0.101)	(0.0863)	(0.0820)	(0.865)	(0.219)
gender	-27.79	27.50	-9.478*	9.983	-6.465	1.676	1.458
	(26.26)	(30.84)	(5.465)	(8.551)	(8.007)	(41.04)	(15.76)
gender_anchorval	-0.0429	-0.681	0.0143	-0.288*	0.117	-0.920	-0.335
	(0.413)	(0.488)	(0.128)	(0.152)	(0.140)	(0.822)	(0.260)
crtscore	27.90	11.30	-3.029	-1.131	-0.231	3.871	5.725
	(17.13)	(14.01)	(3.339)	(2.531)	(2.672)	(30.14)	(9.673)
crtscore_anchorval	-0.467*	-0.0558	-0.0156	0.0540	0.0765*	0.371	0.00472
	(0.253)	(0.224)	(0.0683)	(0.0602)	(0.0419)	(0.460)	(0.140)
Constant	35.21**	46.77***	31.91***	14.55***	16.60***	97.23***	40.88***
	(14.92)	(11.38)	(4.076)	(3.882)	(3.540)	(28.56)	(8.183)
Observations	87	88	88	87	88	87	87
R-squared	0.194	0.123	0.290	0.244	0.251	0.207	0.244

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Reviewing Table 4, we can conclude that the small traces of statistical significance that existed in the previous regression using a continuous age variable vanish when using a compounded dummy variable. However, the main objective was not to ensure statistical significance, but easing the analysis of the economic significance.

When looking at the economic significance, a guideline proposed by Wooldridge (2009, 197-99) is to use the mean value in the relevant variables. Therefore, in order to interpret the economic significance of the interaction variable *highage_anchorval*, as the *highage* dummy variable varies between 0 and 1, the mean value of *anchorval* was kept constant. Therefore, the value of 46.6 was assigned to the *anchorval* variable, as this is the mean in this sample.

That is, by multiplying the coefficient of the interaction variable by 46.6, the following difference in anchoring effect between observations in the low and high age group can be detected. The product of this multiplication can be labeled the average anchoring effect in SEK. In order to interpret the economic significance, the average anchoring effect must be judged in relation to the average price of that specific product rather than just looking at the coefficient.

Consequently, the average anchoring effect was divided by the average value in willingness to pay for each product. This division produces a quotient labeled the average anchoring effect as a percentage of the average willingness to pay in SEK. This value will also serve as the basis for our interpretation of the economic significance of the effect that age has on the anchoring effect. The results from the calculations outlined above can be seen in Table 5.

Table 5

VARIABLES	(1) book	(2) movie	(3) eastegg	(4) choc	(5) juice	(6) speakers	(7) averagewtp
Mean of anchorval = 46.6							
highage_anchorval coefficient	-0.394	0.130	-.0322	-0.147	-.0993	-.0979	-0.0956
Average anchoring effect (SEK)	-18.360	6.58	-1.501	-6.850	-4.627	-4.562	-4.455
Average WTP in SEK	82.15	75.27	42.86	28.83	24.32	134.80	64.87
Average anchoring effect as a percentage of the average WTP (SEK)	22.3%	8.0%	3.5%	23.8%	19.0%	3.4%	6.9%
Observations	87	88	88	87	88	87	87

Looking at the specific values in Table 5, the percentages for the book, the chocolate and the juice stands out as being of fairly high importance. The anchoring effect due to age is equal to

approximately 20 % of the mean price of the respective goods, which can be deemed as highly economically significant. The remaining products show a more moderate effect, with all the effects being well below 10 % of the mean price. Also, as noted previously, the anchoring effect in case of the movie goes the other way. All in all, the economic significance is not as clear-cut as in the previous example, but it is still sizeable enough to warrant further exploration.

Robustness of our results

When testing for heteroskedasticity using both a White and a Breusch-Pagan test for heteroskedasticity, some concern arose that the distribution of the error terms (u_i) could be heteroskedastic (Breusch and Pagan 1979; White 1980). Heteroskedasticity would violate the assumption of homoscedasticity required in the standard linear regression. However, as we decided to run the regressions with robust standard errors, heteroskedasticity will not pose a problem in our analysis.

