When Do Entrepreneurs Exit Failing Ventures? Evidence From Randomized Controlled Trials

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Abstract

When does an entrepreneur concerned with financial performance decide to close a failing venture, and why? While much of the existing literature focuses on whether entrepreneurs exit, relatively little attention has been paid to the timing of exit, particularly under conditions of risk and uncertainty. Traditional economic models, such as expected utility theory (EUT), predict that entrepreneurs taking care of financial performance should maximize financial value when deciding to exit. However, this thesis challenges that assumption by examining how entrepreneurs make exit-timing decisions.

This study employs an experimental approach to examine exit-timing behavior. An incentivized online experiment involving 422 adult participants, comprised of entrepreneurs and non-entrepreneurs, challenges the conventional wisdom that risk attitudes and optimism explain observed behavior. These insights contribute to ongoing debates in entrepreneurship and behavioral decision-making by uncovering cognitive mechanisms that shape exit decisions beyond financial optimization. I advance the research on exit-timing behavior by proposing a new, abductivelyderived theory of exit timing, called “Dual Threshold Theory,”(DTT). DTT matches important aspects of the data and appears to be a promising basis for future research in entrepreneurship and management.

By shifting the focus from *whether* entrepreneurs exit to *when* they exit, this thesis contributes to research on entrepreneurial exit, decision-making under risk and uncertainty, and behavioral finance. The findings offer theoretical and practical implications for understanding how individuals abandon declining ventures. The theoretical contributions of this study extend beyond entrepreneurship, offering potential applications in strategic management, behavioral finance, and corporate decision-making, particularly in contexts where individuals must determine when to abandon declining projects.

Keywords

exit; timing; decision-making; risk; uncertainty; optimism; experiment

Summary for Lay Audience

When does an entrepreneur concerned with financial performance decide to close a failing venture, and why? While much of the existing research focuses on whether entrepreneurs shut down their businesses, relatively little attention has been paid to when they decide to do so, particularly in situations where future outcomes are uncertain but probabilities are known (i.e., risk) and where both outcomes and their likelihoods are unknown (i.e., uncertainty). Traditional economic models, such as expected utility theory (EUT), predict that financially motivated entrepreneurs should close their business at the point when they can get the most money out of it. However, this thesis challenges that assumption by examining how entrepreneurs make decisions regarding exit timing.

This study employs an experimental approach to explore how people decide when to shut down a failing business. An incentivized online experiment involving 422 adult participants, comprised of entrepreneurs and non-entrepreneurs, challenges the conventional wisdom that risk attitudes and optimism explain exit behavior. These insights contribute to ongoing debates in entrepreneurship and behavioral decision-making (how people make important everyday choices) by uncovering cognitive mechanisms that shape exit decisions beyond the financially ideal moment. To explain these findings, I propose a new, abductively derived theory of exit timing, called "Dual Threshold Theory," (DTT). DTT matches important aspects of the data and appears to be a promising basis for future research in entrepreneurship and management.

By shifting the focus from *whether* entrepreneurs exit to *when* they exit, this thesis contributes to research on entrepreneurial exit, decision-making in risky and uncertain situations, and behavioral finance (the study of how psychological and emotional factors affect financial decisions). The findings offer theoretical and practical implications for understanding how individuals abandon declining ventures. The theoretical contributions of this study extend beyond entrepreneurship, offering potential applications in strategic management, behavioral finance, and corporate decision-making, particularly in contexts where individuals must determine when to abandon failing projects.

Co-Authorship Statement

This dissertation is a co-authored effort with Professor Simon Parker (Supervisor, Ivey Business School). As the principal investigator, I was responsible for developing the research question, conducting the literature review, designing and implementing both the pilot and full-scale experiments, analyzing the data, and writing the initial draft of the manuscript. Professor Parker contributed throughout the research process by advising on the theoretical framing, providing feedback on the empirical analysis, and editing and refining the manuscript. The final manuscript is currently under review at the *Strategic Entrepreneurship Journal*.

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Table of Contents

List of Tables

List of Figures

List of Appendices

Chapter 1. Introduction

1.1 Motivation and research question

Entrepreneurial exit is common: "Every entrepreneurial entry carries the potential of becoming an entrepreneurial exit" (Aldrich, 2015: 11); about 28% of entrepreneurs exit every year (Grekou & Liu, 2018). While some exits are voluntary and strategic, others result from deteriorating business conditions that force entrepreneurs to shut down or sell their ventures. Understanding when entrepreneurs choose to exit is important, as exit timing has implications for financial returns, resource reallocation, and entrepreneurial dynamism. A well-timed exit can maximize value creation, allowing entrepreneurs to transition to new opportunities and investors to realize returns. Conversely, poorly managed exits can lead to unnecessary losses, prolonged financial distress, and missed alternative prospects. Despite its significance, research on exit timing remains relatively underdeveloped compared to studies on whether entrepreneurs should exit at all.

Most prior research on entrepreneurial exit has focused on the binary decision of whether to stay or leave a venture. Scholars have examined how financial constraints, industry conditions, and entrepreneurs' characteristics influence the decision to exit (Gianetti & Simonov, 2004; McKenzie & Paffhausen, 2019; Stam et al., 2010; Wennberg & DeTienne, 2014). More recently, a growing body of literature has turned its attention to exit timing, exploring how entrepreneurs delay exit due to emotional attachment, sunk (irreversible) costs, or overconfidence (Chen et al., 2018; Coppens & Knockaert, 2022; Zhu et al., 2018). This research has primarily investigated late exits, where entrepreneurs continue operating unprofitable firms. Entrepreneurs may persist due to psychological ownership, fear of failure stigma, or non-financial motivations such as autonomy and personal fulfillment.

While these studies have improved our understanding of delayed exit, their narrow perspective on exit timing focuses mostly on why entrepreneurs persist with underperforming firms. Relatively less attention has been given to exit timing in contexts where market conditions deteriorate exogenously, beyond the entrepreneur's control. Many ventures operate in competitive markets as "price takers," leaving little leeway for emotional or non-financial factors to take precedence over financial viability (Elbanna & Child, 2007; Holtz-Eakin et al., 1994).[1] Some are older "legacy" businesses that face impending obsolescence and ongoing declines in demand for their products, which cannot be staunched owing to the irreversibility of earlier investments (Dixit & Pindyck, 1994). But young innovative ventures that introduce new technologies are also vulnerable to disruption from new competitors (Kline & Rosenberg, 2009). Furthermore, it has been established that exogenous random shocks rather than strategic choices are the main precursors of entrepreneurial exits (Coad & Storey, 2021); however, negative financial shocks are a more prominent cause of venture closure than positive shocks to the outside opportunities available to entrepreneurs (McKenzie & Paffhausen, 2019).

This thesis investigates how entrepreneurs navigate exit decisions when faced with declining performance that is beyond their control. In view of arguments that entrepreneurs running under-performing and declining firms are driven towards rational decision-making to ensure the survival of their ventures (Elbanna & Child, 2007), one

[1] Note that I am *not* claiming that emotional factors, strategic choices, and other factors are generally unimportant; for some ventures, they surely are. I simply explore a different question: how do entrepreneurs who do not or cannot prioritize emotional ties, decide when to close a declining venture?

might expect such entrepreneurs would choose to exit according to the predictions of expected utility theory (EUT; Arrow, 1951; von Neumann & Morgenstern, 1944). To date, conceptual thinking about the exits of financially motivated entrepreneurs has drawn heavily on EUT (Brachert et al., 2017; de Blasio et al., 2020; Caliendo et al., 2010; Zhang & Wang, 2021). Many entrepreneurs persist with loss-making businesses (Coad, 2014): EUT suggests that only risk-seeking entrepreneurs would be willing to do so. Interestingly, empirical studies of risk preferences invariably show that entrepreneurs tend to be risk averse, not risk seeking (see Parker, 2018, sec. 5.4.1 for a review of the evidence). Is this suggestive of a deeper problem with EUT? For example, do entrepreneurs use heuristics to guide their decision about when to close a declining venture? If so, what heuristic do they tend to use?

It has been difficult to decisively answer these questions empirically owing to the innate limitations of correlational analysis of secondary data, which are prone to omitted variables, endogeneity, and selection biases (Falk & Heckman, 2009; Anderson et al., 2019). This has hindered our ability to understand how entrepreneurs decide when to exit—a topic of continuing scholarly interest (Caliendo et al., 2020; Chirico et al., 2020; Coppens & Knockaert, 2022; Holland & Shepherd, 2013; Lin et al., 2022).

This thesis addresses the following research question: "*When* does an entrepreneur concerned about the value of a declining venture close it, and *why*?" I investigate this question both when entrepreneurs know their venture is declining under conditions of risk (such as might apply to mature, legacy ventures for instance, which have learned the distribution of market outcomes) and when entrepreneurs operate under conditions of uncertainty (such as might apply to young start-ups who are exploiting a novel entrepreneurial opportunity). Distinguishing between risk and uncertainty is important as the information available to an entrepreneur is likely to influence the exit decisions they make. Using EUT as a benchmark, I first theorize about how risk attitudes affect exit decisions under conditions of risk. I then trace how optimism affects exit decisions under conditions of uncertainty, drawing on extensive literature which has highlighted the role of optimism (Alvarez & Parker, 2009; Busenitz & Barney, 1997; de Meza & Southey, 1996). I also explore the impact on exit-timing decisions of sunk exit costs and increases in the volatility, or riskiness, of venture returns. I go on to describe three incentivized, online, controlled experiments whose structure matches the conceptual analysis of the entrepreneur's decision problem, enabling comparisons of actual with predicted exit behavior. The experiments ask subjects to choose when to exit from an entrepreneurial venture generating initially positive but declining profits. These are precisely the conditions where we would expect EUT to be most applicable. The experiments are designed to be simple and easy to comprehend; they deliberately abstract from confounders such as emotional commitment to a venture that they founded themselves (see Section 1.3 for a detailed structure of the dissertation).[2]

[2] Ideally, one might like to run a field experiment in which the researcher randomly assigns adverse shocks to practicing entrepreneurs and observes differences in their exit timings; however, this is practically and ethically infeasible. I do not know of any natural experiment that could causally infer the drivers of exit behavior. This leaves controlled experiments as the only way of obtaining causal evidence about entrepreneurial exit behavior under conditions of declining financial performance. The choice of using controlled experiments answers recent calls from entrepreneurship scholars for more causal inference to increase confidence in empirical research (Anderson et al., 2019; Williams et al., 2019).

1.2 Contributions to entrepreneurship research

This thesis makes the following contributions to entrepreneurship literature. First, it extends knowledge of entrepreneurial exit decisions by focusing analysis on an important class of entrepreneurs: those concerned about the declining financial performance of their ventures. The thesis's findings shed light on an ongoing tension in the entrepreneurship literature relating to whether entrepreneurs exit "optimally." Optimal exit occurs when the expected value of the venture firms first becomes exhausted (Elfenbein & Knott, 2015; Sandri et al, 2010); late exit occurs after that time, entailing avoidable losses; and early exit occurs before that time, entailing foregone profits. To date, conflicting arguments have been advanced for each of these possible outcomes (Elfenbein et al., 2017), but, despite their far-reaching implications for the efficiency of resource usage, prior research has not created suitable empirical settings which can decisively sort among these exit probabilities.

In contrast, my experiment is designed to do precisely that. I found no support for the notion that participants either maximized or tried to maximize the expected financial value of their ventures under conditions of risk—even though they faced compelling financial incentives to do so—nor did they behave in accordance with EUT under heterogeneous risk preferences. Interestingly, the design of the experiment revealed why this theory was rejected: participants simply *did not use information about probabilities when deciding when to exit* (cf. Berg & Gigerenzer, 2010). To be clear, it was not simply that participants applied some idiosyncratic weighting scheme to the objective probabilities they were told about, as is proposed by prospect theory (for example, (Kahneman & Tversky, 1979).[3] Rather, I found no evidence that information about probabilities was used at all, even when real money was at stake. In addition, I found no evidence that participants' decision-making behavior was influenced by optimism under conditions of uncertainty. Thus, my findings pose a puzzle: how *do* entrepreneurs who face declining venture prospects make exit-timing decisions? This finding is the first of the two principal contributions of this thesis.

The second contribution of the thesis is to advance understanding of *how* entrepreneurs make exit decisions. I answer calls from entrepreneurship scholars (including Chirico et al., 2020; DeTienne & Wennberg, 2016) for more research into the role of rationality in decisions about whether to continue or exit from under-performing ventures. My experiment is designed to reflect key aspects of entrepreneurial decision-making. Entrepreneurial settings are often characterized by incomplete information, ambiguous feedback, and high personal stakes tied to whether and when to exit. As a result, they frequently make irreversible choices (such as exit), without knowing whether current losses are temporary setbacks or signs of terminal decline. While my experiment does not simulate the full complexity of managing a venture, it captures core elements of entrepreneurial decision-making, including volatile income trends, irreversible and costly exit, and limited information about future outcomes. It offers a setting in which the cognitive heuristics and behavioral responses underlying exit decisions can be more clearly identified.

In a novel departure from extant exit literature, I also derive abductively a new theory, which I call "Dual Threshold Theory," (DTT). Sifting the quantitative evidence,

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[3] In the specific setting I study, prospect theory and expected utility theory under risk aversion generate identical predictions about exit-timing behavior. See Section 3.2 for details.

in conjunction with qualitative responses to a post-survey questionnaire, yielded clues that I used abductively to construct a new theory of decision-making applicable to situations, like the one I studied, of stopping problems with declining prospects. DTT advances the prior model of exit-timing decisions, specifically Gimeno et al. (1997)'s threshold theory, by introducing *two* subjective exit thresholds. Rather than conditioning exit decisions on probabilities, DTT proposes that individuals base their exit decisions on the most recent declining sequence of incomes in relation to these thresholds. DTT turns out to match important aspects of the data well and is ripe for further conceptual and empirical development by entrepreneurship researchers.

