THE APPEAL OF LOTTERIES AND THEIR USE IN INCENTIVE DESIGN

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Abstract

The tendency of people to overweight small probabilities is a decision bias commonly invoked to explain the appeal of state lotteries. One section of this dissertation describes a series of experiments that examine other decision biases that contribute to the propensity to purchase lottery tickets. Results indicate that lottery ticket purchases are related to myopic decision making, the underweighting of small dollar amounts, and social comparisons between income classes. These studies address the particular appeal of lottery tickets in low income populations, which is often lamented since the poor can least afford a prospect with such a highly negative expected value. A second section attempts to capitalize on the same decision biases that make lotteries appealing to inform the design of incentives. This section asks whether the appeal of lotteries and their implied overvaluation relative to their expected value holds when they are offered as incentives. This question was examined in a pay-for-performance task which compared various configurations of lottery incentives with their expected value. Though lottery-linked incentives did not lead to greater task persistence relative to their expected value, a particular type of lottery incentive resulted in greater task performance compared to all other types of incentives. Support was found for the hypothesis that lottery incentives are particularly motivating in low income populations. A third section reviews other examples of using decision biases that normally detract from the rationality of decision making to instead improve it and to design incentives for positive behaviors. Future research outlines the use of lottery-linked incentives to encourage saving in low income populations.

Introduction

The appeal of lotteries is undeniable. They offer the hope of a sudden, substantial improvement in wealth for an insubstantial cost. Though playing the lottery can be viewed as a harmless form of entertainment, few would advocate that the purchase of lottery tickets reflects a sound financial decision, as lotteries have a highly negative expected value. Moreover, decision theorists often invoke human irrationality – a decision bias – to explain their attractiveness: the overweighting of small probabilities.

This dissertation contains two series of experiments concerning the allure of lotteries. The first demonstrates how other decision biases, aside from probability weighting, can help account for the popularity of lotteries. This research uses experimental manipulations to test factors that encourage people to purchase actual state lottery tickets. The second series of experiments attempts to translate the allure of lotteries into the design of effective contingent financial incentives. This research compares various types of lottery-linked incentives with their expected value.

The financial decision making of low income populations is a recurring theme in this dissertation. Low income populations disproportionately play state lotteries and some of the experiments on the appeal of state lottery tickets address the question of why this is the case. The experiments on the use of lotteries as incentives address the question of whether lottery incentives are more motivating to those with low incomes.

Though much research conducted in the heuristics and biases tradition attempts to offer prescriptive advice to overcome decision biases, i.e., strategies for debiasing, the research described here takes a different approach. Instead of trying to fight against or counteract the effect of decision biases, this research embraces decision biases as levers to guide behavior. Understanding the biases that encourage the poor to play state lotteries could be useful to guide policy decisions, for example, about the types of tickets that can be offered to discourage the poor from playing. Understanding the biases that make lottery

tickets attractive can also be used to design effective lottery-linked incentives to promote beneficial behavior.

Chapter 1 describes in detail the approach of capitalizing on decision biases, which normally undermine the quality of decision making, to instead improve it. This chapter presents a review of the application of insights from behavioral economics to inform policy design and implementation. This section describes policies that aim to help individuals make decisions that improve their long-term welfare without restricting individual autonomy, termed 'light paternalism'. Further, this chapter discusses the importance of using short-term contingent financial incentives to help people make decisions that are in their long-term interests. Policies that use short-term contingent financial incentives recognize that people often suffer from inconsistent time preferences and attempts to align short-term and long-term interests by offering *immediate* incentives for behaviors that promote the individuals' long-term interests. The use of lotteries as incentives is one strategy for designing effective short-term contingent financial incentives. This chapter has been completed in collaboration with George Loewenstein.

Chapters 2 and 3 examine the question: why are lotteries so attractive? State lotteries are very popular despite the fact that they are extremely actuarially unfair, with a return of approximately $.50 on each dollar spent. These studies inform the questions of under what conditions and for which populations, the seemingly pernicious appeal of lotteries can be harnessed to design incentives for desirable behaviors. This work has been completed in collaboration with George Loewenstein and Romel Mostafa.

Chapter 2 presents two experiments in which we tested whether the attractiveness of the lottery is enhanced by myopic framing of ticket purchase decisions. We conducted these experiments in a low income population (travelers at the local Greyhound bus station). Participants were paid for an unrelated task and then offered the opportunity to purchase state lottery tickets. When purchase decisions were made one at a time (myopically), people purchased more tickets compared to when they made a single aggregate decision about how many tickets to purchase. This work integrates two ideas from the behavioral economics literature: the "peanuts effect", according to which people under-value small amounts of money – peanuts – and myopic decision framing, which described the tendency for people to

make decisions in isolation from one another and fail to take into account the interactions between decisions.

Chapter 3 addresses the special attraction that the lottery seems to hold for low income individuals. Two experiments tested the hypothesis that low income individuals play the lottery in part due to social comparisons with higher income classes. Taken together these experiments show that playing the lottery is motivated by cognitions associated with poverty: the perception of low income status and the perception that, while one may be generally disadvantaged relative to those from higher classes, this is not true for games of chance.

Chapter 4 presents an overview of the literature related to contingent financial incentives. First, it reviews previous applications of behavioral economics to incentives. Next, the major theories of motivation in organizational behavior are discussed with a focus on their relevance to the use of contingent financial incentives and lottery incentives.

Chapter 5 explores the use of lotteries as contingent financial incentives using laboratory experiments. This chapter gives the rationale for predictions about the effectiveness of lottery incentives and boundary conditions. The application of these incentives will be informed by the preceding chapters on factors that increase appeal of state lottery tickets. In general, findings were not consistent with the hypothesis that lottery-linked incentives are more effective than their expected value. However, a particular type of lottery incentive was found to increase task performance relative to all other incentive conditions. Support was found for the hypothesis that lottery-linked incentives are particularly attractive for low income individuals. This work is a collaboration with George Loewenstein, Kevin Volpp, and Cindy Cryder.

Chapter 1

The Economist as Therapist: Methodological ramifications of 'light paternalism'

Much economic behavior is, or at least appears to be, rational and self-interested. People balance price and quality when they decide where to shop and what to buy. They decide how much schooling to get and what to study based at least in part on likely returns to different forms of training and in part on their enjoyment of different topics and types of work. They carefully consider investment decisions and hire experts to get good advice. Even if some may view voting itself as irrational, economic interests seem to play at least some role in patterns of voting.

There are areas of life, however, in which people seem to display less than perfect rationality. For example, although the United States is one of the most prosperous nations in the world, with a large fraction of its population closing in on retirement, the net savings rate is close to zero and the average household has $8,400 worth of credit card debt.[1] Fifty percent of U.S. households do not own any equities,[2] but the average man, woman, and child in the U.S. lost $284 gambling in 2004— close to $85 billion in total.[3] Many workers don't "max out" on 401k plans despite company matches (effectively leaving free money "on the table"), and what they do invest often goes undiversified into their own company's stocks or into fixed income investments with low long-term yields. At lower levels of income, many individuals and families sacrifice 10–15% of their paycheck each month to payday loans, acquire goods through rent-to-own establishments that charge effective interests rates in the hundreds of percent, or spend large sums on lottery tickets that return approximately fifty cents on the dollar. Worldwide, obesity rates and associated diseases are high and rising rapidly. Yet people with, or at risk for, life-threatening health conditions often fail to take the most rudimentary steps to protect themselves. One

recent estimate is that modifiable behaviors such as tobacco use, overeating, and alcohol abuse account for nearly one-third of all deaths in the United States [Flegal, Graubard, Williamson, and Gail, 2005; Schroeder, 2007]. Moreover, realization of the potential benefit of proven mediations, some targeted at the same medical problems caused by adverse heath behaviors, is stymied by poor adherence rates among patients. For example, by one year after having a heart attack, nearly half of the patients prescribed cholesterol-lowering medications have stopped taking them [Jackevicius, Mamdani, and Tu, 2002].

As economists, how should we respond to the seemingly self-destructive side of human behavior? We can deny it and assume as an axiom of faith that people can be relied upon to do what's best for themselves. We can assume that families paying an average of $1,000 per year financing credit card debt are making a rational trade-off of present and future utility, that liquidity constraints prevent investing in employer-matched 401k plans, that employees have good reasons for investing in their own company's stock instead of a diversified portfolio, that individuals' coefficients of relative risk aversion are high enough to justify investing in bonds instead of equities, that low income families have good reasons for spending a large fraction of their paycheck on payday loans, usurious interest rates at rent-to-own establishments, and state lotteries, and that people are obese because they have calculated that the pleasure from the extra food, or the pain from the forgone exercise, is sufficient to compensate for the negative consequences of obesity. Indeed, some economists argue exactly that.[4]

Even among economists, however, this may no longer represent a majority view. Stimulated in part by developments in behavioral economics, increasing numbers of economists are questioning whether people really are such reliable pursuers of self-interest, and are coming to recognize that in some predictable situations people are prone to systematic errors.

In some cases, these errors arise from a lack of information, insight, or limited computational ability. For example, people may not recognize that company matches on pension funds effectively represent "free money"; they may not understand why it doesn't make sense to put one's nest egg in one's employer's stocks, and they may not realize that stocks, on average, yield a higher return than bonds. In

other cases, people are well aware of the best course of action but due to self-control problems or limited self-insight, are unable to implement it [e.g., Loewenstein, 1996]. Obesity and cigarette smoking may best fit into this latter category; few people have any illusions about the health risks of smoking or obesity, and many smokers and obese individuals do not believe that the benefits exceed the costs (which is why they often spend large amounts of time and money on attempts to quit). But in many cases this knowledge is insufficient to motivate behavior change.

"Light" Paternalism

Part of the historic antagonism of economists toward behavioral economics may have been driven by a fear that documenting flaws in human decision making would inevitably lead to calls for paternalism. If so, it seems that such fears were well founded. Beyond documenting such apparent violations of rationality and their consequences for economic behavior, behavioral economists have indeed begun to take the next logical step: they have begun to devise "paternalistic" policies designed to steer economic behavior in more self-interested directions. Paternalistic policies have the goal of benefiting people on an individual basis, premised on the idea that people cannot be relied upon to invariably pursue self-interest. Whereas the conventional justification for government regulation is to limit *externalities*—costs people impose on other people that they don't internalize—to promote the public good, the justification for paternalism is to limit *internalities*—costs that people impose on themselves that they don't internalize [Hernstein, Loewenstein, Prelec, and Vaughan, 1993]. Although some of the behaviors that are targeted by paternalistic policies do generate externalities (e.g., the failure to wear a motorcycle helmet imposes psychic and monetary costs on people other than the rider), paternalistic policies are generally aimed at helping the person whose behavior is altered. Existing examples of paternalistic regulations include banning narcotics, protection of the economically desperate with usury laws, health and safety regulations (for dangerous occupations), warnings on cigarettes, public health advertising, FDA drug approval, and the social security system.

In contrast to these existing forms of "heavy-handed" paternalism, however, behavioral

economists have been advocating a new form of what could be called "light" paternalism. Going by labels such as "libertarian paternalism" [Thaler and Sunstein, 2003] and "asymmetric paternalism" [Camerer, Issacharoff, Loewenstein, O'Donoghue, and Rabin, 2003; Loewenstein, Brennan, and Volpp, 2007], the common goal of these approaches is to steer human behavior in more beneficial directions while minimizing coercion, maintaining individual autonomy, and maximizing choice to the greatest extent possible. Light paternalism aims to enhance decision making without restricting it.

In their treatment of "libertarian paternalism," for example, Thaler and Sunstein [2003] note that paternalism is often simply not avoidable. In many situations, they point out, organizations or governments must make decisions that will necessarily affect the choices and welfare outcomes of their constituents. It would seem ridiculous not to consider how such decisions will impact the welfare of those affected. They illustrate the point with the hypothetical case of a company cafeteria manager who must either place healthy items before unhealthy items in a cafeteria line or the reverse, but does not have the option of doing neither. Thaler and Sunstein [2003] argue that in such situations it makes perfect sense for managers to adopt the option that they believe is better for employees—namely, placing the healthy food ahead of the unhealthy food. Another example that has received considerable attention is default options for 401(k) retirement plans. If it is beneficial to invest in a 401k plan, but people tend to stick with the status quo, then it may make sense to change the usual default from not contributing (with the possibility of signing up) to contributing (with the possibility of opting out). The organization must make a choice about whether the default option is enrolled or unenrolled and, if enrolled, at what contribution level. Even if the organization were to have no default option and force employees to select whether they want to be in or out, this still qualifies as a decision of the organization that would lead to a different rate of enrollment and thus affects the welfare of its employees (see Choi, Laibson, Madrian, and Metrick [2005] and see Halpern, Ubel, and Ash [2007] for a discussion in the context of healthcare).

The central insight of Camerer et al.'s [2003] notion of "asymmetric paternalism" is that it is often possible to produce benefits for people who make suboptimal decisions while imposing minimal or no restrictions on those who make rational decisions that optimize their own welfare. In the most pure

cases of asymmetric paternalism, people behaving suboptimally are benefited without imposing any costs on those behaving optimally. To continue with the example of defaults on 401k plans, if people, contrary to the dictates of conventional economics, are influenced by the default option, then changing the default could potentially benefit them; if people are not influenced by the default, then changing it will have no effect on behavior and little if any cost.[5] Such policies not only provide benefits to agents who make mistakes without hurting those who are making a deliberate decision, but should also appeal to economists both who do and who do not believe in rationality. Economists who believe that people are less than perfectly rational will perceive such policies as beneficial, while economists who believe in rationality should see them as, at worst, little more than a low-cost nuisance. Policies of this type use relatively subtle psychological factors to influence behavior, making it possible to accomplish policy goals without imposing more draconian mandatory measures such as raising the contribution rate of social security. Exactly such an approach was adopted in the Pension Protection Act of 2006, which encourages companies to automatically enroll employees into 401(k) plans, and which passed with bipartisan support in an otherwise highly contentious political year. Other examples of policy interventions that fit the criteria for pure asymmetric paternalism include decision framing and expanding choice to offer commitment devices that aid self-control problems (as discussed below).

Critiques of Light Paternalism

Despite the desire to enlist the support of economists who oppose more heavy-handed forms of paternalism, light paternalism is not without its critics. For example, Glaeser [2006] argues that the bureaucrats who guide paternalistic policies cannot be counted on to be any more rational than those affected by the policies and can be counted on to be less interested in the welfare of those affected than in their own welfare. There is certainly some validity to the point, yet there are predictable situations in which the more detached perspectives of policy makers or experts can be more rational than those of individual decision makers. For example, the individual may be faced with tempting choices that are hard to resist but at odds with his or her long-term interests. Policy makers can predict that people will yield to

these temptations and may be able to steer such individuals toward making better choices. Similarly, policy makers may have the information processing resources to figure out the best course of action when it comes to complex decisions, such as when it makes sense to receive different types of health care procedures, in situations in which individuals often make mistakes due to the difficulty of interpreting information.

In a different vein, Sugden [2005] and Klick and Mitchell [2006] argue that there is an inherent value to autonomy—to letting people make mistakes (and, one would hope, learn from them). This may be true in many cases but does not apply when there is no opportunity to learn from experience, as would be the case if one discovered that one's retirement savings were insufficient only upon nearing retirement age. Moreover, this argument seems to reject the very premise of light paternalism— that it is possible to implement paternalistic policies that *do not* restrict individual autonomy or, at worst, do so very minimally. Additionally, paternalistic policies do not preclude learning. Steering individuals toward a welfare-enhancing choice in one situation will be met with positive reinforcement and facilitate learning, which can inform the individual's decisions in other situations.

Finally, in Chapter 1, Gul and Pesendorfer do not provide any kind of principled argument against light paternalism, but one that is based purely on convention. They argue that whether such interventions help or hurt economic agents is irrelevant because economists simply should not be in the business of directing social policy. "The standard approach" to economics, Gul and Pesendorfer argue, "assumes a separation between the economist's role as social scientist and the role that some economists may play as advisors or advocates."They dub the economist who crosses that dividing line an "economist/therapist."

Although Gul and Pesendorfer seem to view "therapist" as a pejorative label, we see no reason to not embrace it. Therapy is, in fact, not a bad metaphor for the new types of policies that behavioral economists have been proposing. Much like a therapist who attempts to steer clients toward more beneficial thoughts and behaviors without forcing them to do anything, all of these variants of light paternalism retain the ultimate autonomy of the individual while at the same time attempting to guide

individuals toward courses of action that are seen as advantageous. Just as a psychotherapist endeavors to correct for cognitive and emotional disturbances that detract from the mental health of the patient, the economist/therapist endeavors to counteract cognitive and emotional barriers to the pursuit of genuine self-interest.

Methodological Issues Underlying Light Paternalism

Although light paternalism is a "growth industry" in economics, it is not yet sufficiently "mature" as an enterprise to have developed standard operating procedures or for its practitioners to have fully thought out the range of methodological issues that it raises. The purpose of this chapter is to begin to address this void in the literature by exploring some of the issues that light paternalism raises for economic methods.

The first issue is how a particular pattern of behavior should be judged as a mistake and, relatedly, how the success of paternalistic policies designed to rectify such mistakes should be evaluated. That is, an informed application of paternalism, whether light or not, requires some form of welfare criterion. Clearly, the traditional welfare criterion used by economists, which involves satisfying people's preferences to the maximum extent possible, cannot be used to evaluate policies that are premised on the view that people do not always choose what is best for themselves. We discuss the question of what type of welfare criterion should be used to evaluate paternalistic interventions.

Second, paternalism, and especially light paternalism, introduces new motives for attempting to understand the psychological processes underlying economic behavior. An enhanced understanding of process can help to explain why people make mistakes in the first place and, more importantly, can provide insights into what types of policies are likely to be effective in correcting the mistakes. We describe how an understanding of psychological process can inform, and already has informed, light paternalistic policies.

Third, in part because light paternalism is such uncharted territory, there is an acute need for testing different possible policies before implementing them on a large scale. There are good reasons why

such tests should be carried out in the field rather than in the lab. Hence, the new paternalism points to the need for an expansion of field experiments—a trend that has already begun [DellaVigna, forthcoming].

In addition to methodological issues, there are pragmatic issues concerning who will implement light paternalistic policies, especially when they involve positive expenditures. We discuss how economic interests can be rechanneled to support endeavors consistent with light paternalism. In some cases, it may be in the interests of private sector industries to offer products or create incentives that help individuals to do what is in their own best interests. In other cases, the government can help align the interests of individuals and private industry. We conclude this chapter with a discussion of how recent trends in economic research on light paternalism relate to positive and normative economics.

In the course of discussing these methodological issues underlying light paternalism, we review a wide range of such interventions that have already been tested, as well as some that are still in the development phase. Therefore, a secondary purpose of this review is to give readers unfamiliar with the topic an overview of the wide range of light paternalistic interventions that are already being implemented and tested.

What Welfare Criterion?

In their paper introducing the notion of libertarian paternalism, Thaler and Sunstein [2003: 175] state that "a policy counts as 'paternalistic' if it is selected with the goal of influencing the choices of affected parties in a way that will make those parties better off," and then continue, "We intend 'better off' to be measured as objectively as possible, and we clearly do not always equate revealed preference with welfare." But what does it mean to measure "better off""objectively"? As Thaler and Sunstein hint, preference-based measures of welfare are not up to the job because they equate utility with preference and hence automatically assume that anything a person voluntarily chooses to do must be welfare enhancing. Clearly, it does not make sense to assess whether someone is committing an error using a measure that is premised on the assumption that people do not commit errors.

In their discussion of asymmetrical paternalism, Camerer et al. [2003] propose, as the ideal,

purely asymmetric paternalistic policies that help people who behave suboptimally but have little or no negative impact on who behave optimally. Some examples that fit this criterion include establishing defaults and framing alternatives so as to steer individuals toward advantageous alternatives, and possibly offering commit options to people with self-control problems.[6] However, Camerer et al. [2003] acknowledge that purely asymmetric policies are not always possible.[7] To extend the applicability of the approach, they propose a looser criterion which simply requires that the net benefit to irrational consumers must exceed the aggregate costs both to rational consumers and any other affected entities such as businesses or taxpayers. This criterion shifts the debate regarding paternalism from philosophical issues about autonomy and freedom to pragmatic issues of benefits and costs (with loss of autonomy potentially treated as a cost). Evaluating costs and benefits, however, once again requires some concept of welfare, and one that does not encode anything an individual does, or would do, as welfare improving by assumption. Several different types of welfare have been proposed that have this property.

Experience Utility

One possible approach, advocated first by Daniel Kahneman, and subsequently embraced by a number of economists, is to base evaluations of welfare on empirically reported happiness, or what Kahneman labels "experience utility" (as distinguished from "decision utility," which corresponds to the modern notion of preference inferred from choice). Layard [2005], for example, argues that maximizing happiness rather than income should be the goal of government policy, and others have argued that happiness data should be used to identify appropriate societal tradeoffs between, for example, inflation and unemployment [Di Tella, MacCulloch, and Oswald, 2003] or between money and airport noise [van Praag and Baarsma, 2005]. Others argue for making happiness a goal of policy, on the basis of evidence that happiness leads to such positive consequences as higher incomes, better work performance, citizenship behaviors, stronger more stable relationships and better health [Diener and Seligman, 2004]. Happiness has a major advantage over revealed preference as a welfare criterion: it is independent of the choices that people make, and hence can be used to evaluate which choices are welfare enhancing and

which detract from welfare. However, as discussed in detail by Loewenstein and Ubel [forthcoming], using self-reported happiness as a policy criterion has several problems.

One problem is that people adapt to both unfortunate and fortunate circumstances, such that after sufficient time they return to their original happiness "set point" (see Frederick and Loewenstein [1999] for review). For example, dialysis patients do not experience significantly different levels of happiness than do healthy controls, even when measured "on line" by multiple reports elicited randomly at different points in the day [Riis, Loewenstein, Baron, et al., 2005]. If we were to use experienced utility as a metric for evaluating welfare, we could not conclude that chronically poor health was an undesirable outcome, a result that few would endorse. Moreover, a recent study found that although colostomy patients reported similar levels of happiness to people who did not have colostomies, they also expressed a willingness to give up 15% of their remaining life span if it could be lived with normal bowel function (i.e., no colostomy) [Smith, Sherriff, Damschroder, Loewenstein, and Ubel, 2007]. Despite being about as happy as healthy people, these patients indicated that they placed a high value on having their former health restored. Measures of welfare based on experience utility would fail to pick up such preferences.

Additionally, there are serious problems with all existing measures of happiness. For example, people tend to naturally "norm" happiness scales to their general circumstances or those of the people around them [Kahneman and Miller, 1986; Ubel, Loewenstein, Schwarz, and Smith, 2005]. Happiness scales are also sensitive to a wide range of non-normative factors, such as current mood, the weather, and earlier questions in the survey [Kahneman and Krueger, 2006]. Finally, existing measures of happiness may miss brief periods of intense grief or regret that might have a substantial negative effect on well-being. Even the best measure of experience utility, using experience sampling techniques, can only measure happiness several times a day. In sum, while happiness measures may provide useful inputs into public policy, it would be a major mistake to base such policies solely on measures of happiness.

Limiting Welfare to "Valid" Choices

An alternative approach, advocated by Bernheim and Rangel (chapter 7), is to adhere to a choice-

based measure of welfare (i.e., "decision utility" in Kahneman's parlance) but to limit the range of choices that "count" as indicative of welfare. Intuitively, their idea is that a person's choices usually promote their well-being, but in some limited situations, such as when a person is overwhelmed by drives or emotions, they may not. Their proposal, therefore, is to adopt a welfare criterion that, in effect, surgically removes "bad" choices from the set of choices that count.

The crux of the problem is then to specify which choices count and which do not. Bernheim and Rangel consider several alternative means of selecting which choices should count, such as "preponderance" (only selecting choices that are made with some frequency) and "self-officiating"(allowing the individual to decide which subset of choices should be taken as valid indicators of welfare), but find objections to all. Ultimately, they conclude that determining which choices are commensurate with welfare and which are not will require "nonchoice data," such as evidence from brain scans to determine when decision making is overwhelmed by visceral states or distorted by "circumstances where it is known that attention wanders, memory fails, forecasting is naive, and/or learning is inexplicably slow." As they express it, "In these instances, we say that the [generalized choice criterion] is suspect."

Although such an approach might be useful in theory, we suspect that it will be many years, if ever, before we are able to interpret patterns of brain activation to make inferences about what types of choices should count as welfare enhancing. How, for example, could patterns of brain activation help to differentiate the many legitimate, intense, pleasures that short-circuit rational thinking (and, indeed, are sometimes all the more pleasurable for doing so) from intense impulses that lead us to behave contrary to self-interest? Likewise, it seems questionable that social scientists will come up with a way to distinguish between the excitement of buying something one really wants and the excitement of squandering part of one's nest egg on a worthless trinket. In practice, we suspect, adjudicating between self-interested and non-self-interested choices will need to be done at least partially on the basis of an evaluation of which behaviors are most likely to confer long-run happiness—that is, on the basis of experience utility. Despite their explicit rejection of experience utility as a welfare criterion, therefore, we suspect that adoption of

Bernheim and Rangel's criterion would inevitably lead to an implicit reliance on judgments of experience utility, albeit in a more subjective and less systematic fashion.

Informed **Decisio**n **Utilit**y

Another possible approach discussed, but not advocated, by Loewenstein and Ubel [forthcoming] involves honoring people's choices as a utility-maximizing welfare criterion, but only if attempts are made to ensure that the decision maker is truly informed. Like the approach proposed by Bernheim and Rangel in chapter 7, this is a choice-based approach, but one that seeks to improve the quality of choice by providing decision makers with information rather than by selecting out a subset of choices that are deemed representative of welfare based on nonchoice data. Informed decision utility would include, but goes well beyond, such measures as food and drug labels. Beyond information labels, such an approach might involve providing warnings about potential decision biases, such as how framing an outcome as a loss or a gain can lead to inconsistent choice.

Further, in situations in which information, however detailed and accurate, fails to provide a real anticipation of consequences, elaborate interventions could be devised to truly inform decision making. For example, one existing program intended to discourage childbearing by those who are not ready for it provides teenagers who are deemed at risk for pregnancy with dolls that require constant attention. The rationale is that, absent such a vivid experience, girls may have an overly romantic view of parenting, even if they are provided with more pallid information about the demands of parenting. Similarly, while smokers may appreciate the health risks of smoking at an abstract level, and may even overestimate such risks, they may not truly understand what it is like to die of lung cancer. In such a situation, again, more innovative interventions might be necessary to truly inform decision making.

The informed decision utility approach, however, suffers from two significant problems. The first is very similar to the fundamental weakness of the approach proposed by Bernheim and Rangel; in practice it is unlikely to avoid the need for recourse to judgments of experience utility. Given the wide range of different informational interventions that are possible, it will be necessary to decide which ones

are worthwhile and which are not. The very act of providing information may frame a decision in a particular way that influences decisions in a particular direction, so it will also be necessary to decide how information intended to inform decision utility should be presented. For example, differences in small risks can be made to seem dramatic if they are presented in terms of ratios or percentages (e.g., "regular exercise can reduce your risk of disease X by 100%") as opposed to absolute terms (e.g., "regular exercise can reduce your risk of disease X by .0001—from .0002 to .0001"). Deciding which decisions to inform and how to inform them, therefore, will require some independent welfare criterion, the lack of which is the very problem that informed decision utility was intended to solve. As was true for the choice-subset notion proposed by Bernheim and Rangel, therefore, we suspect that in practice such decisions are going to be informed, at least in part, by recourse to judgments about which types of information will make decision makers happy or well off in some other sense—that is, by experience utility.

The second problem is that informational interventions are effective against only one of the two broad categories of mistakes that people make—those that result from incorrect information—and not against the other: self-control problems. As noted in the introduction to this chapter, there are many situations in which people lose control of their own behavior and knowingly behave in ways that they know are not in their own long-term self-interest. While information might help people to avoid such situations, once one is in the situation, the most accurate information that it is possible to impart is unlikely to have much if any impact on behavior.