Furthermore, the decision to run the regressions with robust standard errors did not seem to have any meaningful repercussions in terms of altering the results significantly. We conclude this by comparing the results presented above with outputs obtained by running the exact same regression using regular standard errors. Very small differences were found when performing the two regression used to test the two hypotheses, i.e. the results described in Tables 1 and 3.

In the simple regression, the level of significance in terms of the *anchorval* variable in the regression for the movie improved to 1 % from 5 % using robust standard errors. Similarly, in the multiple regression, the *anchorval_age* variable in terms of the book improved to 5 % to 10 %. This shows that, in both cases, the use of robust standard errors strengthened our results. Analogous analysis was also performed regarding the expression with the dummy variable *highage* presented in Table 4. In this case, the differences in statistical significance are slightly larger when introducing regular standard errors compared to the two previous expressions, but still of no practical importance.

In order to further test the robustness of our regressions, alternative regressions excluding one or both of the two control variables were performed. The output from these regressions, arranged in Tables A1-3, can be found in Appendix IV. Correspondingly, these regressions were both performed using regular and robust standard errors and, similar to the regressions described above, altering the type of standard error did not yield any meaningful differences. Similarly, no notable changes were found when altering the use of the *age* variable and the dummy variable *highage* regardless of using robust or regular standard errors.

Varying the type of standard error and the age variable did not result in any significant differences in either effect or statistical significance of the variables relevant for the hypothesis testing. However, the movie is an exception to this general conclusion. When excluding one or two variables, the already positive effect of the interaction variable *anchorval_age* increases notably. Furthermore, the *anchorval* variable tends to lose statistical significance in the cases of the movie and the speakers when omitting one or two control variables.

Precautions with regard to the experiment procedure

In order to confirm the executional consistency of the experimental method outlined in the third section, additional analysis was performed. As we gathered our data in four separate sessions it was necessary to see if any of the samples might have been performed differently. We performed four regressions isolating the observations from the four different sessions and found that the anchoring effect was present for all four groups. The effects were similar and still statistically significant, giving no indications that there were any significant deviations in the setting between the four sessions.

Isolated results of the CRT

As Shane Frederick's Cognitive Reflection Test was used to control for any differences in cognitive ability pertaining to aging, we present its results separately. Moreover, it might be of interest as an additional observation added in terms of the relationship between age and cognitive ability outlined earlier in this paper. The results are described in Table 6:

Table 6

	Lowest score	Highest score	Mean score	Mean score – 1st year	Mean score – 3rd year	Mean score – Male	Mean score – Female
CRT score	0	3	0.456	0.305	0.600	0.952	0.299
No. of obs.	88	88	88	43	45	21	67

The sample mean score is 0.46; implying that, on average, each participant had less than half a question right out of the three questions. When comparing the two grades, the scores are higher for participants studying their third year. This harmonizes with theory arguing that the analytical system develops as we age (Stanovich and West 2000; Klaczynski 2001a). The mean score is considerably lower than those compiled in Frederick (2005), where the most impressive sample, recorded at the Massachusetts Institute of Technology, had a mean score of 2.18. The average respondent in the tests that Frederick has collected has 1.24 answers correct. The lowest average result on a school-basis was recorded at the University of Toledo where the mean was 0.57. In

the study of Bergman et al. from 2010, a CRT test was carried out and the average score was 1.34.

The scores of our respondents are among the lowest recorded, but there are two fairly simple explanations to this. First of all, the tests reported by Frederick and Bergman et al. are exclusively performed on undergraduate students, while our test was performed on younger people. Generally, younger students can be expected to perform worse on cognitive tests. Also, our sample consisted of considerably more females. As discussed, females tend to score lower than males in cognitive tests, including the CRT (see, e.g., Halpern 2000; Frederick 2005).

Discussion of results

General strength of the results

As described in the results section, strong results in favor of Hypothesis 1 can be found by and large, but statistical significance supporting Hypothesis 2 is lacking.

