

# Research Statement

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The primary focus of my research examines the dynamics of decision-making. People do not make decisions in isolation. When choosing whether to buy stocks or stick to bonds, they usually consider how their portfolio had done in the past; when debating to accept or reject an offer, people are affected by how their partner had treated them, throughout the negotiation even in one-shot interactions. In my work I show that features of decisions over time, such as whether a prior outcome closes the associated mental account, the amount of time elapsed between decisions, discrimination faced by a target group in the past, and emotional factors have significant and lasting effects on subsequent behavior. My research aims to incorporate these features into theory to improve our understanding of dynamic decision-making and identify the implications for structuring more effective policy. By better understanding the dynamics of how prior outcomes are mentally grouped with prospects, managers can structure contracts to more closely align their risk preferences with those of their employees; studying how discrimination evolves over time can improve identification of its source, which aids in determining the appropriate intervention. In another line of work, I study how behavioral factors such as social preferences and loss aversion can motivate behavior and apply these findings to the design of incentive schemes. I show when such incentive schemes are effective for encouraging performance, and when they can backfire.

**1 Dynamics of Mental Accounting and Financial Decision-Making.** Understanding the dynamics of individual behavior, specifically how people respond to prior outcomes, is a critical question for both economics and judgment and decision-making. If the value of a stock falls below the purchase price, does this affect the investor's subsequent behavior, and if so, does she seek a riskier position or switch to a safer one? If a casino gambler loses money at the roulette table, does he get discouraged and quit gambling or chase his losses?

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Imas (2016) proposes a reconciliation of seemingly inconsistent findings, where some researchers have found that people take on less risk after prior losses (Kaustia and Knupfer 2008; Shiv, Loewenstein, Bechara, Damasio, and Damasio 2005), while others have found the opposite, that people take on more risk – chasing their losses in response to prior setbacks (Coval and Shumway 2005; Langer and Weber 2008). Analyzing existing data and presenting new experimental evidence, I show that the distinction between realized and paper losses explains this apparent contradiction: after a paper loss individuals become more likely to chase their losses and take on greater risk, while after a realized loss they take on less risk. The paper also makes a theoretical contribution by modifying Cumulative Prospect Theory (Tversky and Kahneman 1992) with the additional assumption on how prior losses are ‘bracketed’ with prospective risky choices (Read, Loewenstein, and Rabin 1999): namely, that paper losses are integrated and evaluated jointly with prospects in the same mental account or ‘bracket,’ while realized losses close the mental account associated with prior outcomes, reset the reference point, and are evaluated in isolation. Besides providing evidence for the main prediction of differential risk-taking after paper versus realized outcomes, I show that the increase in risk-taking following paper losses is a deviation from individuals’ planned risk-taking strategies – after a paper loss they take on more risk than they had initially planned – and that realization mitigates this dynamic inconsistency. Finally, I derive boundary conditions for when loss and gain chasing – and in turn, the effects of realization – should occur. Loss and gain chasing are predicted in positively-skewed environments, and require individuals to be sufficiently loss averse to take on greater risk in an attempt to avoid a negative realization, but not loss averse to the point of rejecting the first gamble. The interplay between realization and individuals’ ability to stick to their risk-taking plan has significant implications for the role of monitoring in choice under uncertainty. Some of the largest losses suffered by financial institutions occurred as a result of traders hiding prior losses while taking on excessive risk in an attempt to cover them (e.g. Nick Leeson’s 1.3 billion dollar loss for Barrings, which wiped out the firm). Since realization brings actual behavior after a loss closer to planned behavior, this provides agents and managers with an important decision-making tool. For example, individuals can automatically set their asset positions to be reported to a third party who can exogenously influence the realization of their positions. Incorporating realization into contracts and monitoring strategies can also allow a risk manager to better align the traders’ investment strategies with their own.

In follow up work with Jinwoo Kim (Carnegie Mellon) and Christopher Olivola (Carnegie Mellon), we are testing the boundary conditions of loss/gain chasing, and the realization effect, as outlined by the theory. In line with the theoretical predictions, we find that people only chase losses and gains in positively-skewed environments. When uncertainty

is negatively skewed, people do not increase their risk-taking after paper outcomes; in fact, they take on less risk after losses regardless of whether they are realized or not, and do not change their behavior after gains. These results have implications for how skewness affects the dynamics of risk-taking. For example, a risk manager concerned with loss chasing can restrict her traders' access to positively skewed assets, thereby minimizing the risk that they deviate from their ex-ante risk-taking strategies.