Capabilities

Yet another approach, advocated by Amartya Sen [1985, 1992] and elaborated on by Martha Nussbaum [2000] is the capabilities approach. This approach is specifically intended to deal with, among other problems, that of adaptation. It rejects the revealed-preference framework for measuring welfare because people adjust their preferences as they adapt to poor social and physical conditions, characterized by poverty or injustice that, most people would agree, objectively reduce the quality of life. In other words, preference and desire can be diminished by "habit, fear, low expectations, and unjust background

conditions that deform people's choices and even their wishes for their own lives" [Nussbaum, 2000: 114]. Sen [1985] gives the example that a person living in impoverished conditions may learn to have "realistic desires" and derive pleasure from "small mercies" and, as a result, may have more desires met than a person in dramatically better living conditions with overambitious desires. Note that this problem with a revealed-preference framework is similar to the problem of adaptation that we discuss in relation to using experienced utility as a welfare criterion. Just as adaptation causes problems for hedonic measures of welfare because people adapt hedonically to situations that virtually everyone would agree are adverse, it can cause problems for preference-based measures if people adapt their preferences to their circumstances and, as a result, become satisfied in situations that would be widely deemed to be unsatisfactory.

The solution proposed by Sen and Nussbaum is to construct a normative theory of welfare that is based on human capabilities—that is, what people are capable of achieving based on the opportunities and living conditions afforded then. Nussbaum delineates several "central human functional capabilities," such as health, freedom from assault, political voice, property rights, equal employment, and access to education, which resemble basic human rights, as well as others that involve self-actualization, such as emotion expression, affiliation with others, and recreation.

The capabilities approach avoids the problem of hedonic adaptation, which is one of the central weaknesses of the experience utility approach. It also avoids the problem of the standard revealed preference approach of treating anything that someone does as welfare enhancing. However, the capabilities approach suffers from crippling problems of its own. Specifically, the approach is impractical to implement because policy makers are unlikely to reach a consensus about which capabilities should be valued and, even if a set of valued capabilities can be agreed upon, the relative values of those capabilities. However, there are similarities between this welfare criterion and the one we propose below. At some point, policy makers should have some discretion to impose "values," such as the improvement of health or the reduction of poverty, on others, even if these changes are not deemed necessary by a preference-based or experienced utility welfare criterion—particularly if it can be done without limiting

individual autonomy.

An Imperfect but Pragmatic Approach

What welfare criterion, then, should be used? We suspect that in most instances the problem will not be as severe as it seems. Although the threshold for light paternalism can be and should be lower than that for more heavy-handed forms of paternalism, we would still advocate that even light paternalistic policies should only be put into play when welfare judgments tend to be relatively straightforward. This is the case when one of the following conditions is met:

1. *Dominance*: In some cases, such as the failure of employees to take advantage of company matches on retirement accounts, a simple dominance criterion will suffice. In the case of company matches, as long as employees have monotonic preferences—that is, prefer more income over less income—they will be better off if they maximize their own contribution, at least up to the level of the maximum company match. The underutilization of 401(k) matching programs most convincingly illustrates that many people do not save optimally, since failing to take advantage of such a match effectively "leaves money on the table." This is the case even after taking into account tax penalties for early withdrawal. The mistake is particularly egregious, and by no means rare, when an employee past retirement age does not make the maximal allowable contribution, since in this case the contribution could be made, matched, and then both the contributed funds and the matched funds withdrawn the next day without penalty [Choi, Laibson, and Madrian, 2005]. Thus, from the perspective of the employee, a default contribution equal to the level of the maximum company match makes perfect sense.

   A somewhat weaker form of dominance is, "stochastic dominance," which involves minimizing risk at any level of return, or maximizing return at any level of risk. The case of including one's own company's stock in a retirement portfolio would seem to come close to violating stochastic dominance.

2. *Clearly negative outcomes*: Given certain circumstances, people make decisions that lead them

down a detrimental path. The resulting outcomes are clearly undesirable, unintended, and not in the decision maker's self-interests. In these cases, a precise welfare criterion is not required because it is clear that people would be better off if they could avoid these negative pitfalls. For example, using a regression discontinuity model, Skiba and Tobacman [2006] found that people who use payday loans have a higher chance of filing for Chapter 13 bankruptcy relative to people who were not approved for the loan. Bankruptcy is a clearly negative outcome leading to filing costs, reorganization of debt, and a 10-year stigma on one's credit report. The shocking statistic that there are more payday loan establishments in the United States than there are McDonalds suggests, at minimum, that government policies which encourage or offer alternative forms of credit could be welfare enhancing for many people.[8]

3. *Self-officiating*: Despite Bernheim and Rangel's dismissal of this criterion in chapter 7, which effectively lets people choose their own goals and then helps them to achieve them through restrictions, incentives, or information to aid self-control, we think this criterion is generally a good one, assuming that the choice of goals is not done in the heat of the moment. If people who are overweight consistently believe that they would be better off were they not overweight, and consistently report that some proposed light paternalistic policy would make them better off, this would seem to be another relatively straightforward situation in which light paternalism can be justified. Thus, for example, if employees at a company themselves decided that they would be better off if, to avoid exposure to temptation, no soda machines were on the premises, a self-officiating criterion would dictate that soda machines should be removed. This is, admittedly, a form of heavy-handed paternalism. A lighter version would keep the soda machines on premises but engineer a system that renders them operable only by employees who have elected ahead of time to give themselves access.

Bernheim and Rangel are very explicit in advocating a welfare criterion based on choice rather than on preference. Our own opinion is that the welfare criterion for evaluating paternalistic policies

should be based on preference. Much as a psychotherapist would likely take at face value a client's professed desire to become happier, more sociable, or less anxious, even if she engaged in patterns of thinking and behavior that led to the opposite result, we would argue that the economist-as-therapist should treat verbal statements of preference as useful information, even if choice is not in line with professed preference. If people express a desire to lose weight but make choices that cause them to gain weight; if they express a desire to be financially solvent but make choices that lead to burdensome debt; if they want to stop smoking but continue to smoke; if they want to take prescription medications but fail to do so, these are all situations in which paternalistic interventions could be helpful. Indeed, the very hallmark of a situation in which paternalism may be justified is a divergence between stated preference and choice. Only in cases where such divergence exists should light paternalistic policies be devised, and they should endeavor to bring choice more in line with stated preference.

As further developments in the measurement of welfare occur, it may ultimately be possible to come up with less conservative measures of welfare that allow for a useful balancing of costs and benefits. Perhaps more fine-grained, domain-specific measures of experienced utility will help get around current problems with the measurement of happiness, allowing for the identification of a broader range of beneficial light paternalistic interventions. Until that happens, however, we would advocate that even light paternalistic policies only be enacted in the clear-cut situations just enumerated.

The Importance of Process

Light paternalism provides new motivation for looking inside the "black box" of human behavior. A better understanding of the processes underlying economic behavior can help to identify when light paternalistic interventions would be helpful and, perhaps more importantly, can help to inform the policies themselves. As we show below, many light paternalistic interventions exploit nonstandard behavioral regularities (e.g., loss aversion, hyperbolic time discounting, and the status quo bias), which ordinarily undermine the optimality of decision making, to instead enhance it.

To illustrate the point, consider the Save More Tomorrow (SMarT) program designed and implemented by Thaler and Benartzi [2004]. The program was designed to deal with the problem that many employees fail to take advantage of the tax breaks and company matches on 401(k) plans and, as a result, fail to save adequately for retirement. The failure to save adequately for retirement stems in part from hyperbolic time discounting (which overweighs the pleasures of current consumption over the pleasures of deferred consumption), loss aversion (because putting money into 401(k) plans is seen as a cut in take-home pay), and the status quo bias (which, when the default contribution rate was zero, encouraged noncontribution).

Employees at companies that participate in the SMarT plan are asked if they would increase their 401(k) contribution rates beginning at the time of their next pay raise. Since the contribution rate does not increase until after a raise, employees do not perceive the increased savings as a cut in take-home pay. Once employees sign up for the plan, they remain enrolled, and the process repeats each year until they reach the maximum contribution rate, unless they opt out. The SMarT plan is designed to make biases that typically discourage saving, such as hyperbolic time preferences, loss aversion, and the status quo bias, work instead to promote saving.

Hyperbolic time preference, a concept first identified by Strotz [1955], refers to the tendency for people to be more impatient in the present (when trading off present against future gratifications) than they are with respect to the future (when trading off future against even more future gratifications). As Strotz [1955:177] expressed it, hyperbolic time discounting implies that individuals who

> naively resolve now what they "will do" in the future, commonly do not schedule the beginning of austerity until a later date. How familiar the sentence that begins, "I resolve, starting next[...]" ! It seems very human for a person who decides that he ought to increase his savings to plan to start next month, after first satisfying some current desires; or for one to decide to quit smoking or drinking after the week-end, or to say that "the next one is the last one."

The SMarT program plays directly on these inclinations, presenting people with the option of doing what comes naturally—spending in the present but saving in the future—a plan that is especially attractive to people with hyperbolic time preferences.

The program also takes account of loss aversion, which describes the tendency for people to put

greater weight on the psychological cost of a loss than on the psychological benefit of an equivalent gain. Due to loss aversion, people are more likely to tolerate a forgone gain than a loss of equal value. The program removes saving from future wage increments (perceived as a forgone gain) rather than having people simply contribute out of income (perceived as a loss).

If that were the whole story, of course, the SMarT plan would not work, because when tomorrow became today people would once again prefer spending over saving. However, at this point another factor comes into play that weighs against such an outcome: The program exploits the status quo bias to maximize continuing adherence by putting into place a decision rule (save a certain fraction out of future wage increases) that remains in effect unless it is explicitly rescinded.

This combination of ingredients seems to work. Initial evaluations of the program found that enrollment was very high (78%), that very few who joined dropped out, and that there were dramatic increases in contribution rates (from 3.5%to 11.6%over 28 months).

Harnessing Decision Biases to Improve Decision Making

Redirecting patterns of behavior that usually hurt people to help them instead is a common pattern among light paternalistic interventions. In this subsection, we discuss a variety of behavioral regularities that can be exploited by the economist/therapist.

The Importance of Immediate Feedback and Reinforcement

In the discussion of hyperbolic time discounting in connection with the SMarT plan, the emphasis was on not imposing immediate out-of-pocket costs on program participants. An even more important implication of hyperbolic time discounting is the need to design interventions that provide participants with very immediate costs and benefits—that is, reinforcement—as well as feedback about their behavior.

Thus, for example, hyperbolic time discounting probably plays a role in drug addiction (because the benefits of taking a drug are immediate and the consequences delayed), and one of the most effective treatments of addiction exploits hyperbolic time discounting to provide addicts with short-term financial incentives to quit [Higgins, Wong, Badger, Ogden, and Dantona, 2000]. Addicts are given coupons for

consumer goods each day when they come in for treatment if their urine sample is negative for drug use. Most of the addicts treated in this program have experienced devastating losses as a result of their addiction, and would seem to have every incentive for quitting. But these small payments often succeed where much larger benefits fail, probably because they are delivered with a frequency that resembles that of drug-taking itself. A general principle is that many suboptimal patterns of behavior are caused by the overweighting of immediate costs and benefits, and hence any attempt to deliver incentives to overcome such patterns needs to provide incentives that can be small but must be frequent.

A line of research in which this insight is already well understood has involved using financial incentives to combat behaviors resulting from self-control problems. Financial incentives have been used to get people to stop smoking [Volpp, Gurmankin, Aschet al., 2006], lose weight [Jeffrey, Thompson, and Wing, 1978; Jeffrey, Gerber, Rosenthal, and Lindquist, 1983], stop taking addictive drugs such as heroin, cocaine, and cigarettes [e.g., Higgins et al., 2000; Heil, Tidey, Holmes, and Higgins, 2003], and get better grades [Angrist, Lang, and Oreopoulos, 2006]. Such interventions can be seen as an even more extreme version of "light" paternalism in that, not only is participation voluntary, but also the introduction of financial incentives (assuming they are rewards and not punishments) actually puts individuals into financial positions that are better than their positions before the intervention. Although people may know that in the long run it is in their best interests to diet, take their medications, or stop using illicit drugs, they often have difficulty implementing such decisions. Financial incentives seem to help mainly by offering short-term payoffs that bring the short-term incentives in line with long-term self interests.[9]

This insight can and should be, but to the best of our knowledge has yet been, applied to savings behavior.[10] Thus, many interventions to increase saving involve attempts to make the prospect of a destitute (or prosperous) retirement more salient to individuals, for example, by presenting vivid images of people suffering poverty in retirement. Such interventions are unlikely to have much of an impact because the prospect of retirement is so remote when people need to begin saving, and because any one day or even month of saving constitutes an inconsequential "drop in the bucket." Savings interventions

that provide people with more immediate and frequent reinforcement are more likely to succeed. Short-term success in implementing saving plans could be reinforced by providing people with daily or weekly feedback of the form: "If you continue to save at this rate, this is where you will be at retirement." And achieving short-term saving goals—even at a daily or weekly level—could be reinforced through small rewards, including lottery prizes. Much as addicts respond to small, immediate gift vouchers, even after failing to respond to the seemingly much larger life benefits of being drug free, it is very likely that small short-term rewards for saving could have an impact that the objectively much larger prospect of a prosperous retirement does not.

Overweighting of Small Probabilities

It is well established that people tend to overweight small probabilities, which contributes to, among other things, the attractiveness of playing the lottery. Although playing the lottery is often viewed as self-destructive, the overweighting of small probabilities can be exploited to individuals' benefits by using it to magnify the value of rewards. Thus, in an ongoing collaboration with Kevin Volpp, Stephen Kimmel, and Jalpa Doshi at the University of Pennsylvania, the first author has been providing people with a lottery-based incentive to take warfarin—a medication that dramatically lowers the likelihood of a second stroke at minimal cost and with few side effects if taken regularly. Patients get an electronic drug dispenser that electronically signals a central office if the correct drawer has been opened on a particular day, indicating that the patient, in all probability, took the pill. Every evening, a number is drawn and, if the number matches the patient's personal lottery number and the drawer was opened during the day, the patient receives a substantial cash prize. The incentive mechanisms plays not only on the overweighting of small probabilities, but also on regret aversion— the distaste for being in a situation in which one would have experienced a better outcome had one taken a different action. It does so by informing participants who fail to take their drug during the day and who win the lottery that they would have won had they taken the drug. The research on drug adherence is funded by an insurance company that is interested in the possibility that the program could be cost-effective if the cost of promoting adherence is

lower than the cost of caring for the people who would have stokes as a result of failing to adhere to their drug regimen. Playing on the overweighting of small probabilities and regret aversion increases the "bang for the buck" and hence the likelihood that the program will be cost-effective. Initial results are promising; two pilot-tests of the intervention, each involving 10 patients followed for one month, resulted in an increase in adherence rates from a baseline of 66%toadherence rates of 96% in one study and 97%inthe other.

*Loss Aversio*n

A second program, currently being pilot tested with obese U.S. veterans who want to lose weight, and developed by Volpp, Loewenstein, and Carnegie Mellon University graduate student, Leslie John, is an incentive scheme for promoting weight loss that involves "deposit contracts." In an innovative study, Mann [1972] found that participants who deposited money and other valuables with a therapist and signed contracts in which return of their valuables was contingent on progress toward pre-specified weight loss lost tremendous amounts of weight: an average of 32 pounds. A subsequent study that also involved deposit contracts produced similarly stunning results, with 47% losing more than 20 pounds and 70% losing more than 15 pounds. In contrast, interventions in which people have simply been paid for weight loss have produced more modest results.

In our in-progress intervention, people who are already motivated to lose weight (a precondition for this being treated as an instance of light paternalism) are invited to deposit an amount up to $90 per month($3 per day), which the experimenters match one for one. The individual then receives a payment of two times the daily amount deposited for every day that his weight falls below a line that entails losing one pound per week. Deposit contracts play on loss aversion, but instead of playing on the underweighting of forgone gains (as does the SMarT program), it plays on the relatively greater weighting of out-of-pocket costs, which renders especially distasteful the prospect of losing one's own deposited money, as well as the experimenter's match. Deposit contracts also play on optimism, which encourages obese people who want to lose weight to put their own money at risk in the first place. The hope is that,

when combined with the subsequent motivational force of loss aversion, optimism about future weight loss will become self-fulfilling.

Framing Effects

Diverse lines of research show that changing superficial features in the presentation of a decision can produce predictable shifts in preference. Such "framing effects" can be exploited to help people make beneficial decisions and, at the very least, should be taken into consideration when presenting people with important information they need to make decisions about government programs, investment decisions, medical decisions, and so forth. Making use of framing effects is consistent with asymmetric paternalism in that it does not limit choice in any way, but can be used to help people make beneficial decisions. Similarly, it is consistent with the guiding principle of libertarian paternalism that information must be presented in some way to the public, so why not present it in a fashion that is advantageous to its recipient? Recent research by Schwartz, Bertrand, Mullainathan, and Shafir [2006] takes advantage of framing effects and loss aversion to increase take-up into employer-sponsored health care flexible spending accounts, which are economically beneficial for the vast majority of employees. Contribution rates were higher when the decision was framed as a loss ("Stop losing money now") compared to when the decision was framed as a gain ("Start saving money now").

Goal Gradients

In another program at an even more preliminary stage of development, the two authors have been developing innovations to increase the efficacy of Individual Development Accounts (IDAs). IDAs are matched savings accounts that allow low income families to accumulated assets to purchase a home, pay for education, or start a small business. One of these innovations involves changing the schedule of deposit goals from a constant goal each month to a schedule based on the goal gradient hypothesis, first proposed by Hull [1932], which states that effort and motivation increase as one gets closer to completing a goal. This principle has been shown to apply to consumer behavior in reward programs, including the finding that even the illusion of progress toward a goal or, in this case, a reward can increase purchases

[Kivetz, Urminsky, and Zheng, 2006].[11] Consistent with the goal gradient hypothesis, the schedule of savings deposits starts very small, increases slowly, and is highest right before the savings goal is met. This feature also makes the plan attractive to people with inconsistent time preferences who weigh immediate consumption much more heavily than future consumption. Initial payments will reduce current consumption only marginally, while the larger payments at the end of the plan reduce consumption more significantly but are heavily discounted.

Summary

The foregoing examples illustrate how, consistent with chapters in this volume that argue against a strict revealed preference approach, an understanding of human psychology can help us both to understand the causes of self-destructive behavior and to devise policies intended to counteract it. New developments will inevitably lead to creative new policies. For example, new research on the neural underpinnings of intertemporal choice [e.g., McClure, Laibson, Loewenstein, and Cohen, 2004] are drawing attention to the important role played by affect in many self-control problems. By drawing on insights about affect—namely, the tendency for "hot" emotions to "cool off" over time—this research may help inform and further the reach of cooling off regulations which already exist in a wide range of domains (e.g., when it comes to door-to-door sales). A challenge for future research will be to kindle the motivational force of hot emotions for beneficial rather than self-destructive ends.

The Need for Expanded Field Research

Conventional economists sometimes accuse behavioral economics of being rife with different effects (e.g., as discussed above, loss aversion, hyperbolic time discounting, and regret aversion), with competing effects sometimes coming into play simultaneously, making it difficult to predict the net impact of a particular exogenous change. There is some validity to this charge, although this state of affairs may reflect the real complexity of human psychology rather than any limitation of behavioral economics. People have different identities and behave differently depending on which identity is

activated in a particular situation [LeBoeuf and Shafir, 2005]. They come to decisions "armed" with an array of different "choice heuristics," and which they employ depends on what type of situation they view themselves as facing [Frederick and Loewenstein, 2006]. At a more physiological level, behavior is the product of multiple neural systems that often act in concert but in some cases come into conflict [e.g., Sanfey, Loewenstein, McClure and Cohen, 2006]. The consequence is that small changes in circumstances or institutions can sometimes have large unforeseeable effects on behavior.

The multiplicity of psychological effects decreases the predictability of individual responses to policy interventions, and, as economists understand particularly well, interactions between individuals create further opportunities for unpredictable effects. To avoid unintended consequences, therefore, there is a pressing need for careful testing of specific interventions before they are implemented on a broad scale. Careful small-scale pilot testing is essential to ensure that the benefits of a large-scale implementation will outweigh the societal costs. Although we do not endorse what seems to be an emerging hostility toward laboratory studies [e.g., Levitt and List, 2008], there is probably no substitute for field studies when it comes to testing light paternalistic interventions.

An example of a paternalistic intervention with unexpected and unintended consequences was the "Move to Opportunity" experiment that was conducted in several major U.S. cities in the 1990s [Katz, Kling, and Liebman, 2001]. Although not an example of light paternalism, the study is useful for illustrating the utility of field experiments as a tool for evaluating any kind of paternalistic intervention. Families receiving subsidized housing were randomly assigned to one of three conditions: a group given a restricted housing voucher that could only be used in low-poverty neighborhoods (less than 10% below the poverty line), a group given an unrestricted housing voucher, and a control group. The purpose of the study was to provide the first unconfounded test of the impact of neighborhood characteristics on economic and noneconomic outcomes. Although not framed by its developers as a test of paternalism, providing restricted vouchers can be interpreted as a form of paternalism, since they limit the choices of those who receive them, presumably with their best interest in mind.

The results of the Move to Opportunity experiment were surprising [Kling, Liebman, and Katz,

2007]. Although moving to a more economically advantaged neighborhood did have some beneficial effects, especially for girls, it also had some surprising negative effects that were concentrated mainly among boys. Girls had beneficial outcomes in the areas of mental health, educational outcomes (staying in school, reading and math achievement), risky behaviors (alcohol use, cigarette use, and pregnancy), and physical health. However, for boys there were substantial negative effects on physical health and risky behaviors. Results for adults were also disappointing. Contrary to expectations, there was no evidence of economic improvement in earnings, employment, or welfare usage for adults. Follow-up interviews indicate that these effects may be due to disrupted social networks and transportation difficulties. However, there were significant beneficial effects for adult obesity and mental health.

The Move to Opportunity study underlines the importance of testing paternalistic interventions on a small scale, but in the field. Although moving poor families into affluent neighborhoods may have clear benefits, such as increasing the safety of children, there may be a host of unintended consequences that could not have been anticipated at the outset. Moreover, the disappointing results from the Move to Opportunity study underscore the importance of collecting information about process, which was the theme of the preceding section. Beyond the disappointing results of the program itself, an unfortunate aspect of the research component of the program was the failure to collect sufficient qualitative data to shed light on why the program produced some of the perverse results that it did. Such process data could be used as an input into developing an improved follow-up program.

Whatever its limitations when it came to monitoring process variables, the Move to Opportunity program did provide extremely good outcome measures, which enabled a very clear delineation of its effects. This is an essential practice that should be applied more diligently in other field evaluations of light paternalism, and that applies most significantly to what is unquestionably the most important application of light paternalistic policies to date: interventions to increase saving.

As already touched upon, a number of researchers have tested interventions designed to encourage people to save more of their income. Note that these interventions are paternalistic in the sense that they assume that people do not naturally save as much as they want to or should. They are “light” in

the sense that all are voluntary; none force people to save money. Although some do impose restrictions on withdrawals from savings, these are purely voluntary. These studies have employed a wide range of methods.

Several "natural experiments" (or "quasi experiments" as the psychologists who developed the techniques refer to them; e.g., Campbell [1969]), have examined the effects of increasing default contributions on increasing participation and contribution rates to 401(k) plans (see Choi, Laibson, and Madrian [2004] for review). These studies track changes in the savings and investment behavior of employees at companies that abruptly change some aspect of their policy. Presumably, such a change in policy does not coincide with an equally sudden and simultaneous change in the preferences of employees. Such studies show that simply by changing the default from unenrolled to enrolled dramatically increases enrollment, even though in either case the employee retains total decision-making autonomy, making this a near-perfect example of asymmetric paternalism [Choi et al., 2004; Madrian and Shea, 2001]. Employees are also highly influenced by the default level of contribution and the default for the asset allocation among available investment funds, underscoring the need to set optimal default contribution rates and diversification strategies.

Other research examining interventions to promote saving has involved field experiments in which a variable of interest was manipulated exogenously. For example, Duflo and Saez [2002] examined the impact of an educational intervention to increase enrollment [Duflo and Saez, 2003]. A random sample of employees in a subset of departments were offered a $20 payment for attending an informational fair, and their 401(k) contributions were tracked as well as those of their coworkers. The most interesting finding from the study was that social information plays an important role in participation in 401(k) plans. Enrollment was significantly higher in departments where some individuals received the monetary inducement to attend the fair than in departments where no one received the inducement. However, increased enrollment within these treated departments was almost as high for individuals who did not receive any monetary inducement as it was for individuals who did, demonstrating the influence of social information.

Another field experiment focusing on saving examined the interest in, and response to, the introduction of a voluntary commitment savings product that restricted access to deposits [Ashraf, Karlan, and Yin, 2005]. Existing customers of a bank in the Philippines were randomly assigned to one of three conditions: a commitment group who were given the option of opening the restricted account, a marketing group who received a special visit to encourage savings, and a control group who were not contacted. Twenty-eight percent of the commitment group enrolled in the restricted account. After 12 months, individuals in the commitment group were significantly more likely to have increased their savings by 20% than were participants in the marketing group or the control group. Average savings balances of the commitment group increased by 81%relativetothecontrol group. Further, this study sheds light on which individuals are most likely to enroll in restricted savings accounts. Results of a pre-experiment survey show that impatience over immediate trade-offs, but patience over future trade-offs (consistent with hyperbolic discounting), predicts program enrollment, particularly for women.

A major, although seemingly unavoidable, limitation of all of these studies is the paucity of outcome measures that were collected. All of the studies of saving behavior examined the impact of, for example, changing retirement savings defaults on the affected account (the account for which the default rule is changed) but did not look at the impact on the overall financial position of the individuals and families involved. The problem with such a limited focus is that the change in retirement saving may have had other undesirable effects that were not measured by existing studies. If the increase in retirement saving comes out of frivolous consumption, that might be a good thing, but what if it leads to an increase in credit card debt, or a cutback of spending on nutrition or children's education? Without knowing the answer to these questions, it is difficult to come to any confident conclusion about the benefits of the seemingly "successful" programs to increase retirement saving. Indeed, even if it were shown that increasing retirement saving did not come at the expense of increased debt or decreased investments in human capital, it still would be difficult to evaluate the effects of such programs in a comprehensive fashion. For example, if the increase in retirement saving came out of vacation trips, is this necessarily a good thing? Might it be better for a family to take nice vacations while the children are young and then to

live on a shoestring during retirement?

Another limitation of most of the field experiments that have been conducted is their failure to manipulate program parameters in a fashion that, if an intervention were successful, would provide insight into what specific features of the intervention matter. For example, the Save More Tomorrow plan, which combines several features, has been proven successful in increasing saving. However, the relative importance of each specific feature is unclear. Thus, perhaps a program that committed people to save in the future but did not deduct that saving from future pay increases would work just as well as the current SMarT plan. Without studies that randomly assign participants to different configurations of plan features, we will never know the answer to questions of this type.

Beyond field research examining the impact of light paternalistic interventions, there is a need for basic research on topics that will inform the design and evaluation of effective policy. First, and consistent with the discussion above, the question of the optimal welfare criterion is in some sense an empirical question. Research could potentially address questions such as which criteria most closely mirror people's lay theories and values (e.g., whether people are more comfortable with choice-based or happiness-based policy decisions) and could also examine the types of trade-offs between autonomy and guidance that people endorse.[12] Additionally, to understand the trade-offs between different welfare criteria, it is important to have basic research on reliable and valid welfare measures. Progress has been made on the development of methodology to measure experience utility, such as with the use of ordinal scales to minimize the problem of scale recalibration and the use of experience sampling techniques [see Kahneman and Krueger, 2006; Riis et al., 2005]. Future research could focus on measures that correspond to different welfare criteria. For example, the self-officiating welfare criterion entails an attempt to ascertain what an individual desires most of the time, but preferences often fluctuate. Just as experience sampling has been used to capture fluctuations in happiness over time, it could also be used to measure fluctuations in preferences over time.

Second, consistent with the need for expanded research on process discussed above, there is a

need for basic research on topics that will inform the design of policy. For example, we still have an extremely imperfect understanding of the psychological factors leading to undersaving, overeating, and a variety of other problems. To what extent is undersaving due to the overweighting of immediate gratifications, to procrastination (the intention to start saving tomorrow and the belief that one will do so), the "drop-in-the-bucket" effect (the view that one small indulgence or act of self-denial will have a negligible impact on one's overall level of saving), to overoptimism about future revenue sources, or a host of other possible contributing factors. A better understanding of why people fail to save could aid in the design of light paternalistic interventions. Similarly, many light paternalistic interventions involve giving people feedback and/or rewards for behaving in a self-interested fashion. However, we still have little understanding of what types of rewards are most motivating (e.g., lotteries vs. cash payments vs. in-kind rewards) or about what types of rewards pose the greatest threat of crowding out people's intrinsic motivation to do what's best for themselves.