Beyond its theoretical contributions, this thesis has important practical implications. Understanding how entrepreneurs decide when to exit can inform the development of policies and support mechanisms that assist business owners in making optimal exit decisions. Additionally, the insights gained from this research might have broader applicability outside the domain of entrepreneurship. For example, it might be relevant to dynamic decision-making in areas of strategy and behavioral finance, including terminating obsolete product lines or declining subsidiaries, and knowing when to sell stocks in legacy industries that are undergoing technological disruption.

1.3 Dissertation structure

This dissertation is organized as follows.

Chapter 2 provides an overview of existing research on entrepreneurial exit, focusing on multiple dimensions of exit, theoretical perspectives, and individual-level determinants of exit decisions. It distinguishes between studies on whether to exit and when to exit, outlining key frameworks and empirical findings. The chapter concludes with a discussion of gaps in the literature and the need for further research on exit-timing decisions. This review lays the conceptual groundwork for the experimental study presented in Chapter 3 by identifying underexplored areas that motivate the design and focus of the experiment.

Chapter 3 presents the experimental approach used to investigate how entrepreneurs make exit decisions from declining ventures under varying conditions, including risk and uncertainty; it also outlines hypothesis development, experimental design, data collection, and analytical methods. The chapter then discusses the results of the experiment, including key findings on decision-making patterns and the role of cognitive biases in shaping exit timing. Also, in this chapter, DTT is introduced as a new framework for understanding how entrepreneurs decide when to exit.

Lastly, Chapter 4 synthesizes the findings and discusses their theoretical and practical implications. It evaluates how the research contributes to entrepreneurial exit theory and decision-making scholarship. Additionally, the chapter explores broader applications of the findings beyond entrepreneurship, including implications for strategy, behavioral finance, and policy. Finally, it outlines directions for future research, emphasizing the need for further empirical validation and theoretical refinement of DTT.

Chapter 2. Literature Review

The purpose of this chapter is to comprehensively review previous research on the individual-level determinants of entrepreneurial exit and to focus on two central aspects: decisions regarding *whether to exit* and *when to exit* (for the scope and boundaries of this review, see Section 2.2.1). By doing so, I seek to provide an overview of the current state of exit research and identify potential avenues for future research. The review is structured as follows. In Section 2.1, I review how exit is defined and operationalized in the literature. In Sections 2.2 and 2.3, I discuss relevant theoretical frameworks that provide useful insights into understanding entrepreneurial exit. In Section 2.4, I describe the process of searching for and selecting relevant journal articles. In Sections 2.5 to 2.7, I review existing studies on the individual-level determinants of exit, starting with decisions about whether to exit (Section 2.6) and moving on to studies on when to exit (Section 2.7).

2.1 Multiple dimensions of exit: levels, types, timing, and strategies

Exit occurs at different levels within an entrepreneurial context. Firms may exit by shutting down their operations while entrepreneurs remain involved in entrepreneurship, referred to as business exit or firm survival (Brüderl et al., 1992; Burgelman, 1994; Pennings et al., 1998). Conversely, entrepreneurs may exit the firm they created while the business continues to operate—referred to as entrepreneurial exit (DeTienne, 2010; Holmes & Schmitz, 1995; Jenkins & McKelvie, 2016; Parker & van Praag, 2012). While these types of exits are distinct, they are often closely intertwined and influence one another. In some cases, firm exit results in entrepreneurial exit. For example, when a business exits due to financial distress (e.g., distress liquidation or distress sale), the entrepreneur may also leave entrepreneurship entirely. Alternatively, a successful firm-level exit (e.g., harvest sale or liquidation) can provide opportunities for subsequent entrepreneurial activity, such as starting a new venture (i.e., serial entrepreneurs) or managing multiple businesses (i.e., portfolio entrepreneurs). In these cases, firm exit does not necessarily result in entrepreneurial exit. Similarly, entrepreneurial exit can drive firm-level exit. An entrepreneur's decision to retire, transition to paid employment, or pursue new opportunities may lead to a voluntary business closure. Entrepreneurs may also leave their firms while ensuring that the business continues to operate under new ownership, such as through succession or an independent sale. These two scenarios illustrate that entrepreneurial exit can lead to different firm-level outcomes, influenced by the circumstances and exit strategies employed.

Depending on the level at which exit is observed and studied, existing research on exit can be broadly divided into two streams. One stream focuses on firm-level exit, such as exit from a particular market or industry (Anderson & Tushman, 2001; Mitchell, 1994). Many early exit studies in strategic management and organization theory belong to this stream. Assuming that an entrepreneur's primary objective is to survive in the long run and therefore they are reluctant to exit, researchers in this stream often conceptualize exit as failure or an involuntary choice due to poor performance and consider survival as a measure of success (Brüderl et al., 1992; Pennings et al., 1998). However, more recent studies in the field of entrepreneurship argue that exit should not be viewed solely as failure since entrepreneurs may voluntarily choose to leave their firm or close their business for various reasons, such as poor health (Hessels et al., 2018), family responsibilities (Jayawarna et al., 2020), retirement (Morris et al., 2020), and other entrepreneurial opportunities (DeTienne & Cardon, 2012). This stream of research primarily deals with entrepreneurial exit, examines individuals' career choice between paid employment and entrepreneurship, and emphasizes the voluntary nature of decisions to exit their business (e.g., Evans & Leighton, 1989; Evans & Jovanovic, 1989). Scholars in this line of research follow DeTienne (2010: 203)'s definition of exit: "the process by which the founders of privately held firms leave the firm they helped to create;[sic] thereby removing themselves, in varying degree, from the primary ownership and decision-making structure of the firm."

Exit literature has examined various types of exits depending on how exit is operationalized. One type is actual exit, which refers to observable outcomes such as business closures or sales. These are typically measured using secondary data sources, such as financial reports, or primary data from surveys that capture whether a business shut down (Gimeno et al., 1997; Symeonidou et al., 2022). Another type is exit intention, which reflects the cognitive and psychological precursors to actual exit, capturing entrepreneurs' plans or desires to leave their ventures (Ajzen, 1991; Collewaert, 2012; Hsu et al., 2016). Exit intention is mostly measured through self-reported surveys, interviews, or experiments, where respondents indicate their likelihood of leaving their business in the future (Brigham et al., 2007; Lindblom et al., 2020; Sardeshmukh et al., 2020).

Exit can also be classified based on whether it involves exit from entrepreneurial activities or exit from ventures. Research on exit from entrepreneurial activities examines cases where individuals leave entrepreneurship entirely, transitioning to unemployment (Bird & Wennberg, 2016), paid employment (Bird & Wennberg, 2016; Hessels et al., 2018), or retirement (Morris et al., 2020; Rönkkö et al., 2024). This type of exit is typically measured at the individual level through labor market surveys or longitudinal studies tracking employment status over time (Hessels et al., 2018; Jayawarna et al, 2020; Shahid & Kundi, 2022). On the other hand, studies on exit from ventures explore cases where entrepreneurs disengage from a specific business but may remain active as entrepreneurs, such as in the case of serial entrepreneurs. These exits are measured at the entrepreneur level using longitudinal surveys, self-reported data, or interviews that capture post-exit career paths and activities (Baù et al., 2017; Hessels et al., 2011).

While a significant body of exit studies has primarily focused on the binary question of whether entrepreneurs exit or not, other research has explored diverse aspects, such as exit timing and modes. The first research question in studies on exit timing is why some entrepreneurs persist in failing ventures, while others choose to exit. Scholars in this area have identified various factors contributing to persistence despite adverse financial conditions, including emotional attachment (Shepherd et al., 2009), escalation of commitment (Yamakawa & Cardon, 2017), and optimism (Lindblom et al., 2020). Another line of inquiry examines the factors that lead to early, optimal, and late exits. The optimal exit occurs when an entrepreneur leaves a venture at a point that maximizes its value. An early exit occurs when an entrepreneur exits the venture prematurely, preventing the realization of its full potential, whereas late exit occurs when an entrepreneur delays leaving a venture beyond the optimal timing, resulting in significant financial losses. Most studies addressing this question draw on economic theories to establish normative benchmarks for optimal timing (e.g., Elfenbein et al., 2017; Sandri et al., 2010; Chen et al., 2018). They compare the decisions of actual entrepreneurs with these benchmarks and employ experimental methods to explore deviations and the factors influencing timing decisions.

Lastly, research on exit modes[4] examines the various pathways through which entrepreneurs exit their ventures, including initial public offerings (IPOs), mergers and acquisitions (M&A), business sales, succession, and liquidation. This body of literature identifies the key factors that shape these decisions, such as financial goals, market conditions, and personal motivations, when choosing an exit strategy or route (e.g., DeTienne & Chirico, 2013; DeTienne et al., 2015).

2.1.1 Boundary conditions

This review examines individual-level determinants of exit, focusing on firm-level and entrepreneurial exits as well as *why* and *when* exit occurs. I deliberately narrowed the scope to provide a deeper understanding of the processes underlying the exit decision-making process. However, this does not diminish the impact of macro- and firm-level factors. While these factors, such as technological disruptions and organizational performance, shape the broader context where exit decisions are made, they do not uniformly translate into exit outcomes. For instance, entrepreneurs' traits, perceptions, cognitive biases, and emotional states play an important role in determining how they respond to such influences. That is, faced with similar challenges, some entrepreneurs

[4] Some scholars distinguish between exit strategies and exit routes. For instance, DeTienne et al. (2015) define an exit strategy as the intended approach an entrepreneur plans to use to leave the firm, whereas an exit route refers to the actual method implemented during the exit process. In this review, however, I use the term "mode" to encompass both concepts.

may choose to persist, while others may decide to exit. In a similar vein, studies on exit modes are excluded, as they primarily examine factors at the firm level or external circumstances (e.g., financial performance, market conditions, and stakeholder pressures). These factors, while relevant, fall outside the scope of this review, which focuses on the individual-level factors influencing exit decisions.

In the next section, I briefly summarize key theoretical frameworks used to examine exit, focusing on their core ideas and how they have been applied in the context of exit decisions. I first review theories that explain *whether* entrepreneurs choose to exit in Section 2.2 and then discuss theories that explain *when* they decide to exit[5] in Section 2.3. A thorough discussion of all relevant factors is beyond the scope of this review. Instead, I will focus on the key ideas of each theory and their application to entrepreneurial exit. A review of how these theories have been applied and tested in empirical studies will be discussed in Sections 2.6 and 2.7.

2.2 Theories on whether to exit

2.2.1 Social cognitive theory

Social cognitive theory (SCT) posits that behavior is shaped by a dynamic interplay between personal factors, environmental influences, and the behavior itself (Bandura, 1986). This reciprocal interaction, termed *reciprocal determinism*, indicates that individuals both influence and are influenced by their environment. Environmental factors refer to the external conditions and influences that shape behavior such as social

[5] This categorization does not imply that these theories are exclusively applicable to one question or the other. In practice, some frameworks provide insights into both dimensions of entrepreneurial exit. The structure is used for clarity and to facilitate discussion.

norms and situational influences. These factors interact with personal and behavioral factors, providing stimuli that can reinforce or modify behavior. Behavioral factors are the actions or reactions individuals take, which both influence and are influenced by their personal factors and the environment. Personal factors include internal characteristics such as cognitive, emotional, and motivational elements that influence how individuals perceive and respond to situations.

SCT outlines several important factors that shape behavior. One is *self-efficacy*, which refers to an individual's belief about their ability to exercise control over challenging demands and perform actions that are necessary to achieve a specific goal. It influences individuals' emotions, thoughts, motivations, and actions. People with high self-efficacy view challenges as opportunities, set ambitious goals, and persist despite setbacks. They recover quickly from failure and believe it is due to factors they can control, such as not putting in enough effort or lacking certain skills. This mindset leads to greater personal accomplishment, reduced stress, and a lower risk of depression. In contrast, those with low self-efficacy avoid difficult tasks, set low goals, and easily give up when faced with challenges. Another key concept is *outcome expectancies*, which relate to the beliefs about the expected consequences of a given action. Outcome expectancies are a key source of motivation, and individuals are more likely to engage in behaviors they think will lead to positive outcomes. That is, when individuals believe that their efforts will ultimately result in desired outcomes, these expectations can help maintain their behaviors over long periods.

In the context of entrepreneurial exit, self-efficacy is one of the most frequently studied concepts. Two mechanisms have been extensively examined in this area. First, some studies focus on the direct effect of self-efficacy, suggesting that high self-efficacy motivates entrepreneurs to cope effectively with challenges and pursue ambitious goals, thereby leading to favorable outcomes and a reduced likelihood of exit (Caliendo et al., 2023; Cardon & Kirk, 2015). Second, other studies highlight the interaction between circumstances and self-efficacy. They suggest that environmental factors, such as perceived barriers in the institutional environment (Shahid, 2023), as well as personal circumstances like health (Hessels et al., 2018) or family support (Kawai et al., 2023), significantly influence an entrepreneur's perceived efficacy and, in turn, affect the likelihood of exit. These studies focus on how unfavorable environmental conditions may diminish an entrepreneur's self-efficacy, thereby increasing the likelihood of exit, and how supportive environments can reinforce their sense of competence and control, reducing the likelihood of exit.