In [Heimer and Imas \(2018\)](#), we apply the insights from the dynamics of mental accounting to examine the role of leverage in financial markets. According to standard theories of decision-making, access to leverage should make investors better off. The ability to borrow expands investors' choice sets, allowing them to take advantage of trading opportunities without having to liquidate current holdings. We argue that leverage can interact with existing behavioral biases – specifically, the reluctance to realize losses and close a mental accounting in the red – to impair decision-making and hurt performance. We use two data sources to provide support for this claim. First, we exploit regulation that restricts the amount of leverage available to U.S. retail traders of foreign exchange. Traders constrained by the regulation are more willing to realize losses, exhibiting a smaller disposition effect, and improve their market timing. We corroborate these findings in an experimental asset market. Access to leverage leads to significantly lower earnings. This decrease in performance is driven by levered participants holding on to losses for longer than those without access to leverage. Together, our findings show that policy that restricts choices to take on greater risk in environments where loss chasing is prevalent can improve performance and financial outcomes. In [Akepanidtaworn, Di Masio, Imas, and Schmidt \(2018\)](#), we exploit a unique data set of institutional investors (average portfolio valued at \$586 million) to show that even financial experts are prone to biases stemming from a focus on past returns. Investors in our data set display clear skill in buying, but consistently underperform in selling – even relative to a random selling strategy. Much of this underperformance can be explained by their tendency to overwhelmingly sell positions with extreme prior returns. Both the worst and best performing assets are sold at rates 30 percent higher than assets that just under or over performed. This selling strategy is a mistake: selling positions with extreme returns results in greater forgone profits than selling more moderate positions *or* randomly chosen holdings. Moreover, investors who are most prone to the heuristic of focusing on extreme returns also leave the most money on the table.

In [Imas, Loewenstein, and Morewedge \(2018\)](#), we show that people take advantage of flexibility in mental accounting to rationalize selfish behaviors. Prior research has shown that people are more likely to spend ill-gotten-gains (money earned via unethical means) more virtuously. We replicate this finding, but demonstrate that when people exchange un-

ethically obtained money for the same amount but from a different, clean, source, they spend it as if it was earned ethically. Such behavior represents an extreme violation of fungibility: unethically obtained cash traded for an identical sum significantly changes the individuals propensity to spend the money on charitable giving. We demonstrate the implications of flexibility in mental accounting for spending decisions given multiple sources of earnings. When the source of earnings is clearly identified, we find that ill-gotten gains are spent more virtuously than money obtained ethically. However, when earnings gained through ethical and unethical tasks are pooled together such that the source of any given amount is ambiguous, the entire sum is spent as if it were ethically obtained. Our results have implications for the development of financial technology and behavioral industrial organization, specifically for the design of compensation schemes and organizational structure.

In [Evers, Imas, and Loewenstein \(2018\)](#), we study how mental accounting affects people’s preferences over the timing of gains and losses. The hedonic editing hypothesis predicts that as a result of diminishing sensitivity of the prospect theory value function, people should maximize value by mentally segregating gains and integrating losses ([Thaler 1985](#)). These theoretical predictions have received mixed support, with people seemingly preferring to separate both gains and losses over time ([Linville and Fischer 1991](#)). We argue that prior studies have missed the role of categorization in mental accounting. In our proposed theoretical model, when outcomes are perceived to be in the same category, they are booked to the same mental account and are evaluated jointly; when outcomes are members of different categories, they are booked to different accounts and evaluated in segregation. In line with these predictions, we show that people indeed prefer to group losses from the same category close together in time and to separate losses from different categories. Category membership has the opposite effect for preferences over the timing of gains, with similar gains being segregated in time and different gains being grouped together. These results have significant implications for firms and policy makers. For example, our findings suggest that people would prefer to receive their State and Federal tax returns separately; however, if taxes are owed, combining the two payments would be less painful than writing two separate checks.

**2 Dynamics of Discrimination.** In [Bohren, Imas, and Rosenberg \(2018\)](#), we demonstrate how studying the dynamics of discrimination can be used to identify its source. Discrimination can be preference-based – individuals have preferences against a particular group – or belief-based – individuals believe a particular group performs differently from other groups. Moreover, belief-based discrimination can either be statistical, fully rational and stemming from correct beliefs, or biased, either in people’s initial beliefs or their updating process. Distinguishing between these sources of discrimination is critical for the design of policy

and for examining long run consequences. Discrimination has largely been studied in static settings, which makes it difficult to identify its source (Bertrand and Duflo 2017). We first theoretically show how the dynamics can be used to identify its source. Preference-based models predict that discrimination should remain relatively constant at different stages; if discrimination is statistical, then it should mitigate over time. However, if discrimination is belief-based with at least some bias, then discrimination should not only attenuate, but may actually reverse directions. We compliment the theoretical results with a field experiment on a large Q & A forum that is an important resource for students and researchers in STEM fields. The setting is unique in allowing us to exogenously vary the perceived gender identity of the individual posting content and his or her reputation, which is based on prior evaluations on the same platform. We wrote a series of questions and posted them on accounts that exogenously varied in gender of assigned usernames (male and female), and their reputation (low or high). High reputation was built up by posting content until the associated account reached the top 25<sup>th</sup> percentile on the forum. We find significant initial discrimination against females, with content posted to low reputation female accounts receiving lower evaluations than content posted to similar male accounts. However, at higher reputations, discrimination is not only mitigated but reverses direction: male account holders now receive lower evaluations than female account holders. This dynamic reversal implies the observed discrimination is belief-based with at least some level of bias.