Third, there is a need for new technologies to aid in the implementation and assessment of paternalistic interventions. For example, devices that measure weight, blood sugar levels, and blood pressure and that, like the electronic pill dispenser we have been using to improve warfarin adherence, permit two-way communications with a central administrator, could introduce a range of new possibilities for light paternalistic interventions.

Implementing Light Paternalism: Rechanneling Economic Interests

Currently, there are a wide range of economic interests aligned, in effect, against consumers—entities that profit when, for example, consumers consume large amounts of food or alcohol, smoke cigarettes, play the lottery, incur credit card debt, or overdraw their bank accounts (incurring overdraft charges that provide a substantial flow of revenues to banks). These efforts are not necessarily driven by malicious motives; a company that failed to play on consumer weaknesses but faced competitors that did would be likely to lose business (see Loewenstein and O'Donoghue [2006] and Issacharoff and Delaney [2006] for a discussion of this issue).[13]

Admittedly, there are economic forces arrayed on the other side, for example, the diet industry, sellers of nicotine patches, and financial companies that benefit when people amass financial assets. But the forces that play on consumers' weaknesses tend to be much stronger than those that bolster consumer defenses, and the motives of those arrayed on the other side are often ambivalent.[14] For example, nicotine patches are sold to people who are addicted to cigarettes, so their makers have, at one level, an interest in promoting addiction. Likewise, although the sellers of commercial diets would probably attract more customers if they were effective in promoting weight loss, they make the most money by selling hope rather than actual results. Hospitals similarly have the goal of curing sickness, but they have little motivation in promoting preventive medicine, which would just hurt their bottom line. An important goal for economists interested in light paternalistic solutions to such problems, therefore, is not only to devise clever solutions to suboptimalities in consumer behavior but to figure out creative ways to implement and fund such solutions.

In some situations, incentives for light paternalistic policies could be put into place via legislation or other forms of government regulation. For example, companies could be given tax breaks that are dependent on employee contribution rates to 401(k) plans, in which case they could potentially be motivated to change defaults or, perhaps, introduce the SMarT plan. Through tax incentives or granting agencies, governments can promote business models that make it easier for individuals to act in their own best interests, such as nutritious and affordable fast food. The so-called "fat tax" is an example of a much more heavy-handed intervention that could work against the ever-declining prices of high-calorie foods, a situation that many economists hold responsible for growing levels of obesity.

In other situations, however, it is going to require the creativity of economists to play matchmaker and to identify areas of mutual interest that might not have spontaneously emerged without their intervention. Take obesity, for example. Although, as described, there are a number of economic entities (including, possibly, the medical industry) that stand to gain from obesity or the behaviors that cause it, there are also some economic interests that lose when people gain weight. Prominent among those who

stand to lose are insurance companies. Although, as an industry, insurance companies may be indifferent to whether people are thin or fat, individual life insurance companies would benefit if their customers lost weight. If creative, low-cost interventions could be designed, therefore, it is quite possible that insurance companies would be motivated to underwrite the costs. Insurance companies would also be in a position to lobby for legislation that would allow them to adjust their rates based on the weight of a prospective customer, which would pass the economic benefits of weight loss on to consumers or their employers.

As another example, take drug adherence. Here, health insurers could potentially be motivated to provide funding for interventions that had the potential to reduce health costs. In fact, as already alluded to, the first author, along with researchers at the University of Pennsylvania, have secured funding from an insurance company to pilot test an intervention intended to increase adherence to warfarin—an antistroke medication. Pharmaceutical companies also have a direct stake in drug adherence although their interests are somewhat more conflicted than those of insurance companies.

Saving is an example where there is a confluence of interests between customers and the bank. Further, people's difficulty in saving and desire to save more create a circumstance in which banks can even extract rents by aiding customers in saving more. A recent study conducted in the Philippines examined the impact of hiring deposit collectors, bank employees who come to customers' house to pick up savings deposits, a practice that is prevalent in some developing countries [Ashraf, Karlin, and Yin, 2006]. The use of deposit collectors increased savings by 25% relative to control groups, and people were willing to pay for this service. The study suggests that people are willing to pay because the service reduces the transaction costs of having to go to the bank, facilitates adherence to financial planning, and restricts the spending of spouses. Banks in the United States are just starting to take advantage of people's difficulty in saving to develop marketable products, such as American Express's "Savings Accelerator Plan" for their One Card that contributes 1% of eligible purchases into a savings account.

As a final example, consider lotteries. Despite the fact that state lotteries return only 50 cents on the dollar—the lowest payout rate of any form of legal gambling [Clotfelter and Cook, 1989]—in fiscal year 2003 Americans spent almost $45 billion on lotteries, or $155 for every man, woman, and child in

the United States. Lotteries are played disproportionately by low income individuals, with many studies finding that poor people put a larger fraction of their income into lotteries and others finding that they actually spend a larger absolute amount per capita. The purchase of lottery tickets by the poor could be considered a type of "poverty trap"—a cycle of behavior that prevents poor people from improving their situations.

The most obvious solution to this problem might seem to be to regulate the lottery, but that is very unlikely to happen since the lottery generates a sizable amount of revenue for states, and because any restriction of availability is likely to lead to the reemergence of illegal, unregulated alternatives. A "rechanneling of economic interests" would entail that the financial services industry market investment alternatives that have lottery-like properties—i.e., that have a small cost and a small probability of yielding a large payout—but that, unlike lotteries and other forms of gambling, yield a positive expected return. Trying to "pull" people away from gambling and toward investing could potentially be much more effective than trying to "push" people away from gambling. The potential money amounts to be reaped are staggering, and allocating this money to capital formation instead of operating lotteries would be socially productive.

We believe that the key to selling these low-cost, high-risk investments is to make it possible to invest small amounts at a time and make the investments convenient to purchase on a daily basis. We have conducted experiments on state lottery ticket purchases in a low income population and found that rates of ticket purchases are high when people make purchase decisions one at a time, that is, myopically. This finding can be explained in part by what is termed the "peanuts effect" [Prelec and Loewenstein, 1991; Weber and Chapman, 2005]. For each decision, the dollar they spend on a ticket is underweighted—that is, merely considered a "peanut"—and so they go for the gamble. However, rates of purchases are significantly lower when the decision to purchases several tickets is aggregated into a single decision. Then people are less likely to write off the amount necessary to purchase several tickets as insignificant.

This insight into decision making under uncertainty can be used to help low income individuals to

invest and to save. Though people may not be willing to take a substantial sum of money to invest (or may not have the self-control to save the minimum balances necessary to open an investment account), they may be willing to devote small amounts of money, spread out over time, to investments options. The startup costs are quite high for the convenient sale of low-cost investments. However, there is a lot of potential to market other types of investments in addition to those designed to dissuade gambling, such as investments in equity index funds and savings in money market accounts.

The convenient sale of low-cost investments in a system that minimizes transaction costs by providing only a few investment options has great potential to increase the money that the average individual devotes to investing and saving, especially for low income individuals and for those who typically play the lottery. At a minimum, investment companies should market investments as an alternative to gambling. An ad could feature two people, one who spends a dollar a day on the lottery, and show the money being put on a pile and then shrinking or burning, and one who invests it, and show the money accumulating gradually into a huge pile.

Conclusion: A Methodology of Normative Economics

Milton Friedman, in his famous 1953 paper "The Methodology of Positive Economics," distinguished between two approaches to economic methods, which he termed positive and normative economics.[15] Friedman defined positive economics as a "body of systematized knowledge concerning what is," which, he continued, could "provide a system of generalizations that can be used to make predictions about the consequences of any change in circumstances." Normative economics, in contrast, encompassed a "body of systematized knowledge discussing criteria of what ought to be," and a "system of rules for the attainment of a given end." [Friedman, 1953: 3].

Although Friedman devoted most of his essay to a discussion of the methodology of positive economics, he did not dismiss the value of normative economics. Rather, he lamented that normative economics would be unavoidably contentious, because, he believed, issues of values were much more difficult to resolve than issues of fact.[16] Friedman himself, of course, never shied from the normative

[Krugman, 2007]. In fact, as typified by his famous *Free to Choose*, much of his professional life was devoted to arguing about what ought to be and what system of rules would be most successful in achieving his vision of the good society. Believing as he did in rational choice and the benefits of free markets, his conclusions were generally fairly predictable: eliminate regulations and eliminate any barriers to unrestricted competition.

In the last several decades, however, a new view of human behavior has taken root among many economists, one that recognizes through methods of positive economics limitations in people's pursuit of self-interest. Research on the psychology of decision making, the role of affect in decision making, and neuroeconomics have led to the recognition that human behavior can in some cases be suboptimal or even self-destructive, and have contributed to our understanding of when, why, and how deviations from self-interest occur. The new research has, in turn, spawned a whole new area of normative economics focused on the two elements of normative economics identified by Friedman: the measurement of welfare and the design of economic and social systems that maximize welfare.

Although embracing an interventionism that conservative thinkers such as Milton Friedman generally disdain, the new light paternalism can be viewed as in fact quite sympathetic to their arguments and philosophy. Eschewing traditional forms of heavy-handed command and control, light paternalism endorses diversity in policy experimentation, the use of market incentives rather than mandates, and the use of improved informational and feedback mechanisms to verify effects, push objectives, and guard against unintended consequences. Although light paternalism is still in its infancy, it has already produced insights into regulation and incentive design that are likely to have far-reaching consequences. Economists, we believe, should be and, as we have documented, to a very great extent already are in the business of "discussing criteria of what ought to be" and attempting to devise economic institutions that maximize the likelihood that what ought to be in fact occurs. If this brands us economist/therapists, then we embrace this label with pride.

Notes

1. See www.spendonlife.com/content/CreditCardDebtEliminationAndFactsAbout DebtInAmerica-1-22 3-3.ashx.
2. According the Investment Company Institute, this includes equity and mutual fund holdings in employee-sponsored retirement plans (www.ici.org/statements/res/rpt_05_ equity_owners.pdf).
3. American Gaming Association (www.americangaming.org/Industry/factsheets/statistics_detail.cfv?id =7).
4. Murphy [2006].
5. There is a third class of people who could potentially be made worse off by a default. For example, a high savings default would not be optimal for people carrying high credit card debt, and these people may fail to "rationally" opt out of default. This point is further discussed in a later section that highlights the need for pilot testing and good outcome measures to ensure against net negative consequences of paternalistic policies.
6. However, one potential problem with precommitment options is that people who are in "cold states"—e.g., not hungry or not craving drugs—may be unable to fully appreciate the force of their own future motivation and hence may be excessively prone (i.e., more prone than would be optimal) to commit their own future behavior [see, e.g., Badger et al., 2007; Nordren, van der Plight, and Harreveld, in press).
7. Legislation that regulates information disclosure, e.g., the Federal Truth in Lending Act, is close to purely asymmetric and would probably satisfy this criterion. Other forms of information disclosure might be more questionable. For example, food labels can make one miserable if one fails to diet [Loewenstein and O'Donoghue, 2006]. Cooling off periods that require a mandatory waiting period for certain purchases or activities, such marriage, are even less strictly asymmetric. Cooling off periods are designed to prevent people from making mistakes when they are in a state of arousal that they will later regret, but they do impose real costs on those who must delay their purchase. In such

situations, asymmetric paternalism can be justified only if the benefits (in this case, the utility that otherwise would have been lost from making purchasing errors) exceeds the costs for people who engage in the behavior regardless of visceral state (in this case, the cost of having to delay the purchase by those who do, in fact, want to make it).

8. There are approximately 30,000 payday loan outlets in the United States, which is about double the number of McDonald's restaurants.
9. A review of 47 studies on the effect of financial incentives to encourage preventative health care reveals that overall these interventions are successful, at least in the short run [Kane, Johnson, Tawn, and Butler, 2004]. The incentives were effective 74%of the time for simple preventive measures, such as vaccinations, and 72% of the time for complex preventative measures that required sustained behavioral change, such as weight loss. A variety of different types of incentives (cash, coupons, free medical care, lotteries, gifts, and punishment) were effective.
10. Individual development accounts offer financial incentives for saving through monthly matching and have been an extremely promising tool for helping low income families build assets. However, like employee matching of 401(k) contributions, matching is not immediate and frequent enough to be an optimal reinforcer.
11. The motivational effect of the illusion of progress toward a goal was demonstrated by greater purchase acceleration when people were given a "buy 12 coffees, get one free" card with two preexisting bonus stamps than when they were given a "buy 10 coffees, get one free" card.
12. For an example of using empirical research to elicit values about policy trade-offs, see Ubel and Loewenstein [1996] and Ubel, Loewenstein, Scanlon, and Kamlet [1996].
13. Although not necessarily malevolent, in some cases these forces can take on sinister forms. For example, the "Center for Consumer Freedom (Promoting Personal Responsibility and Protecting Consumer Choice)" (www.consumerfreedom.com/ index.cfm) describes itself (see the "About Us" link) as a "nonprofit coalition of restaurants, food companies, and consumers working together to promote personal responsibility and protect consumer choices" and as being in opposition to "the

growing cabal of ‘food cops,’ health care enforcers, militant activists, meddling bureaucrats, and violent radicals who think they know ‘what’s best for you’ [that] are pushing against our basic freedoms.”

14. This is true even when it comes to the biggest success story to date for light paternalism: savings behavior. The first author had the experience of pitching an idea for increasing employee retirement saving to a company that offered an employer match, only to be discreetly informed that it wasn’t in the company’s interest to encourage its employees to save more since an increase in company matches would only detract from the bottom line.
15. In doing so, he drew on the earlier work of John Neville Keynes [1891].
16. In contrast to his respectful views of normative economics, Friedman was less favorable toward economists who ignore data altogether. Writing in 1953, Friedman failed to anticipate the remarkable methodological advances that were to occur in the next half-century, some of them enabled by the development of the computer. “One effect of the difficulty of testing substantive economic hypotheses has been to foster a retreat into purely formal or tautological analyses....economic theory must be more than a structure of tautologies if it is able to predict and not merely describe the consequences of action” [Friedman, 1953, 11–12].

Moreover, Friedman believed that many apparent disputes over values actually revolve around issues of fact and hence could be resolved empirically—that is, through the methods of positive economics. As an example, he cited disputes over the desirability of minimum wage legislation that seemingly revolved around values but, which he posited, hinged on, and hence could be resolved by knowledge of, the impact of an increase in the minimum wage on employment. While not denying the significance and utility of normative economics (which he hardly could have done without risking the label of hypocrite), Friedman believed it would be possible to diminish the scope of normative economics by expanding that of positive economics. Casual empiricism, as well as empirical research, however, suggests that issues of value are rarely resolved by recourse to data [see, e.g., Mitroff, 1974]. Empirical testing usually has a sufficient subjective element such that clever

investigators can, by framing the question in the right way, or by using the right methods, come up with the answer they seek (see Glaeser, chapter 13). Thus, for example, Plott and Zeiler [2005] show that with a magical mixture of experimental manipulations, they are able to reduce the magnitude of the endowment effect. Indeed, even on the issue that Friedman used to illustrate the capacity of positive economics to supplant normative economics—the impact of an increase in the minimum wage on employment—there has been a remarkable tendency for empirical research conducted by proponents of raising the minimum wage to conclude that doing so has minimal or even positive impact on employment, with the opposite pattern observed in the research of opponents. Fuchs, Krueger, and Poterba [1998] conducted a survey of labor and public economists at leading research universities that elicited, among other things, respondents' beliefs about the impact of an increase in the minimum wage on youth employment, their degree of support for an increase in the minimum wage, and various questions about values and political orientation. Despite many decades of research on the topic, they found a remarkable lack of convergence among researchers regarding the impact of a minimum wage hike on employment. Moreover, there was also little evidence that settling the positive issue would, in fact, help to resolve the normative one. Support for an increase in the minimum wage was strongly correlated with a researcher's social and political values but barely related to economists' beliefs about the impact of an increase in the minimum wage on employment.

Chapter 2

Myopic Risk-Seeking:
The impact of narrow decision bracketing on lottery play

Abstract

In two experiments conducted with low income participants, we find that individuals are more likely to buy state lottery tickets when they make several purchase decisions one-at-a-time, i.e. myopically, than when they make one decision about how many tickets to purchase. These results extend earlier findings showing that 'broad bracketing' of decisions encourages behavior consistent with expected value maximization. Additionally, the results suggest that the combination of myopic decision making and the "peanuts effect" – greater risk seeking for low stakes than high stakes gambles – can help explain the popularity of state lotteries.

Introduction

State lotteries are a multibillion dollar industry and the most popular form of legal gambling (Kearney, 2005a). In 2005, total sales from state lotteries surpassed $50 billion, with instant games accounting for the largest fraction -- 50% -- of this amount (Hansen, 2007). Playing the lottery is inconsistent with expected utility maximization, assuming diminishing marginal utility. Yet, despite its negative expected value (about -$0.47 for each dollar spent, on average; LaFleur and LaFleur, 2003), clearly many people find playing the lottery appealing.

The enormous popularity of the lottery suggests that people do get some value from playing it, perhaps entertainment or excitement. However, while the benefit of a single ticket purchase may seem to outweigh the cost, people may fail to fully account for the long-term, cumulative cost of playing. This cost can be substantial, especially for low income families who spend a disproportionate fraction of their income on lottery tickets. Much as small increases in calorie intake can, over long periods of time, lead to substantial weight gain, the ongoing cost of playing the lottery can have adverse consequences for low

income families. One study found that the introduction of a state lottery reduced low income households' ' expenditures on food, rent, mortgage, and other bills by 2.5% and by 3.1% when the lottery included instant games (Kearney, 2005b).[1]

We present research that helps explain the popularity of lotteries, despite their high cost. We propose that when people decide whether to purchase a lottery ticket, they consider each ticket individually rather than adopting a long-term view that aggregates the cost of multiple ticket purchases. We test the prediction that people buy more tickets when they view the decision to purchase tickets *myopically*, making one decision at a time, rather than *broadly bracketing* the decision – i.e., considering the aggregate consequences of purchasing multiple tickets.

Our study is modeled after prior research on 'myopic loss aversion' (Bernartzi and Thaler, 1995), which refers to the combination of narrow bracketing and loss aversion (the disproportionate weighting of losses relative to gains). Research on myopic loss aversion examines people's propensity to reject advantageous gambles (i.e. gambles with positive expected values) when they are presented one at a time. As demonstrated in the classic example by Samuelson (1963), a single 50-50 chance of gaining $200 or losing $100 offers an equal chance of ending up with a gain or loss. Loss aversion leads to an overweighting of the latter, which discourages people from taking the gamble.[2] However, when one considers many plays of such a gamble, the odds of ending up with a loss progressively diminish, which encourages greater risk taking. Myopic loss aversion has been demonstrated in numerous laboratory studies (Bellemare et al., 2005; DeKay and Kim, 2005; Gneezy, Kapteyn, and Potters, 2003; Gneezy and Potters, 1997; Keren and Wagenaar, 1987; Langer and Weber, 2001, 2003; León and Lopes, 1988; Redelmeier and Tversky, 1992; Thaler et al., 1997; Wedell and Böckenholt, 1994), and has been used to explain such diverse phenomena as the attractiveness of expensive car rental collision insurance coverage and the equity premium puzzle (Benartzi and Thaler, 1995).

The current study, in contrast, focuses on a different type of prospect than those thus far examined in the myopic loss aversion literature. We examine people's propensity to accept disadvantageous bets – specifically lottery tickets -- when evaluating them myopically. Our research

builds on the prior work of Langer and Weber (2001, 2005), who also challenge the generality of the myopic loss aversion results. They demonstrate that for some risky prospects "reverse myopic effects" exist in which gambling is more attractive when decisions are made myopically. The prospects identified by Langer and Weber have a positive expected value and the risk profile of holding a junk bond or issuing a loan, in which there is a large probability of a moderate return but a small chance of a large loss in case of default. An example of such a gamble, shown experimentally to be more attractive with myopic evaluation rather than with broad bracketing (corresponding to playing the gamble three times), is a 90% chance to gain $15 and a 10% chance to lose $100 (Langer and Weber, 2005). The gamble is more attractive with myopic evaluation because individuals who are prone to loss aversion and diminishing sensitivity to gains do not proportionately value the likely increase in the magnitude of the gain, but greatly dislike the increased chance of ending up with a loss.

Like Langer and Weber, we present a "reverse myopic effect" using state instant lottery tickets, which have an outlay of $1 for a very small probability of a large gain ($5,000, putting aside intermediate prizes), with an overall negative expected value. However, our explanation for this effect differs from that described by Langer and Weber (2001, 2005). As we discuss in detail below, the attractiveness of a single lottery ticket can be explained by a combination of overweighting the small probability of winning and underweighting the small cost of the ticket. Both of these effects are diminished with broad bracketing, leading to the prediction that people will be less prone to purchase lottery tickets under broad than narrow (myopic) bracketing. This prediction is opposite to the positive relationship between broad bracketing and risk taking observed for the positive expected value prospects commonly examined in the myopic loss aversion literature, but is consistent with the general assertion that broad decision bracketing induces people to assess the aggregate consequences of decisions, leading to better outcomes (Kahneman and Lovallo, 1993; Read, Loewenstein and Rabin, 1999). However, as explored by Langer and Weber (2001, 2005), there exist exceptions to this general rule whereby broad bracketing will lead to the rejection of advantageous prospects.

Why broad bracketing discourages lottery ticket purchases

That broad bracketing will decrease lottery ticket purchases is predicted by theories that can account for why people play the lottery in the first place: Markowitz's theory of the utility of wealth (1952) and the probability weighting function from Kahneman and Tversky's (1979) prospect theory.

One possible reason why people play the lottery is that spending small amounts on the tickets yields smaller disutility than one would expect if one assumed diminishing marginal utility. To explain the occurrence of simultaneous gambling and insurance purchases, Markowitz (1952) proposed a utility function defined over gains and losses (rather than absolute levels of wealth) that had three inflection points, one at the status quo, one on the gain side, and another on the loss side (Figure 1). Markowitz's utility function is convex for small gains and concave for small losses. In the domain of gains, this implies that when the stakes are small, people prefer fair gambles to small certain gains (e.g. a gamble with a 10% chance to win $1 is preferred to $.10 for sure). When stakes are high, then people prefer large certain gains to a fair gamble (e.g. $100 for sure is preferred to a 10% chance to win $1000). In the domain of losses, it is the reverse. People are more risk averse for small stakes losses (e.g. losing $.10 for sure is preferred to a 10% chance to lose $1), and risk seeking for large stake losses (e.g. a 10% chance to lose $1000 is preferred to losing $100 for sure). This underweighting of small gains and small losses was later dubbed the "peanuts effect" (Prelec and Loewenstein, 1991), and has been demonstrated empirically in numerous laboratory studies (see Greene and Myerson, 2004, for a review and see Weber and Chapman, 2005 for an in-depth investigation of the effect).

The peanuts effect in Markowitz's utility function can help to explain why people buy lottery tickets. When people decide whether or not to purchase a $1 lottery ticket, they are choosing whether to incur the loss of $1 to obtain a small chance to win a large sum of money and they underweight this small cost. However, as costs rise, as would be the case if one bought multiple tickets, the marginal disutility of paying for tickets increases as the utility function becomes steeper. Thus, Markowitz's utility function predicts that people will purchase fewer tickets as the decision is bracketed more broadly because thinking in terms of large money amounts (e.g., spending $5 for 5 lottery tickets) shifts them to a point on the utility function where the marginal disutility of making the payments is larger.

Another possible reason for why people play the lottery is that they place disproportionate weight on small probabilities, as specified by many generalized expected utility theories (e.g. Edwards, 1962; Kahneman and Tversky, 1979; Quiggin, 1982; Tversky and Kahneman, 1992). Overweighting small probability outcomes increases the appeal of lottery tickets, which offer a small probability of winning a large prize. Moreover, most of the theories that posit overweighting of small probabilities also assume insensitivity to variations in probability at low levels -- that is, the probability weighting function is elevated but relatively flat for low levels of probability (Kahneman and Tversky, 1979; Prelec, 1998; Tversky and Kahneman, 1992). The implication of this general property of the weighting function, termed discriminability, is that people become less sensitive to changes in probability as they move away from the "certainlywill not happen" and "certainly will happen" endpoints (Gonzalez and Wu, 1999). Again, this property leads to the prediction that broad bracketing will decrease lottery ticket purchases because people are insensitive to the difference between, for example, a 0.001 chance of winning relative to a 0.002 chance of winning, but are sensitive to the increased cost required to produce such a doubling of probability.

The prediction that people will purchase fewer tickets when the decision is broadly bracketed holds even if we consider that people derive utility not just from the value of the gamble itself, but also from the associated entertainment of playing. As predicted by the peanuts effect, broad bracketing will shift people to a point on the utility function where the marginal disutility of the cost of the tickets becomes steeper, making it less likely that the monetary and entertainment value of the gamble will compensate. Similarly, insensitivity to small increases in the probability of winning, relative to a change from *no* chance to *a* chance, would make five chances to win less than five times as exciting as a single chance.

The current study

We test the prediction that broad decision bracketing reduces lottery ticket purchases. Experiment 1 confirms this central prediction and Experiment 2 ensures that this effect persists in the face of decision feedback about the outcomes of previous lottery ticket purchases. Since most lottery tickets don't pay off,

people tend to get negative feedback from playing the lottery repeatedly, and this feedback might counteract the two effects just discussed. Both studies were conducted at the Greyhound bus station in Pittsburgh because it provides a constantly replenishing population of low income individuals. Low income individuals spend a higher percentage of their income on lottery tickets than do those with higher incomes (Brinner and Clotfelter, 1975; Clotfelter and Cook, 1989; Kearney, 2005a; Livernois, 1987; Spiro, 1974; Suits, 1977),[3] despite the fact that the negative expected value exerts a disproportionate adverse impact on their financial position. We discuss the implications of our results for deterring low income populations from playing state lotteries.

Experiment 1

To test the hypothesis that broad decision bracketing will decrease ticket purchases, we gave participants the opportunity to earn $5 and then offered them the opportunity to purchase lottery tickets. This decision was framed in three different ways using a between-subjects design. In the *myopic* condition, participants made 5 decisions about whether to purchase a ticket, one decision at a time. In the *broad bracketing* condition, participants decided how many tickets to buy in one single decision (between 0 and 5 tickets). We also included a third, *all-or-nothing* condition, similar to the *broad bracketing* condition, in which participants were given a single choice between buying 5 lottery tickets or none. Based on the theories described above, we predicted that participants would purchase more lottery tickets in the *myopic* condition than in the *broad bracketing* condition or the *all-or-nothing* condition.

Methods

The sample consists of 122 participants who were approached while they waited to board buses at the Greyhound station in Pittsburgh, Pennsylvania. Everyone in the station was approached unless they were sleeping, talking on the phone, about to board, unable to speak English, or exhibiting signs of psychosis.

We asked potential participants to complete a survey in exchange for $5. This survey, unrelated to the experiment, asked about their opinions on Pittsburgh. After completing the survey, all participants were given the opportunity to either keep the $5 they had earned from completing the survey or to use this money to purchase instant scratch-off lottery tickets. Since many participants were traveling out of state, they were told that we would cash in a winning ticket for any amount other than the jackpot. We chose instant lottery tickets because they are the most popular of all lotteries, are disproportionately played by low income individuals (Kearney, 2005b), and because the instant payment feature makes them attractive to travelers who are in transit to a different state.

Participants were informed that they would be making decisions about instant scratch-off tickets, each of which cost $1. They were randomly assigned to one of the three conditions. In the *myopic* condition, participants were told they would be receiving their payment in stages. In each stage, the participant was told, "Here is $1 as part of the payment for your time filling out the survey" and were handed $1. When they flipped to the next page, they were shown an instant scratch-off ticket and read the following:

Would you like to buy a lottery ticket?

____ *Yes* ____ *No*

This procedure was repeated five times. To hold information constant across conditions, participants were not allowed to scratch off any ticket(s) they purchased until the conclusion of the experiment.

In the *broad bracketing* condition, participants were told, "Here is $5 as the payment for your time filling out the survey," and were handed $5. When they flipped to the next page, they were shown 5 instant scratch-off tickets and read:

How many tickets do you want to purchase?