2.2.2 Role theory

Role theory assumes that individuals have various roles, such as women, managers, or entrepreneurs, and these roles come with a set of behavioral expectations based on that person's position within a group or system (Biddle, 1986; Tubre & Collins, 2000). It suggests that individuals tend to behave in ways that align with their role expectations because individuals who fail to conform may receive sanctions, while individuals who conform are rewarded or not penalized. The theory also asserts that as people adopt new roles, they modify their behavior to conform to these role expectations (Newman & Newman, 1995). These key tenets of role theory have been used to develop several interrelated theories, such as social role theory, role congruity theory, and role identity theory.

Social role theory, proposed by Eagly (1987), builds on role theory by examining how societal and cultural structures shape specific roles, particularly gender roles. It suggests that differences in behavior between men and women arise from the roles society assigns them based on gender (Eagly, 1987). For example, men are often associated with traits like competitiveness and assertiveness, while women are linked to nurturing and cooperative traits (Eagly & Wood, 2012).

Role congruity theory builds on social role theory by focusing on the consequences of incongruence between individual characteristics and role expectations. Proposed by Eagly and Karau (2002), this theory highlights the biases and prejudices that arise when gender roles conflict with the expectations of specific roles. For instance, leadership roles are traditionally associated with masculine traits, which align with stereotypical male gender roles but conflict with communal traits typically associated with women. This incongruence often leads to two forms of prejudice: women are evaluated less favorably for leadership roles, and their actual leadership behaviors are judged more harshly than men's. This theory highlights how societal expectations can create barriers to entry and success in roles for individuals whose identities do not align with stereotypical norms.

While social role and role congruity theories focus on external societal structures, role identity theory shifts the focus to the individual (Stryker & Serpe, 1994) and explores how roles are internalized and integrated into one's self-concept. For instance, someone who strongly identifies with their role as an entrepreneur may exhibit behaviors, attitudes, and decisions that align with entrepreneurial traits, such as risk-taking and innovation. Role identity theory also examines how transitions between roles influence identity. Major transitions, such as leaving entrepreneurship, can lead to shifts in identity that require adjustments in behavior and self-perception. The difficulty with these transitions can vary depending on the individual's attachment to their previous role and the level of support they receive during the transition process.

Some research in role theory demonstrates that entrepreneurial exit is significantly influenced by the conflicting pressures that arise from the multiple roles entrepreneurs possess (Hsu et al., 2019; Usero et al., 2024; Zhu et al., 2021). Entrepreneurs often manage diverse responsibilities tied to their business, family, and social contexts, which generate competing demands on their time, energy, and emotional resources. This conflict forces entrepreneurs to prioritize the role most critical to their identity or immediate needs.

Some scholars explore gender as a critical factor in shaping how these conflicting pressures result in entrepreneurial exit. Entrepreneurship is often seen as requiring traits like independence, risk-taking, and aggressiveness—traditionally associated with masculinity (Gupta et al., 2009). As a result, it is frequently perceived as inconsistent with female gender roles, which emphasize caregiving and family responsibilities (Ahl, 2004; Shelton et al., 2008). This role mismatch creates significant stress for female entrepreneurs, leading to higher rates of exit when family and business demands conflict.

Another line of research examines entrepreneurs' retirement decisions using a role identity perspective (Morris et al., 2020; Rönkkö et al., 2024). Entrepreneurs whose work roles are closely tied to their identity are often reluctant to retire because it implies losing an important part of their self-concept (Feldman, 1994; Chevalier et al., 2013) and a loss of identity (Talaga & Beehr, 1995; Adams et al., 2002).

2.2.3 Conservation of resources theory

The conservation of resources (COR) theory posits that individuals possess a finite number of resources and strive to gain resources, maintain existing resources, and prevent resource loss (Hobfoll, 1989). Individuals value resources, which serve as a means to obtain more highly valued resources. They are loosely defined as objective resources (e.g., food, clothing, housing), personal characteristics (e.g., skills, knowledge), condition resources (e.g., marriage, employment), and energy resources (e.g., money, time, credit).

According to the COR, stressors, such as excessive workload and high uncertainty, threaten or cause a depletion of people's resources. When experiencing resource loss (e.g., exhaustion) following such threats, people try to mobilize resources as a coping mechanism to protect themselves. For example, they might step away from resource-draining situations or reduce commitments to conserve remaining resources and prevent additional resource loss. Alternatively, they may seek social support from partners, family, friends, and colleagues to replenish their resource reservoir. COR also suggests that resource reserves play a key role in determining individuals' perceptions of stressful situations and influencing how people respond to and overcome such situations. It predicts that people rich in resources may be more resilient and less affected by stressors, but they employ more productive coping strategies; those with poor resource reserves may be more vulnerable to the negative influences of ongoing resource challenges and employ maladaptive coping strategies.

Recent studies on entrepreneurial exit have utilized the COR theory to explain the impact of poor health and stressors on exit decisions. One body of literature focuses on the protective mechanism of exit, where entrepreneurs choose to leave their ventures to prevent further resource depletion (Liu et al., 2024; Zhao et al., 2023). Entrepreneurs facing significant resource losses adopt coping strategies to prevent further resource loss and conserve their remaining resources. That is, they consider exit as a means to eliminate the causes of resource depletion (Alarcon, 2011; Barthauer et al., 2020; Demerouti et al., 2001).

Another body of literature focuses on the buffering mechanisms and examines how acquiring additional resources or leveraging surplus resources can mitigate pressures leading to exit (Shahid & Kundi, 2022). According to the COR theory, entrepreneurs with access to ample resources, whether external or internal, are better equipped to manage challenges and remain persistent. Thus, external resources, such as support from family and peers, help alleviate the psychological burden of entrepreneurship. Internal resources, including traits like self-efficacy and psychological well-being, enable entrepreneurs to appraise challenges as temporary and manageable. Together, these external and internal resources create a buffer that mitigates the negative impact of resource constraints, reducing the likelihood of exit.

2.2.4 Prospect theory

Prospect theory (PT) offers a behavioral framework for understanding how individuals make decisions involving risk (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). This theory emerged as a response to the limitations of EUT (von Neumann &

Morgenstern, 1944). EUT had long been the dominant framework for understanding decision-making under risk, assuming that individuals make rational choices to maximize expected utility. However, empirical evidence increasingly demonstrated that everyday decisions often deviate from these predictions (Coombs, 1975; Mosteller & Nogee, 1951; Tversky, 1969). In response, Kahneman and Tversky developed PT to better account for the complexities of human behavior.

PT introduces several critical concepts that distinguish it from EUT. First, it posits that decisions are evaluated relative to a *reference point* rather than absolute outcomes. Gains and losses are perceived as deviations from this reference point. The determination of this reference point often depends on an individual's expectations, experiences, or the framing of choices. A closely related concept, the *framing effect*, highlights that the way information is presented influences whether an outcome is perceived as a gain or a loss relative to an individual's reference point. This perception may, in turn, shape decision-making and behavior. Second, two key concepts closely related to each other are *loss aversion* and the *endowment effect*. *Loss aversion* suggests that, for many people, the emotional impact of losing a certain amount is greater than the satisfaction gained from acquiring the same amount. This asymmetry explains behaviors such as risk aversion in gains and risk-seeking tendencies in losses. The *endowment effect*, usually seen as a manifestation of loss aversion, refers to the tendency for people to value items they own more highly than identical items they do not own. Simply put, ownership increases the perceived value of a good. Third, the *value function* captures how individuals perceive gains and losses; it is concave for gains, convex for losses, and steeper for losses than for gains. This S-shaped curve reflects diminishing sensitivity, where individuals are less sensitive to changes in value as they move farther from the reference point. Lastly, PT also introduces *probability weighting,* which explains the behavioral tendency to overweight small probabilities and underweight large ones. This leads to behaviors such as buying lottery tickets (overvaluing low-probability gains) or purchasing insurance (overestimating low-probability losses).

The principles of PT provide valuable insights into how entrepreneurs' attachment to their firms and their perceptions of exit shape their willingness to exit. For many entrepreneurs, their business is not only a financial asset but also an extension of themselves (Hoang & Gimeno, 2010; Shepherd & Haynie, 2009). This strong emotional attachment amplifies the endowment effect, leading entrepreneurs to overvalue their firms simply because they own them. This overvaluation, in turn, amplifies loss aversion and makes entrepreneurs reluctant to exit (Sanguineti et al., 2022). The way entrepreneurs frame exit also plays an important role (Jiao et al., 2021; Sanguineti et al., 2022). When exit is framed as a loss (e.g., losing a core part of their identity or control over the firm), psychological barriers to exit become stronger. On the other hand, framing exit as a gain (e.g., reallocating remaining resources or pursuing new ventures) shifts entrepreneurs' focus from current losses to potential future benefits, making them more likely to exit.

2.3 Theories on when to exit

2.3.1 Threshold theory

Threshold theory provides a framework for understanding when entrepreneurs choose to exit (Gimeno et al., 1997). Similar to prospect theory, which emphasizes how decisions are assessed relative to a reference point, threshold theory focuses on subjective thresholds defined as “the level of performance below which the dominant organizational constituents will act to dissolve the organization” (Gimeno et al., 1997: 750). Unlike traditional economic theories, which assume decisions are based solely on financial outcomes, it acknowledges that thresholds are shaped by the interplay of both financial and non-financial factors. As a result, entrepreneurs with different performance thresholds may respond differently to the same level of financial performance.

These factors include expected financial returns (e.g., monetary benefits), expected non-financial benefits (e.g., autonomy, job satisfaction), switching costs (e.g., financial or psychic costs of transitioning to a new venture or career), and the probability of achieving expected outcomes. According to the theory, the expected financial returns are associated with continuing the current venture versus pursuing alternative opportunities. Entrepreneurs compare the financial performance of their current business to potential gains from alternative options. High expected financial returns from alternatives increase the entrepreneur’s threshold level, making the entrepreneur more likely to exit. On the other hand, expected non-financial benefits from entrepreneurship lower the performance threshold, increasing the likelihood of persistence with an underperforming firm. High switching costs decrease performance thresholds, making exit less attractive. Similarly, entrepreneurs who perceive limited or less appealing alternatives are more likely to persist, as the perceived costs of switching are high.

Most studies based on threshold theory have empirically examined how the four factors influence persistence by raising or lowering the entrepreneur’s threshold (Ma et al., 2018; Mattingly et al., 2016). Some of these studies explore the role of psychic income in the context of family business (Ma et al., 2018; Symeonidou et al., 2022).

Family businesses are characterized by a strong attachment to socioemotional wealth, which includes non-financial goals such as family legacy and control over the business (Berrone et al., 2012; Gómez-Mejía et al., 2007). This socioemotional wealth lowers the threshold level, encouraging family business owners to tolerate lower financial returns and persist longer (Gimeno et al., 1997; Siepel et al., 2017).

2.3.2 Economic theory

Deciding when to exit involves evaluating present losses against uncertain future outcomes—a problem addressed by economic models such as Expected Utility Theory (EUT), Net Present Value (NPV), and Real Options Theory (ROT). These frameworks offer distinct perspectives on how decision-makers evaluate alternatives involving probabilistic outcomes, sunk costs, and dynamic conditions.

EUT (von Neumann & Morgenstern, 1944) posits that rational individuals aim to maximize the expected utility of outcomes (utility maximization), rather than their objective or monetary value (value maximization). Utility refers to a subjective representation of value that reflects individual preferences, particularly toward risk. EUT introduces risk attitudes as a central feature of decision-making. Risk-averse individuals prefer a certain payoff over a risky one even if the expected value is the same; risk-seeking individuals prefer the risky option; risk-neutral individuals are indifferent between the two. EUT thus offers a preference-based explanation for behavior under risk, in which both the probabilities of outcomes and the size of those outcomes are known.

In contrast, the NPV rule guides continuation or termination decisions based on the projected financial returns of a project. Under this rule, decision-makers evaluate the future cash flows of a project and discount them to present value using an appropriate discount rate. The NPV model suggests that the project should proceed when the NPV is positive; otherwise, it should be terminated. The model assumes static, one-shot decision-making with full information about future cash flows.

While both EUT and NPV provide useful normative baselines, neither fully captures the flexibility decision-makers possess when facing uncertainty over time. This limitation is addressed by ROT, which incorporates the value of managerial discretion and timing flexibility in sequential decision-making environments (Dixit & Pindyck, 1994). Real options refer to “opportunities to purchase real assets on possibly favorable terms” (Myers, 1977: 163). Investing in real options confers the right, but not the obligation, to acquire (or dispose of) real assets in the future (McGrath, 1997); it helps optimize decision-making in a dynamic, uncertain environment by creating opportunities for decision-makers to gather information and assess the benefits of waiting until the uncertainty is resolved.

ROT provides useful insights for exit decisions. The fundamental intuition is that as uncertainty increases, the distribution of possible future performance widens, thereby increasing the potential for improvement in the situation. In other words, when there is a high level of uncertainty related to decisions, immediate exit might not be economically sound—the downside losses of delayed exit might be similar to those of immediate exit, and entrepreneurs would miss the potential benefits that would be realized if the situation improves.

The value of delaying exit under high uncertainty becomes more significant when the decision involves sunk costs (Coucke et al., 2007; McGrath, 1999). Traditional economic studies suggest that past expenditures should not influence current decisions and should consider factoring in sunk costs evidence of biased decision-making (referred to as escalation of commitment, which will be discussed in Section 2.3.3). However, ROT takes sunk costs into account and suggests that when they are significant, it may be rational for entrepreneurs to bear operating losses and keep the business running as long as the losses are not greater than the value of keeping the options open (Dixit, 1992). For instance, entrepreneurs who decide to exit now may want to re-enter later if conditions improve. If this is the case, significant sunk costs would make re-entry costly, as entrepreneurs would need to repay those sunk costs. However, without sunk costs, there is no economic reason to persist since the entrepreneur could exit and re-enter without significant costs (Dixit, 1989).