Despite not finding any evidence in favor of any age-related disparity of the anchoring effect, the fact that we found such a strong effect among the adolescents is cause for attention and further examination in itself. In showing a strong anchoring effect using a sample not drawn from a university, this study contributes to the state of knowledge by adding to the observed situations in which anchoring can be found. It also helps to strengthen the empirical support for some of the findings by Ariely, Loewenstein and Prelec (2003). While we provide an empirical example, showing that the effect certainly can be replicated, our results are not fully as strong as theirs.

Apart from us, others have tried to replicate the Ariely, Loewenstein and Prelec study, with varying success. While Bergman et al. (2010) succeeded; there have been studies failing to show the effect (see, e.g., Alevy et al. 2011; Fudenberg, Levine and Maniadis 2012). Potential sources of the difference between our study and the others may include: a sample from an arguably more representative population, the lack of awareness of experiments in general, comfortable and familiar environment, choice of products as well as a well-executed experiment.

The anchoring effect has been shown to differ with awareness or knowledge (Wilson et al. 1996; Epley and Gilovich 2005; LeBoeuf and Shafir 2009). A lower level of awareness for the participants in our study as compared to those of other studies may have contributed to our strong results. Undergraduate business students are more likely to be aware of the anchoring effect or similar cognitive biases than secondary school students. Also, business students are in general more commonly used as subjects in economic experiments, which probably results in a higher general familiarity with the structures and goals of economic experiments. These two reasons provide support for the assumption that our subjects were less aware of the anchoring effect, as compared to participants in several other studies. This may have contributed to the strong anchoring effect.

Furthering the argument that the strong results may be partly due to awareness is the fact that the experiment was set in the participant's ordinary classroom as a part of their regular class.

This might have made them less suspicious of the objective of the experiment. Other tests are often conducted in a designated and separate arena that may divert participants from their natural behavior. Getting away from these may have contributed to the strength of our effect.

Additionally, it must be noted that participation in the experiment was mandatory in the sense that it was part of the regular schedule. This is opposed to how experiments are often carried out in university settings, where they are often held outside of the curriculum.[4] Allowing subjects to decide themselves whether to participate or not could result in a biased sample, as the people most interested in economic experiments or the particular subject might choose to take part to a higher degree. This could hypothetically decrease the anchoring effect. In this study, this issue was obviously not present as no similar self-selection was possible as the classes generally had a high rate of attendance.

As the design of this experiment was consciously adapted to fit younger participants, some changes were made that could have affected our results. It is possible that there was a better match between the products and the participants' preferences in this study, which could be suspected as very few zero-bids[5] were received and the products were on average valued similarly to their respective retail price. Supposing that a more appropriate selection was made, this would accordingly increase the reliability of the valuations.

We gave great effort to describing the transaction procedure in order to make sure that all participants understood that they were presented with an actual purchasing decision. It is possible that the participants, due to the supplementary information that was given during the experiment, viewed the task as a product valuation rather than an experiment. We also believe this emphasis on the transaction procedure to have increased the external validity of the study by enforcing that this was actually a real purchasing opportunity with genuine consequences, rather than just a theoretical experiment.

Differences among products

As can be concluded from the results, a strong anchoring effect is present for all products. The movie is slightly less statistically and economically significant than the other products, something that may be due to the item not being an appropriate product according to the experiment's standards. Today, many teenagers download movies, legally or illegally, via the internet. Therefore, the choice of including a movie in the experiment might, in hindsight, oppose the idea that the products chosen should be common consumer goods that the participants should

[4] This is based on the authors' own experiences from similar experiments conducted at several universities.
[5] Only 2 out of 525 total bids were zero-bids.

be willing to actually purchase. That is, even if reasonable answers were given, it might not have felt like an actual purchasing situation, as the participants would not really buy the product in its presented form.