____ *5 lottery tickets*

____ *4 lottery tickets*

____ *3 lottery tickets*

____ *2 lottery tickets*

____ *1 lottery tickets*

____ *No lottery tickets*

In the *all-or-nothing* condition, the procedure was identical to the broad bracketing condition, except now participants could only buy 5 lottery tickets or none:

Do you want to buy 5 lottery tickets?

____ *Yes* ____ *No*

Next participants reported demographic information and their usual frequency of playing the lottery. We anticipated that people who frequently play the lottery would tend to buy lottery tickets in our experiment.

Results

Table 1 presents the demographic breakdown of the sample, which is by intention not representative of the U.S. population. The median income, at $19,000, is less than half that of the general population ($48,201 in 2006) and over half of the sample (54%) is African American.

The dependent variable for each participant was the total number of lottery tickets purchased. Figure 2 shows the distribution of ticket purchases for each of the experimental conditions. Since the distributions of ticket purchases are positively skewed, we used a non-parametric Mann-Whitney Test to analyze differences in lottery ticket purchases across conditions. As can be seen in Table 2, our prediction that broad bracketing would lead to fewer purchases was supported. Participants in the *myopic* conditions purchased more than twice the number of tickets than those in the broad bracketing condition, a significant difference. Similarly, ticket purchases in the *all-or-nothing* condition were less than half those in the *myopic* condition, also a significant difference.

Figure 2 shows that in the *all-or nothing* condition, in which participants could choose to purchase either 0 or 5 tickets, 87% of the participants purchased 0 tickets. The distribution of ticket purchases is positively skewed in the *myopic* and *broad bracketing* conditions, and more so in the *broad*

bracketing condition. It seems that participants in the *broad bracketing* condition are reluctant to purchase more than 2 tickets. In fact, no participant purchased 3 or 4 tickets and only one purchased all 5 tickets.

We used regression analysis to ensure that the effect of decision bracketing on ticket purchases holds when we control for demographic variables, which might have varied between conditions despite random assignment. We used Poisson regression since the data is a count of the number of tickets purchased (Table 3). We restricted the analysis to the *myopic* and *broad bracketing* conditions because the *all-or-nothing* condition has a binary dependent variable (0 tickets purchased or 5 tickets purchased), whereas the dependent variable in the *myopic* and *broad bracketing* conditions ranges from 0 to 5 tickets. Decision bracketing was a dummy variable, coded 0 for *myopic bracketing* and 1 for *broad bracketing*. Due to the difficulty of interpreting Poisson coefficients, Table 3 displays the exponentiated coefficients which are equivalent to incidence rate ratios. A one unit increase in the independent variable is associated with a multiplicative change in the mean number of tickets purchased by a factor of the incidence rate ratio.

Specification 1 shows that participants in the *broad bracketing* condition purchased significantly fewer tickets than those in the *myopic* condition when there are no control variables in the model (also shown in Table 2). In Specification 2, we include the dummy variable chronic, which reflects the tendency to play the lottery in daily life (coded 1 if the participant reported playing the lottery at least a few times a month, 0 otherwise). As expected, the coefficient on chronic is significant and positive, indicating that across conditions, chronic players purchased more lottery tickets. Table 4 displays mean ticket purchases for chronic and non-chronic players and includes the *all-or-nothing* condition, which was excluded from the regression analysis. Specification 3 includes both chronic and decision bracketing and shows that the effect of decision bracketing remains significant after controlling for chronic.

Previous research found that ticket purchases are inversely related to age and education, males play more than females, and African Americans play more than other ethnic groups (Clotfelter et al., 1999; Light, 1977). Specification 4 shows the effects of these demographic control variables. Age is only significant when included with age squared. There is a tendency for African Americans (coded as 1 if

African American, 0 otherwise) to have a higher propensity to play the lottery, but this does not reach significance ($z = 1.49$, $p = 0.14$). The coefficients for the variables college (coded 1 for a college graduate, 0 otherwise) and female (coded 1 if female, 0 otherwise) were not significant.

Specification 5 includes the experimental and control variables. The full model shows that the effect of broad bracketing is negative and significant, indicating that broad bracketing reduces purchase of lottery tickets, controlling for all demographic variables. The incidence rate ratio indicates that the number of tickets purchased in the *broad bracketing* condition is 0.44 times the number of tickets purchased in the *myopic* condition, holding all other variables constant. In absolute terms, this corresponds to a decrease in expected purchases by 0.79 tickets. The coefficient of chronic also remains significant. Chronic players purchase 2.74 times the number of tickets as non-chronic players, as predicted by the incidence rate ratio of the Poisson regression in the *myopic* and *broad bracketing* conditions. This corresponds to an increase in expected purchases of 1.39 tickets. According to the actual means of the data displayed in Table 4, which also includes the *all-or-nothing* condition, chronic payers purchase exactly twice the number of tickets as non-chronic players. The quadratic relationship between age and tickets purchased indicates that there is a negative effect of age on percentage of lottery ticket purchases before age 31 and a positive effect thereafter. African Americans purchase more tickets at a marginal level of significance, with African Americans purchasing 1.55 times that of other ethnic groups, corresponding to an absolute difference of about a half of a ticket. Now the coefficient on college is significant, but in the 'wrong' direction, indicating that people with a college degree purchase 1.93 times more tickets than those without a college degree, an absolute difference of 0.80 tickets. There remains no effect of gender on ticket purchases.

Noting that our sample has a lower level of education than the general population helps to explain the unexpected positive relationship between a college degree and ticket purchases. A college education may have different significance for a population of people traveling by Greyhound than it would have in a broader sample. Perhaps the college graduates in our sample have unmet income aspirations that motivate them to play the lottery.

Income was reported by only approximately 57% of the participants in the *broad bracketing* and *myopic* conditions, and thus was excluded from the analysis. When income is included in the full model, the effect of broad bracketing remains significant (*IRR* = 0.467, z = -2.18, p = 0.03), even though the sample is practically cut in half, and the effect of income (expressed in thousands)[4] on ticket purchases is not significant (*IRR* = 0.990, z = -0.83, p = 0.41).

Discussion

We find that myopic decision making results in more lottery ticket purchases relative to the *broad bracketing* and *all-or-nothing* conditions. Studies on myopic loss aversion thus far have only examined prospects with positive expected values and demonstrated that broader decision bracketing leads to increased risk taking. In contrast, the current study offers evidence that for attractive prospects with negative expected values, broad bracketing can reduce risk taking. Combining these findings points to the more general hypothesis that broader bracketing produces behavior closer to expected value maximization. It should be noted that our experimental paradigm departs from the reality of how people typically decide to purchase lottery tickets (although it offers a higher degree of realism than a typical laboratory experiment); it is unusual to receive an unexpected proposition to purchase lottery tickets while waiting for a bus. To increase the realism of the situation we used actual lottery tickets and we had participants "earn" money to purchase tickets, instead of merely endowing them with it. This was done to reduce the house money effect, which is the tendency to consume (Henderson and Peterson, 1999) or risk (Ackert et al. 2006; Thaler and Johnson, 1990) money that was received as a result of a windfall.

One could argue that the number of tickets purchases in the myopic condition is artificially inflated because participants did not have a chance to learn from their mistakes. In the real world, when people make decisions one at a time they get feedback about outcomes. With lotteries, this feedback is generally negative, because people win only rarely. We conducted Experiment 2, which gave participants feedback about the outcome of each decision before they made their next, to ensure that the results of

Experiment 1 did not overstate the impact of narrow bracketing. We find that this is not the case; if anything, feedback increases the effect of narrow bracketing.

Experiment 2

Experiment 2 replicated the *myopic* and the *broad bracketing* conditions from Experiment 1, and also included a third condition: *myopic with feedback*. In this condition, participants were asked to scratch off each lottery ticket that they purchased immediately after purchasing it. We hypothesized that participants would purchase fewer lottery tickets in the *broad bracketing* condition than in the *myopic* condition or the *myopic with feedback* condition.

We had no strong expectations concerning the difference between the two myopic conditions. Losing feedback might give participants the opportunity to learn about the consequences of playing the lottery, and thus decrease ticket purchases. Alternatively, losing feedback might increase ticket purchases due to the desire to recover losses from previous rounds (Thaler and Johnson, 1990) or due to the gambler's fallacy (Jarvik, 1951), the perception that one is "due for" a win after a string of losses.

Methods

Participants were recruited from the Greyhound bus stations in the same manner described in Experiment 1. One hundred and seventeen participants participated in the experiment.

As in Experiment 1, participants completed an unrelated survey on Pittsburgh as a pretense for providing them with $5 to spend on lottery tickets. Participants were randomly assigned to a condition in a between-subjects design. The *myopic* and *broad bracketing* conditions were exactly as they were in Experiment 1. The *myopic with feedback* condition was identical to the *myopic* condition except that participants were asked to scratch off each ticket that they purchased. They were given $1 of their payment and then asked if they wanted to purchase a lottery ticket. Next they turned the page and were asked:

If you bought a lottery in the previous round, please report what was the outcome of the lottery:

_____ *I won the lottery. The amount I won is:* _____

_____ *I did not win the lottery.*

Finally, participants reported demographic information and their usual frequency of playing the lottery. Since only about half of the sample reported income in Experiment 1, experimenters checked to see if the income question was answered. If not, then the experimenter approached the participant and explained that this information was completely confidential and important for the research. Then the participant was given the opportunity to privately fill in their income.

Results

Table 5 presents the average number of tickets purchased in each condition and a Mann-Whitney significance test for each of the *myopic* conditions compared to the *broad bracketing* condition. The mean number of tickets purchased in the *broad bracketing* condition was lower than that in the *myopic* condition at a marginal level of significance, replicating the finding of Experiment 1. The mean number of tickets purchased in the *broad bracketing* condition was significantly lower than in the *myopic with feedback* condition. Although mean ticket purchases were higher in the *myopic with feedback* condition than in the *myopic without feedback* condition, this does not reach statistical significance with a Mann-Whitney test ($z = 0.76$, $p = 0.44$).

Figure 3 compares the distribution of ticket purchases for each of the experimental conditions. Note that the distributions for *broad bracketing* and *myopic* conditions are very similar to their distributions in Experiment 1, as are their means (see Tables 2 and 4). Again we see that in the *broad bracketing* condition, no one purchases 3 or 4 tickets and only 2 participants purchase 5 tickets. The distributions for the *myopic* and the *myopic with feedback* conditions are more skewed to the right than the *broad bracketing* condition. The *myopic with feedback* condition is even more skewed to the right than the *myopic* condition, although this difference is not significant.

In Experiment 2, we rejected the use of a Poisson model in favor of the negative binomial model because the LR-test statistic was significant ($x^2(1) = 40.99$, $p < .01$), indicating substantial overdispersion

in the data. We collapsed the two myopic conditions using the decision bracketing variable, which was coded as 0 for the *myopic* and *myopic with feedback* conditions and 1 for the *broad bracketing* condition. The dummy variable, feedback, indicates whether or not decision feedback was given, coded 0 for both the *myopic* condition and the *broad bracketing* condition and 1 for the *myopic with feedback* condition.

Specification 1 of Table 6 shows that participants in the *broad bracketing* conditions purchased significantly fewer tickets than those in the myopic conditions. The coefficient on feedback is positive, but not significant. Specification 2 includes the dummy variable chronic only, which reflects the tendency to play the lottery in daily life (coded 1 if the participant reported playing the lottery at least a few times a month, 0 otherwise). The coefficient on chronic is positive, but is not significant. Table 4 breaks down ticket purchases by chronic and non-chronic players and shows that the mean difference is small, less than half a ticket. We are not sure why the significant effect of lottery play in daily life, found in Experiment 1, does not replicate here. Specification 3 includes chronic with broad bracketing and feedback and shows that the effect of decision bracketing remains significant.

Specification 4 includes all demographic control variables, coded as described in Experiment 1. The modified procedure to collect better income data (discussed above) was effective. Eighty-six percent of the sample reported their income, so we include this variable in our analysis as a demographic control variable (expressed in thousands). However, none of the demographics, including income, are significant. A possible explanation is that our sample is more homogenous than those used in prior investigations on the impact of demographic variables on lottery ticket purchases. Our sample has a lower income, is less professional and has a higher percentage of African Americans than the U.S. population (see Table 1). Also, in Experiment 2, there were fewer observations for both young and old participants. This restriction of range on age might help explain why the quadratic relationship between age and ticket purchases found in Experiment 1 did not replicate in Experiment 2. It is also important to note that previous studies often find inconsistent effects of demographic variables (e.g. Hansen, Miyazaki and Sprott, 2000).

Although including demographic variables in the sample does not change the results of our manipulation, their inclusion highlights that the results of the experimental manipulation were not due to demographic

factors that varied between conditions, despite random assignment. Specification 5 includes decision bracketing, feedback, and all demographic variables. The coefficient on decision bracketing remains significant, after controlling for all other variables. The number of lottery tickets purchased when the decision is broadly bracketed is 0.33 times the number of tickets purchased when the decision viewed myopically. In absolute terms, this corresponds to an expected decrease of 1.10 tickets.

The results of the regression analysis suggest that receiving feedback about decision outcomes does not reduce the myopic risk seeking effect. We examined the effect of feedback more closely, specifically looking at the effect of receiving positive (winning) versus negative (losing) feedback in the previous round. This analysis is limited to the 2nd, 3rd, 4th, and 5th decisions and only those when there had been a ticket purchased in the previous round (57 observations). As could be expected, the majority of the tickets purchased were losing tickets (77.2%), with 7 wins that simply recouped the cost of the ticket with either a free ticket or $1, 5 wins of $2, and 1 win of $4.[5] Using logistic regression analysis with standard errors clustered by participant, we find that when a losing ticket is purchased in the previous round, participants are more likely to purchase another lottery ticket in the subsequent round (Odds Ratio = 2.98, $z = 2.17$, $p = 0.03$) and this effect persists when all control variables are included in the model (Odds Ratio = 4.84, $z = 2.34$, $p = 0.02$).

Discussion

Experiment 2 replicates the finding that broad bracketing decreases lottery ticket purchases. The inclusion of the *myopic with feedback* condition shows that the relationship between lottery tickets purchases and myopic decision making is unaffected by the opportunity for ticket purchasers in the myopic condition to learn from feedback. Feedback about the outcomes of previous decisions does not facilitate learning about the poor odds of winning the lottery. The opportunity to learn from previous decisions, if anything, strengthens the relationship between myopic perception and lottery ticket purchases. This is surprising because few people ever won any money from playing the lottery. Of the

seventy tickets purchased in the *myopic with feedback* condition, only eight tickets returned more than $1, with $4 being the highest win.

It may be that the high level of ticket purchases in the *myopic with feedback* condition is due to the desire to recover losses from previous rounds or due to the gambler's fallacy. Our results are consistent with both of these explanations. We find that participants are significantly more likely to purchase a lottery ticket in a given round if they purchased a losing ticket in the previous round.

Conclusion

Taken together, the results of Experiments 1 and 2 offer consistent evidence that myopic decision making is a significant factor that promotes lottery ticket purchases. Experiment 1 manipulated decision bracketing in two ways: by giving participants the choice of purchasing 5 tickets or nothing and by allowing participants to choose in a single decision how many tickets to purchase. In both cases, participants purchased fewer tickets when they viewed the decision to purchase tickets broadly rather than myopically. The results of Experiment 2 indicate that this effect is not attenuated, but if anything strengthened, by giving participants the opportunity to receive feedback about the results of previous decisions.

With the exception of the work by Langer and Weber (2001, 2005), one may be left with the impression from the myopic loss aversion literature that broader decision bracketing necessarily leads to greater risk seeking, since this literature has only examined prospects with positive expected values. The results of the current study extend the literature on myopic loss aversion by demonstrating a "myopic risk seeking effect" – that myopic evaluation of attractive prospects with negative expected values induces risk seeking behavior while broader decision bracketing reduces risk seeking behavior. These findings are reconciled by the more general theory that broad decision bracketing yields decisions more in line with expected value maximization.

From a policy perspective, these results can be interpreted to suggest that lottery ticket purchases may be a mistake, or at least to indicate that lottery ticket purchases are not a consistent preference.

However, it would be futile to argue that lotteries should be abolished. Lotteries aren't going away. Even with a payoff of only $.53 on the dollar, they are extraordinarily popular and especially among low income families. Approximately 50% of households with an income less than $25,000 play the lottery, and among the households that play, the annual per capital expenditure is upwards of $550 (Clotfelter, et al, 1999). The disproportionate consumption of lottery tickets by low income individuals, combined with the fact that proceeds from lottery tickets generate revenue for the state, has led some to view state lotteries as a kind of regressive, albeit voluntary, tax. If leveling a very high tax on low income families is not considered desirable, there is a simple solution: raise the payout on lotteries and reduce the variability of prizes. Given the importance of lottery revenues for many state treasuries, this seems unlikely to occur.

However, our results do point to a potential policy application that could selectively reduce ticket purchases by low income players and promote responsible gambling. Lottery tickets could be sold in packages of multiple tickets, e.g. packs of 5 undiversified $1 tickets. In line with our research findings, this should decrease the sale of lottery tickets overall by reducing people's propensity to discount the low cost of a ticket as a 'peanut' without realizing how costs add up over time. Such a policy could selectively reduce sales for low income players rather than high-income players because the dollar value of a 'peanut' can be expected to increase as income increases (Markowitz 1952). This intervention would be attractive to a state that would like to decrease its share of gambling revenue generated by low income consumers. Of course, this must be carefully pilot tested first to avoid unintended consequences. One could imagine a scenario in which problem gamblers are hooked on a "daily dose" of lottery gambling and might step up their daily consumption to the purchase minimum.

It could be argued that this strategy would detract from the utility that a low income individual derives from ticket purchases in the form of entertainment and excitement. However, it is also possible that the long-run consequences of fewer ticket purchases may increase overall utility. The money that would have been spent on lottery purchases may be used instead for other forms of entertainment or consumption that may more than compensate for the reduced utility from lottery playing. As suggested by Kearney's (2005b) analysis, lottery ticket expenditures could be used instead to pay bills and build assets

(in the form of mortgage payments), which may reduce the financial stress of low income individuals. Nevertheless, it is impossible to assert with certainty that selling lottery tickets in packets of multiple tickets would either increase or decrease overall utility.

Another application of our findings is the treatment of pathological lottery gambling. Effective clinical treatments involve education about erroneous beliefs that promote gambling– such as the gambler's fallacy and the illusion of control (Sylvain, Ladouceur, and Boisvert, 1997). Education about the peanuts effect should be part of this education, possibly including demonstrations of how quickly gambling expenses add up and comparisons to alternative purchases that could be made if the money was invested instead.

Notes

1. These estimates are conservative since they do not account for the fact that a substantial fraction of the households included in the data do not play the lottery. Clotfelter et al., (1999) estimates that approximately 50% of low income households play the lottery.
2. See Benartzi and Thaler (1999) for a discussion of why this decision implies loss aversion, not simply risk aversion.
3. Some studies even find higher absolute demand for lottery tickets among low income populations (Clotfelter et al., 1999; Hansen, 1995) and Hansen, Miyazaki and Sprott (2000) report that, across five states, income is a more consistent predictor of lottery ticket sales than education, race, or age.
4. Results are unchanged if income is excluded from the analysis.
5. Since the outcome of the 5^{th} ticket purchase is irrelevant for future decisions, this count excludes the 5^{th} round.

Tables

Table 1. Demographic information

		Experiment 1	Experiment 2
N		122	117
Age	Mean	31.6	32.2
	Median	26	33
	Range	18-78	18-82
Income	Mean	$28,575[a]	$29,630[b]
	Median	$19,000	$25,000
	Range	$8,400-$85,000	$0-$150,000
Education	At Least College Degree	21%	28%
	No College Degree	79%	72%
Gender	Males	52%	65%
	Female	48%	35%
Race	African American	54%	56%
	Caucasian	36%	33%
	Hispanic	3.5%	4%
	Asian	3%	4%
	Reported "other"	3.5%	3%
Occupation[c]	Managerial Professional	7%	
	Technical Professional	5%	
	Sales and Marketing	10.5%	
	Administrative / Clerical	16%	
	Skilled Blue Collar	17%	
	Unskilled Blue Collar	21.5%	
	Students	18%	
	Retired	2%	
	Homemaker	3%	

a. Only 67 participants reported income data in Experiment 1.
b. 101 participants reported income data in Experiment 2.
c. Occupation data was collected for Experiment 1 only.

Table 2. Mean lottery tickets purchased in each condition in Experiment 1.

Condition	**Mean Tickets (Standard Deviation)**	**Mann-Whitney Test**
Myopic n=43	1.58 (1.58)	
Broad Bracketing n=40	0.75 (1.00)	Myopic vs. Broad Bracketing $z = 2.46$, $p = 0.01$
All-or-nothing n=39	0.64 (1.69)	Myopic vs. All-or-nothing $z = 4.09$, $p < 0.01$

Table 3. Poisson regression analysis of the effect of broad decision bracketing on lottery ticket purchases Experiment 1. Analysis restricted to the *myopic* and *broad bracketing* conditions.

	Incidence Rate Ratios				
	(1)	(2)	(3)	(4)	(5)
BROAD BRACKETING	0.474**		0.467**		0.443**
	(0.104)		(0.102)		(0.109)
CHRONIC		2.502**	2.542**		2.741**
		(0.535)	(0.543)		(0.629)
AGE				0.899**	0.886**
				(0.029)	(0.031)
AGE^2				1.001**	1.001**
				(0.001)	(0.001)
AFRICAN AMERICAN				1.410	1.551$^+$
				(0.326)	(0.371)
COLLEGE				1.518	1.928*
				(0.394)	(0.521)
FEMALE				1.249	1.122
				(0.280)	(0.247)
McFadden's Pseudo R^2	0.048	0.063	0.113	0.070	0.188
Observations	83	83	83	72	72

Note: Incidence rate ratios are reported instead of regression coefficients due to their ease of interpretation. Standard errors are in parentheses.
** p<0.01, * p<0.05, $^+$ p<0.10

Table 4: Comparison of ticket purchases between chronic and non-chronic players.

	Experiment 1	**Experiment 2**
Non-Chronic Players	0.87 (1.41) n=103	1.26 (1.79) n=95
Chronic Players	1.74 (1.85) n=19	1.70 (1.87) n=20

Table 5. Mean lottery tickets purchased in each condition in Experiment 2.

Condition	**Mean Tickets (Standard Deviation)**	**Mann-Whitney Test**
Broad Bracketing n=38	0.71 (1.23)	
Myopic n=40	1.45 (1.91)	Myopic vs. Broad Bracketing z =1.55, p = 0.12
Myopic with Feedback n=39	1.79 (2.00)	Myopic with Feedback vs. Broad Bracketing z = 2.22, p = 0.03

Table 6. Negative binomial regression analysis on the effect of broad decision bracketing on number of lottery tickets purchased. Analysis includes all conditions in Experiment 2: the *myopic* condition, the *myopic with feedback* condition, and the *broad bracketing* condition.

	Incidence Rate Ratios				
	(1)	(2)	(3)	(4)	(5)
BROAD BRACKETING	0.490*		0.489*		0.330**
	(0.171)		(0.173)		(0.141)
FEEDBACK	1.238		1.248		0.983
	(0.389)		(0.396)		(0.348)
CHRONIC		1.346	1.168		1.222
		(0.486)	(0.411)		(0.517)
AGE				0.985	0.972
				(0.061)	(0.059)
AGE^2				1.000	1.000
				(0.001)	(0.001)
AFRICAN AMERICAN				1.012	0.846
				(0.328)	(0.272)
COLLEGE				0.612	0.608
				(0.238)	(0.229)
FEMALE				0.976	1.273
				(0.349)	(0.462)
INCOME				1.005	1.007
				(0.007)	(0.007)
McFadden's Pseudo R^2	0.019	0.002	0.021	0.009	0.037
Observations	117	115	115	97	96

Note: Incidence rate ratios are reported instead of regression coefficients due to their ease of interpretation. Income is expressed in thousands. Standard errors are in parentheses.
** p<0.01, * p<0.05

Figures

Figure 1. Markowitz's proposed utility function.

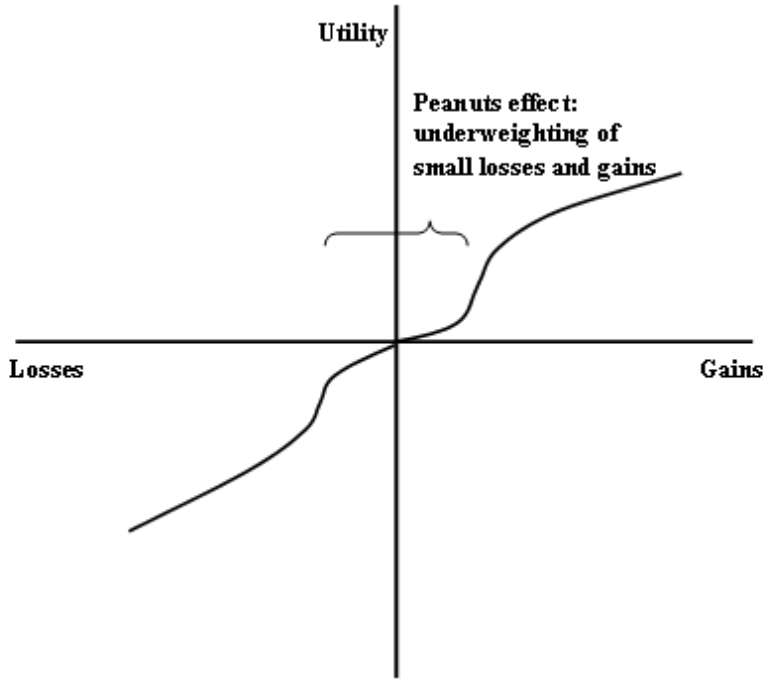


Figure 2. Histogram of lottery tickets purchased in the myopic, broad bracketing and all-or- nothing conditions for Experiment 1.

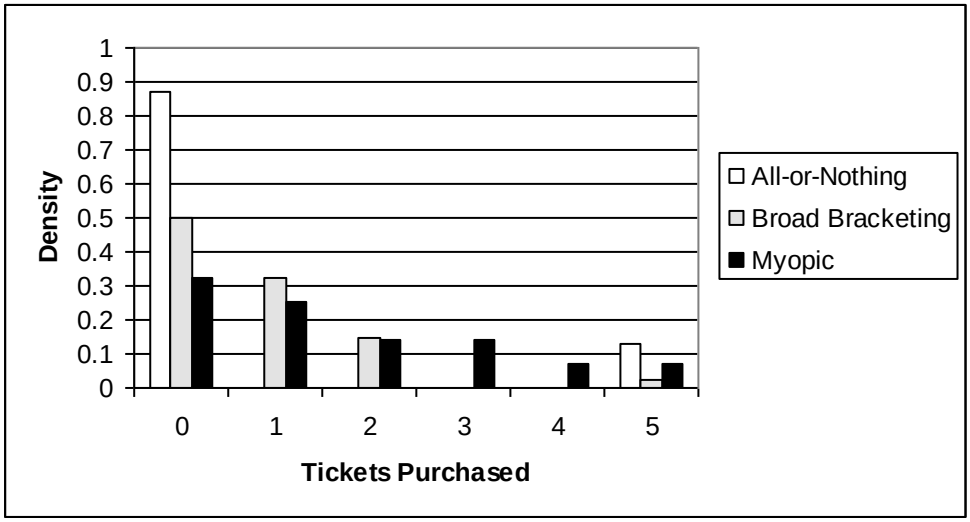
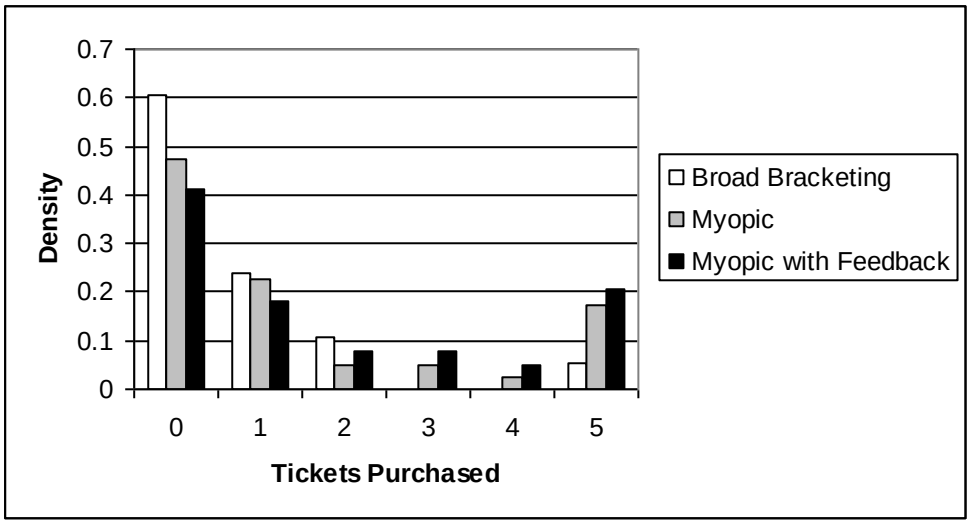


Figure 3. Histogram of lottery tickets purchased in the broad bracketing, myopic, and myopic with feedback conditions for Experiment 2.