These economic frameworks are frequently used as theoretical benchmarks in experimental studies of entrepreneurial exit behavior, particularly to investigate discrepancies between optimal exit timing and actual decisions made by entrepreneurs in contexts of high risk or uncertainty. In this line of research, the optimal exit point is typically defined as the moment when the venture's expected returns are no longer positive. An early exit refers to a decision to exit before reaching this point, potentially leaving financial value on the table, whereas a late exit is when the entrepreneur continues beyond the optimal point, thereby incurring losses. This stream of research also explores factors contributing to deviations from optimal exit points, such as psychological influences and cognitive biases (Elfenbein et al., 2017; Musshoff et al., 2013; Sandri et al., 2010).

2.3.3 Behavioral theory

Behavioral decision theory (e.g., Einhorn & Hogarth, 1981; Kahneman & Tversky, 1979; Simon, 1959) also provides a valuable lens for understanding when to exit. Unlike classical decision theory, which assumes that individuals act rationally to maximize utility (von Neumann & Morgenstern, 1944), behavioral theory recognizes that individuals often make decisions under conditions of uncertainty, limited information, and emotional influences, resulting in systematic deviations from optimal decision-making. In the context of exit-timing decisions, escalation of commitment is among the most extensively studied factors (e.g., Coppens & Knockaert, 2022; DeTienne et al., 2008; Yamakawa & Cardon, 2017).

Continuing to invest resources into a failing course of action despite negative outcomes is an escalation of commitment (Brockner, 1992; Staw, 1981) and stems from cognitive mechanisms such as self-justification, sunk cost, and framing effect (for a review see Brockner, 1992). Individuals are often motivated to defend past decisions to avoid the psychological discomfort of acknowledging mistakes (Staw, 1976). This desire to justify past decisions is closely tied to the sunk-cost fallacy; this fallacy suggests that sunk costs, which should have been excluded from decision-making, act as a psychological anchor, making it difficult for individuals to detach from prior investments. Consequently, these entrepreneurs feel obligated to justify these expenditures by continuing rather than exiting to cut losses.

The framing effect also influences escalation by shaping perceptions of potential outcomes. When decisions are framed in terms of losses rather than gains, individuals are more likely to take risks to avoid those losses—a principle derived from PT (see Section 2.2.4). For example, framing a business situation as negative outcomes (e.g., “we lose everything we've invested if we exit now") encourages risk-seeking behavior and escalated commitment to avoid realizing those losses. Conversely, framing a situation as positive outcomes (e.g., "exiting now will allow us to use resources for more profitable opportunities") makes individuals more risk-averse, reducing the likelihood of escalation and persistence.

Irrational escalating behavior is also often driven by individuals' evaluation of the likelihood of success (Hung et al., 2011) and their high confidence (Whyte et al., 1997). Overoptimism—the tendency to underestimate the likelihood of negative future outcomes and overestimate the probability of positive future outcomes (Weinstein,1980)—is a significant driver of persistence. Over-optimistic individuals tend to perceive obstacles and setbacks as temporary (Bird, 2005) and believe they can eventually achieve successful outcomes (Hmieleski & Baron, 2009; Scheier et al., 2001), thus promoting greater persistence.

Lastly, another factor, overconfidence—a construct closely related to overoptimism—is a systematic tendency to overestimate one's own skills, knowledge, and decision-making capabilities relative to others (Camerer & Lovallo, 1999; Malmendier & Tate, 2005; Moore & Healy, 2008). Overconfident individuals are more likely to attribute successes to their abilities and dismiss external signals that suggest the venture is failing (Chen et al., 2018). This bias distorts the entrepreneur's evaluation of risk associated with their firm, leading to decisions based on subjective confidence rather than objective analysis. Overconfidence also interacts with escalation of commitment, as overly confident individuals might be reluctant to revisit their previous decisions (Moore & Cain, 2007).

2.4 Review methodology and selection criteria

The search for academic articles written in English took place in late October 2024. To find relevant papers, I conducted abstract searches in the Web of Science Core Collection database, which identifies articles containing the search terms in the abstract. This database offers a wide range of scholarly literature across multiple academic disciplines, including science, social science, and the arts and humanities. Its advanced search features, such as Cited Reference Search and KeyWord Plus, enhance the efficiency of navigating a vast amount of scholarly literature, offering reliable sources and facilitating robust research. The Web of Science database is well known for its quality and comprehensiveness and has been commonly used by scholars for literature reviews (e.g., Cefis et al., 2022; Newman et al., 2021).

The search terms for the topic search consisted of two parts. The first part included the terms: "entrepreneur,*" "venture,*" and "start-up* or startup.*" The second part, combined with the first term using *AND* included terms: "exit,*" "clos,*" and "persist.*"[6] The asterisk (*) was used for the right-hand truncation of a word, enabling the expansion of search results by including variations of a word with the same root.

From the initial search results, which yielded thousands of papers, I identified papers on entrepreneurial exit, focusing primarily on empirical research. I excluded studies that are review articles, special issues, editorials, commentaries, scale development, validation articles, and conference proceedings. This process resulted in a preliminary list of 2,336 articles. I then reviewed the abstracts and full texts (when

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[6] Persistence with underperforming firms can be seen as a form of late exit. Although it is not an immediate exit, it is likely to lead to eventual exit.

needed) of each paper and further refined the list. First, I excluded studies that examine venture capital exit decisions. Second, I excluded papers that mention entrepreneurial exit but do not discuss in detail the phenomena after exit (e.g., re-entry into the traditional workforce or entrepreneurship). Third, I excluded papers addressing exit from the venture creation process (i.e., nascent entrepreneurs exiting during the creation stage), as these are distinct from exit decisions involving established ventures. Fourth, I excluded articles that discuss exit modes (e.g., the choice between IPO and M&A). Finally, as this review focuses on individual-level determinants of exit, I excluded papers that primarily examine firm-level or macro-level determinants (see Section 2.1.1 for further discussion). This process resulted in a total of 98 papers—77 papers on decisions on whether to exit and 21 papers on decisions regarding when to exit. Figure 1 provides an overview of the review process.

Figure 1. Overview of the review process and paper selection criteria

Search boundaries

- Database: Web of Science
- Cover period: Publications before October 2024

Search terms

- Entrepreneur* OR Venture* OR start-up* OR startup*

AND

- Exit* OR Clos* OR Persist*

Exclusion criteria

1. Review articles, special issues, editorials, commentaries, scale development, validation articles, and conference proceedings.
2. Not in English
3. Examine venture capital exit decisions
4. Mention entrepreneurial exit but do not discuss in detail and discuss phenomena after exit
5. Examine exit from the venture creation process
6. Exit mode papers (e.g., choice between IPO and M&A)
7. Primarily examine firm-level or macro-level determinants

Final result

98 papers
(77 papers – Whether to exit; 21 papers – When to exit)

2.5 Individual-level determinants of exit

While firm-level and macro-level factors such as firm performance, market trends, and industry competition are often discussed particularly in relation to startup failure or survival (MacMillan et al., 1987; Merrifield, 1987; Song et al., 2008; Yang & Aldrich, 2012), the personal characteristics, motivations, and emotions of entrepreneurs also play a significant role by influencing how entrepreneurs perceive challenges, evaluate options, and ultimately decide to exit their ventures (DeTienne & Cardon, 2012; Kier et al., 2021; Shepherd et al., 2009).

Understanding the impact of these factors is essential because entrepreneurs are powerful decision-makers who play a pivotal role in shaping the trajectory of their ventures (Bird, 1988; Krueger et al., 2000). Entrepreneurs' demographic profile, health status, emotional resilience, or motivational drivers can affect their ability to sustain a venture or their desire to exit (Chadwick & Raver, 2018; Coppens & Knockaert, 2022; Justo et al., 2015; Shahid & Kundi, 2022). These individual differences shape the exit decision-making process and influence outcomes, such as persistence with underperforming ventures or hasty exits, highlighting the importance of examining the underlying processes.

The next section delves into the multifaceted ways in which individual-level factors—ranging from demographic traits to emotional and cognitive factors—shape entrepreneurial exit decisions. In Section 2.6, I discuss individual factors affecting whether to exit or not. In Section 2.7, I explore drivers influencing decisions on exit timing. Together, these discussions provide a deeper understanding of entrepreneurial exit. Table 1 summarizes key distinctions between "whether to exit" and "when to exit" studies.

Table 1. Comparison of "whether" and "when" studies

Dimension	Whether to exit (n = 77)	When to exit (n = 21)
Typical research question	Who exits and why?	Why do some entrepreneurs persist too long with underperforming firms?
Exit decision	Binary (exit vs. continue)	Temporal (early, late, optimal)
Theoretical frameworks	Social cognitive theory, Role theory, Conservation of resources theory, Prospect theory	Threshold theory, Escalation of commitment, Real options theory
Data/Method	Survey, Longitudinal household data	Survey, Lab experiments

Note: Examples highlight dominant theoretical and methodological patterns and are not exhaustive. For example, some theories, such as threshold theory, are relevant to both types of exit decisions.

2.6 Papers on whether to exit

2.6.1 Demographics and entrepreneurial characteristics

Demographic factors, such as gender, age, and education, along with entrepreneurs' characteristics, such as previous experience, have been consistently identified as key predictors of entrepreneurial exit (Bates, 2005; Hsu et al., 2016; van Praag, 2003). Gender is one of the most extensively studied demographic factors, shaping both the likelihood and motivations for leaving a venture. Research has primarily demonstrated how societal roles and expectations, shaped by traditional gender norms, create unique challenges for women. These dynamics are often examined in relation to family dynamics and family supports, using frameworks such as social role theory (see Section 2.2.2) and the work-family interface to explore how the interaction between work and family roles shapes job attitudes and behaviors (Greenhaus & Allen, 2011).

Female entrepreneurs often face the challenge of balancing between traditional gender roles, such as caregiving and entrepreneurial demands (Brush et al., 2019; Foss et al., 2019; Yang & Triana, 2019). These societal expectations place pressures on women, making it more difficult for them to prioritize and sustain their businesses (Thébaud, 2016), increasing the likelihood of entrepreneurial exit. These pressures may be particularly pronounced during early parenting stages, when balancing business operations with intensive caregiving demands becomes increasingly difficult. Jayawarna et al. (2020) argue that the presence and age of children within a household play a critical role in shaping entrepreneurial exit decisions. Women with preschool-aged children are particularly affected, as these caregiving demands are more intensive compared to older children. The authors further suggest that the likelihood of exit diminishes when female entrepreneurs can outsource childcare responsibilities.

Likewise, Hsu et al. (2016) demonstrate that work-family dynamics are more likely to cause family-to-business interference for women entrepreneurs. According to gender role theory, societal expectations describe how men and women are expected to behave (Eagly, 1987; Heilman, 2001). Entrepreneurship is perceived as a career requiring masculine traits (Gupta et al., 2009) and often conflicts with the caregiving roles that society assigns to women. This role conflict increases the likelihood of exit for female entrepreneurs, who may experience greater regret when their business obligations interfere with family responsibilities (Shelton et al., 2008). Men, however, are less affected by such dynamics because their role as entrepreneurs aligns with the breadwinner stereotype, resulting in fewer conflicts with family obligations (Hsu et al., 2016). This gendered disparity in the effect of work-family dynamics on entrepreneurial exit is further reflected in Justo et al.'s (2015) findings, which show women are more likely to exit voluntarily for personal or family-related reasons, and menare often driven to exit because of business failure. The authors suggest that this finding is attributed to women's tendency to approach entrepreneurship with a holistic perspective, integrating financial, family, and societal goals. Men, in contrast, are more likely to focus on profit maximization and career advancement, aligning their exit decisions with financial imperatives (Brush, 1992).

While family can impose constraints on entrepreneurial journeys, it can also provide support that enhances entrepreneurial resilience. For example, family members located nearby can offer critical resources such as business advice, ideas, and access to markets and labor, which help entrepreneurs recognize opportunities and make informed decisions (Bird & Wennberg, 2016). For immigrant entrepreneurs, in particular, proximity to family members reduces the likelihood of exit by providing a reliable safety net and emotional support during challenging times (Bird & Wennberg, 2016). Family financial resources also play a role in reducing the likelihood of exit by mitigating business risks, covering unexpected shocks, and ensuring operational sustainability (Bird & Wennberg, 2016). Jayawarna et al. (2020) also find that a woman entrepreneur's likelihood of exiting decreases when her partner's income increases. Such financial stability reduces the immediate pressures to generate consistent business income, providing women with greater flexibility to maintain their ventures.

Education has been identified as another factor that shapes how entrepreneurs perceive and make exit decisions. As suggested by role theory, gendered stereotypes may lead society to perceive women entrepreneurs as less capable of dealing with challenges, causing women to doubt their abilities (Anglin et al., 2022; Rocha & van Praag, 2020). However, education can help counteract these negative perceptions by equipping women with the skills and knowledge necessary to overcome crises, thereby reducing the likelihood of exit (Usero et al., 2024). Beyond individual skill-building, education also leads to changes in perspective, enabling entrepreneurs to view exit with a future-oriented mindset (Sanguineti et al., 2022). Rather than viewing exit as a failure, these entrepreneurs are more likely to perceive it as a strategic step toward broader goals, such as pursuing new opportunities or reallocating resources to more promising ventures (Sanguineti et al., 2022; Taylor, 1999). This effect aligns with the framing effect in PT, which highlights how individuals interpret and evaluate their options as either losses or gains, ultimately influencing their decisions (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992; see Section 2.2.4).