Another potential explanation is that the name of the movie - "50/50" - might have served as an anchor in itself, undesirably affecting the valuation by introducing a competing anchor. However, judging from the results, this is probably not the case. The form used for the valuation, found in Appendix II, requires the participants to submit descriptions of the six different products and all students described the item as "a movie" or "a DVD". No single respondent overtly thought of the item as "the movie 50/50" or simply "50/50" when posting their valuation. Consequently, the movie can be compared to other trouble-free products that have similar numerical anchors on their packaging, such as the chocolate (weight in grams) and juice (volume in milliliter). Additionally, previous experiments have included goods such as wine bottles and other goods with numbers printed clearly on their packaging without noticing any issues with unwanted anchors. To sum up, the concern with statistical significance regarding the movie was not likely due to an unwanted anchor stemming from its title.

While great caution was taken not to introduce any unwanted anchors in the experiment, it is not possible to not have any unrelated numbers present in the experimental environment. In fact, it might not even be preferred to have a totally clean environment as this might reduce the external validity of the study by presenting the subjects with an unrealistic buying situation. To use an example: it might have raised more suspicion and unwanted attention if the numbers indicating the weight of the chocolate from its packaging was removed, as this would create a distraction rather than just letting the participants think of the goods as their everyday consumer products.

A final potential source of the variation in terms of the anchoring effect found between our products might be related to the discussion on the impact of the plausibility of the anchor values. A reason for the increased strength of the effect shown between the fourth and fifth quintile presented in Table 2 may, in accordance with the arguments presented by Epley and Gilovich (2001, 2005), be due to the anchoring value approaching a more appropriate range.

The age span of our sample

While the anchoring effect is highly significant for all products, the same cannot be said regarding a difference in anchoring with respect to age that is tested in Hypothesis 2. Significance is only to be found in the case of the book and chocolate, both being significant at the 5 % level.

One potential explanation to why no general significance was discovered is that our study only examines a fairly narrow age gap. While looking at first and third year students at a secondary school only allowed for two years of age difference, it was advantageous from another perspective. Namely, it made it possible to keep several external factors constant, which enabled for comparisons between the two groups. From an age-perspective, it would have been preferable to conduct the study with e.g. 15 and 25 year olds, as this range stretches over a larger age span. However, it is important to note that increasing the age span would make it harder to draw any conclusions with regards to the possible policy implications.

More speculatively, we believe that widening the age span, if possible, could be helpful in showing a difference in the anchoring effect between different age groups. It is possible that the difference in age between our subjects simply is not relevant and that a larger discrepancy can be found in other, but equally large, age spans. Another approach could be to compare our study with other similar studies made with other age groups to get suggestions regarding what age span may be appropriate to study. Nonetheless, we would like to note that this may be difficult due to other potential differences between the samples and methods besides just age, which disenables us from drawing casual inferences between our results and results of other studies.

If we hypothesize that anchoring is reduced by increasing age due to more exposure to buying situations and an augmented responsibility for the household economy, a different age span may yield a different effect. This can be related to discussions on experience by Bettman and Park (1980), Park and Parker (1981) and van Exel et al. (2006). Let us further assume that most secondary school students in Stockholm still live at home with their parents and carry similar responsibilities in the household regardless of their age. These two postulations imply that the adolescents in our sample have a similar level of experience in terms of making purchasing decisions.

If the statements above hold water, then it is possible that our age span did not capture the relevant phase where differences in age really have an effect. Perhaps altering the age span slightly to encompass ages from 18-22, would be a beneficial option in this case as this age span would likely capture the age when most people in Sweden move out and start their own household. This, on the other hand, will present difficulties relating to selection bias, as people that move out early might share some characteristics relevant for anchoring. It is also not certain that it is possible to find mirroring groups in terms of socioeconomic, geographical and other relevant factors when increasing the age span. However, we would also have to assume that

general experience makes a difference in our experiment using common consumer goods, which is something that admittedly may be questionable.

On another note, studying students from secondary school also improves the external validity of the study. While we are aware that this school attracts students with above-average grades and is located in a well-off municipality, it is still an improvement in terms of external validity compared to studies testing undergraduate business students. It must also be noted that, even if the school is located in an affluent region, it has a wide catchment area. By recruiting throughout the Northern suburbs of Stockholm, the school is endowed with some diversity in terms of socioeconomic and cultural factors.