Chapter 3

Subjective Relative Income and Lottery Ticket Purchases

Abstract

Despite a return of only $.53 on the dollar, state lotteries are extremely popular, especially among the poor, who play the most and yet can least afford to play. In two experiments conducted with low income participants, we examine how implicit comparisons with other income classes increase low income individuals' desire to play the lottery. In Experiment 1, participants are more likely to purchase lottery tickets when they are primed to perceive that their own income is low relative to some standard. In Experiment 2, participants purchase more tickets when they consider situations in which rich people or poor people receive advantages, implicitly highlighting the fact that everyone has an equal chance of winning the lottery.

Introduction

'All you need is a dollar and a dream' is a catchy advertisement for the New York State Lottery that is typical of how lotteries are marketed. In the current paper, we ask why that dream seems to be particularly attractive to people with low incomes. Research on state lotteries finds that low income individuals spend a higher percentage of their income on lottery tickets than do wealthier individuals (Brinner & Clotfelter, 1975; Clotfelter & Cook, 1987, 1989; Livernois, 1987; Spiro, 1974; Suits, 1977), a pattern highlighted by the statistic that households with an income of less than $10,000 spend, on average, approximately 3% of their income on the lottery (Clotfelter et al., 1999). Some studies even find higher absolute demand for lottery tickets among low income populations (Clotfelter et al., 1999; Hansen, Miyazaki & Sprott, 2000; Hansen, 1995).

The connection between lottery play and income is unfortunate because the purchase of lottery tickets by the poor can be considered a type of "poverty trap" – a cycle of inefficient behavior that prevents low income individuals from improving their financial situations. State lotteries have the lowest

payout rate of any form of legal gambling (Clotfelter & Cook, 1989) and provide a much lower rate of return than the assets that more affluent families tend to invest in. Over the years 1964-2003, the average expected value was -$.47 for each dollar spent (LaFleur & LaFleur, 2003).[1] Moreover, poverty creates "smaller margins of error" so that behaviors, such as playing the lottery, which have a negligible effect on the financial well-being of a middle class person, can have a profound impact on that of a poor person (Bertrand, et al., 2004).

Given the compelling reasons *not* to play the lottery, why is lottery play so prevalent among low income individuals? We propose that implicit comparisons with other income classes leads low income individuals to view playing the lottery as one of the few means available to attempt to 'correct' for their low relative income status. After a brief review of studies examining the impact of relative income on happiness and behavior, we present two studies that test hypotheses that stem from this idea.

Relative income

Several lines of research in psychology and economics focus on the consequences of comparisons with others for affect and behavior. Social comparison theory (Festinger, 1954; Suls & Wheeler, 2000), equity theory (Adams, 1965) and relative deprivation theory (Crosby, 1976, Walker & Smith, 2001) all posit that people do not simply evaluate the absolute value of their income, performance, achievements, etc., but that these evaluations are heavily influenced by comparisons with others. Economic and decision research has incorporated the idea of relative standing in the formulation of social-comparison based utility functions (Loewenstein, Thompson & Bazerman, 1989, Messick & Sentis, 1985), according to which disadvantageous, and in some cases advantageous, inequality reduces utility.

Research in both economics and psychology has found that happiness depends, in part, on relative standing (Frank, 1985). Easterlin (1974, 1995, 2001) finds that happiness is at best weakly related to changes in absolute income; within a nation, self-reported happiness remains stable over time, even when per capita income increases substantially. Similarly, over the life cycle, the increase in income that comes with middle age and the decrease in income commonly associated with retirement are not correlated with

changes in happiness. In contrast, within a country at one point in time, greater income is significantly correlated with greater happiness, suggesting that happiness depends, in part, on relative standing in the income hierarchy.

Further research has substantiated the claim that relative standing is a powerful predictor of happiness by examining income reference points set by relevant social comparison groups. Luttmer (2005) finds that controlling for absolute income, high neighborhood earnings are associated with lower levels of happiness, an effect that is stronger for those who socialize more with their affluent neighbors as opposed to friends and relatives outside of their neighborhood. Hagerty (2000) finds that although a person's absolute income is the strongest predictor of income satisfaction, the income distribution of the community in which they live is also a significant predictor. Clarke and Oswald (1996) observe no relationship between satisfaction and absolute income level, but find that income relative to co-workers has a significant effect on satisfaction. Solberg et al. (2002) find that poor financial standing relative to others creates unmet desires, which partially mediates the effect of social comparisons on income satisfaction.

Since social comparisons of income and compensation have substantial influences on happiness and satisfaction, it is not surprising that they can be powerful motivators of behavior and influence decision-making. Many economists have theorized that people seek to compensate for a low relative income status by engaging in conspicuous consumption or working longer hours (e.g., Duesenberry, 1949; Frank, 1985, Veblen, 1934). Consistent with such predictions, Schor (1998) finds that people who perceive their financial situation to be below that of their reference group save significantly less than those who perceive it to be above that of their reference group. Bowles & Park (2005) demonstrate a similar effect on labor supply. Data on work hours from ten countries shows that greater income inequality is associated with longer working hours. Closely related, Neumark and Postlewaite (1998) find evidence that women whose sisters' husbands have a higher income than their own husbands are more likely to be employed.

Current studies

The motivation for our first study dates back to what may have been the first attempt by economists to understand lottery ticket purchases. Friedman and Savage (1948) proposed that normally risk-averse low income individuals are motivated to play the lottery because they derive disproportionate utility from increases in income that could potentially propel them into the middle or upper class. We build on this theory that the purchase of state lottery tickets, in part, derives from a desire to correct for low income status by positing that whether one considers oneself to have a low income is in part a *subjective* judgment which depends on explicit or implicit social comparisons, not merely the absolute value of one's income. Experiment 1 tests the hypothesis that inducing a person to view their relative financial standing in negative terms will increase lottery ticket purchases. Previous work has examined the relationship between absolute income and lottery ticket purchases; however, it is difficult to infer causality because relative income is in part endogenous (due to decisions made by the individual). In this study, we demonstrate causality by manipulating participants' *subjective* feelings of poverty.

The motivation for the second study stems from the idea that low income individuals may feel that their low standing in society prevents them from having the same opportunities as those with higher socioeconomic status. A game of chance, in a sense, levels the playing field and gives the poor the same opportunity to win as everyone else. This would make lotteries disproportionately attractive to low income individuals, since they may feel they rarely get such fair odds *relative* to those from upper income classes. Thus, we test the hypothesis that being primed to judge the lottery as an 'equal-opportunity prospect' for all class categories will increase lottery ticket purchases.

We studied a low income sample because we wanted to understand what drives the purchase behavior of the poor, who are disproportionately affected economically by playing the lottery. We conducted *framed field experiments* as defined by the criteria and terminology of Harrison & List (2004). The experiments were conducted with a subject pool chosen to represent the target population (low income participants), using a commodity that is not artificial (actual state lottery tickets), and in a domain of behavior in which most of the subjects had prior experience and/or prior information.

Experiment 1: Relative Income Induction

Experiment 1 tests the hypothesis that people who feel poor in a relative sense due to implicit comparisons with others are more likely to purchase lottery tickets. The rationale behind this hypothesis is that lottery tickets may be seen as a vehicle to correct for low income status. This is similar to the conceptualization by Bowles & Park (2005) that forgoing leisure for longer workdays may be considered a means of correcting for lower relative income standing. It is also related to the idea, proposed by Kahneman and Tversky (1979) that people tend to be risk-seeking when their wealth falls below some salient point of reference. We test this hypothesis in a controlled experiment that induces a subjective feeling of poverty.

Methods

Participants were recruited from the Greyhound Bus Station in downtown Pittsburgh, PA. The mean income of the sample was $29,228 and median income was $19,944 (see Table 1 for complete demographic information). Seventy-nine participants were asked to complete a survey which elicited their opinions about the city of Pittsburgh, in exchange for a $5 payment. The survey was not used for research purposes, but served as a pretense for paying them $5, which they could later spend on tickets. We had participants "earn" the money, instead of merely endowing them with it, to reduce the house money effect. The house money effect describes the propensity for people to consume (Henderson & Peterson, 1999) or risk (Ackert et al. 2006; Thaler & Johnston, 1990) money that they have received as a result of a windfall. Although our procedure may not completely eliminate this effect, we feel that the results are still important even if they are only generalizable to lottery ticket purchases made with financial windfalls, gifts, or bonuses or when people feel they have 'money to burn.'[2]

After completing the survey, participants filled out demographic information on age, gender, race, marital status, and finally, income. Our relative income manipulation was embedded in the income

question. By random assignment, half of the sample was induced to feel that their income was in the middle of the income range with the following question:

What is your yearly income (choose an income bracket):
____Less than $10,000
____Between $10,001 and $20,000
____Between $20,001 and $40,000
____Between $40,001 and $60,000
____More than $60,000

The other half of the sample was induced to feel that their income was on the low end of the income range with the following question:

What is your yearly income (choose an income bracket):
____Less than $100,000
____Between $100,001 and $250,000
____Between $250,001 and $500,000
____Between $500,001 and $1 Million
____More than $1 Million

This second version of the income measure was designed to induce the experience of *low relative income*.

Immediately after filling out the income question, participants were handed five $1 bills and then shown a Pennsylvania State Instant scratch-off ticket. They were told that the instant tickets were previously purchased for $1 each and that they could purchase between 0 and 5 tickets for $1 each. Finally, participants filled out additional demographic information.

Results

Participants who reported their income on a low scale (checks at intervals between $10,000 and $60,000), designed to make they feel they had a *high relative income*, purchased .67 tickets on average. Participants who reported their income on a high scale (check at intervals between $100,000 and $1,000,000), designed to make them feel they have a *low relative income*, purchased 1.28 tickets on average. Figure 1 presents the frequency distribution of ticket purchases in the two conditions.

Since the dependent variable is an ordered categorical variable, we analyze the data using ordered probit. Specification 1 of Table 2 shows the marginally significant effect ($p<.09$) of the induction (coded 1 for subjective low relative income and 0 otherwise). Specification 2 contains only the dummy control

variable, Chronic, which reflects self-reported lottery play in daily life (coded 1 if the participant normally plays the lottery at least a few times per month, 0 otherwise). Not surprisingly, chronic players purchased more tickets at a marginally significant level. After controlling for this factor, as can be seen in Specification 3, the relative income manipulation becomes significant at the .05 level. Specification 4 includes various demographic variables: African American (code 1 if African American, 0 otherwise), Education (code 1 if the participant had a college degree, 0 other otherwise), Age and Age^2. These variables were included based on results we obtained from a previous study in the same population (Haisley et al., 2007) and a national survey on state lottery players (Clotfelter et al., 1999). The coefficients of the control variables all have the correct signs, but are not significant. Specification 5 shows that the effect of the induction remains significant, when all control variables are included in the estimation equation.

To interpret the estimated parameter coefficients, Table 3 presents the marginal probability effects of the relative income manipulation for specifications 1, 3, and 5 of the ordered probit analysis. The marginal probability effects show how the relative income manipulation affects the distribution of responses. For example, in the full model, we see that the relative income induction decreases the probability of purchasing 0 lottery tickets by 27% and increases the probability of purchasing 5 tickets by 11% (see Specification 3 of Table 3).

Discussion

These results support the hypothesis that inducing people to perceive that their income is lower than some reference point increases their propensity to purchase lottery tickets. This manipulation does not force an explicit social comparison and the participant is very unlikely to be aware of the manipulation, as it is embedded in other demographic questions. Despite its subtlety, however, the experimental manipulation of subjective poverty has a substantial effect. Ticket purchases were nearly doubled in the low relative income condition. Results support the idea that when people are made to feel subjectively poor, they view the lottery as a means to correct for their low income status.

Experiment 2: The Lottery as a Social Equalizer

Experiment 1 presents evidence that lottery ticket purchases are driven in part by the perception of low relative income. But why should such a perception motivate the poor to resort to the lottery as a means to correct for their low standing? Prior research suggests that opportunities that ensure equality among different classes can be motivating for people who are usually discriminated against. In a study conducted with boys from different castes in India, Hoff & Pandey (2004) found that when the caste of each boy was announced, low caste boys performed worse on a pay-for-performance task. The authors theorized that the caste announcement triggers the belief in low caste boys that however good their performance, they will be rewarded prejudicially. This theory was substantiated by the finding that low caste boys performed better when the payment was determined by a *lottery* that selected one boy to be paid for his productivity at a very high wage, even though the caste of each boy had been announced.

A similar logic can explain why low income individuals have a particular affinity for state lotteries. Members of the lower class may feel that their low status prevents them from having the same opportunities as other members of society, due to class discrimination or by virtue of having fewer monetary, educational, or social capital advantages. Lotteries may be considered a 'social equalizer' in that, no matter what your position in society, everyone has an equal chance to win. The poor may feel they are rarely given such fair odds *relative* to others in their daily life. Recognition of this fact could potentially make low income individuals disproportionately motivated to play the lottery.

Methods

Eighty-three participants were recruited from the Greyhound Bus Station in downtown Pittsburgh, PA. The mean income of this sample was somewhat lower than in the first study, and the sample is younger, with a higher minority representation (see fourth column of Table 1).

As in Experiment 1, people waiting to board buses were approached to complete a short survey in exchange for $5. In the control condition, participants filled out the same survey from Experiment 1,

which elicited their opinions about Pittsburgh. In the experimental condition, participants completed a survey which asked them a series of questions about whether a rich person, middle class person or poor person would have an advantage or an equal chance when it came to eight different outcomes: 1) being awarded a scholarship 2) wining playing a slot machine 3) being elected mayor 4) finding $100 on the ground 5) becoming a superstar singer 6) being a victim of identity theft 7) getting a promotion 8) getting discounted housing. These events were deliberately chosen so that some would favor rich people (e.g. being elected mayor), some poor people (e.g. getting discounted housing), and some neither (e.g. win playing a slot machine).[3] Although we did not ask them explicitly whether a rich or poor person would have a better chance of winning the lottery, the questions--particularly the question about playing a slot machine--were intended to make respondents think about the fact that everyone would have an equal chance.

Immediately after they completed the survey, participants were handed five $1 bills as their payment and were given the opportunity to purchase lottery tickets. Next participants filled out demographic information.

Results

The main hypothesis, that participants in the experimental group would purchase more lottery tickets compared to those in the control group, was supported. Participants in the control group purchased .54 tickets on average while participants in the experimental group purchased 1.31 tickets on average. Figure 2 presents the frequency distribution of ticket purchases in the two conditions.

Again, we use ordered probit to analyze lottery ticket purchases. Specification 1 in Table 4 shows the significant effect of the social equalizer induction variable (coded 1 for the experimental group, 0 for the control group). Specification 2 includes the control variable, Chronic (coded 1 if the participant plays the lottery at least a few times per month, 0 otherwise). This coefficient of Chronic is in the right direction, but not significant, probably due to the low number of chronic players in this sample (16 participants). Specification 3 shows that the effect of the induction remains significant when chronic is

included in the model. Specification 4 includes the same demographic variables as in Experiment 1. They are in the right direction, but not significant, and Specification 5 shows that the effect of social equalizer induction remains significant when all control variables are included in the model. Table 5 shows the marginal probability effects of the social equalizer induction for specifications 1, 3, and 5 of the ordered probit analysis.

Discussion

These results support our hypothesis that low income individuals may be particularly drawn to purchasing lottery tickets because lotteries afford them an equal opportunity of winning. They are likely to perceive the lottery as a rare opportunity to compete on equal footing with people who are more affluent. One potential criticism of this finding is that the induction materials introduce a number of ideas, about class, luck, ability, social equity, and therefore obfuscate the driver of our effect. We conducted additional analyses on the participants in the experimental condition only to bolster our claim that the effect is driven by the belief among the poor that a game of chance does not discriminate among classes but that upper and middle classes have an advantage when it comes to rewards based on ability.

This supplemental analysis uses the responses to the manipulation questions: "Check which group is most likely to win playing a slot machine" and "Check which group is more likely to get a promotion." These two questions were chosen because the first measures the belief that all class categories are equally lucky and the second measures the belief that the middle and upper class have the advantage when it comes to receiving a reward based on ability. A variable was created by giving one point for reporting that all classes have an equal chance at winning playing a slot machine and one point for reporting that middle income and rich people were most likely to get a promotion. This variable predicts ticket purchases in the experimental condition with ordered-probit analysis, though not at a significant level with a two-tailed test (β =0.42, z= 1.56, p=.11).

Conclusion

These experiments shed light on the association between income and lottery play. It would be naive to think that low income individuals disproportionately play lotteries due to ignorance or cognitive errors. It is more likely that low income individuals are disproportionately motivated to purchase lottery tickets due to some factor that relates to their economic status. Study 1 indicates that lotteries are more alluring for poor people because they provide an opportunity to correct for low income status. Study 2 indicates that part of their appeal is that they are one of the few opportunities available to the poor for a sudden increase in wealth.

The results of this paper point to a cruel irony. People with low incomes play the lottery, which amounts to effectively burning $.47 on every dollar spent, in part because the cognitions associated with poverty increase the appeal of playing. This creates a vicious cycle. The subjective feeling of poverty leads people to take actions that effectively exacerbate the financial condition which led to the actions in the first place. The cost is not insubstantial. Approximately 50% of households with an income less than $25,000 play the lottery, and among the households that play, the annual per capita expenditure on lotteries is above $550 (Clotfelter, et al, 1999).

Do these findings provide evidence that lottery ticket purchases are evidence of irrationality? Though our findings show that preferences for lottery tickets are not fixed or stable, but are influenced by the decision context, we do not believe that the purchase of tickets is *necessarily* irrational (aside from compulsive gamblers for whom playing the lottery is clearly an irrational, addictive behavior).[3] People spend money on a lot of recreational activities, such as movies, amusement parks, books, travel and casinos that provide intangible benefits, and it would be difficult to argue that 'buying a dream' in the form of a lottery ticket is less rational than any of these purchases. It is also possible that small, periodic lottery winnings make it possible for people who otherwise (perhaps due to self-control problems or ‘impossible to decline’ requests of family or friends) could not save money, to periodically win a sufficient sum to enable the purchase of consumer durables. It must be acknowledged, however that there

are less expensive ways to commit to save, such as bank accounts with restrictions on withdrawals akin to Christmas clubs (see Ashraf et al, 2006).

Regardless of whether playing the lottery meets the qualifications of economic rationality, it is unfortunate that the cost of 'buying a dream' has to be so high. Why should wealthy people purchase dreams that provide an average real return of 7% per annum while poor people purchase dreams that provide an instantaneous return of -47% or worse? Some economists have argued that, although playing the lottery is voluntary, it should be viewed as a regressive tax. This tax is substantial. In 2006, lottery ticket sales generated $17 billion in net revenue (Stodghill & Nixon, 2007). In our opinion, states should not be in the business of extracting wealth from poor people, especially when, as we show, the psychological experience of poverty is in part responsible for the attractiveness of lotteries. State lotteries should not be banned, as that would surely drive the activity underground. Instead, we propose a simple solution that would avoid leveling a high tax on low income families: provide an actuarially fair rate of return less any cost of administration, and reduce the variation in prize returns by increasing the number of winners and reducing the jackpot amounts.

Additionally, the marketing, advertising, and use of game variability and promotions should be curbed. The most recent development is the introduction of lottery video game terminals, which are part of an effort to attract younger customers (Stodghill & Nixon, 2007). Though the mandate of many state lotteries is explicit in its goal of maximizing revenue, using lotteries to generate discretionary revenue for the state through a *seemingly* "painless" tax only encourages exploitation of the poor's naturally tendency to be drawn to the lottery. As argued by Clotefelter & Cook (2007), a profit maximization strategy is inappropriate and states should adapt a model similar to that of state-run liquor monopolies, where the goal is to regulate and control the sale of alcohol in order to accommodate "unstimulated" demand, but not to promote it. Given the important source of revenue that lotteries have become for states, however, one shouldn't hold one's breath waiting for such changes to occur.

Is there a middle ground? Our findings point to a policy recommendation that allows for a compromise between doing away with the profit maximization strategy of state lotteries and completely

ignoring the financial well being of low income lottery patrons. In short, we find that the feelings and cognitions associated with poverty increase the attractiveness of lotteries. So why not capitalize on this tendency instead of lamenting it? Our results suggest that lotteries are powerful *motivators* for low income populations. Perhaps they can be used to encourage financially beneficial behaviors, such as saving. There is a wealth of evidence that lottery-linked savings accounts can be applied quite successfully in low income populations. In developing countries, microfinance institutions have utilized such accounts where, for example, customers accumulate lottery tickets by making regular minimum deposits (Ashraf et al., 2003). Many commercial banks outside of the U.S. also use lottery-linked savings accounts. In a typical arrangement, monthly drawings are held for cash and prizes and customers get one lottery ticket for every $X they have on deposit at the time of the drawing (Guillen & Tschoegl, 2002). These accounts typically draw customers from the lower end of the income distributions. These programs benefit banks by increasing deposit balances and benefit customers by increasing their financial security, although often these accounts have slightly reduced interest rates to help cover the costs of the prizes. Policy makers should explore the establishment of similar financial services in the U.S., either through partnerships with banks or directly through state lotteries, such as by offering lottery tickets with a savings component. Of course, careful pilot research must be done to evaluate the social benefit and avoid unintended consequences of such programs before implementing them on a wide scale.

Notes

1. Given diminishing marginal utility, the situation appears even bleaker when the return on the lottery is viewed in terms of expected utility instead of expected value. The evidence is equivocal about whether winning increases average utility. Gardner & Oswald (2007) find significant improvements in psychological stress with medium-sized lottery wins (up to $200,000). However, Brickman et al. (1978) find that lottery winners are no happier than people who did not win and winners actually take less pleasure in mundane everyday activities. Anecdotally, there is evidence that winning the lottery can be a stressful life event and even trigger a depressive episode (Nissle & Bschor, 2002).
2. Note also that almost all experiments conducted by psychologists and economists – including studies of risky decision making, experimental games, intertemporal choice and almost all other topics -- involve 'house money'; very few studies ask participants to spend their own money. Although it is not relevant to the focus of this paper, Appendix 1 reports the response frequency distributions for each item.
3. Although it is not relevant to the focus of this paper, Appendix 1 reports the response frequency distributions for each item.
4. Compulsive lottery playing is not an insignificant problem. Twenty percent of callers to the 1-800-GAMBLER national hotline had trouble controlling spending on state lottery tickets, second only to casino gambling, according to the Council on Compulsive Gambling of New Jersey, 2002 Help Line Statistics.

Tables

Table 1. Demographic information for Experiments 1 and 2.

		Experiment 1	Experiment 2
n of participants		79 (39/40)	83 (41/42)
Age	Mean	40.17	29.4
	Median	38	24
	Range	18-78	18-62
Income	Mean	$29,228	$19,944
	Median	$20,000	$16,500
	Range	0-$256,000	$0-$85,000
Education	At Least College Degree	19%	14.6%
	No College Degree	81%	85.4%
Gender	Males	49%	61%
	Female	51%	39%
Race	African American	41%	48.2%
	Caucasian	49%	37.0%
	Hispanic	3%	2.5%
	Asian	4%	2.5%
	Reported “other”	4%	9.8%

Table 2. Ordered probit analysis on the number of tickets purchased in Experiment 1: The Relative Income Induction).

	Coefficients				
	(1)	(2)	(3)	(4)	(5)
INDUCTION	0.447^{+}		0.557*		0.712*
	(0.26)		(0.28)		(0.30)
CHRONIC		0.534^{+}	0.667*		0.635^{+}
		(0.33)	(0.34)		(0.36)
AGE				-0.0306	-0.0306
				(0.045)	(0.046)
AGE^2				0.000413	0.000426
				(0.00050)	(0.00052)
AFRICAN AMERICAN				0.297	0.394
				(0.28)	(0.30)
EDUCATION				-0.321	-0.234
				(0.36)	(0.39)
Observations	79	77	77	75	75
Pseudo R-squared	0.0159	0.0144	0.0376	0.0172	0.0616

Note: Standard errors in parentheses
* p<0.05, $^{+}$ p<0.10

Table 3. Marginal probability effects of the Relative Income Induction in Experiment 1.

	(1) Relative Income Induction	(2) Relative Income Induction with Chronic	(3) Relative Income Induction with all Control Variables
0 Tickets	-0.17^{+}	-0.21*	-0.27**
	(0.10)	(0.10)	(0.10)
1 Ticket	0.04	0.05^{+}	0.07^{+}
	(0.03)	(0.02)	(0.04)
2 Tickets	0.06	0.08^{+}	0.09*
	(0.04)	(0.04)	(0.05)
3 Tickets	-	-	-
4 Tickets	-	-	-
5 Tickets	0.08^{+}	0.09^{+}	0.11**
	(0.05)	(0.05)	(0.05)

Note: Standard errors in parentheses
** p<0.01, * p<0.05, $^{+}$ p<0.10

Table 4. Ordered probit analysis on the number of tickets purchased in Experiment 2: The Social Equalizer Induction.

	Coefficients				
	(1)	(2)	(3)	(4)	(5)
INDUCTION	0.673**		0.649*		0.672*
	(0.27)		(0.28)		(0.29)
CHRONIC		0.248	0.156		-0.00884
		(0.33)	(0.33)		(0.36)
AGE				-0.0777	-0.0663
				(0.074)	(0.077)
AGE^2				0.00117	0.000963
				(0.0010)	(0.0011)
AFRICAN AMERICAN				0.0530	0.153
				(0.28)	(0.29)
EDUCATION				-0.563	-0.629
				(0.46)	(0.49)
Observations	83	80	80	79	79
Pseudo R-squared	0.0322	0.00309	0.0326	0.0199	0.0495

Note: Standard errors in parentheses
**p<0.01, * p<0.05

Table 5. Marginal probability effects of the Social Equalizer Induction in Experiment 2.

	(1) Relative Income Induction	(2) Relative Income Induction with Chronic	(3) Relative Income Induction with all Control Variables
0 Tickets	-0.25**	-0.24**	-0.24*
	(0.10)	(0.10)	(0.10)
1 Ticket	0.05^{+}	0.05^{+}	0.06^{+}
	(0.03)	(0.03)	(0.03)
2 Tickets	0.07*	0.06^{+}	0.07^{+}
	(0.03)	(0.03)	(0.04)
3 Tickets	0.30	0.03	0.03
	(0.02)	(0.02)	(0.02)
4 Tickets	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
5 Tickets	0.09*	0.08*	0.08*
	(0.04)	(0.04)	(0.04)

Note: Standard errors in parentheses
** p<0.01, * p<0.05, $^{+}$ p<0.10

Figures

Figure 1. Histogram of lottery tickets purchased in the High and Low Relative Income conditions in Experiment 2.