Entrepreneurial experience plays a multifaceted role in shaping exit decisions. On one hand, it fosters entrepreneurs' emotional attachment to their ventures, reducing their likelihood of exit; on the other hand, it can develop a strategic mindset that may increase their willingness to leave their firms. Drawing on PT, Sanguineti et al. (2022) illustrate how tenure reinforces the endowment effect, making entrepreneurs more emotionally attached to their ventures over time. This attachment reflects and amplifies the underlying influence of loss aversion because the fear of losing what has been built outweighs rational considerations for exit. Similarly, Jiao et al. (2021) demonstrate that founder-CEOs' high levels of stock ownership shape their exit decisions by framing substantial equity stakes as wealth to protect, consistent with loss aversion. They argue that this fear of losing financial stability often increases the likelihood of exit, particularly post-IPO. Founder-CEOs with longer tenures develop strong emotional connections to their ventures. Because they closely associate their identity with their firms, they tend to frame exit as a personal loss (Berrone et al., 2010). As a result, they are less likely to exit, even when financial benefits from ownership stakes are high.

Prior entrepreneurial experience mitigates these biases because it helps entrepreneurs develop resilience against loss aversion through repeated exposure to decision-making under uncertainty (Kahneman, 2003). Sanguineti et al. (2022) support this perspective, showing that entrepreneurs with prior experience prioritize long-term goals over immediate emotional reactions to losses. This tendency is further reinforced by the practical skills and networks accumulated through previous ventures, enabling them to identify new opportunities and approach exit decisions strategically rather than emotionally. The authors also find that entrepreneurs with global experience are more likely to consider strategic exit and explore new markets and opportunities.

As discussed, entrepreneurial exits are not solely financial decisions—they are personal and emotional processes, often closely tied to the entrepreneur's identity and passions. Entrepreneurs see their ventures as extensions of themselves (Hoang & Gimeno, 2010; Shepherd & Haynie, 2009). Their work is deeply linked to their self-concept; leaving a venture could feel like losing a significant part of their identity, creating psychological barriers to exit (Adams et al., 2002; Chevalier et al., 2013; Feldman, 1994). Entrepreneurial passion, defined as a "consciously accessible, intense positive feeling resulting from engagement in activities with identity meaning and salience to the entrepreneur" (Cardon et al., 2009: 515), intensifies these identity ties. Passionate entrepreneurs find fulfillment and satisfaction in the activities associated with their ventures (Shane et al., 2003). For them, leaving their firms might mean walking away from something that has given their life purpose and joy. This dynamic is particularly evident in transitions like retirement, which Morris et al. (2020) explore through the lens of role theory and work-role attachment theory. They frame retirement (i.e., a form of entrepreneurial exit) as a role transition involving the loss of work-related roles. Their findings suggest that entrepreneurs with high entrepreneurial passion find this transition particularly difficult and, as a result, are less likely to exit, as their self-worth is closely tied to their ventures.

2.6.2 Stressors and health

Stressors and entrepreneurs' health, which are tightly connected, have significant implications for exit decisions. The role of these factors has recently begun to receive attention. Entrepreneurship often demands long working hours, significant emotional investment, and countless decisions (Boyd & Gumpert, 1983; Buttner, 1992; Harris et al., 1999; Jamal, 1997; Uy et al., 2013). These factors create an environment that exposes entrepreneurs to heightened stress, which increases their vulnerability to poor mental health and raises the likelihood of entrepreneurial exit (Hessels et al., 2018; Sardeshmukh et al., 2020; Shahid & Kundi, 2022; Zhao et al., 2023).

Conflict within entrepreneurial ventures is one of the significant stressors. For example, Collewaert (2012) shows that task and goal conflicts are significant stressors in entrepreneurial ventures and lead to exit decisions. Task conflicts, involving disagreements over how to achieve goals, can diminish entrepreneurs' confidence and sense of control. Similarly, goal conflicts, which stem from misaligned priorities between entrepreneurs and stakeholders, such as investors emphasizing short-term profits over long-term visions, intensify this strain by undermining collaboration and shared purpose. In both cases, unresolved conflicts can lead to emotional exhaustion, frustration, and dissatisfaction with the venture, leading entrepreneurs to view exit as a viable solution to escape these ongoing tensions.

Entrepreneurial exit can be influenced by stressors through their negative effects on mental health. Many studies on this topic draw on the COR theory to explain how mental health affects exit decisions (see Section 2.2.3 for a detailed discussion). For example, Sardeshmukh et al. (2020) demonstrate how role ambiguity and work-family conflict contribute to entrepreneurial exit by fostering emotional exhaustion. Role ambiguity creates uncertainty about priorities and actions, forcing entrepreneurs to navigate unclear expectations, which depletes their psychological resources. Work-family conflict, on the other hand, arises from competing demands between professional and family roles, leading to strain and frustration. Both stressors accumulate over time, draining emotional reserves and resulting in emotional exhaustion. Entrepreneurs experiencing emotional exhaustion may choose to exit as a protective mechanism to prevent further resource loss. Similarly, Zhao et al. (2023) apply the COR theory to demonstrate how person-environment misfit exacerbates the depletion of psychological and emotional resources. The authors demonstrate that entrepreneurs facing such misfits tend to experience chronic resource loss as they struggle to align their abilities with the demands of entrepreneurship, resulting in burnout. In this case, as discussed in Sardeshmukh et al. (2020), entrepreneurs are more likely to exit to protect their remaining resources.

In contrast to the negative effects of stressors and mental health problems, positive mental health factors play a crucial role in enhancing resilience against exit pressures. Studies indicate that life satisfaction and subjective well-being are particularly impactful, as they foster a mindset that enables entrepreneurs to reframe exit as a strategic transition rather than a failure (Lindblom et al., 2020; Rönkkö et al., 2024). For instance, Rönkkö et al. (2024) find that entrepreneurs nearing retirement who have high life satisfaction are more likely to view exit as a positive outcome, reflecting their success. This positive mindset encourages strategic decision-making and reduces the emotional burden associated with leaving a venture. In a similar vein, Lindblom et al. (2020) emphasize the role of subjective well-being in fostering optimism and energy. The authors suggest that by alleviating the effects of stress and exhaustion, well-being enables entrepreneurs to maintain focus and persistence when facing adversity. Thus, optimistic entrepreneurs are better equipped to view challenges as opportunities, allowing them to continue their ventures and reduce the likelihood of premature exit.

Some papers examine how positive mental health acts as a psychological buffer, enabling entrepreneurs to better manage stress and continue their ventures under challenging conditions (i.e., a buffering mechanism; see Section 2.2.3). Building on the COR theory, Shahid and Kundi (2021) highlight the protective effects of affect-based well-being (AWB) and cognitive-based well-being (CWB). These forms of well-being help entrepreneurs regain energy and cope more effectively with emotional exhaustion, thereby reducing the likelihood of exit caused by emotional exhaustion.

2.6.3 Resilience

Resilience, conceptualized as a collection of favorable attitudes and behaviors (Cooper et al., 2013), has also been studied as a factor that reduces the likelihood of exit by enabling entrepreneurs to navigate challenges and mitigate the negative effects of stressors. Chadwick and Raver (2018) show that psychological resilience enables entrepreneurs to view challenges as opportunities rather than threats, encouraging proactive behaviors such as developing skills and resources to adapt to changing conditions. These proactive efforts allow entrepreneurs to gain strategic advantages that mitigate external pressures and strengthen their survival prospects. Elshaer and Saad (2021) further explore two key mechanisms through which resilience influences entrepreneurial exit intentions. First, highly resilient entrepreneurs exhibit adaptability, which allows them to modify their behavior and strategies to address challenges. Second, resilience enables entrepreneurs to leverage institutional relationships and social capital to navigate changing environments. Usero et al. (2024) examine how resilience helps female entrepreneurs address the unique challenges they face, such as work-family conflicts. They show that education plays a crucial role in strengthening resilience by equipping women with the knowledge, skills, and confidence to deal with challenges. Additionally, they identify family income as an economic buffer against financial pressures, further enhancing resilience and supporting persistence in entrepreneurial endeavors.

2.6.4 Emotions

Entrepreneurs often experience various emotional challenges. These emotions, shaped by both external circumstances and internal evaluations, illustrate the psychological nature of entrepreneurial exit decisions. Negative emotions such as regret, frustration, and fear of failure are studied in the context of entrepreneurial exit, providing insights into how entrepreneurs respond to the pressures and conflicts of their roles.

First, regret can drive entrepreneurs toward exit as a corrective mechanism. Hsu et al. (2019) argue that entrepreneurs frequently reflect on "what might have been" and blame themselves for unfavorable outcomes. This thinking often leads to decisions aimed at avoiding future regret, which could result in exiting their ventures. For instance, entrepreneurs enduring long working hours, financial uncertainty, and work-family conflicts may feel regret over their career choices, considering exit a way to reorganize their priorities and mitigate further emotional strain. Female entrepreneurs are particularly prone to regretful thinking due to the demands of entrepreneurship and family obligations (Kawai et al., 2023; see Section 2.6.1 for more detailed discussion). Kawai et al. (2023) suggest that this regret, intensified by societal pressures to excel in both roles, reduces persistence and satisfaction with their entrepreneurial journeys, ultimately increasing the likelihood of exit. Family support, however, plays an important role in moderating this dynamic by providing resources and stability, enabling entrepreneurs to anticipate more positive outcomes despite challenges. These findings align with research on gender and family dynamics discussed in Section 2.6.1.

Frustration is another negative emotion that can push entrepreneurs toward exiting their ventures. Souitaris et al. (2020) explore this dynamic, particularly in situations where founders lose power within their own firms as the venture evolves. When entrepreneurs feel blocked from achieving their current goals and lose control over their firms, frustration arises (Fox & Spector, 1999). The authors argue that founders who lose power during an IPO process may experience frustration because they perceive themselves as unable to correct undesirable changes. This frustration can drive withdrawal behaviors, such as partial or full exits from the venture, as founders seek to alleviate the emotional strain caused by their lack of control. In this case, exiting is a way to distance themselves from a situation that conflicts with their visions and generates emotional distress.

Lastly, fear of failure shapes the way entrepreneurs cognitively evaluate the viability and desirability of continuing their ventures and pushes entrepreneurs toward exits. Individuals assess their situations based on both internal and external cues (Bandura, 1986). When entrepreneurs experience fear of failure, they may perceive continued investment in the venture as too risky. This heightened sense of risk and potential loss motivates them to consider exit. For example, Shahid et al. (2024) explore how fear of failure operates in developing economies and demonstrate that externally, environmental uncertainties and financial risks create significant concern about the feasibility of sustaining a venture. This fear is further amplified by internal doubts, including doubts about their competencies and the pressure to meet stakeholders' expectations. Entrepreneurs experiencing fear of failure may assess these risks as unmanageable and, in turn, perceive exit as a strategy to avoid personal, financial, and reputational losses. This reflects a cognitive evaluation process in which the perceived inability to navigate challenges outweighs the motivation to persist, ultimately leading to exit.

2.6.5 Cognitive factors

The discussion above on fear of failure highlights the importance of cognitive evaluations in shaping entrepreneurial exit decisions. Entrepreneurs' perceptions of their abilities and the challenges they face significantly influence their decision to persist or exit. Within this cognitive framework, self-efficacy and stress appraisal have been studied as key factors.

Self-efficacy, defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986: 391), is a critical determinant of entrepreneurial persistence (see Section 2.2.1 for more discussion). Building on SCT, studies on self-efficacy demonstrate how self-efficacy mediates the relationship between internal and external obstacles and entrepreneurial exit. For example, Hessels et al. (2018) show that depression diminishes entrepreneurs' capacity to manage the complexities of their ventures, leading to avoidance behaviors—exit in this case. Also, Shahid (2023) reveals that perceived barriers, such as insufficient institutional support, negatively influence self-efficacy. This reduced confidence undermines entrepreneurs' belief in their ability to overcome barriers which makes exit a more attractive option.

Stressors are not uniformly negative but depend on how individuals interpret them as either manageable or overwhelming (Cavanaugh et al., 2000; Folkman et al., 1986; LePine et al., 2005). The process of stress appraisal shapes how entrepreneurs respond to their circumstances (Cavanaugh et al., 2000; LePine et al., 2005; Pearsall et al., 2009). Entrepreneurs who perceive stressors as hindrances or threats are more likely to experience frustration and demotivation. Zhu et al. (2017) illustrate how weak family support can heighten hindrance appraisals, leading entrepreneurs to view their responsibilities as overwhelming and increasing their intentions to exit. The lack of instrumental and emotional support in such cases creates a negative feedback loop, intensifying stress and the perception of barriers. In contrast, challenge appraisals, where entrepreneurs perceive difficulties as opportunities for growth and development, have a positive effect (Bennett et al., 2021). Entrepreneurs with high challenge appraisals are more likely to persist because they frame their obstacles as addressable challenges, which enhances resilience. In sum, the interplay between self-efficacy and stress appraisal may highlight a dual pathway in entrepreneurial decision-making. Entrepreneurs with high self-efficacy might adopt challenge appraisals, viewing stressors as manageable and motivating persistence. On the other hand, those with low self-efficacy might select hindrance or threat appraisals, reinforcing the likelihood of exit.