In relation to the external validity, caution must be raised regarding the narrow age span of this study. While having a narrow age span facilitates any conclusions concerning potential policy implications, it is not favorable from an external validity perspective. Limiting our experiment to adolescents will severely dampen the conclusions that can be drawn with regard to the general population. However, it should be pointed out that this study is still on par with most other works within the field as the age span on the average university is not remarkably wider than ours.

CRT

A CRT was included in our experiment in order to give us some way of controlling for differences in cognitive ability. While we are aware that the other studies have not been able to find a connection between anchoring and results on the CRT (see, e.g., Oechssler, Roider and Schmitz 2009; Bergman et al. 2010), it was simply the only test that was possible to carry out in the limited time available.

While we sympathize with the argument made in Bergman et al. (2010) that a larger sample size might help in discerning the effect of the CRT on anchoring, it is not certain that a larger sample will prove the CRT to be a good indicator of anchoring. We believe that the mixed evidence for a relationship between the CRT and various biases is due to its simplicity; what makes up cognitive ability in all its depth can probably not be accurately described based on three questions.

Concluding remarks

Policy implications

Even if the age span possibly was found to be too small to judge whether any difference in age exists, it was chosen with potential interesting policy implications in mind. An initial thought was to relate the results to differences in consumer protection when passing the legal age of majority, which in Sweden is 18. When reaching this age, a person is no longer considered a minor and earns legal rights and responsibility for their own actions and economic situation. Fittingly, the age for first and third year students in a Swedish secondary school is 17 and 19, which would cover this span. Consequently, if the results would have been different, the framework for consumer protection for minors could have been discussed in the vein of van Boom (2011).

However, there is a possibility that it might be more telling to look at a completely other timespan, rather than just a wider one. For instance, looking at younger students might yield larger differences in the relevant factors, such as analytical ability and memory, that may also affect anchoring.

It should also be noted that just the fact that we have found such a strong effect in a sample including minors may be cause for attention, considering that they often are in a relatively more exposed economic position.

Future research

Generally, the subject of anchoring is well researched in both the economic and psychological fields. However, there is still work to be done exploring the anchoring effect in real world-settings. This could be done by using a an observational approach in order to use preexisting data, as done recently by Johnson, Schnytzer and Liu (2009) as well as Dodonova and Khoroshilov (2004). While limiting the settings being available for examination, the use of preexisting data removes any concerns about the participants being made aware of the purpose or the objective of the experiment.

Another approach is to work with experiments that better simulate an event similar to a real world-experience and with real consequences, such as the one carried out in this paper. In our opinion, it is vital that behavioral economics widens its perspective and works more with real world-settings than just hypothetical scenarios. Even if laboratory studies definitely have a purpose in e.g. examining the underlying mechanisms of anchoring, trying to simulate real world-settings should be used more often.

Another point to be made in regards to this specific paper is that the second research question purposefully was not stated as a general question. It is tempting to pose the question as investigating whether the anchoring effect does vary with age independent of any setting or factor, as this would increase the scope of the study. The reason for taking this more cautious outlook is, however, due to concerns about internal validity. As the literature review showed, anchoring effects tend to vary greatly in different experiments' settings and can be easily affected by certain factors. It would be somewhat disingenuous to draw too widespread conclusions from only one experiment and the scope of this thesis did not allow including several types of experiments in order to provide the possibility of drawing more general conclusions. That said, we endorse further studies replicating this experiment in other settings and with different subjects to gain further knowledge in how age affects the anchoring effect in purchasing decisions.

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Appendices

Appendix I: An English translation of the experiment instructions

Thank you for taking part in this pricing experiment. We are interested in how much you might be interested in paying for a number of items. We will show you a couple of products and then ask two questions about your valuation of each object:

- In the first question we will ask if you would want to buy the product at a set price. This price will be decided randomly by turning the last two digits of your personal number into a price in SEK.

- In the second question we will ask you to state the highest amount you would be willing to pay for the product.