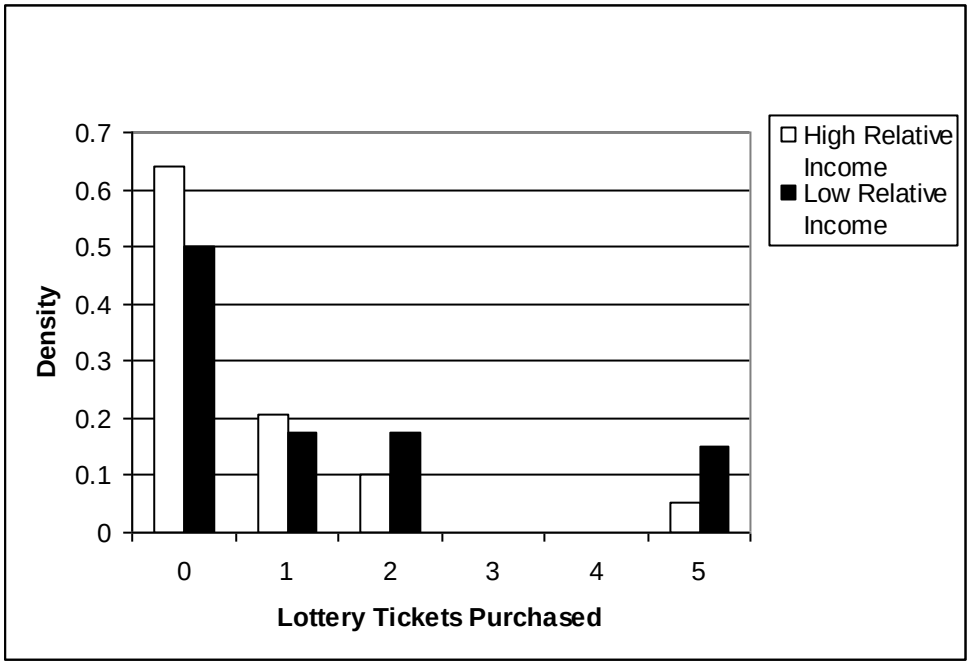
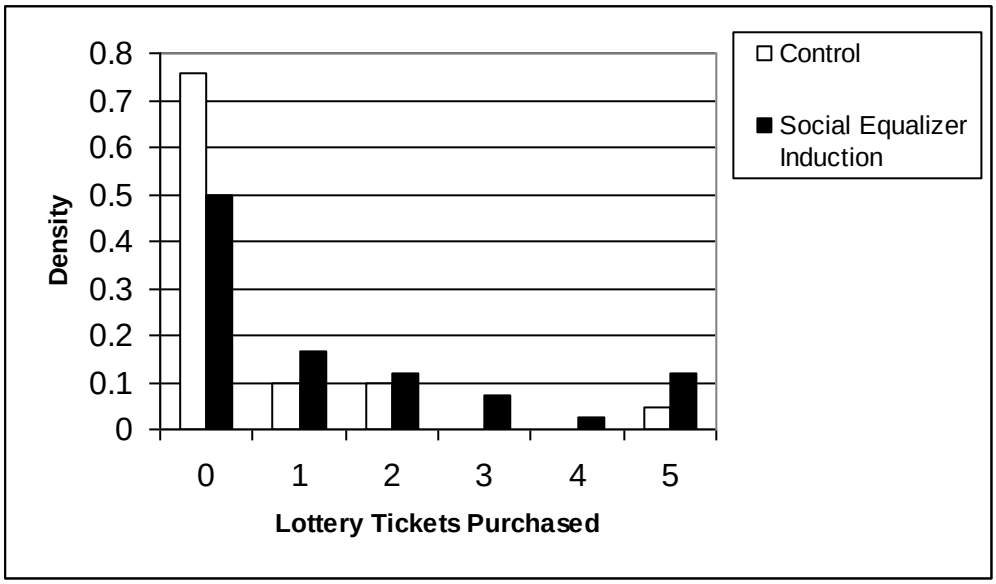


Figure 2. Histogram of lottery tickets purchased the Control and the Social Equalizer Induction conditions in Experiment 3.



Appendix 1

Survey used in the experimental condition of Experiment 2. The response frequencies are filled in on this survey.

Check which group is most likely to:	Poor People	Middle Class People	Rich People	Equal chance for all
get a scholarship.	10%	40%	19%	31%
win playing a slot machine.	3%	31%	14%	52%
be elected mayor.	2.5%	12%	78%	7.5%
find $100 on the ground.	14.5%	22%	10%	53.5%
become a superstar singer.	5%	24%	20%	51%
be a victim of identity theft.	16.5%	24%	16.5%	43%
get a promotion.	0%	30%	30%	40%
get discounted housing.	63%	10%	5%	22%

Chapter 4

Contingent Financial Incentives and Lotteries

Trends in both management and public policy suggest that tying financial compensation to behavior is becoming increasingly widespread. Since the 1970s an increasing fraction of jobs in the U.S. labor market explicitly pay workers for their performance using a bonus, commission, or piece rate (1976-1998) (Lemieux, Macleod, & Parent, 2006). This increase is consistent with the view that monitoring costs have declined over time with advances in information and communication technologies that facilitate collecting and processing data on worker output. These developments help to more closely associated performance with compensation and also offer the opportunity for managers to selectively increase specific outputs and behaviors with contingent rewards.

Similarly, in public policy programs that tie monetary rewards to specific behaviors are gaining increasing popularity. There has been bipartisan support for a move away from traditional welfare programs that offer 'hand-outs' to the poor. Instead, novel programs are supplementing the traditional by offering financial incentives for the poor to take action to improve their financial well-being. These new programs link financial incentives to meeting goals in education, employment, job training, community service, and financial responsibilities (e.g. paying bills on time and saving). A similar trend has emerged in healthcare policy. Recent research has examined the use of financial incentives for encouraging preventative healthcare, treating substance dependence, and encouraging medical compliance (see Giuffrida & Torgerson, 1997 and Kane, Johnson & Butler, 2004 for reviews).

These trends underscore the importance of research on using financial incentives to improve performance in organizations and inform policy design and implementation. Though there has been extensive work on the subject in organizational behavior (e.g., expectancy theory), psychology (e.g.,

operant conditioning) and economics (e.g., agency theory), there are still many questions that remain about the optimal way to design and structure financial incentives. Bartol & Locke (2000) note:

> "The problem of how to motivate people to work by means of monetary incentives has been a primary concern of owners and managers since the beginning of the industrial revolution. The fact that the problem has never been fully resolved is a reflection of its complexity." (p. 104)

This chapter applies a concept from the behavioral economics literature (more generally, the behavioral decision making literature) to inform the design of financial incentives: nonlinear probability weighting. This concept, first described by Kahneman & Tversky (1979), asserts that people do not treat probabilities linearly, but rather overweight low probabilities. This implies that lottery-linked incentives will be overvalued relative to their expected value.

The Application of Behavioral Economics to Incentives

Behavioral economics draws on psychology and economics to construct descriptive theories of human behavior. This is in contrast to normative economic theories, which describe optimal behavior assuming rationality, stable preferences, and that people compute the costs and benefits of different actions to select the action that provides optimal returns (March, 1988). Behavioral economics examines the limitations of economic theory and increases its explanatory power in several broad areas of research: bounded rationality, bounded will-power, and bounded self-interest (Loewenstein & Camerer, 2004; Mullainathan & Thaler, 2000).

Bounded rationality describes people's attentional, memory, computational, and information processing limitations which often lead to heuristic processing, or 'rules of thumb' (see Kahneman, 2003 for review). Heuristic processing has the advantage of helping people simplify their judgment and decision tasks into manageable levels of complexity (Simon, 1982). However, it has the drawback of leading to systematic biases in judgment and decision making, such as myopic perception, non-linear probability weighting, inconsistent time discounting, reference-dependence, egocentrism, memory distortions, hypothesis-testing biases and so on. These biases make judgments and decisions inconsistent

and subject to 'manipulation', as they are influenced by a host of non-normative factors. These include myopic vs. aggregate presentation, serial position (position in or ordering in a sequence), gain vs. loss framing relative to some reference point (e.g., expectations, a social comparison, or the status quo), elicitation method (e.g., pricing vs. choosing), and superficial manipulations of uncertainty (e.g., risk vs. ambiguity).

It is logical to assume that these decision biases will carry over onto how financial incentives are perceived and valued, and thus influence motivation and performance. The goal of the current research is to apply research findings to the practical end of financial incentive design. There are a host of decision biases that may be relevant to the design of financial incentives. The research described here addresses the tendency to systematically overweigh small probabilities, with the prediction that lottery rewards will be valued at a premium relative to their expected value under certain conditions.

To date, there have been several streams of research that apply insights from behavioral economics to financial incentives. This work demonstrates responses to incentives is influenced by factors such as perceptions and inconsistent time preferences, and thus is not always in line the predictions of normative economic theory. The most prevalent examples of this work are reviewed below.

The standard model of agency theory predicts that 1) effort is at its lowest point in the absence of extrinsic incentives, 2) effort increases monotonically with the size of the incentive, and 3) introducing incentives cannot lower effort levels (Kreps, 1997). However, "perverse effects" of incentives have been demonstrated where moving from no incentives to small incentives decreases performance in pay-for-performance tasks (Gneezy & Rustichini, 2000; 2002). There are many potential explanations for this effect. The small incentive may deplete intrinsic motivation, trigger the thought that the effort is not 'worth it', or signal that the task is unimportant. People may think that working in the small incentive condition may damage one's future bargaining position by signaling a willingness to accept a low wage or by precluding the opportunity to later demand reciprocation for one's effort. Similarly, motivation "crowding-out" theory in economics (e.g. Frey & Jegen, 2001) and cognitive evaluation theory in psychology (discussed further below) document the ability of incentives to deplete intrinsic motivation

under certain conditions. Like excessively small incentives, excessively large incentives can also have a detrimental 'choking' effect (Ariely et al., 2005). Part of the rationale for why lotteries may be useful for incentive design is that they can 'reframe' small incentives as a potential chance for a large gain.

Standard economic theory predicts discounted present-value maximization. Future costs and benefits ought to be discounted in value (e.g., by the current rate of interest offered by banks), ideally by a constant rate per period of time delay, described mathematically by an exponential discount function. However, behavioral economics demonstrates that behavior is more accurately described by a hyperbolic discount function. This model captures the tendency for discount rates to decline with the duration of time delay, with the steepest decrement in current value as we defer immediate consumption (see Frederick, Loewenstein & O'Donoghue, 2002 for review). This excessive overweighting of present utility and discounting of future utility captures our weakness for immediate gratification. This leads to self-control problems, characterized by inconsistent decision making. In the present, we succumb to immediate benefits (such as consumption) and delay immediate costs (such as saving), believing that our choices will be more disciplined in the future. However, when the future comes we renege on prior commitments and pursue immediate gratification rather than long-run well-being.

Hyperbolic time discounting prescribes the use of *immediate,* small incentives to help align short-term and long-term interests. For example, drug addiction is clearly not consistent with long-term welfare, but overcoming addiction is difficult because the benefits of drug use are immediate, while the substantial benefits associated with quitting are in the future. Many successful drug treatment interventions employ the use of immediate incentives, such as a small reward in exchange for a clean urine test. Increasingly, welfare programs are employing the same tactic to encourage positive behaviors, such as job training, school attendance, nutrition, etc. The recent success of Mexico's large-scale Oportunidades program (25% of the population was enrolled) has spurred the launch of similar small scale programs in U.S. cities. Programs that "pay people to do the right thing" are being hailed as "the latest front in the war against poverty." For more discussion of research on the use small, immediate rewards in programs designed to promote long-term well-being, see Chapter 1. The focus of the current chapter is on a strategy

to make small, immediate, contingent financial rewards more effective, with the intent of informing interventions in both public policy and organizations.

Theories of motivation in organizational behavior concerning contingent pay

The question of how to motivate people with financial incentives is a central topic of study in organizational behavior. Compensation in organization is a fundamental. It represents 70% of total cost on average in organizations (Blinder, 1990). It has tremendous influence on the motivation of employees through its effect on their goals and behavior, and on the composition of organizations through the attraction and retention of employees.

Most major theories of motivation predict that linking pay to performance will increase motivation and align organizational and individual interests. Expectancy theory is grounded in subjective expected utility theory. It holds that people make choices based on 1) their *expectancy* that efforts will lead to a certain level of performance 2) their belief that their performance will lead to valued outcomes (*instrumentality*) and 3) the value they place on the outcome (*valence).* Under expectancy theory, tying financial incentives to specific behaviors or outputs primarily increases the instrumentality link, which increases extrinsic motivation to expend effort and consequently improves performance (Porter & Lawler, 1968; Vroom, 1964).

Though it is clear that expectancy theory predicts that linking pay to performance improves performance, it is not clear what the theory would predict regarding the efficacy of lottery incentives versus certain incentives. On one hand, lottery incentives decrease the instrumentality of effort by linking it to an uncertain outcome. On the other hand, lottery incentives may increase the valence of the reward by reframing low certain rewards as the possibility of earning a substantial amount of money, or by associating the reward with fun and suspense.

Linking pay to performance helps address the two major problems in employment contracts raised in agency theory: moral hazard (an agent not acting in the best interests of the principle) and adverse selection (an agent misrepresenting one's skill, motivation, etc.). Making pay contingent on

performance reduces the moral hazard problem by better aligning the interests of the principle and the agent. When it is not possible to sufficiently monitor the behavior of the agent with behavior-based pay, such as piece work or sales commissions, outcome-based pay may be used, which links pay to a measurable outcome, such as stock returns or profits. Contingent pay also diminished adverse selection, as the most productive workers will be attracted to firms that reward productivity. Lazear (2000) demonstrated that when an auto-glass firm moved to a piece-rate system, more able workers began taking these jobs.

Agency theory also points out a fundamental problem with using outcome-based pay. With outcome-based pay, the individual has limited control over outcomes, e.g. from the actions of other organizational members, competitors, or general economic conditions. Agency theory suggests that employees are more risk averse than employers because they can not diversify their employment. Thus, the benefits of outcome-based pay must be traded-off with the extra expense of having to offer a compensation pay differential for employees to accept risk sharing.

In this framework, lottery-incentives appear unfavorable since they introduce more risk to the value of one's paycheck. However, Wiseman & Gomez-Mejia (1998) present a theoretical analysis of the application of prospect theory to agency theory, the Behavioral Agency Model. They argue that prospect theory calls into question the prediction that variable pay increases the perceived compensation risk of agents. The Behavioral Agency Model asserts that base pay is included in one's conception of perceived current wealth, whereas contingent pay is not. According to prospect theory, people are loss averse, not universally risk averse. Thus, agents will be risk averse when base pay is at risk, since this would be perceived as a loss to current wealth, and less risk averse or risk neutral when contingent bonus pay is at risk. The analysis stresses the importance of adding contingent incentives to a compensation scheme, termed 'layering', so that there is no perceived threat to current wealth level. Thus, a strong caveat for the use of lottery-linked incentives is that they should only be used as a supplement or bonus to compensation.

The literature on goal setting theory also confirms the positive relationship between contingent financial incentives and performance (Locke & Latham, 1990). According to goal setting theory, incentives increase acceptance of difficult goals, thus increasing performance (Locke, Lathan, & Erez, 1998). There is some support for the assertion that the relationship between incentives and performance is at least partially mediated by goal setting, either through goal commitment (e.g. Reidel et al, 1998) or goal level (e.g. Wright & Kacmar, 1995). For example, Wright (1992) found that both piece rate and bonus pay lead to higher goal commitment than hourly pay. This literature also asserts that it is crucial to make financial incentives contingent on performance, not goals. Simply linking rewards to goal attainments results in lowered goal levels and lowered self-efficacy (Wright & Kacmar, 1995). Taken together, research supports the position that goal-setting procedures should not replace contingent financial incentives as a means for improving performance.

Operant conditioning or reinforcement theory also predicts that linking financial incentives to performance will increase motivation, as well as learning. Hundreds of studies on operant conditioning, first described by Skinner (1953), have established that extrinsic rewards influence behavior. Reinforcement is the presentation of a reward or punishment in a temporal relation with a response. When rewards are administered subsequent to a behavior, rewards reliably increase the likelihood of the behavior occurring again. This work has lead to the widespread application of rewards to increase motivation and to promote behavioral change in a range of applied settings and disciplines. Reinforcement theory informs predictions about how the temporal association between the financial incentive and the target behavior should be structured to be most effective. The various schedules of reinforcement are reviewed in Chapter 5 as part of the rationale for why lottery incentives will be motivating. An extremely effective schedule is the variable ratio schedule of reinforcement, which corresponds closely with lottery incentives (Kazdin, 1994).

Though most popular theories of motivation predict a positive relationship between financial incentives and motivation, cognitive evaluation theory (also known as self-determination theory) (Deci and Ryan, 1980; 1985) offers the most significant argument against the use of financial incentives. The

main theoretical argument is that although financial incentives may have a positive effect on performance, financial incentives may have detrimental effects on intrinsic motivation. Intrinsic motivation refers to the satisfaction, interest, and pleasure derived from carrying out an activity well without regard to the external reward for the activity (Amabile, 1993). In cognitive evaluation theory, intrinsic motivation derives from the need for autonomy and competence and rewards 'control' behavior, undermining autonomy. In a typical demonstration of the ability of financial rewards to undermine intrinsic motivation, subjects are either paid or not paid for working on a task. Next, all subjects are given the opportunity to spend free time working on the task without any extrinsic incentive to do so. Subjects who were paid in the first period later spend less free time later on the task, which is taken as evidence that rewards decrease intrinsic motivation. A meta-analysis by Deci, Koestner and Ryan (1999) found that if subjects expect a monetary reward, intrinsic motivation (measured by the time spent on the task) is reduced. When intrinsic motivation is measured self-reported enjoyment and interest in the task the effects, although significant, are smaller.

Cognitive evaluation theory has been the subject of extensive debate. There is agreement that while valid, this theory has numerous boundary conditions. In a meta-analysis Eisenberger & Cameron (1996) found that free time spent on the task is reduced only when the reward was tangible (e.g. not praise), expected, and independent of meeting a performance goal. In another meta-analysis Cameron et al. (2001) find that negative effects are only found when a reward is expected and when it is loosely tied to level performance. When the reward is linked to level of performance, they found either a positive or no effect on intrinsic motivation. Additionally, there are numerous problems associated with the experimental paradigm that demonstrates the effect. The withdrawal of pay could be viewed as punishment or could lead to disappointment as it violates expectations of pay. Fehr & Falk (2002) argue that disappointment might have a powerful effect because self-serving biases rapidly make people feel entitled to a previously paid reward. So if the reward is withdrawn, loss aversion and negative reciprocity (the desire to punish unfair behavior) will influence performance. Similarly, if the withdrawal of the rewards is perceived as a violation of norms of fairness, equity theory (Adams, 1965) predicts that people

would attempt to restore their previous input/output ratio by reducing productivity. Further, there are several theoretical problems with self-determination theory (see Bartol & Locke, 2000).

It is important to note that even if rewards do have a negative effect on intrinsic motivation under certain conditions, the net effect of rewards on total motivation and performance is positive. The relationship between contingent financial incentives is well-established in laboratory research. Though the results are not entirely consistent, several meta-analyses demonstrate that financial incentives do indeed improve performance. Wiersma (1992) found that rewards enhanced performance, with an average effect size of 0.34. A quantitative meta-analysis on laboratory experiments, field studies, and simulations demonstrated that financial incentives are related to performance (Jenkins et al., 1998). The estimated effect size of incentives on performance quantity was .34 and significant effects were found in all three settings. Qualitative reviews of the laboratory and applied evidence endorse the effectiveness of linking pay to performance (Bucklin & Dickinson, 2001; Gerhart, 2000).

When is contingent pay effective in organizations? There are a number of reasons why firms may not be able to implement efficient contingent performance systems. The most crucial factor is job complexity and the associated monitoring costs. There is empirical support for is prediction. Brown (1990) found that the choice between a fixed salary, merit pay and piece rate compensation depends on the monitoring costs. Similarly, MacLeod and Parent (1999) differentiate between bonus pay, commission contracts, and piece-rate contracts and find that commission contracts are widely used in sales jobs, where the level of sales provides a clean measure of performance. When performance measures are more subjective, then firms either use bonus pay or hourly pay with little explicit pay-for-performance. When pay-for-performance is used, workers report more autonomy, thought to reflect less monitoring.

Interdependence between employees is another job characteristic that affects the suitability of contingent pay (MacLeod and Parent, 1999). For example, in an assembly-line, the pace of the line is constrained by the slowest worker, and hence all workers must work at a similar pace. Another factor is the correlation of performance measures with quality of performance. Lemieux, Macleod, & Parent, (2006) give the example of a software programmer that is paid by the number of lines of computer code

generated. He or she will produce many of lines of code, even though the code may be error-ridden and inefficient. Another example is teachers "teaching for the test" when they are rewarded based on the standardized test scores of students.

The appropriateness of lottery incentives in organizations. Like most contingent financial incentives, lottery incentives are most appropriate in for tasks in which monitoring costs are low, task complexity is low, there is low task interdependence, and performance quality is relatively stable or can be easily observed. As emphasized in agency theory, it is imprudent to have all of an employee's salary tied to output and thus uncertain. This emphasizes the importance of 'layering' these rewards on top of base and framing them as bonuses. Lottery incentives should be used as a supplement above base salary to encourage specific behaviors identified as important by managers. One way to ensure that they are perceived as a bonus is to frame their introduction as a short-term 'initiative' programs with an end date at which the promotion will expire. An appropriate time to use them may be in times of organizational change, when employees may be reluctant to comply with new procedures. This may encourage learning new, challenging tasks or for creating new routines. Lottery rewards may also be appropriate for mundane tasks which employees find tedious, but management highly values.

Conclusion

Overall, the literature on motivation in organizational behavior endorses the use of contingent financial incentives to encourage motivation. This literature also offers recommendations about situations in which contingent financial incentives and lottery-linked incentives may be effective. The behavioral economics literature illustrates that people do not always respond to incentives in ways that are consistent with strict assumptions of rationality. In this vein, the irrational, overweighting of small probabilities may be applied to design lottery-contingent financial incentives. Chapter 5 will further elaborate on the rational for the use of lottery-linked financial incentives.

Chapter 5

Experiments on the Use of Lotteries as Incentives

Abstract

This section asks whether the appeal of lotteries and their implied overvaluation relative to their expected value holds when they are offered as incentives. This question was examined in a series of experiments using a pay-for-performance anagram-solving task. Various configurations of lottery incentives were compared with their expected value. Across all experiments, lottery-linked incentives did not lead to greater task persistence (measured by time spent working) relative to their expected value. However, a particular type of lottery incentive resulted in greater task performance (measured by correctly solved anagrams) compared to all other types of incentives. This lottery incentive offered the combination of a moderate probability of a low reward and a low probability of a high reward. Support was also found for the hypothesis that lottery incentives are particularly motivating in low income populations.

Introduction

The purpose of this study is to examine the relationship between lottery incentives and motivation, measured by persistence in a problem-solving task. Several lines of research suggest that a probabilistic reward may give you 'more bang for your buck' compared to a reward that offers a guaranteed payoff with an equivalent expected value. However, research to date has not rigorously analyzed the question of whether lotteries are more motivating than their expected value. Further, little is known about how varying lottery parameters influences their efficacy as incentives. This research has the goal of understanding if lottery incentives are actually more motivating than their expected value, and if so, under what conditions. Lotteries can take many different configurations outside of the typical

ambiguous, small probability of a large financial reward. This research also compares the relative strength of various configurations of lottery incentives.

Several studies have found that lottery rewards are effective in promoting pro-social (e.g. Diamond & Loewy, 1991) and work behaviors (e.g. Evans et. al, 1998). The use of lotteries as incentives for charitable giving has also been demonstrated (e.g. Landry, Lange, List, Price, & Rupp, 2006). Some companies have implemented lottery reward systems. For example, at Continental Airlines employees with perfect attendance for six months were entered into a lottery to win a new car (Sims, 2002). Additionally, banks offer a real world example of how probabilistic rewards have been successfully applied to increase the motivation to save. Many banks and micro-credit institutions offer lottery-linked savings accounts where customers receive lottery tickets for every $X they have on deposit (Guillen & Tschoegle, 2001; Ashraf et al., 2003). These accounts have reduced interest rates to compensate for the cost of the lottery prizes. The popularity of these accounts implies that the lottery incentive is more motivating than a standard fixed interest rate. Aside from adding excitement and suspense to an otherwise dull task, there are several theoretical underpinnings for the propositions that lottery-linked rewards may be more effective than their expected value.

Rationale for the use of Lottery Incentives

Probability weighting. First, the research on the probability weighting function predicts that lotteries will be overvalued relative to their expected value. Much empirical research demonstrates that people do not treat probabilities linearly. This is captured by the probability weighting function, as described by prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). It is an inverse S-shaped function, which is concave for low probabilities and convex for high probabilities. People subjectively overweigh the likelihood of low probabilities and underweigh the likelihood of high probabilities. The function is relatively flat in mid-range probabilities, indicating diminished sensitivity to changes. The tendency to systematically overweigh small probabilities has been used to explain the premiums that people are willing to pay to purchase lottery tickets and insurance.

Reinforcement Theory. Schedules of reinforcement lie on a continuum which ranges from continuous (i.e., every occurrence of the targeted response is reinforced) to extinction (i.e., occurrences of the targeted response are never reinforced) (Ferster & Skinner, 1957). In a fixed interval schedule, rewards are delivered for the first response after the interval expires, regardless of the number of responses during the no-reinforcement interval. This corresponds to hourly pay. Since only one response is required in order to obtain the reward, fixed interval schedules of reinforcement are characterized by a post-reinforcement pause followed by very low rates of responding. Variable interval schedules are similar to fixed interval, except that the time interval is variable instead of constant. Variable interval schedules are characterized by consistent low to moderate rates of responding since the reward is available at any point after the elapsed time limit (as opposed to only at the time it elapses).

In a fixed ratio schedule, rewards are delivered contingent upon the completion of a fixed number of responses. This corresponds to a piece rate system. Fixed ratios are characterized by high rates of responding. However, a disadvantage associated with fixed ratio schedules is that responses between the delivery of reinforcements are characterized by a pause (as in fixed interval schedules) followed by a high rate of responding. The post-reinforcement pause leads to a loss of time that could be used productively and an inappropriately rapid rate of responding, the 'compensatory increase' may decrease the accuracy or quality of task performance (Alberto & Troutman, 1995).

Finally, variable ratio reinforcement schedules, which give rewards at a variable rate, are very efficient, resistant to extinction, and produce continuous rates of the target behavior (Skinner, 1953). This schedule of reinforcement corresponds to all gambling devices and lottery incentives. Variable ratio schedules are similar to fixed ratio schedules except that in variable ratio schedules, the ratio of responses to rewards varies so on average X responses are reinforced. Randomization of the delivery of rewards in variable ratio schedules ensures that the subject does not know if the first, third, or twentieth response will be reinforced. The main advantage of variable ratio schedules is the near elimination of the post-reinforcement pause and thus increased time spent on the task. Subjects respond more consistently and at a moderate rate because they are not certain which response will result in the delivery of a reward. The

consistent rate eliminates the need for a compensatory increase in rate of responding; therefore, subjects may make fewer mistakes due to the prevention of hurried responding.

Myopic perception and the peanuts effect. In general, reinforcement theory asserts that the power of a reward increases with the frequency of reinforcement and decreases with the temporal distance from the desired behavior (Kazdin, 1994). Holding incentive cost constant, in order to keep the reward frequency high, the magnitude of each reward must be small. In other words, in order to keep the reward closely coupled with behavior it must be presented as small amounts at a time, rather than in aggregate when the work is completed.

However, as discussed in detail in Chapter 2, the peanut's effect describes people's tendency to underweigh small gains (Prelec & Loewenstein, 1991), and has been demonstrated empirically in numerous laboratory studies (see Greene & Myerson, 2004 for a review and see Weber & Chapman, 2005 for an in-depth investigation of the effect). Research on the 'peanuts effect' makes the prediction that people will prefer a gamble to a small certain gain, e.g., most prefer a 10% chance to win $1 than $.10 for sure. Markowitz (1952) first described this tendency and proposed a utility function defined over gains and losses (rather than absolute levels of wealth). This function is very similar to the prospect theory value function: risk aversion in the domain of gains and risk seeking in the domain of losses. However, Markowitz's function has two additional inflection points, one on the gain side, and another on the loss side, making it convex for small gains and concave for small losses. In the domain of gains, this implies that when the stakes are small, people prefer fair gambles to small certain gains.

Logically, people should realize that small rewards will add up over time. However, people are quite prone to myopic perception or shortsightedness. Myopic decision making refers to the tendency to make decisions without considering the aggregate consequences of making the same decision multiple times. Myopic decision making has been used to explain the equity premium puzzle (Benartzi & Thaler, 1995) and people's reluctance to save adequately for their retirement (Thaler, 1990).