2.7 Papers on when to exit

While studies discussed in Section 2.6 provide valuable insights into why entrepreneurs decide whether to exit their ventures, they leave an important question unanswered: *how do entrepreneurs decide the appropriate timing for exit?* The decision to exit early, late, or at an optimal moment[7] can significantly affect not only outcomes for entrepreneurs but also the broader implications for stakeholders, industries, and economies (Bahrami & Evans, 1995; DeTienne, 2010; Haveman & Khaire, 2004; Mason & Harrison, 2006). This calls for a deeper investigation into the determinants of exit timing.

Exit-timing decisions are shaped by an interplay of internal and external factors. Internal factors, such as emotional attachment and biases, can influence an entrepreneur's ability to objectively evaluate when to exit and consequently lead to entrepreneurs' persistence with poorly performing firms. However, persistence, often regarded as an essential trait of successful entrepreneurs, can be problematic and irrational, especially when external forces, such as technological advancements or disruptions, make exit not merely a rational choice but an inevitable one. This decision-making process is further complicated by whether decisions are made under conditions of risk or uncertainty. Risk refers to situations where probabilities of outcomes are known, enabling more calculative and analytical decision-making (Knight, 1921). Uncertainty involves situations where such probabilities are unknown (Knight, 1921), leaving greater room for bias and heuristics to influence decisions (Mousavi & Gigerenzer, 2014). To unpack these mechanisms, the following sections explore both non-experimental studies (Section

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[7] For definitions of these types of exits, see Section 2.3.2.

2.7.1) and experimental studies (Section 2.7.2), discussing how internal and external factors shape the timing of entrepreneurial exits and persistence. This categorization is particularly useful given that exit timing is inherently a dynamic process, often occurring over multiple decision points. Experimental methods offer advantages in capturing these dynamics by allowing researchers to manipulate conditions and observe behavior over time. Separating the literature in this way helps illuminate how different methodological approaches generate complementary insights into exit-timing decisions.

2.7.1 Non-experimental papers on the determinants of exit timing

2.7.1.1 Biases

Entrepreneurs' persistence with failing ventures is often shaped by escalation of commitment—the tendency to continue investing resources into a project despite negative outcomes or evidence of failure (Staw, 1981; see Section 2.3.3 for a discussion on how cognitive biases, including escalation of commitment, drive non-optimal exit). Within the literature, various dimensions of commitment—psychological, financial, and stakeholder-related—interact to drive escalation tendencies, influencing exit-timing decisions.

Entrepreneurs often view their ventures as extensions of their identity, developing strong emotional attachment and psychological ownership over time (Hoang & Gimeno, 2010; Shepherd & Haynie, 2009; Yamakawa & Cardon, 2017). This strong connection can foster a sense of belonging and responsibility, making exit increasingly challenging. The endowment effect from PT further explains this difficulty as entrepreneurs tend to overvalue their ventures due to emotional and personal stakes (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). Greater time investment in ventures amplifies overvaluation and strengthens affective commitment, creating a psychological barrier to exit (Yamakawa & Cardon, 2017). Zhu et al. (2018) extend this perspective by showing that adversity enhances the effect of psychological ownership. Under high adversity (i.e., when venture performance is below entrepreneurs' expectations), psychological ownership becomes a stronger driver of persistence, as entrepreneurs feel increased motivation to protect their ventures despite unfavorable outcomes (Brown et al., 2005; Holland & Shepherd, 2013; Pierce et al., 2003). Conversely, under low adversity, the need to protect their firms diminishes, weakening escalation tendencies (Brown et al., 2005; Pierce et al., 2003).

The financial dimension of escalation behavior is another critical aspect highlighted by Yamakawa and Cardon (2017). Entrepreneurs with significant financial investments in their ventures often fall into the trap of the sunk-cost fallacy (Arkes & Blumer, 1985; Garland, 1990), treating past expenditures as reasons to persist rather than to cut losses. This fallacy reinforces irrational continuance, as entrepreneurs justify their investment while hoping for a turnaround. Coppens and Knockaert (2022) complement this finding by examining how operating debts influence persistence. They highlight how entrepreneurs facing financial obligations to external stakeholders, such as suppliers, contractors, or investors, may feel forced to continue operating despite unfavorable conditions. This pressure stems from a need to justify prior decisions and protect their reputation, driving escalation tendencies that reinforce entrepreneurial persistence.

In a similar vein, entrepreneurs may also feel a strong sense of social obligation, particularly to their employees, which further reinforces their persistence. Both

Yamakawa and Cardon (2017) and Coppens and Knockaert (2022) show how entrepreneurs managing ventures with larger workforces tend to persist longer and delay exit to support their employees. Valeau (2022) adds nuance to this discussion by showing that normative commitment, rooted in loyalty and moral obligations, becomes especially pronounced during periods of venture decline. This means that entrepreneurs may prioritize collective welfare over personal well-being, delaying exit to fulfill their responsibilities to stakeholders.

Cognitive biases such as overconfidence and overoptimism, which often drive entry into entrepreneurship, can also result in delayed exit. Using computational modeling, Chen et al. (2018) show how these biases influence exit timing. Specifically, overconfidence, characterized by an overestimation of one's abilities, knowledge, performance, and level of control relative to others (Camerer & Lovallo, 1999; Malmendier & Tate, 2005; Moore & Healy, 2008), can lead entrepreneurs to fail to adequately adjust their perceptions when facing new information; overly narrow confidence intervals make them too certain of their knowledge (i.e., over-precise belief updating, Chen et al., 2018). Entrepreneurs might discount or misinterpret adverse market signals thereby extending their commitment to ventures that might not be viable. Interestingly, Chen et al. (2018) also discuss the interplay between optimism and belief updating and highlight how entrepreneurs with under-precise belief updating adapt more effectively to new information. The study also emphasizes that under-precise belief updating (i.e., entrepreneurs adjust their beliefs too rapidly relative to optimal updating) enables optimistic entrepreneurs to adopt a "fail fast, fail often" mindset, facilitating faster exits from unviable ventures.

Optimism—the tendency to overestimate the likelihood of positive future events and underestimate the probability of negative future events (Weinstein,1980)—has both benefits and drawbacks. On the one hand, it fosters resilience and enables entrepreneurs to view challenges as opportunities for growth (Markman et al., 2005). On the other hand, excessive optimism can lead to persistence beyond rational points. Entrepreneurs with over-optimism often hold overly favorable expectations about their firm's future while believing that market conditions will improve soon and their business will eventually turn around (Åstebro et al., 2007, 2014; Camerer & Lovallo, 1999; Zhang & Cueto, 2016). Optimistic entrepreneurs frequently misinterpret negative signals, such as financial losses or declining sales, as temporary setbacks. This misplaced optimism not only distorts their perception of the firm's actual viability but also leads them to escalate their commitment to failing ventures as discussed in Section 2.3.3.

Adomako et al. (2016) expand on this relationship, showing that the effect of optimism on persistence depends on entrepreneurs' cognitive styles. For example, entrepreneurs with a cognitive planning style, characterized by structured and goal-oriented thinking, persist longer by systematically organizing tasks and devising strategies to achieve entrepreneurial goals more effectively. This study also shows that those with a cognitive creating style, marked by creativity and a preference for unconventional approaches, are more likely to persist longer as they view uncertainty and challenges as opportunities.

2.7.1.2 Threshold

Threshold theory explains why entrepreneurs persist too long or delay exiting their ventures and emphasizes the role of personal aspirations that guide decision-making. As discussed in Section 2.3.1, the core argument of threshold theory is that exit decisions are determined by firm performance relative to the entrepreneurs' performance threshold. According to threshold theory, entrepreneurs with higher performance thresholds are more likely to exit when performance falls below this threshold, as they are more likely to find the situation unacceptable. In contrast, those with lower performance thresholds find the same level of poor outcomes more acceptable, are willing to bear greater risk, and are consequently less likely to exit (DeTienne et al., 2008; Gimeno et al., 1997).

These aspirations are shaped by the interplay between economic performance, psychological commitments, and the perceived costs and benefits of alternatives (Gimeno et al., 1997; see Section 2.3.1 for a discussion on how individual factors shape thresholds and exit). Two factors influencing the exit thresholds are entrepreneurs' human capital and psychic income. Gimeno et al. (1997) examine this relationship and find that general human capital, such as transferable skills, raises thresholds for persistence by expanding alternative career opportunities, leading to a relatively earlier exit compared to those with lower thresholds. In contrast, this study finds that specific human capital, such as venture-specific knowledge, binds entrepreneurs to their current ventures, lowering thresholds by reducing mobility and thereby delaying exit.

A recurring theme across studies based on threshold theory is the trade-off between economic rationality and non-financial motivations. Gimeno et al. (1997) emphasize the influence of psychic income, and Ma et al. (2018) emphasize the impact of emotional commitments; both studies demonstrate how non-financial benefits can lower performance thresholds. This dynamic has been extensively studied in the context of family entrepreneurs who often persist due to non-financial motivations such as maintaining family legacy and family reputation, showing the significant role of relational and emotional factors in shaping these thresholds (Ma et al., 2018).

Thresholds are also influenced by external opportunities. Entrepreneurs continuously compare their current ventures to alternatives (Gimeno et al., 1997; Mattingly et al., 2016). High expected returns from alternatives raise the threshold for persistence, making exit more attractive. However, the presence of switching costs—both financial and emotional—creates substantial barriers to exit. These costs include losses from sunk investments, the necessary effort to transition to new ventures, and the emotional strain of leaving an established business, which collectively lower the perceived attractiveness of exit.

Entrepreneurial experience and cognitive flexibility further explain how thresholds are shaped. As entrepreneurs accumulate experience, they can develop heightened metacognitive abilities that help them strategically focus on decision factors most relevant to their goals (Krueger, 2007; St-Jean & Audet, 2012). With greater experience, entrepreneurs become more adept at filtering out irrelevant information and evaluating financial returns, opportunity attractiveness, and the likelihood of achieving expected outcomes. This cognitive flexibility allows them to adjust their threshold levels, enabling them to adapt more effectively to uncertain conditions.

2.7.1.3 Emotions

Emotions play a central role in shaping entrepreneurial persistence and exit decisions, often operating as hidden costs that influence exit timing. Among these emotional costs, anticipated grief and regret have received attention. Shepherd et al. (2009) illuminate how anticipated grief shapes entrepreneurs' persistence by enabling entrepreneurs to emotionally prepare for potential failure. Entrepreneurs who have a deep emotional investment in their ventures face a significant psychological toll when considering exit. Anticipatory grieving, the process of mentally and emotionally preparing for loss, helps entrepreneurs deal with their attachment to the venture before failure occurs. The authors suggest that a moderate period of persistence for anticipatory grieving allows entrepreneurs to gradually detach from their ventures, reducing the intensity of grief after exiting. While grief reflects the emotional costs of post-exit, anticipated regret represents the cost of prematurely abandoning a venture. Huang et al. (2022) show that entrepreneurs often imagine the regret they might experience if they leave too early, which motivates them to exit late. Anticipated regret also affects exit timing by shaping entrepreneurial cognition. The negative emotions associated with anticipated regret push entrepreneurs to think more deeply and critically about their ventures, prompting them to break from their initial mental models (Liguori et al., 2018). By collecting new information, improving their skills, and refining their market insights, entrepreneurs reshape their cognitive processes to minimize anticipated regret (Huang et al., 2022). As a result, they invest more in justifying their initial decisions, often persisting longer before considering exit.

Affective activation is another emotional factor distinct from anticipated grief and regret. While grief and regret focus on emotional costs associated with potential failure or premature exit, affective activation highlights the energizing role of positive emotions in motivating persistence. Stevenson et al. (2022) show that positive external feedback, such as supportive comments during crowdfunding campaigns, triggers affective activation—a heightened emotional arousal that motivates entrepreneurs to persist despite setbacks.

This validation generates excitement and reinforces belief in the venture's potential, maintaining motivation and encouraging strategic actions like refining plans or seeking additional resources. By interpreting challenges as manageable, entrepreneurs with affective activation are more likely to persist with their ventures.

2.7.1.4 Passion and identity

Studies collectively emphasize the role of passion in sustaining entrepreneurial efforts despite challenges. Entrepreneurial passion involves an enthusiasm or a love for entrepreneurial activities (Cardon et al., 2009; Shane et al., 2003). This passion is closely tied to confidence, or self-efficacy, in doing entrepreneurial tasks (Cardon & Kirk, 2015). When entrepreneurs believe they are good at something, they feel more connected to it (Baum & Locke, 2004); this connection makes them more passionate about their work, which fuels persistence. Cardon and Kirk (2015) provide the foundation for understanding entrepreneurial passion as a mediator between self-efficacy and persistence. They suggest that entrepreneurs with strong confidence in their abilities (i.e., high self-efficacy) are more likely to enjoy their work; this enjoyment fuels their passion for entrepreneurial activities, which gives them the emotional energy and purpose needed to persist. This passion makes it easier to overcome obstacles and stay focused, maintaining long-term engagement with their ventures (see Section 2.6.1 for a detailed discussion about passion and exit).

Building on this, other studies examine how self-efficacy, as a mediator, bridges the relationship between entrepreneurial passion and persistence. For example, Kiani et al. (2021) emphasize that passion boosts self-efficacy by strengthening entrepreneurs' confidence in their abilities to navigate challenges. This heightened self-efficacy, in turn, fosters resilience and effort, allowing entrepreneurs to persist even under adverse conditions. Feng and Chen (2020) extend this discourse by distinguishing between harmonious and obsessive passion. They argue that harmonious passion reflects a voluntary and flexible engagement with entrepreneurial activities; harmonious passion facilitates a balanced and healthy engagement in the venture, enabling entrepreneurs to persist by enjoying the process and adapting to challenges. In contrast, obsessive passion is driven by external or uncontrollable pressures to engage in entrepreneurial work; though obsessive passion can also lead to persistence, particularly in high-stakes or competitive contexts, Feng and Chen suggest that it poses the risk of negative outcomes, such as emotional exhaustion and burnout, when entrepreneurs prioritize their ventures over other aspects of their lives. These findings underscore that while both forms of passion can result in persistence, the underlying motivation shapes the sustainability and well-being of entrepreneurs over time.