For every item we will randomly select one person who will actually be offered to buy that product (this will be done by randomly drawing a questionnaire for every product after every participant has handed in their questionnaire; no participant will be offered to purchase more than one item). By flipping a coin we will then decide if that participant's answer to the first or second question will be used for the actual decision to purchase.

If you are chosen and the first question is chosen by the coin-toss, we will then look at your yes/no-answer to the question of whether or not you wish to purchase the item at the random (personal number) price. If you have answered yes to that question we will sell you the item at that price. If you answered no then no transaction will take place.

If you are chosen and the second question is chosen by the coin-toss:

- The price of the item will be decided by randomly drawing a price from a box containing notes with prices from 5 SEK and up. That is 5 SEK, 10 SEK, 15 SEK etc. up to the highest possible price. The highest possible price is determined by what we believe is the highest reasonable valuation of any of the products.

- If the price you stated as your maximum willingness to pay in the second question is greater than this randomly decided price then the item will be sold to you for the randomly decided price.

- If the price you stated as your maximum willingness to pay in the second question is lower than this randomly decided price then no transaction will take place.

Since your answer to the second question does not affect how much you would eventually buy the product for but merely if you buy the product or not, it is to your advantage to state the true maximum amount that you would be prepared to pay for the item. That means that posting a lower number as you maximum willingness to pay than what you actually think is not beneficial.

Appendix II: English translation of the form for valuation exercise

Begin by writing the last two digits of your personal number in all boxes below

Item 1. Description_____

Would you buy this item for ☐ SEK? Circle: YES or NO

The highest amount I would be willing to pay for this item is _____ SEK.

Item 2. Description_____

Would you buy this item for ☐ SEK? Circle: YES or NO

The highest amount I would be willing to pay for this item is _____ SEK.

Item 3. Description_____

Would you buy this item for ☐ SEK? Circle: YES or NO

The highest amount I would be willing to pay for this item is _____ SEK.

Item 4. Description_____

Would you buy this item for [ ] SEK? Circle: YES or NO

The highest amount I would be willing to pay for this item is _____ SEK.

Item 5. Description_____

Would you buy this item for [ ] SEK? Circle: YES or NO

The highest amount I would be willing to pay for this item is _____ SEK.

Item 6. Description_____

Would you buy this item for [ ] SEK? Circle: YES or NO

The highest amount I would be willing to pay for this item is _____ SEK.

Appendix III: Frederick's Cognitive Reflection Test in its original design

- A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?

  ____ cent(s)

- If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

  ____ minutes

- In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

  ____ Days

Appendix IV: Regression outputs for robustness analysis

Table A1

VARIABLES	(1) book	(2) movie	(3) eastegg	(4) choc	(5) juice	(6) speakers	(7) averagewtp
age	12.52	1.811	0.700	4.622*	0.766	-8.493	1.701
	(8.880)	(8.081)	(2.448)	(2.369)	(1.982)	(13.75)	(4.801)
anchorval_age	-0.341**	0.0334	-0.0725	-0.0857**	-0.0416	-0.211	-0.115
	(0.157)	(0.140)	(0.0543)	(0.0418)	(0.0420)	(0.363)	(0.101)
anchorval	1.280***	0.517**	0.438***	0.362***	0.191**	1.673*	0.738***
	(0.303)	(0.213)	(0.107)	(0.0788)	(0.0795)	(0.848)	(0.212)
gender	-3.838	29.88	-9.087	7.340	-9.449	-11.18	2.245
	(20.95)	(29.10)	(5.593)	(7.743)	(7.925)	(31.34)	(13.71)
gender_anchorval	-0.537	-0.623	-0.0450	-0.210*	0.234	-0.301	-0.270
	(0.364)	(0.432)	(0.109)	(0.121)	(0.148)	(0.542)	(0.217)
Constant	36.06**	46.71***	29.21***	12.36***	16.77***	88.44***	38.60***
	(16.33)	(12.58)	(4.125)	(3.504)	(3.580)	(26.75)	(8.063)
Observations	87	88	88	87	88	87	87
R-squared	0.189	0.104	0.286	0.252	0.211	0.180	0.245