Taken together, myopic perception coupled with the tendency to underweigh small dollar amounts detracts from the attractiveness of small, frequent financial rewards closely coupled with

behavior (thus not aggregated). The use of lottery incentives offers a potential solution to counteract these effects by having each reward offer the possibility of a large financial gain.

Boundary Conditions

Research on the peanuts effect suggests that lotteries will be most effective when the magnitude of the certain reward is low. When the magnitude of the certain reward is low, people tend to be risk seeking in the domain of gains (e.g. a gamble with a 10% chance to win $1 is preferred to $.10 for sure). When stakes are high, then people tend be risk averse in the domain of gains (e.g. $100 for sure is preferred to a 10% chance to win $1000).

Required effort level is another potential boundary condition. Kivetz (2003) proposed that uncertain rewards will be most effective when the effort needed to obtain the reward is either very low or very high, holding reward magnitude constant. He proposed that effort creates the expectation of a reward, creating a reference point for judging compensation. Lotteries may be effective when required effort is very low because the expectation of compensation is negligible. In situations of moderate effort, a lack of compensation will be coded as a loss. An important caveat to this is that the sure-reward must be viewed as sufficient compensation for the required effort. If effort is very high, a small-sure reward will not be satisfactory and will be viewed as a loss. Conversely, a large uncertain reward for very high effort provides the possibility of avoiding the perceived loss and receiving highly satisfactory compensation. This assertion is supported by the finding of risk-seeking in the domain of losses (Kahneman & Tversky, 1979, Payne et al. 1980) and break-even effects, whereby people tolerate more risk in order to eliminate prior losses (Thaler & Johnson, 1990). Taken together, these propositions point to a U-shaped curvilinear relationship between effort and preference for lottery rewards.

This theory was tested in the context of frequency (or loyalty) programs. In a hypothetical music rating rewards program, participants were given a choice between a small, certain reward of a free CD or a large, uncertain reward of a 1 in 30 chance to win a portable MP3 player. Results confirmed that preference for the large, uncertain reward was highest when no effort was required and when a great deal

of effort was required. This result was replicated in a similar study in the context of completing online surveys. This experiment also added a condition in which participants would additionally receive a guaranteed payment for each survey completed. It was hypothesized that the presence of the certain reward would decrease additional reward expectations. In this condition, as expected, preference for the large, uncertain reward was higher.

In the Kivetz (2003) experiments, the preponderance of choice was for the small, certain reward, which is evidence against the efficacy of lottery rewards. Even in under circumstances where the preference for the small, certain reward was attenuated (low and high effort & the presence of a guaranteed reward), preference for the large, uncertain reward was less than 50%. However, there are several limitations of this research. All of the experiments were hypothetical and the dependent measure was choice, not actual behavior under different incentive programs.

Socioeconomic status is another potential boundary condition. Lottery-linked incentives may be particularly important for understanding financial incentives in low income populations. The strongest evidence for this comes from research on state lottery players, which finds that lotteries are most appealing to the poor. Low income individuals spend a higher percentage of their income on lottery tickets than do wealthier individuals (Brinner & Clotfelter, 1975; Clotfelter & Cook, 1987, 1989; Livernois, 1987; Spiro, 1974; Suits, 1977), a pattern highlighted by the statistic that households with an income of less than $10,000 spend, on average, approximately 3% of their income on the lottery (Clotfelter et al., 1999). Some studies even find higher absolute demand for lottery tickets among low income populations (Clotfelter et al., 1999; Hansen, 1995) and Hansen, Miyazaki and Sprott (2000) report that, across five states, income is a more consistent predictor of lottery ticket sales than education, race, or age. However, it is difficult to infer causality because income is in part endogenous (due to decisions made by the individual). Chapter 3 offers causal evidence for the relationship between low income status and the appeal of lotteries by manipulating subjects' *subjective* feeling of poverty.

Further, there is evidence that lottery-linked savings accounts can be applied successfully in low income populations. Commercial banks outside of the U.S. that use lottery-linked savings accounts

typically draw customers from the lower end of the income distribution. Similar accounts and savings bonds that disburse interest based on a lottery drawing of the bond serial numbers are used by microfinance institutions in developing countries (Ashraf et al., 2003). The current study will test whether socioeconomic status moderates the effect of lottery-linked incentives.

Parameters of lottery incentives.

Research on variable interval reinforcement schedules has shown that the frequency of the target behavior is a function of the total reinforcement provided by the schedule (Kazdin, 1994). Thus, lotteries with moderate probabilities of low rewards may act as more powerful reinforcers than lotteries with low probabilities. However, lotteries with low probabilities of high rewards offer the small hope of a large and exciting gain and may exploit the tendency to overweigh small probabilities. A combination lottery incorporates both features by running two independent lotteries.

Recent research suggest that a very effective probabilistic reward is a "combination lottery", which combines a moderate probability of a small reward (e.g., a 20% chance of $10) and another lottery that gives a very small probability of a large reward (e.g., a 1% chance of $100). This configuration allows for relatively frequent reinforcement of the behavior by giving a $10 reward every fifth occurrence of the target behavior, on average, and the presence of a strong motivating incentive-- the hope of the $100 reward. This type of lottery has been found to be effective in promoting compliance with prescription medication (Volpp et al., 2008a) and weight loss (Volpp et al., 2008b). However, it is unclear whether a combination lottery is more effective than simpler lotteries of equivalent expected values: e.g., a lottery with a 20% chance of $15 or a lottery with a 1% chance of $300.

Experiment 1

The current study will examine the use of probabilistic incentives to promote motivation, specifically, persistence in a pay-for-performance problem solving task. The goals of the study are to determine whether lotteries are more effective than certain rewards and whether combination lotteries are

more effective than simpler lotteries with equivalent expected values. Although some studies do find effects of incentives on performance quality (e.g. Eysenck & Eysenck , 1982; Gneezy & Rustichini, 2000; Wieth & Burns, 2006), in a quantitative meta-analysis on the effects of financial incentives on performance (Jenkins et al., 1998) there was a relationship between financial incentives and performance quantity, but not quality (e.g. accuracy). This suggest that the relationship between incentives and performance operates through persistence or time spent on the task. Thus, persistence, measured by time spent working, is the main dependent variable.

Hypothesis 1: Persistence will be higher when the incentive is probabilistic than when it is certain.

Hypothesis 2: Persistence will be higher when the incentive is a combination lottery than when it is a simple lottery.

Also, as described in the boundary conditions section, there is an expected interaction with socio-economic status:

Hypothesis 3: The efficacy of lottery incentives compared to certain incentives will be more pronounced for those with lower socio-economic status.

Methods

Participants. Data was collected from two separate populations. Experiment 1a was conducted with Carnegie Mellon undergraduates who received extra course credit for their participation. One hundred and one participants completed the experiment. In Experiment 1b, ninety-two participants were recruited from pedestrian street traffic in a busy area and offered snacks and 'the chance to earn money' for completing the experiment. The experiment was run in a large truck equipped with laptops in cubicles.

Procedures. The experiment was run using web-based software. The task was to solve anagrams: jumbled letters that could be unscrambled to form a word. Participants were shown an example of an anagram and its solution, then reported initial interest in the task. Next the incentive was described. It was

explained that they would receive the incentive for each anagram they solved correctly and that each anagram had one and only one correct solution. The incentive conditions are shown in Table 1.

Participants were informed that if they earned money, they would be paid privately at the end of the experiment in cash (except for the jackpot condition, where they were told they would receive a check). Since our dependent measure was time spent on the task, we wanted to make sure that the anagrams were hard enough to ensure that participants would become discouraged and decide to leave before attempting to solve all of the 70 anagrams. The anagrams increased in difficult over time and this information was disclosed to participants. Finally, participants read that they could leave the experiment at any time by clicking an exit button. This button was displayed on every anagram page.

In the certain condition, each time an anagram was solved correctly a screen stating, "That's right! You have earned $.10" was shown. In the lottery conditions, each time an anagram was solved correctly a screen stating, "That's right! Click below to play the lottery (or lotteries) with an X% chance to win $Y" was shown. Next, the outcome of the lottery (or lotteries) was immediately revealed.

After clicking the exit button, participants completed a survey. This survey included questions about the reason they left the experiment. This was asked in order to exclude participants who had to leave due to a prior appointment. However, it was not possible to analyze the data excluding these participants because a very high percentage of participants gave some excuse for leaving. Participants also reported demographic characteristics, interest in the task, measures of cognitive ability, how much they value of money, and socio-economic status.

Control Variables. In their review of the effect of financial incentives on performance of cognitive tasks in experiments, Camerer & Hogarth (1999) conclude performance is affected not only by incentives and thus the effort that participants exert, but also by cognitive abilities, measured by educational background, general intelligence, and experience with a task. They note that, "*If experimenters manipulate incentives because of a prior belief that incentive effects are large, they should spend more time measuring and manipulating capital variables as well."* Rydval & Ortmann (2004) re-

analyzed the results of Gneezy & Rustichini (2000) and found that cognitive abilities are at least as important as, if not more important than, financial incentives (Rydval & Ortmann, 2004).

In order to measure cognitive abilities related to the anagram task, we will ask participants to self-report SAT scores (relevant for the student population) and educational achievement (the general population). Based on the idea that individuals may vary in their propensity to work for money, we also included a 'Value of Money' scale as an additional control. This measure asked the following questions:

Would you complete a 1-hour survey for $5?

Would you complete a 1-hour survey for $25?

Would you complete a 1-hour survey for $100?

Would you complete a 1-hour survey for $1000?

Would you go an entire day without drinking liquids for $5?

Would you go an entire day without drinking liquids for $25?

Would you go an entire day without drinking liquids for $100?

Would you go an entire day without drinking liquids for $1000?

Socio-economic status. Since the income of undergraduates would not be a good predictor of socio-economic status, participants reported the highest level of educational attainment for their parents and their parent's income, and the following question:

How much "free" spending money do you have each MONTH after paying all bills? That is, how much money do you have to spend on restaurants, purchases, entertainment, services, or to put towards savings? We realize this may vary from month to month. Estimate the average over the past year.

Participants recruited from the general population were also asked to report their income as a measure of socioeconomic status.

Results

The dependent variable, time spent on task, was measured by page timers that counted the amount of time the participant viewed each anagram. Unfortunately, the results of Experiments 1a and 1b were not in line with predictions. In Experiment 1a there was a significant increase in time spent on the task for the certain condition compared to the lottery conditions, contrary to Hypothesis 1. Mean time spent working on the task was 13.38 in the lottery conditions (s.d. = 9.92, n=83) and 18.84 (s.d.=18.85, n=18) in the certain condition. This difference is marginally significant with a t-test (t = 1.19, p = .06). This effect did not replicate in Experiment 1b. In Experiment 1b, if anything, less time was spent solving anagrams in the certain condition compared to the combined lottery conditions, but this effect was not significant. There were no significant differences between the lottery conditions, offering evidence against Hypothesis 2, which predicted the combination lottery would be more effective than the simpler lotteries. Condition means are displayed in Table 2.

The interaction of socioeconomic status and certain vs. lottery rewards, predicted by Hypothesis 3, was not found in Experiment 1a or 1b. It proved very difficult to measure socioeconomic status in the student population, as there was almost no correlation between the intended measures: spending money, parents' education, and parents' income. The interaction was not significant for any of the measures. Income was used as a measure of socioeconomic status in the general population, but here the interaction was also not significant.

Exploratory data analysis examined whether low socioeconomic individuals spent more time problem solving in the jackpot condition, which most resembles state lottery tickets. This analysis revealed that the expected interaction was observed for the jackpot vs. all other conditions and income in Experiment 1b (see Table 3). Tobit regression analysis was used since the dependent measure, time, is censored at zero. Specification 1 shows that there is no significant difference between the jackpot condition (coded 1) and all other conditions (coded 0). Specification 2 shows that across conditions, time spent on the task was associated with higher income. The significant interaction in Specification 3 indicates that in the jackpot incentive condition, there is a negative relationship between income and time spent working. These results suggest that the jackpot incentive is more appealing to low income

participants. Figure 1 compares the amount of time spent working by high and low income participants (defined by a median split) in each condition and confirms that low income individuals spent more time working in the jackpot condition.

Specification 4 shows that the interaction holds when control variables are added to the data. The control variable, correct anagrams, reflects the number of anagrams correctly solved. As could be expected, the more anagrams solved, the longer the time spent on the task.[1] Surprisingly, level of education and the value of money measure (VOM) are negative. The effect of the control variables on time spent working and number of anagrams correctly solved is examined in more depth in a combined data analysis.

Discussion

There are several potential explanations about for why the lottery incentives were not as effective as hoped. It was predicted that with a low expected value, only the incentive in the certain condition would be perceived as a 'peanut' and its value underweighted. Perhaps the dollar values in the incentive conditions were also too small and thus underweighted (especially the $.25 and $.50 rewards).

Another possibility is that the hypothesized results were not observed in Experiment 1 due to the anagrams getting progressively harder. In the certain condition, participants immediately begin earning easy money. They might not have viewed the $.10 as a 'peanut' because at first it seems that the $.10 earnings would quickly add up to a substantial amount. The initial perception that they will earn a substantial amount in the experiment may make them more persistent when the anagrams get harder. Conversely, in the lottery conditions, they do not have this initial rapid accumulation of earnings. In Experiment 2, the initial easy anagrams were replaced with anagrams of moderate difficulty.

The interaction between the jackpot incentive vs. all other incentives and income is promising. Though it was not initially hypothesized, it is logical that if low income individuals disproportionately play the lottery they may be more motivated than high income individuals by an incentive that gives them

a chance to win big, as does a state lottery. However, these results were not explicitly predicted so they must be replicated before they can be considered reliable.

Experiment 2

Experiment 2 incorporated several changes to the experimental design in the hope of increasing the chance of finding the predicted effects. For the reasons discussed above, Experiment 2 increased the expected value to $1 and replaced the initial easy anagrams with anagrams of moderate difficulty.

Additionally, two more conditions were added. The 'mixed' condition examined the effect of giving a portion of the total reward for certain and making a portion dependent on a lottery. The 'sweepstakes' condition resembles a tournament pay scheme in that high performance relative to others increases your expected pay-off. Each time an anagram was solved correctly, the participant would receive one 'lottery ticket' for the chance to win $500 in a lottery drawing that would occur after 50 participants completed the experiment (actually after 50 participants completed this experimental condition). The amount and number of participants was chosen based on the rough estimate that each participant would get about 10 anagrams correct, on average, giving the tournament condition an expected value of $1 for each anagram correctly solved. Further, lottery animation was added to increase the excitement associated with playing the lottery. Each time the screen read, "Click below to play the lottery with a X% chance of $Y," a spinning slot machine was displayed.

As in Experiment 1, we predicted that the probabilistic incentives would have a greater impact than certain incentives (Hypothesis 1) and that the combination lottery would outperform the simpler lotteries (Hypothesis 2). Based on the results of Experiment 1, we revised the prediction about the interaction between socio-economic status and income. Instead of predicting an interaction between the certain condition and income, we predicted an interaction between the jackpot condition and income.

Hypothesis 4: The efficacy of the jackpot incentives compared to other incentives will be more pronounced for those with lower socioeconomic status.

Methodology

Participants. As in Experiment 1, the data was collected from two separate populations. Experiment 2a was conducted with Carnegie Mellon undergraduates. In Experiment 2b, participants were recruited from the general population using the data collection truck.

Procedures. The experiment was run using the same procedures described in Experiment 1, with the addition of the mixed and tournament conditions, the increase of the expected value of the incentive from $.10 to $1, the lottery animation, and the change in anagram difficulty. The experimental conditions are listed in Table 4. Additionally, at the end of the experiment a manipulation check asked participants: "In this experiment, what would you get for each anagram you solved? (This is to make sure you remembered the instructions)." Participants selected from a list of all the conditions.

Results

In Experiment 2a, nine out of the 147 participants who completed the experiment were excluded from analysis because they failed the manipulation check. In Experiment 2b one data point was excluded that was more than five standard deviations above the mean. Additionally, 33of the total 185 participants were excluded for failing the manipulation check.

As in Experiment 1, there was little support for Hypothesis 1, which predicted that lottery incentives would be more effective than certain incentives. Time spent solving anagrams did not significantly differ between the certain condition and the lottery conditions in Experiment 2a or 2b, though more time was spent working in the certain condition than in the lottery conditions in the student population (the mean was 17.07 in the certain condition and 16.43 across the lottery conditions). Further, there was no support found for Hypothesis 2, which predicted that the combination lottery would outperform the other lottery conditions. Mean time spent working for each condition is displayed in Table 5.[2]

Hypothesis 3 predicted that the jackpot condition would be particularly effective for low income participants. The analysis for this hypothesis is limited to the general population sample since this

population has greater variation on income than college undergraduates and because it is easier to measure socioeconomic status in this population by having them report their income. Table 6 shows the interaction analysis between a jackpot incentive vs. all other conditions and income. Only limited support was found for the prediction of a negative interaction between a jackpot incentive and socioeconomic status. Specification 1 shows that the jackpot condition is not significantly different from the rest of the conditions. Specification 2 shows that across all conditions, people with lower incomes work longer, at a marginal level of significance, contrary to the findings of Experiment 1b. In Specification 3, the interaction is not significant, but becomes significant in Specification 4 when control variables are included in the model. The significant interaction indicates that across all conditions, there is a negative relationship between income and time spend working but that this relationship is stronger in the jackpot incentive condition. The control variables have similar effects as in Experiment 1b. Again, working longer is associated with getting more correct and negatively associated with education. The Value of Money Measure remains negative, but is no longer significant.

Figure 2 displays the time spent in each condition broken down by a median split of income. We see that low income participants do spend more time working in the jackpot condition compared to other conditions. Interestingly, high income participants seem to work longer in the high probability condition. It may be that this difference is driven by expectations about the number of anagrams that they will correctly solve. People with higher incomes may believe they can get enough anagrams correct to win the high probability lottery and accumulate $5 multiple times. In contrast, low income participants may have lower expectations about the number they will get correct but may highly value the very low probability chance of winning the jackpot. Just getting *one* correct gives them that small chance to win a substantial amount of money.

Discussion

Experiment 2 did not offer an additional support for the hypothesis that lottery incentives would be more motivating than certain incentives. However, the results suggest interesting dynamics between

income and the types of incentives that are most motivating. Figure 2 illustrates that a jackpot lottery is most motivating for low income participants and the high probability lottery is most motivating for high income participants. Since this pattern of results replicates the pattern found in Experiment 1 (see high, jackpot, and certain conditions in Figures 1), a third experiment was run to see if this result is reliable. A third experiment was also necessary since we have only partial support for the relationship between a jackpot lottery incentive and income - the interaction is only significant when control variables are included in the model.

Experiment 3

In order to try to resolve the issue of whether jackpot incentives are particularly effective in low income populations, another replication was conducted with a limited number of conditions. In addition to the jackpot condition and the certain condition, we also included the high probability condition, since the results of Experiments 1b and 2b both suggested that high income people persist longer at the task in this condition. Two interactions with income were hypothesized:

Hypothesis 4: The effect of income on persistence will be positive in the certain condition and negative in the jackpot condition.

Hypothesis 5: The effect of income on persistence will be more positive in the high probability condition than in the certain condition.

Methods

Participants were recruited from the general population using the mobile data collection truck. Procedures and measures were identical to those described for Experiment 2b. The only difference was that collection was limited to three conditions: certain ($1 for sure), jackpot (0.1% chance of $1000), and high probability (20% chance of $5).

Results

One outlier was excluded which was almost four standard deviations away from the mean. Additionally, 17 participants out of the 132 participants who completed the experiment were excluded for failing the manipulation check. Mean time spent working is displayed in Table 7. There were no significant differences between conditions or between the certain condition and all other conditions.

Visual inspection of the data in Figure 3 makes apparent that the interaction between the high vs. certain condition and income is not confirmed in this data. Though the interaction between the jackpot vs. certain condition and income is suggested by Figure 3, Table 8 shows that the interaction, although in the predicted direction, does not reach significance even when control variables are included in the model.

Discussion

The results of Experiment 3 did little to elucidate the relationship between income and the attractiveness of lottery incentives. Though the pattern of results is consistent with the jackpot vs. certain interaction hypothesis, the interaction is not significant.

Combined Data Analysis

The combine data analysis groups the data across the five experiments which were conducted in two populations (general population and students) and across expected value of the reward for solving each anagram ($.10 and $1). As described above, two outliers and those who failed the manipulation check were excluded from analysis.

Time spend working

Table 9 displays the mean time spent solving anagrams for each condition. The hypothesis that the lottery rewards would be more effective than certain rewards received no support. The reverse was found. Mean time spent solving anagrams in the certain condition was 20.59 minutes (s.d. = 14.11, n = 140) and 17.36 minutes in the lottery conditions (s.d. = 12.19, n = 456). This difference is statistically significant ($t = 2.65$, $p < .01$). This effect is driven primarily by the student population and does not reach statistical significance in the general population ($t = 1.49$, $p = .14$).

The dependent variable is measured in time spent solving anagrams and does not account for the extra time spent running the lotteries in the lottery incentive conditions. Another dependent variable, total time, was analyzed that takes into account the full time that the participant was in the experiment. Results are largely unchanged with this variable. Across all data, total time is higher for participants in the certain conditions compared to the lottery conditions, even though the certain condition takes less time because lotteries need not be run. This difference is marginally significant (t =1.62, p = .10).

A tobit regression analysis was conducted with the full data set to examine the effects of condition, the expected value of each anagram solved, population, and control variables (see Table 10). Specification 1 confirms that more time is spent solving anagrams in the certain condition compared to the lottery conditions across both populations. Specification 2 shows that significantly more time is spent working when the expected value of the reward is $1 compared to when it is $.10, even though the anagrams were easier in the experiment with the expected value of $.10. In Specification 3 there is significantly more time spent working in the general population compared to the student population.

Specifications 4 and 5 add control variables to the model. This analysis is divided between the subject pool and the general population since there is restriction of range in the subject pool on education and age. Further, in the student population, monthly spending money, instead of income, was used as a proxy for socioeconomic status. Contrary to the prediction that cognitive ability (measured by education in the general population and SAT Verbal scores in the student population) would be a control variable positively associated with persistence, both relationships are negative and significant.

The combined data analysis for the interaction between socioeconomic status and the jackpot incentive is limited to participants who were recruited from the general population, since we have a more meaningful measure of socioeconomic status for this population (reported income) than we have for students. This analysis shown in Table 11 provides some support for the relationship between income and the jackpot incentive. The interaction shown in Specification 3 indicates that there is a negative relationship between income and time spent working in the jackpot incentive condition, whereas there is no relationship between income and time spent working across the other conditions. The interaction

remains significant when control variables are included in Specification 4. Since this analysis also includes Experiment 1b, which had an expected value of $.10, the control variable, Expected Value (coded 1 if $1 and 0 if $.10), was added to the model.

Anagrams correctly solved

Though there were no hypotheses concerning the number of anagrams correctly solved, exploratory analysis was conducted. There was no significant difference between the number of anagrams solved in the certain condition compared to all other conditions, which is a variation of Hypothesis 1 with correct anagrams substituted for time spent working as the dependent variable.

However, there were significantly more anagrams solved in the combination lottery condition compared to all other conditions, which is a variation on Hypothesis 2. Mean number of anagrams solved in the combination incentive condition was 10.96 (s.d.=7.94, n=74) and 9.00 (s.d.= 6.63, n=522) in all other conditions and this difference is statistically significant (t = 2.32, p = .02). The difference between the combination lottery condition and the certain condition (M=9.04, s.d. = 7.38, n= 140) is marginally significant (t = 1.76, p = .08). Both of these patterns are in this direction in each experiment (except Experiment 4, which does not have a combination lottery condition) but do not reach significance. Table 12 shows that significantly more anagrams were solved in the combination lottery condition (coded 1 if in combination lottery condition, 0 otherwise) compared to all other conditions even when time spent working and control variables are included in the model.

In order to further examine the effects of control variables, again, the sample is divided between the student and general population for the reasons described above. This analysis examined correctly solved anagrams controlling for the time spent working, which is positive and significant in both populations (see Table 13). Spending money was not significantly associated with the number of anagrams solved in the student population. However, income was significantly and negatively related to anagrams solved in the general population. Though the proxies for cognitive ability, education and SAT Verbal scores were found to be negatively associated with time spent working in previous analyses, they

are positively associated with solving more anagrams. In both populations, initial interest in the task predicted the number of anagrams correctly solved significantly and the Value of Money measure predicted the number of anagrams solved at a marginal level of significance in the general population. The expected value of the reward was not included in this analysis since it is confounded with the difficulty of the anagrams.

Conclusions

The initial hypothesis that lottery incentives would be overvalued relative to their expected value received little support in these studies. The data suggest that persistence is greater for certain rewards compared to uncertain rewards, although this effect does not reach significant in the general population. However, there is some evidence that the combination lottery incentive may be more motivating than the other incentive conditions. The combined data analysis revealed that participants solved significantly more anagrams in the combination lottery condition compared to all other conditions.

There are several possible explanations for why the results were not more in line with predictions. One possibility is that the task was too difficult or required too much effort. Kivetz (2003) found that lottery incentives are less effective when the effort required to complete the task is high, since when people work hard, the absence of payment is coded as a loss. Although we did not measure task difficulty, the anagrams were designed to be discouraging to prevent all of the participants from reaching the last anagram, which would have reduce variation on the dependent variable. Participants often spontaneously reported that the task was very hard.

Similarly, it maybe that people are less willing to accept risk for payment than they are willing to accept risk for entertainment. An employment-like context may invoke risk aversion and loss aversion more than in a purchasing context. Perhaps lottery-linked incentives will be more effective in other contexts such as incentives for saving or incentives for preventative healthcare. These are things that people would do or are supposed to do for themselves anyway, so unrewarded effort in these domains would not be coded as a loss.

Another potential boundary condition, discussed in the introduction, was between lottery incentives vs. certain incentives and incentive magnitude. It was thought that lottery incentives would be more effective when reward magnitude was low, since lotteries have the advantage of reframing very low rewards into the chance for a big win. The interaction between reward magnitude and certain vs. lottery rewards was not included in the main analysis since it did not reach marginal significance even with control variables included in the model (β = 4.12, t = 1.49, p = .14). However, the interaction was in the predicted direction. It may be that the effect would have been found with an even smaller expected value, e.g. $.01 for each anagram correctly solved.

There was a limited amount of support found for the hypothesis that the jackpot condition is more effective in low income populations. This interaction is highly significant in Experiment 1 and in the combined data analysis. It reaches significance with control variables included in the model in Experiment 3. Further, across all experiments, the figures that compare time spent working across condition and a median split of income show that persistence is greater for low income participants in the jackpot condition, and typically low income participants work harder in the jackpot condition than they do in any other condition. However, this interaction is not significant, though in the right direction, in Experiment 3.

Tables

Table 1. Experimental conditions of Experiments 1a and 1b.

Condition	**Incentive**
Certain	$.10
Combination	20% of $.25 & 1% of $5
High Probability	20% of $.50
Low Probability	1% of $10
Jackpot	.01% of $1,000

Table 2. Mean time (in minutes) spent solving anagrams. Standard deviations in parentheses.

Condition	Experiment 1a	Experiment 1b
Combination Lottery (20% of $.25 & 1% of $5)	13.93 (12.07) n=19	18.32 (11.64) n=18
Jackpot (0.01% of $1000)	11.61 (9.12) n=27	17.61 (16.76) n=17
Low Probability (1% of $10)	15.28 (9.55) n=19	14.91 (6.53) n=17
High Probability (20% of $.50)	13.45 (9.31) n=18	21.10 (17.34) n=17
Certain ($.10 for sure)	18.85 (15.01) n=18	16.43 (9.77) n=23

Table 3. Tobit regression analysis of the interaction between a jackpot incentive and socioeconomic status in Experiment 1b.

Time (min)	(1)	(2)	(3)	(4)
Jackpot Incentive	0.014		9.382+	7.007
	(3.403)		(5.508)	(4.315)
Income		0.139*	0.253**	0.225**
		(0.060)	(0.071)	(0.059)
Jackpot X Income			-0.333**	-0.295**
			(0.124)	(0.097)
Correct Anagrams				0.944**
				(0.194)
Initial Interest				-0.485
				(0.897)
Age				0.042
				(0.116)
Education				-2.361**
				(0.637)
Gender				-3.646
				(2.347)
VOM				-1.502^{+}
				(0.760)
Constant	17.597**	13.150**	10.494**	27.796**
	(1.463)	(2.279)	(2.456)	(7.768)
Observations	92	72	72	72
Pseudo R-squared	2.42e-08	0.00905	0.0217	0.0889

Note: Standard errors in parentheses. Income expressed in thousands.
** p<0.01, * p<0.05, + p<0.10

Table 4. Experimental conditions of Experiments 2a and 2b.