Entrepreneurial identity adds another dimension to persistence. Identity ties deeply to how entrepreneurs perceive themselves and their ventures. This strong connection motivates them to stay committed to their ventures even when faced with challenges—giving up would feel like a threat to their core identity (Adams et al., 2002; Chevalier et al., 2013; Feldman, 1994). Using an inductive, qualitative method, Smith et al. (2023) explore how entrepreneurs navigate identity threats—“an experience appraised as indicating potential harm to the value, meanings, or enactment of an identity” (Petriglieri, 2011: 644)—by engaging in the process by which they manage and reconcile different aspects of their identities (i.e., inter-identity work). They find that entrepreneurs who faced identity threats tend to rely on another part of their identity, such as their relationship with God. This helps them either reinforce their confidence in their entrepreneurial role (i.e., inter-identity affirming) or lower the pressure they feel (i.e., inter-identity humbling), enabling them to better persist in their ventures.

2.7.2 Experimental papers on the determinants of exit timing

Laboratory experiments have become an increasingly valuable methodological tool in entrepreneurship research (for a broader review of experimental studies in entrepreneurship, see Hsu et al., 2017). Lab experiments involve creating controlled environments, often with financial incentives, where participants make decisions in tasks designed to mimic daily strategic dilemmas. The primary advantage of laboratory experiments is high internal validity. Researchers can precisely manipulate variables, hold extraneous factors constant, and unpack causal mechanisms. These experiments also allow for repeated measures, enabling researchers to observe decision patterns across multiple rounds and under different treatments. However, this approach faces a key limitation: external validity. A common critique concerns the extent to which findings from controlled experimental tasks, particularly those involving student participants, can be generalized to the complex environments in which entrepreneurs operate. Moreover, in entrepreneurship research, the difficulty of recruiting actual entrepreneurs often results in small and unrepresentative samples, which further intensifies concerns about external validity. Despite these limitations, lab experiments have been effectively used to uncover the mechanisms underlying exit decisions, a context in which isolating cognitive and behavioral drivers is particularly challenging in non-experimental or field studies.

A recurring theme in experimental studies is the tension between normative economic models and the influence of behavioral biases on exit timing. These studies often utilize rational decision-making frameworks such as NPV and ROT to establish theoretical benchmarks for optimal exit timing (for more detailed discussion, see Section 2.3.2). Under NPV, the benchmark is the point at which the expected future profits are less than the costs of maintaining the venture (Brealey et al., 2007). In contrast, ROT emphasizes the option value of waiting under uncertainty (Dixit & Pindyck, 1994; McGrath, 1999; Trigeorgis, 1996). These studies aim to determine whether actual decision-makers make decisions consistent with theoretical benchmarks and, if not, to identify the factors driving these discrepancies.

For instance, Sandri et al. (2010) experimentally investigate whether delays in project termination result from rational strategic waiting—consistent with real-options logic—or from psychological inertia. The study employs a controlled laboratory experiment involving 84 non-entrepreneurs randomly assigned to low- or high-volatility conditions and a small-scale replication involving 15 high-tech entrepreneurs in the high-volatility condition. The findings show that participants consistently exit significantly later than the optimal timing predicted by the NPV model. Although many participants exhibit some alignment with real-options reasoning, suggesting that participants intuitively recognize the strategic benefit of waiting, a majority delay exit beyond even the real-options threshold, indicating the presence of psychological inertia. Notably, they demonstrate that risk aversion does not predict earlier exits—challenging assumptions that more cautious individuals would exit sooner.

Echoing the findings of Sandri et al. (2010), Musshoff et al. (2013), in an online experiment with 63 German farmers, find a similar tendency to postpone disinvestment beyond the point recommended by economic models. Although ROT more accurately predicts disinvestment timing than the NPV model, many participants still delay exit even beyond the real options threshold, suggesting the presence of behavioral inertia, potentially driven by status quo bias, sunk cost sensitivity, or psychological attachment. In contrast to Sandri et al. (2010), additional regression analyses confirm that more risk-averse participants exit earlier, suggesting that risk preferences alone may not fully explain disinvestment behavior.

Extending this line of inquiry, Elfenbein et al. (2017) disentangle the rational and behavioral components of exit delay through a controlled lab experiment. Rational delay arises when decision-makers wait to exit due to the option value of gathering more information under uncertainty, as predicted by ROT. In contrast, behavioral delay reflects a deviation from this optimal benchmark, typically due to cognitive biases. The study recruits 133 student participants randomly assigned to one of two roles: "entrepreneurs" (n=66), who receive equity stakes (i.e., they earn the firm's profits and have the right to make exit), and "advisors" (n=67), who do not receive equity stakes (i.e., they observe the same profit signals but do not earn profits from the firm and only offer exit recommendations). The study finds that advisors tend to exit at or near the optimal timing. That is, they incorporate the option value of waiting but do not persist beyond optimal benchmarks (i.e., rational delay). In contrast, entrepreneurs exhibit both rational and behavioral delays. Like advisors, they recognize the value of waiting in uncertain conditions, but they also persist significantly longer than the optimal exit point. This excess delay occurs because they respond more to positive signals than to negative ones—consistent with motivated reasoning and confirmatory bias (i.e., biased belief updating). Moreover, the authors find that their exit thresholds are significantly lower than those of advisors. Taken together, these results emphasize that, while economic models like real options predict better than NPV, they still fall short of fully capturing the heuristic and psychological influences that shape entrepreneurial exit decisions.

DeTienne et al. (2008) also provide evidence supporting the argument that entrepreneurs are prone to various biases through the lens of threshold theory (Gimeno et al., 1997) and escalation of commitment (Staw, 1981). Their findings reveal that persistence is influenced not only by rational economic factors but also by cognitive biases and entrepreneurs' thresholds for performance. Entrepreneurs persist irrationally due to self-justification, a bias that leads them to justify their prior investments of time, money, and effort (Staw, 1981; see Section 2.3.3). Moreover, persistence decisions are influenced by individual performance thresholds (Gimeno et al., 1997; see Section 2.3.1), which are shaped by factors such as personal investments, the availability of abundant resources in the environment (i.e., environmental munificence), and the shared belief among team members in their ability to achieve goals (i.e., collective efficacy). Notably, they find that extrinsically motivated entrepreneurs tend to be more sensitive to sunk costs and personal investments but are less affected by environmental complexity or collective efficacy.

Lin et al. (2022) further reveal that even entrepreneurs who believe they are making rational decisions often deviate from rational behavior by neglecting key factors or relying disproportionately on past information. That paper explores the cognitive processes influencing entrepreneurial persistence decisions and focuses on how rational decision-making style and the need for cognitive closure (NFCC) shape entrepreneurs' emphasis on retrospective and prospective factors. Entrepreneurs with high NFCC tend to prioritize retrospective factors (e.g., period and degree of underperformance) due to their desire to avoid uncertainty and rely on familiar, easily processed information (Kruglanski & Webster, 1996). They also show that rational decision-making is associated with reduced emphasis on prospective factors (e.g., risk of default); entrepreneurs with this style focus on reducing uncertainty and risk by basing their decisions on past, concrete, and justifiable information. Overall, these experimental studies highlight the limitations of purely rational frameworks and the importance of integrating behavioral perspectives into our understanding of entrepreneurial exit decisions.

2.8 Discussion and Directions for Future Research

Chapter 2 provides a comprehensive review of prior research on entrepreneurial exit, focusing on the decisions about whether and when entrepreneurs choose to exit. I first reviewed the key theoretical perspectives on entrepreneurial exit and then highlighted notable findings on various individual-level determinants. In this section, I summarize insights from the literature, identify gaps, and suggest opportunities for future research to deepen the understanding of entrepreneurial exit.

First, much of the existing research has focused on the binary decision of whether to exit, identifying key individual-level determinants such as self-efficacy (e.g., Caliendo et al., 2023), stress (e.g., Zhu et al., 2017), and emotions (e.g., Hsu et al., 2019). This body of work provides valuable insights into who exits and why but offers little understanding of when exit occurs. This gap is particularly important because exit timing can significantly influence post-exit outcomes. Exiting too soon may result in abandoning a venture before fully realizing its potential; delaying exit can lead to unnecessary financial losses.

Although some studies have examined exit timing in underperforming firms (e.g., Adomako et al., 2016; Cardon & Kirk, 2015; Smith et al., 2023), they do so indirectly by investigating why entrepreneurs persist too long rather than when they choose to exit. Although persistence research has identified factors such as escalation of commitment (Yamakawa & Cardon, 2017), anticipated grief (Shepherd et al., 2009), and low threshold (Gimeno et al., 1997) that help explain why entrepreneurs continue, three key limitations stand out. First, most studies frame persistence as a negative outcome (Coppens & Knockaert, 2022; Yamakawa & Cardon, 2017); however, persistence is not inherently irrational, and in some cases, such as Amazon's early years, this persistence may reflect strategic patience under uncertainty. Second, the literature does not specify how long is "too long," making it difficult to assess when persistence becomes problematic. Furthermore, this research does not fully explain the mechanisms that lead entrepreneurs to stop persisting and choose to exit. As a result, an important question remains: *What mechanisms lead some entrepreneurs to exit too early, while others persist beyond the optimal point?*

A few experimental studies have attempted to address this question by examining early and late exits in relation to an optimal exit; consequently, they primarily focus on factors that contribute to exit delays, such as confirmatory bias (Elfenbein et al., 2017) and psychological inertia (Sandri et al., 2010; Musshoff et al., 2013). One might argue that late exit research answers the exit-timing question, but early exits may not simply be the opposite of late exits. Rather, they may involve distinct decision-making processes that intertwine with factors such as uncertainty avoidance, risk preference, and fear of failure—none of which are extensively explored in late exit research. For instance, uncertainty avoidance can lead entrepreneurs to exit preemptively, particularly when faced with ambiguous market conditions or technological shifts. Entrepreneurs with a low tolerance for uncertainty may perceive early exit as a strategic choice to mitigate potential downside risks rather than waiting for clearer market signals. Similarly, risk assessment could play a crucial role in shaping exit-timing decisions. Risk-averse entrepreneurs may prioritize minimizing losses (Kihlstrom & Laffont, 1979), leading them to take a more conservative approach when assessing their venture's prospects and increasing the likelihood of an earlier exit. This alternative viewpoint presents an opportunity for future research to further investigate the complexities of exit timing. Future studies could examine the psychological and cognitive mechanisms that distinguish early, late, and optimal exits, exploring how factors such as uncertainty avoidance, risk perception, and decision-making biases shape exit timing. In addition, longitudinal studies tracking entrepreneurs over time could further illuminate how persistence evolves into exit, and experimental research could identify the causal effects of cognitive biases in delaying or accelerating exit.

Second, earlier studies—mainly cross-sectional analyses using household survey data—examined demographic and human capital factors, such as age (van Praag, 2003), gender (Justo et al., 2015), education (Millán et al., 2012), and prior entrepreneurial experience (Sanguineti et al., 2022). These studies identified which entrepreneurs are more likely to exit but provided limited insight into the underlying reasons for their decisions. Exit has often been framed as an economic or firm-level outcome, such as business closure or survival, rather than as a complex, personally driven decision. More recent research, however, has shifted attention to the psychological, emotional, and cognitive dimensions of exit, recognizing that leaving a business is not merely a rational response to declining performance but a complex personal decision. For example, studies have examined how stress, mental health, and emotions influence both the likelihood and timing of entrepreneurial exit (e.g., Hessels et al., 2018; Holland & Shepherd, 2013; Lindblom et al., 2020). They show that a high level of self-efficacy or subjective well-being buffers against stress and negative emotions, enabling entrepreneurs to persist despite adversity (Asante et al., 2022; Shahid & Kundi, 2022). Conversely, when entrepreneurs perceive challenges as obstacles rather than opportunities (i.e., hindrance appraisal) and lack family support, they experience greater strain, which, in turn, accelerates exits (Kawai et al., 2023; Zhu et al., 2017). These studies help explain why some entrepreneurs remain resilient in challenging circumstances, while others leave more quickly.

More can be done to expand on these findings. One promising direction is understanding the cognitive mechanisms underlying exit decisions. Entrepreneurs often rely on mental shortcuts to assess uncertainty, risk, and opportunity, which may lead to premature or delayed exits. For example, recency bias might lead entrepreneurs to overemphasize their most recent events rather than considering long-term trends, while availability bias may cause them to overweigh highly salient past failures. Future studies could examine how heuristics shape exit decisions, particularly in contexts of uncertainty and stressful situations. Since heuristics often come into play under these conditions (Bingham & Eisenhardt, 2011; Guercini & Milanesi, 2020), they can shape how entrepreneurs perceive and respond to challenges and influence their decision to exit. Another avenue for future research is the interaction between heuristics and psychological and emotional factors, shaping how entrepreneurs navigate adversity. Psychological resilience—the ability to cope and adapt in the face of adversity (Bonanno, 2004; Connor & Davidson, 2003; Newman, 2005)—is one potential factor at play in this relationship. While resilience has been widely studied in post-exit recovery and re-entry (Corner et al., 2017; Hayward et al., 2010), its role in exit decisions remains less explored (with a few exceptions, Chadwick & Raver, 2018; Elshaer & Saad, 2021; Usero et al., 2024). Studies could examine whether certain heuristics amplify or weaken the effects of resilience that influence an entrepreneur's decision to persist or exit.