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2

VARIABLES	(1) book	(2) movie	(3) eastegg	(4) choc	(5) juice	(6) speakers	(7) averagewtp
age	11.73	2.221	0.375	4.918*	1.268	-6.469	2.123
	(8.446)	(8.241)	(2.640)	(2.538)	(1.933)	(13.34)	(4.579)
anchorval_age	-0.301*	0.0153	-0.0536	-0.0935**	-0.0637	-0.292	-0.128
	(0.157)	(0.151)	(0.0591)	(0.0447)	(0.0409)	(0.353)	(0.0989)
anchorval	1.348***	0.483**	0.426***	0.330***	0.201**	1.574*	0.718***
	(0.290)	(0.206)	(0.107)	(0.0800)	(0.0778)	(0.861)	(0.213)
crtscore	23.56	17.67	-4.260	1.595	-1.593	9.965	7.621
	(16.63)	(13.69)	(3.519)	(2.930)	(2.886)	(26.23)	(9.049)
crtscore_anchorval	-0.478**	-0.207	-0.0186	-0.0181	0.105**	0.0874	-0.0856
	(0.229)	(0.205)	(0.0563)	(0.0475)	(0.0502)	(0.330)	(0.121)
Constant	25.40*	46.02***	28.64***	12.94***	15.70***	83.00***	35.89***
	(14.61)	(11.52)	(4.317)	(3.467)	(3.588)	(29.14)	(8.066)
Observations	87	88	88	87	88	87	87
R-squared	0.171	0.100	0.270	0.212	0.269	0.181	0.221

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3

VARIABLES	(1) book	(2) movie	(3) eastegg	(4) choc	(5) juice	(6) speakers	(7) averagewtp
age	13.13	2.212	0.921	4.899*	0.585	-8.193	2.024
	(8.821)	(8.399)	(2.575)	(2.495)	(1.919)	(13.72)	(4.772)
anchorval_age	-0.359**	0.0192	-0.0771	-0.0928**	-0.0357	-0.221	-0.124
	(0.156)	(0.145)	(0.0541)	(0.0438)	(0.0415)	(0.366)	(0.102)
anchorval	1.150***	0.391*	0.424***	0.322***	0.239***	1.589*	0.677***
	(0.295)	(0.215)	(0.104)	(0.0737)	(0.0749)	(0.800)	(0.205)
Constant	35.41**	52.81***	27.17***	13.58***	14.87***	86.56***	38.97***
	(15.38)	(11.97)	(4.230)	(3.014)	(3.522)	(25.52)	(7.856)
Observations	87	88	88	87	88	87	87
R-squared	0.126	0.078	0.221	0.210	0.161	0.164	0.211

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix V: Results of the Ariely, Loewenstein and Prelec experiment

TABLE I
AVERAGE STATED WILLINGNESS-TO-PAY SORTED BY QUINTILE OF THE SAMPLE'S SOCIAL SECURITY NUMBER DISTRIBUTION

Quintile of SS# distributions	Cordless trackball	Cordless keyboard	Average wine	Rare wine	Design book	Belgian chocolates
1	$ 8.64	$ 16.09	$ 8.64	$ 11.73	$ 12.82	$ 9.55
2	$ 11.82	$ 26.82	$ 14.45	$ 22.45	$ 16.18	$ 10.64
3	$ 13.45	$ 29.27	$ 12.55	$ 18.09	$ 15.82	$ 12.45
4	$ 21.18	$ 34.55	$ 15.45	$ 24.55	$ 19.27	$ 13.27
5	$ 26.18	$ 55.64	$ 27.91	$ 37.55	$ 30.00	$ 20.64
Correlations	.415 p = .0015	.516 p < .0001	.328 p = .014	.328 p = .0153	.319 p = .0172	.419 p = .0013

The last row indicates the correlations between Social Security numbers and WTP (and their significance levels).

The table can be found in the original study performed by Ariely, Loewenstein and Prelec (2003).