Condition	**Incentive**
Certain	$1 for certain
Combination	20% of $2.50 & 1% of $50
High Probability	20% of $5
Low Probability	1% of $100
Jackpot	.1% of $1,000
Mixed	$.50 for certain & 1% of $50

Tournament	Earn 1 lottery ticket for a drawing competing with 50 other participants

Table 5. Mean time (in minutes) spent solving anagrams in Experiment 2. Standard deviations in parentheses.

Condition	Experiment 2a	Experiment 2b
Combination Lottery (20% of $2.50 & 1% of $50)	14.38 (12.36) n=16	19.61 (10.56) n=21
Jackpot (0.1% of $1000)	11.87 (7.86) n=17	18.60 (14.30) n=17
Low Probability (1% of $100)	14.92 (9.93) n=14	17.87 (12.40) n=21
High Probability (20% of $50)	14.88 (10.14) n=30	17.73 (10.94) n=24
Certain ($1.00 for sure)	17.07 (11.28) n=30	20.89 (11.09) n=25
Mixed	18.81 (11.26) n=14	21.92 (12.36) n=22
Tournament	14.23 (12.56) n=17	19.52 (11.28) n=21

Table 6. Tobit regression analysis of the interaction between a jackpot incentive and socioeconomic status in Experiment 2b.

Time (min)	(1)	(2)	(3)	(4)
Jackpot Incentive	-1.007		3.968	8.244+
	(2.989)		(5.919)	(4.877)
Income		-0.058+	-0.048	-0.005
		(0.033)	(0.034)	(0.035)
Jackpot X Income			-0.135	-0.205*
			(0.125)	(0.104)
Correct Anagrams				0.619**
				(0.114)
Initial Interest				0.868
				(0.677)
Age				0.148
				(0.134)
Education				-2.142**
				(0.729)
Gender				-3.347
				(2.018)
VOM				-0.686
				(0.605)
Constant	19.604**	21.997**	21.744**	26.257**
	(1.003)	(1.713)	(1.792)	(6.976)
Observations	151	104	104	104
Pseudo R-squared	1.36e-05	0.00381	0.00533	0.0637

Note: Standard errors in parentheses. Income expressed in thousands.
** p<0.01, * p<0.05, + p<0.10

Table 7. Mean time (in minutes) spent working in Experiment 3. Standard deviations are in parentheses.

Condition	Mean
Jackpot (0.1% of $1000)	22.45 (14.41) n=36
High Probability (20% of $50)	21.84 (12.68) n=34
Certain ($1.00 for sure)	25.70 (17.46) n=44

Table 8. Tobit regression analysis of the interaction between a jackpot incentive and socioeconomic status in Experiment 3.

Time (min)	(1)	(2)	(3)	(4)
Jackpot Incentive	-1.562		1.345	2.255
	(3.041)		(4.793)	(3.958)
Income		-0.076	-0.037	0.033
		(0.050)	(0.069)	(0.070)
Jackpot X Income			-0.079	-0.097
			(0.099)	(0.081)
Correct Anagrams				1.279**
				(0.221)
Initial Interest				-1.042
				(1.074)
Age				0.253+
				(0.149)
Education				-1.133
				(0.873)
Gender				-0.375
				(2.988)
VOM				1.389
				(0.925)
Constant	24.016**	25.995**	25.270**	10.292
	(1.709)	(2.339)	(3.003)	(9.206)
Observations	114	87	87	87
Pseudo R-squared	0.000280	0.00323	0.00430	0.0600

Note: Standard errors in parentheses. Income expressed in thousands.
** p<0.01, * p<0.05, + p<0.10

Table 9. Mean time (in minutes) spent working on anagrams in the combined data analysis.

Condition	All Data
Combination	16.71 (11.65) n=74
Jackpot	17.01 (13.48) n=114
Low Probability	15.89 (9.86) n=71
High Probability	18.01 (12.36) n=124
Certain	20.59 (14.11) n=140
Mixed	20.71 (11.88) n=36
Tournament	17.15 (12.00) n=38

Table 10. Tobit regression analysis for the combined data analysis on time spent working on solving anagrams.

Time (min)	All Data			General Population	Subject Pool
	(1)	(2)	(3)	(4)	(5)
Certain	3.228**			1.951	3.125*
	(1.217)			(1.651)	(1.493)
Expected Value		3.278**		6.098**	3.296**
		(1.101)		(1.588)	(1.267)
General Population			5.418**		
			(1.035)		
Anagrams Correct				0.849**	1.025**
				(0.097)	(0.108)
Initial Interest				0.198	0.755+
				(0.527)	(0.431)
Age				0.144+	
				(0.082)	
Education				-1.625**	
				(0.457)	
Female				-3.321*	-1.790
				(1.475)	(1.234)
VOM				-0.482	0.017
				(0.457)	(0.531)
Income				-0.008	
				(0.026)	
Spending Money					0.000
					(0.001)
SAT Verbal					-0.030**
					(0.009)
Constant	17.360**	15.902**	14.873**	18.584**	21.358**
	(0.590)	(0.905)	(0.801)	(5.001)	(6.619)
Observations	596	596	596	263	218
Pseudo R-squared	0.00148	0.00187	0.00568	0.0501	0.0574

Note: Standard errors in parentheses. Income expressed in thousands.
** p<0.01, * p<0.05, + p<0.10

Table 11. Tobit regression analysis of the interaction between a jackpot incentive and socioeconomic status in the combined data analysis.

Time (min)	(1)	(2)	(3)	(4)
Jackpot Incentive	-1.369		4.354	5.297*
	(1.318)		(2.952)	(2.443)
Income		-0.032	-0.003	0.022
		(0.026)	(0.030)	(0.029)
Jackpot X Income			-0.118*	-0.120*
			(0.060)	(0.049)
Correct Anagrams				0.857**
				(0.096)
Initial Interest				0.117
				(0.524)
Age				0.171*
				(0.081)
Education				-1.724**
				(0.453)
Female				-3.037*
				(1.461)
VOM				-0.416
				(0.454)
Expected Value				5.931**
				(1.575)
Constant	18.380**	21.401**	20.405**	21.260**
	(0.576)	(1.228)	(1.380)	(5.030)
Observations	596	263	263	263
Pseudo R-squared	0.000228	0.000716	0.00251	0.0459

Note: Standard errors in parentheses. Income expressed in thousands.
** p<0.01, * p<0.05, + p<0.10

Table 12. Tobit regression analysis of the combination lottery incentive compared to all other conditions for the number of anagrams correctly solved.

Correct Anagrams	(1)	(2)
Combination Incentive	2.052*	2.277**
	(0.881)	(0.871)
Time		0.261**
		(0.022)
Initial Interest		1.176**
		(0.201)
Age		0.037
		(0.035)
Education		0.395*
		(0.192)
Female		0.214
		(0.566)
VOM		0.263
		(0.183)
Constant	8.825**	-6.708**
	(0.311)	(1.949)
Observations	596	479
Pseudo R-squared	0.00139	0.0604

Note: Standard errors in parentheses.
** p<0.01, * p<0.05, + p<0.10

Table 13. Tobit analysis of control variables on the number of anagrams correctly solved in the combined data analysis.

Correct Anagrams	Student Population	General Population
Spending Money	0.000	
	(0.000)	
Initial Interest	0.544*	1.425**
	(0.244)	(0.298)
Female	-0.429	-0.434
	(0.701)	(0.871)
VOM	0.485	0.500+
	(0.302)	(0.267)
Time Working	0.284**	0.259**
	(0.032)	(0.031)
SAT Verbal	0.020**	
	(0.005)	
Age		0.102*
		(0.047)
Education		0.474+
		(0.270)
Income		-0.033*
		(0.015)
Constant	-12.689**	-8.939**
	(3.761)	(2.933)
Observations	218	263
Pseudo R-squared	0.0679	0.0611

Note: Standard errors in parentheses.

Income expressed in thousands.
** p<0.01, * p<0.05, + p<0.10

Figures

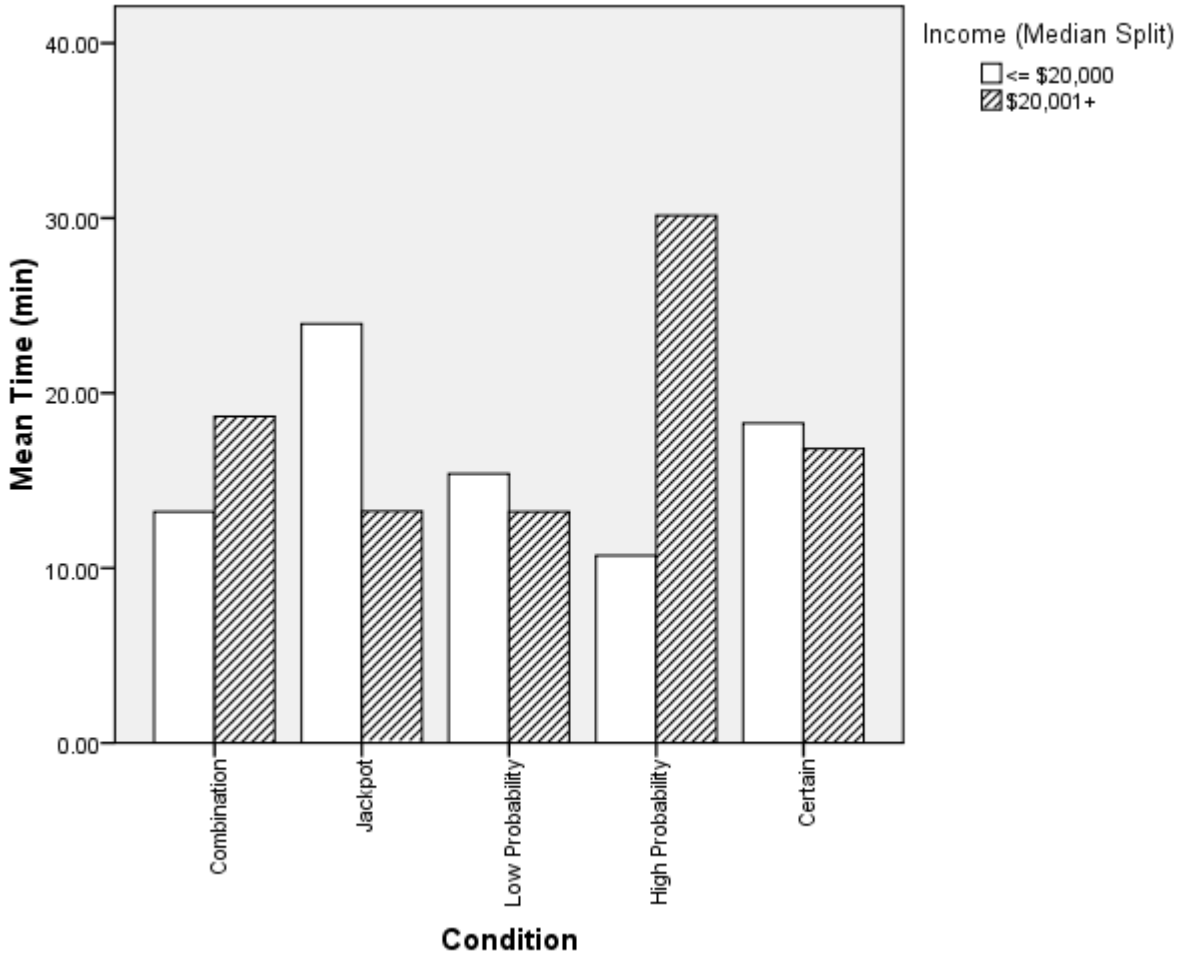


Figure 1. Time spent solving anagrams by condition and income in Experiment 1b.

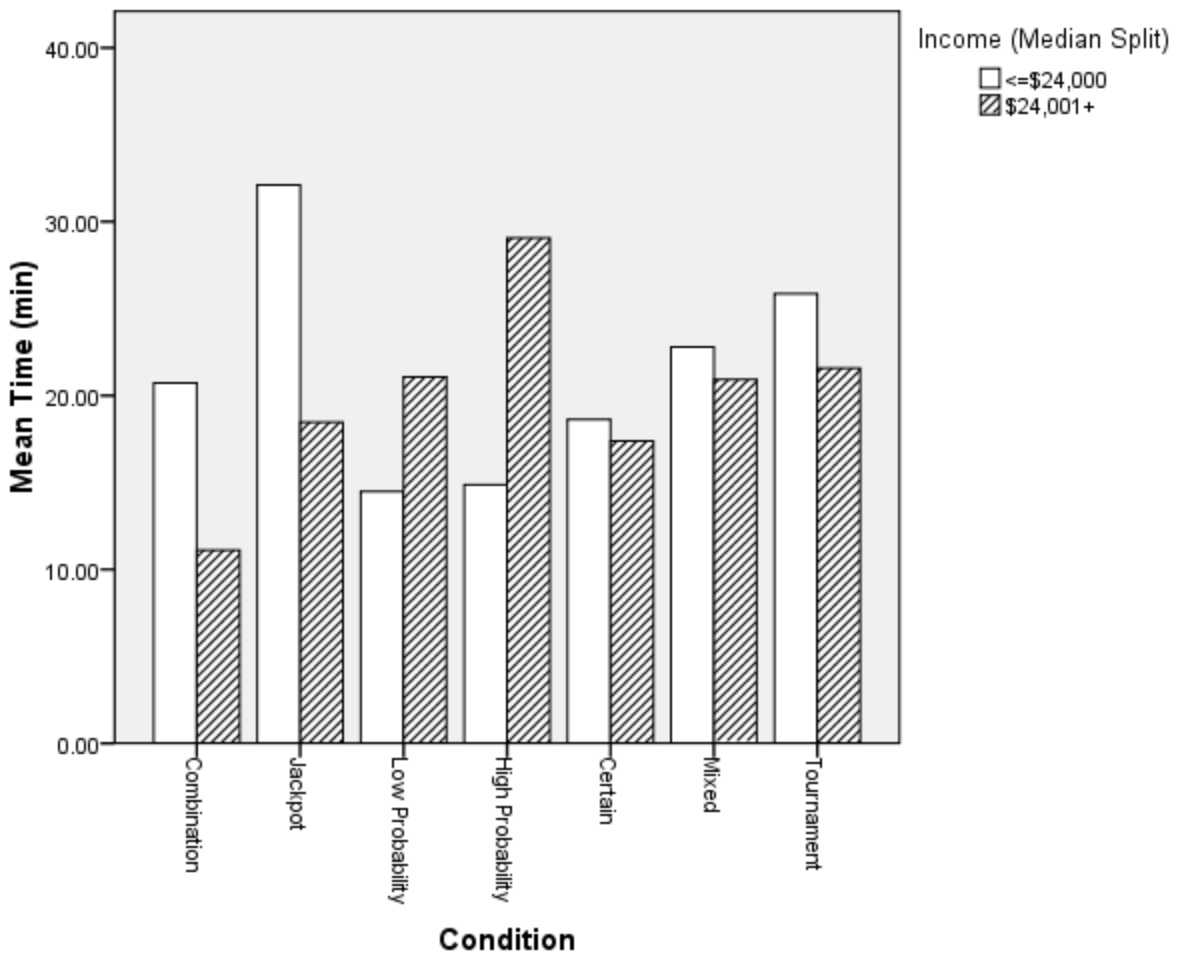


Figure 2. Time spent solving anagrams by condition and income in Experiment 2b.

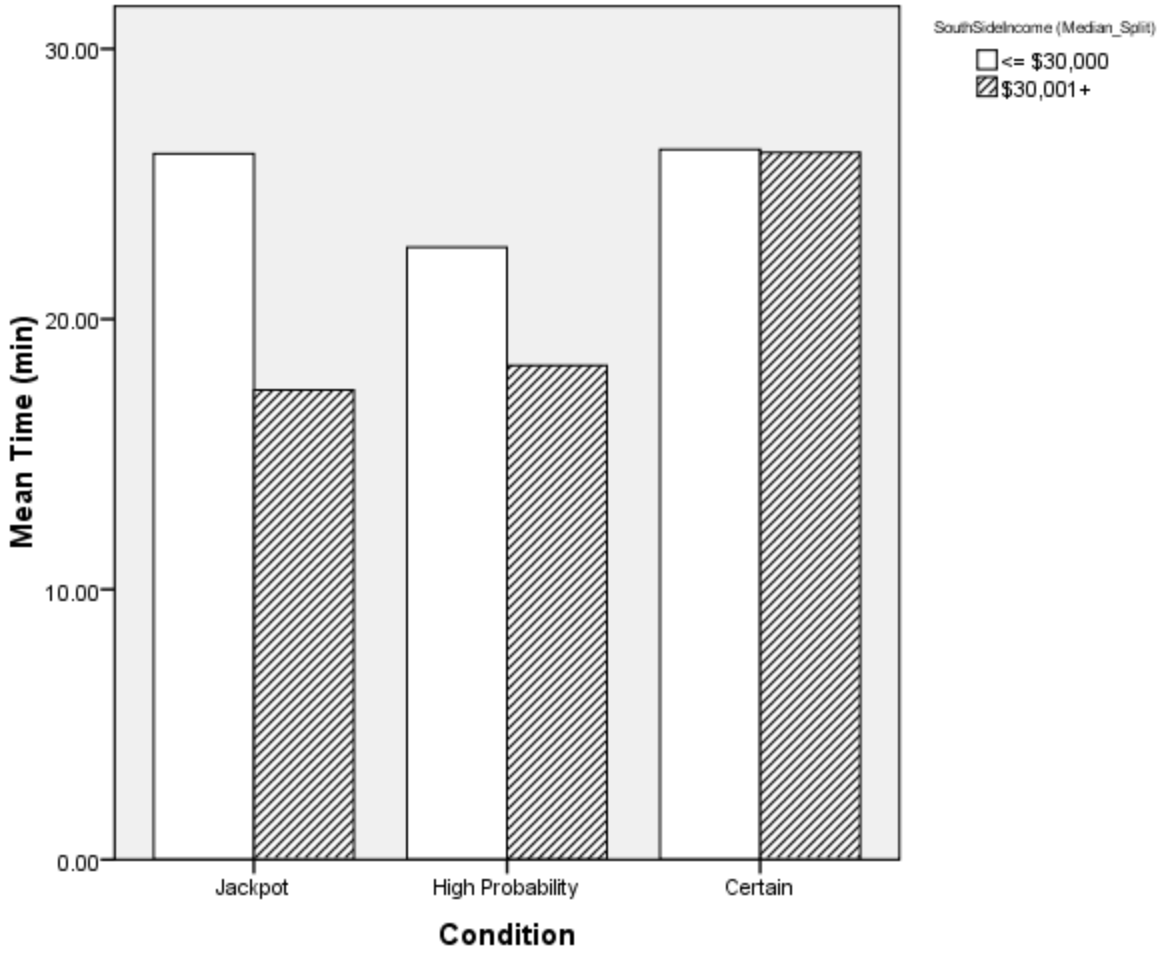


Figure 3. Time spent solving anagrams by condition and income in Experiment 3.

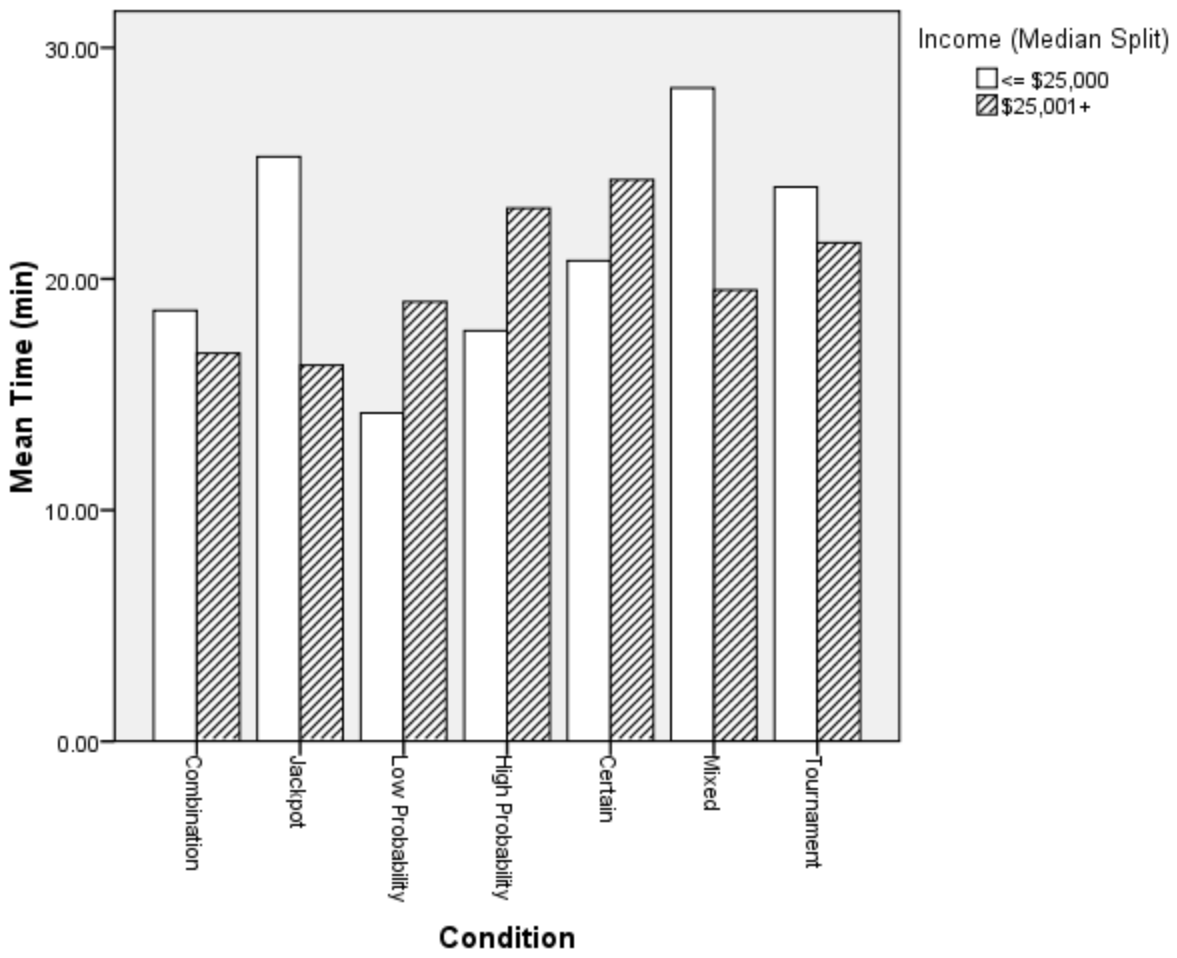


Figure 4. Time spent solving anagrams by condition and income in combined data analysis.

Notes

1. Causality probably goes both ways here. The more time spent working, the more anagrams solved and the more anagrams one gets correct, the longer one will persist at the task. Results are unchanged if this variable is excluded from the analysis.
2. The n is greater in the certain and the high probability conditions because this data was collected after results of Experiment 2b revealed that high income participants were particularly motivated by the high probability incentive. More data was collected in this condition to get a sense of whether this was also true for college students, who might be considered to have a relatively high socioeconomic status.

Conclusions and Future Research

There has been much progress in the fields of behavioral economics and psychology in understanding how biases or inconsistencies in decision making. Organizational behavior has a tradition of not only building new theory, but also in applying existing theory to practical ends. This dissertation hopes to make a contribution to the application of descriptive research on biases in order to understand how to guide people to make better decisions, not simply through prescriptions and debiasing, but by designing decision making environments that encourage positive behaviors.

Chapter 1 describes this approach and the relevance of behavioral economics to public policy. Chapters 2 and 3 are aimed at understanding biases that effect the decision to play state lotteries and strategies to deter gambling. Chapter 5 asks the question of whether biases that normally undermine decision making can be used to design effective incentive systems to encourage motivation and persistence.

Throughout the dissertation there is the goal of understanding and improving the financial decision making of low income populations. The studies on state lottery tickets are aimed at understanding the propensity of low income individuals to play the lottery. The research on the use of lotteries in incentive design examines whether or not lottery incentives are particularly effective in low income populations.

This dissertation describes several lessons about the factors that encourage people to purchase state lottery tickets. Chapter 2 demonstrates that the decision is driven in part by the tendency to underweight the small cost of the ticket and the failure to realize how small costs add up across multiple decisions. Chapter 3 offers causal evidence for the empirically observed relationship between income and the attractiveness of the lottery. In this study, when participants were made to *feel* poor, they purchased more lottery tickets.

Chapter 5 found little support for the hypothesis that lottery-linked incentives would be more motivating than their expected value. The hypothesis was tested across two participant populations (students and the general population) and two levels of expected value ($1 and $.10). It is clear that persistence, measured by time spent working, is not significantly greater for lottery-linked incentives. However, a combined data analysis across all experiments revealed that participants solved significantly more anagrams in the combination lottery condition compared to all other conditions. The combination lottery incentive was hypothesized to be the most effective lottery incentive because it involves two independent lotteries: one that gives a high probability of a low reward (and thus frequent reinforcement) and one that gives a low probability of a high reward (and thus the hope of a substantial payout).

Several possible explanations were discussed as to why results were not more in line with predictions. However, it is most likely related to the nature of the task. These incentives were offered for a task that required a high level of effort. Many participants described the task as very tedious. Kivetz (2003) found that lottery incentives are less effective when the effort required to complete the task is high, since when people work hard, the absence of payment is coded as a loss.

Future research will apply the topics of this dissertation to understanding how to use decision making biases to encourage positive behaviors. This research will aim to promote preventative healthcare behaviors and encourage saving in low income populations.

One project will examine lottery-linked incentives in a task that requires little effort, and is intrinsically interesting – playing mental acuity games. These games are considered preventative healthcare since they are linked to cognitive functioning in older populations and are encouraged in geriatric medicine. Again, lottery incentives will be compared to their expected value. This experiment may produce the desired effect since the task will be less difficult than the anagram task and because it will play on regret aversion. Research has documented many ways in which the anticipation of regret can influence decision making (see Zeelenberg, 1999 for review). The use of lottery incentives makes it possible to play on regret aversion by informing people if they *would* have won the lottery had they completed the desired task. The power of regret aversion is illustrated by the Dutch lottery (Zeelberg &

Pieters, 2004). This lottery draws the winning numbers from postal codes so everyone who lives in that postal code gets a prize *if* they bought a ticket. Thus, people get feedback about whether they would have won had they purchased a ticket. Similarly, this experiment will inform participants that they will be notified if they won the lottery even if they did not engage in the target behavior.

In another line of future research, field experiments are planned to encourage saving in Individual Development Accounts (IDAs), which offer incentives to help low income populations to save for the purchase of a home, secondary education, or starting a small business. One IDA experiment concerns the schedule of savings deposits. Based on the principles of myopic decision making and the peanuts effect, the experiment predicts that moving savers from a quarterly to a monthly or bi-weekly deposit schedule will encourage saving and increase retention in the program. People tend to underweight small dollar amounts (the peanuts effect) and fail to realized how multiple decisions are aggregated over time (myopic decision making): one dollar saved each day for five days hurts less than five dollars saved on one day. Thus, IDA deposits will be viewed as less of a loss to current consumption when deposits are small and frequent compared to when they are large and rare.

A second IDA experiment concerns incentives for saving. An individual's savings in an IDA are generously matched using federal, state, and private funds. (IDAs typically employ a 2:1 match rate, which allows the account holder to withdraw $3 for every $1 deposited.) This experiment tests whether total savings and retention in the program will be greater when a portion of the match is distributed by a lottery that is run at the time of each deposit. In the lottery group, there is a 20% chance of a 5:1 match and a 1% chance of a 30:1 match. If neither lottery is won, savers will receive a default 1:1 match rate. This arrangement has an expected value equivalent of a 2:1 match, and thus the average match rate will not differ between participants in the control and treatment groups. This experiment will also play on regret aversion by informing participants if they won the lottery, even if they did not make a deposit. The prediction that the lottery incentive will increase motivation to save is supported by the popularity of lottery-linked savings accounts in commercial banks outside the U.S. and in micro-finance institutions.

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