**3 Emotions and Behavior.** Emotions and other visceral states are important drivers of human decision-making (Loewenstein 2000), yet relatively few papers have attempted to incorporate them into economic theory. Disregarding emotional states implies that ‘seemingly irrelevant factors’ (Thaler 2015) such as time between decisions and prior social interactions should not affect behavior. In Gneezy, Imas, and Madarász (2014), we develop a theoretical model of dynamic emotions and social behavior, where emotional fluctuations triggered by past decisions cause a temporary shift in preferences, and individuals anticipate these effects. Drawing from the psychological literature on emotions (Baumeister, Stillwell, and Heatherton 1994), we assume that an individual experiences aversive feelings of guilt after she violates an internalized norm and that guilt makes prosocial acts more attractive. After the initial increase of guilt, the feeling depreciates over time as the individual’s emotional state gradually reverts back to the original “cold” one. A norm violation creates a temporal bracket where the immediate onset of guilt increases the propensity for prosocial behavior that diminishes over time. Moreover, the model predicts that since donating after a norm violation will make the guilty person feel better, if the charitable opportunity is small or limited, then knowing that this opportunity exists may *encourage* unethical behavior in the

present. Evidence from several experiments were consistent with the hypotheses: individuals were most charitable directly after engaging in unethical behavior (e.g. lying) and this increase decayed with the passage of time. Moreover, people seemed to anticipate that charity would alleviate their guilt: when told that a donation opportunity would directly follow their decision to lie or not, they lied more. These results have implications for how the availability of prosocial opportunities may affect ethical behavior, suggesting that ‘cheap’ prosocial options may actually encourage norm violations.

In [Gneezy and Imas \(2014\)](#), we demonstrate that emotions are important for strategic interactions. Specifically, we show that individuals anticipate the emotional dynamics in others and use them strategically in competitive contexts. We designed an experiment where people competed in one of two different tasks. One task was cognitive and involved solving an optimization problem; the other task was strength-based. We predicted that being angry would hurt performance in the former and help in the latter. After the task was described, one participant was given the opportunity to anger the other. The results showed that performance was affected by anger in line with our predictions – angry participants performed worse on the cognitive task and better on the strength task. Importantly, individuals correctly anticipated behavioral effects of anger and used the opportunity strategically, angering opponents more in the task where it helped them than where it hurt. Our results have implications on how emotional factors can be incorporated into economic theory. Specifically, the findings suggest that in social interactions, rather than being naive about the effects of emotions on behavior, individuals appear to anticipate them correctly.

**4 Incentive Design.** Designing incentive schemes to best motivate effort is an important design question for organizations. [Imas \(2014\)](#) studies if and when prosocial incentives—where charitable contributions are directly tied to effort levels—lead to better performance and greater effort provision than standard, self-benefiting incentives. I find that individuals indeed provide greater effort under prosocial incentives than under standard, self-benefiting ones when the incentive stakes are low. However, this difference disappears or reverses when the stakes are high. These results suggest that if the budget for a certain task or project is small, organizations should take advantage of the scope insensitivity of prosocial incentives by tying small charitable contributions to performance rather than compensating individuals directly. In [Schwartz, Keenan, Imas, and Gneezy \(2018\)](#), we argue and show that while prosocial incentives may be affective in motivating individuals on the intensive margin – after they have selected into the activity or agreed to participate – they are ineffective on the extensive margin. In a series of field experiments we demonstrate that if people have a salient opportunity to avoid an activity or task involving prosocial incentives, they do so,

even if donating the earnings is *optional*.

In [Imas, Sadoff, and Samek \(2016\)](#), we present results from a series of experiments that measure both the impact of gain and loss contracts on productivity and people’s preferences for the contracts themselves. We find that people indeed work harder under loss than gain contracts. Surprisingly, rather than having a preference for the gain contract, we find that people actually prefer loss contracts. More loss averse individuals exert higher effort and have a greater preference for loss contracts. This suggests that people do anticipate their loss aversion and select into loss contracts as a commitment device to improve performance, using one bias – loss aversion – to solve another – a lack of self-control. Our findings imply that firms may not need to pay a premium to persuade potential employees to work under loss contracts, and that offering such contracts could be beneficial for both parties.

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