Across the literature, I also note that decision-making style—"a learned habitual response pattern exhibited by an individual when confronted with a decision situation" (Scott & Bruce, 1995: 820)—remains an underexplored predictor of exit. While exit research has examined specific cognitive biases, such as escalation of commitment (Yamakawa & Cardon, 2017) and overconfidence (Chen et al., 2018), and their influence on persistence, less attention has been given to how different decision-making styles shape exit likelihood; timing has also received relatively less attention (with one exception, Lin et al., 2022, which examines how rational and intuitive decision-making styles influence persistence). Entrepreneurs may vary in their approach to decision-making. Some rely on analytical, data-driven reasoning, while others depend on intuitive, experience-based judgments. These styles likely influence how entrepreneurs assess business performance, recognize signals for exit, and determine the optimal time to exit. For instance, an intuitive decision-maker may rely on gut feelings and emotions, sometimes leading to overconfidence and a delayed exit. In contrast, those with an analytical style may assess business conditions more systematically and detect warning signs earlier, making them more likely to exit in a timely manner. Future research could explore how decision-making styles shape the way entrepreneurs perceive, evaluate, and navigate the exit process, as well as how they interact with internal and external factors to influence entrepreneurial exit outcomes. In addition, to advance our understanding of the exit decision-making process, studies could further investigate whether particular decision-making styles contribute to premature exits or prolonged persistence beyond an optimal point.

Finally, despite growing interest in the psychological and cognitive processes underlying entrepreneurial exit, researchers have rarely used experimental methods. Existing studies predominantly rely on archival data, surveys, or qualitative case studies, which are valuable but have inherent limitations in establishing causal relationships and teasing apart the cognitive and psychological drivers of entrepreneurial exit. To complement these approaches, some experimental studies have been conducted. However, most focus on testing specific theoretical frameworks—particularly threshold theory and escalation of commitment for persistence—rather than capturing the full complexity of exit decision-making (Coppens & Knockaert, 2022; DeTienne et al., 2008). These studies mostly use conjoint experiments to analyze how entrepreneurs weigh different factors when making exit decisions. Such experiments present participants with hypothetical business scenarios, requiring them to decide whether to persist under varying conditions. By systematically altering decision-making factors (e.g., financial performance, alternative opportunities, and future growth potential), these studies help identify which factors entrepreneurs prioritize when making exit choices. Since conjoint experiments present exit as a one-time choice from a given set of alternatives rather than an evolving decision process, they may overlook how entrepreneurs revise their decisions in response to uncertainty, feedback, or emotional regulation.

Exit decisions result from a continuous process of evaluation in which entrepreneurs integrate new information, manage uncertainty, and adjust their expectations over time. Given this complex nature of exit decisions, which could be susceptible to cognitive biases, psychological influences, and external constraints, experimental methods could offer controlled environments to systematically test the causal mechanisms underlying these choices. A few experimental studies have begun to explore these dynamics, particularly by manipulating financial conditions (e.g., Elfenbein et al., 2017; Musshoff et al., 2013; Sandri et al., 2010), yielding insights into how entrepreneurs respond to changes in income and financial uncertainty. Expanding this body of work could offer valuable causal insights by addressing key questions, such as *how do individual-level factors (e.g., risk preferences and optimism) affect the timing of exit decisions under risk and uncertainty? Do entrepreneurs systematically misjudge the viability of their ventures, leading them to deviate from financially optimal exit timing—either by persisting too long or by exiting prematurely? If so, what mechanisms might explain these deviations?* Addressing these questions through carefully designed experiments could complement observational findings, refine theoretical models of exit, and offer practical implications for entrepreneurs seeking to mitigate the negative consequences of suboptimal exit decisions.

In sum, the discussion above reveals that existing research falls short of capturing the full complexity of entrepreneurial exit timing—particularly the cognitive mechanisms that drive both early and late exits. While prior studies have provided valuable insights into who exits and why, they have paid less attention to when entrepreneurs exit and how that timing is shaped under various conditions, including risk and uncertainty. The following chapter addresses this gap by introducing three controlled, incentivized experiments that examine entrepreneurs' exit-timing decisions from a declining venture. I first discuss the theoretical background and hypotheses. Next, I provide a detailed description of the experimental design, followed by the results and a discussion of the mechanisms driving the exit behaviors observed in the studies.

Chapter 3. Experimental Studies on Exit-Timing Decision

Section 2.7 provides a brief overview of prior experimental studies on exit-timing decisions. Much of this literature refers to “late” and ”early” exits, usually defined relative to “optimal” exit (Elfenbein & Knott, 2015; Sandri et al, 2010; for definitions of these types of exits, see Section 2.3.2.). I will follow this practice in the rest of this thesis.

3.1 The exit timing decision problem

Entrepreneurs often operate in environments where performance fluctuates from period to period but is expected to worsen over time from market saturation, technological obsolescence, or changing consumer preferences. To capture this decision environment, I modelled a *stochastically declining venture,* defined as a venture where actual income in any period could increase or decrease but the expected value exhibits a declining trajectory. As noted in the Introduction, I studied a setting in which a) entrepreneurs prioritize financial returns and b) cannot take actions to remediate stochastically declining incomes. This situation is especially likely to apply in markets where competitive pressures are sufficiently stringent that any decision to pursue non-financial objectives would increase costs and therefore prices—which would drive consumers away, forcing the firm to change its practices to focus on financial goals if it is to survive (Holtz-Eakin et al., 1994).

In my setting, entrepreneurs have only one decision to make each period they operate: continue or exit. This simplifies the decision problem, turning the exit decision into a “stopping problem.” These problems have been studied extensively in decision theory (Banks et al. 1997; Seale & Rapoport, 1997)—though less so in entrepreneurship (Choi et al., 2008). To fix ideas and derive testable theoretical predictions, I next describe a simple stopping problem, which is used as the basis for the experimental design described later in the paper. Appendix A provides a mathematical representation of the problem.

Suppose that each period an entrepreneur decides to continue, their venture generates a stochastic income (net profit), which adds (if positive) or subtracts (if negative) from the current value of their venture. Entrepreneurs face the same decision every period. If they decide to exit, they receive the value of their business less some known and fixed exit costs.[8] Under conditions of *risk*, entrepreneurs can calculate the *expected value* of their future income; under *uncertainty*, the expected value is unknown (Knight, 1921). A topic of interest to discuss would be a situation where the initial value of the firm is positive, but its expected change is negative each period; after enough time elapses, the firm's value will almost certainly turn negative.

EUT predicts that risk attitudes affect continuation or exit decisions (see Section 2.3.2). In general, entrepreneurs could be either risk-neutral, risk-averse, or risk-seeking (Caliendo et al., 2010). Risk-neutral entrepreneurs do not care about income variation; risk-averse entrepreneurs seek to avoid it (e.g., by taking insurance to smooth out returns); and risk-seekers seek it out (e.g., by gambling). Several entrepreneurship studies investigate how risk attitudes affect exit behavior (Caliendo et al., 2010; Cho & Orazem, 2021; Zhang & Wang, 2021). Evidence shows that a given person's risk preferences are

[8] Examples of exit costs include loss of financial assets in the case of insolvency (Fu et al., 2020); the redundancy of specific human capital that cannot be deployed elsewhere (Mahieu et al., 2022); and loss of reputation or status (Parker & van Praag, 2010).

temporally stable over long periods of time (Chuang & Schechter, 2015; Schildberg-Hörisch, 2018).[9] The same appears to be true of optimism (Billingsley et al., 1993; Landier & Thesmar, 2009).

Below, I will first discuss the case of entrepreneurs operating under conditions of risk. In this case, EUT generates sharp predictions about exit-timing decisions for the problem described above. I will then theorize for conditions of uncertainty.

3.2 Hypothesis development

3.2.1 The case of risk

The Risk Neutral entrepreneur. Consider first an entrepreneur who does not care about risk and wants to only maximize the expected value of their venture—the risk neutral entrepreneur. Since the exit cost is fixed, it should not affect their timing decision: they know they are going to have to pay it eventually, regardless of when they exit. In contrast, the expected income next period *does* affect the risk neutral entrepreneur's exit timing decision. Suppose, for example, that expected income is stochastically declining but still in positive territory. Each period the entrepreneur continues, they continue to add a diminishing positive amount to the value of their venture, which is what they care about. Hence, they will continue for as long as expected income remains positive and exit the first time that expected income turns negative:[10]

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[9] This does not of course imply that risk preferences *never* change; for example, Wennberg et al. (2016) argue that risk preferences evolve as ventures age and increase in size. However, this is not a consideration in our experiment.

[10] Of course, the risk neutral entrepreneur is not omniscient, and they cannot know in advance the income that is actually drawn in the next period. There is a chance that it could be positive—in which case they would have done better *ex post* to continue than to exit. But they must make decisions *ex ante*, i.e., before next period's income arrives, on the basis of their best guess (i.e., their expectation of future incomes).

Hypothesis 1a. A risk-neutral entrepreneur will exit the first time their expected income next period turns negative.

Hypothesis 1b. Their exit timing decision is invariant to the exit cost.

Hypothesis 1c. Their exit timing decision is invariant to the degree of risk.

For a given decision problem, the researcher observes the last income (the "terminal income") that a risk-neutral entrepreneur would accept before exiting. This provides a benchmark for defining deviations from "optimal" exit chosen by the risk-neutral entrepreneur. "Early" and "late" exits have two salient cases. Early exits occur when entrepreneurs exit with a positive terminal income, while late exits occur when entrepreneurs exit with a negative terminal income. Late and early exits are not necessarily irrational. Indeed, EUT provides a rational basis to understand these decisions based on risk attitudes. I discuss the two relevant cases next.

The Risk Averse entrepreneur. Next, consider an entrepreneur who is willing to accept variation in income if the worst-case outcome is known to be non-negative but not necessarily otherwise. If there is a possibility they will make a loss next period, risk-averse agents expect to forgo more utility from a loss than they obtain from a gain (Kihlstrom & Laffont, 1979). They will therefore exit before the time chosen by their risk-neutral counterpart, and with a higher terminal income.

Thus, one distinction between the risk-averse and the risk-neutral entrepreneur is that the former may exit even if the expected income next period is positive, while the latter never would. A second distinction is that a higher exit cost moves the risk-averse agent's net payoff closer to the zero boundary, enticing them to exit even earlier. In contrast, the risk-neutral entrepreneur's decision is invariant to exit costs, as noted above. A third distinction is that, unlike risk-neutral entrepreneurs who do not condition their exit decisions on the degree of risk, an increase in risk induces the risk-averse entrepreneur to exit earlier than they would otherwise:[11]

Hypothesis 2a. A risk-averse entrepreneur will exit early, i.e., when expected income next period is still positive.

Hypothesis 2b. For those exiting early, the probability of exit is increasing in the exit cost.

Hypothesis 2c. For those exiting early, the probability of exit is increasing in the degree of risk.

Next, consider the risk-seeking entrepreneur who is willing to accept losses as the price to pay to gamble. Their behavior is the mirror image of their risk-averse counterpart: they prefer to continue making losses beyond the optimal time rather than exiting. The prospect of eventually making a positive income persuades them to continue more than the prospect of losses discourages them:

Hypothesis 3a. A risk-seeking entrepreneur will exit late, i.e., when expected income next period is negative.

Hypothesis 3b. For those exiting late, the probability of exit is decreasing in the exit cost.

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[11] Note that there is no need to specify a specific utility function to generate these hypotheses, since the arguments apply for all risk-averse utility functions. The same is also true for the risk-seeking entrepreneur analyzed below. This is a major advantage because it allows for different types of risk preferences without requiring me to assume a particular functional form—such as a logarithmic, power, or exponential utility function. This allows me to avoid testing a compound hypothesis, which requires testing both the behavioral prediction and the assumption that a particular utility function is correct.

Hypothesis 3c. For those exiting late, the probability of exit is decreasing in the degree of risk.

Finally, Prospect Theory (PT) (Kahneman & Tversky, 1979) is another candidate theory of entrepreneurial exit behavior (Wennberg et al., 2010). PT holds that for outcomes that exceed some subjective and idiosyncratic "reference point" (RP), agents frame outcomes as "gains," and below their RP, they frame outcomes as "losses." Though generally assumed to be positive, RP is unobservable by the researcher and hard to elicit even by direct questioning. When facing a pure gamble in the gain frame, agents behave like risk averters; when facing a pure gamble in the loss frame, they behave like risk seekers, albeit using different (weighted) probabilities (Barberis, 2013; Bromiley, 2010). In my experimental context, participants make decisions about whether to continue or exit a venture with stochastically declining returns. Participants could set their RP based on initial income, prior expectations, or a target outcome. Depending on where an individual anchors their RP, the same income stream could be perceived as either a gain or a loss. For example, a participant whose RP exceeds the given income would frame the situation as a loss and, consistent with PT, exhibit risk-seeking behavior by delaying exits in hopes of avoiding a realized loss. Conversely, if the RP is below the given income, the income would be framed as a gain, and risk aversion would predict an earlier exit. Hence PT generates the same qualitative predictions as Hypotheses 2 and 3 in my set-up. As will be seen below, it will *not* be necessary to add further structure to the decision problem to separate PT from EUT.

3.2.2 The case of uncertainty

Unlike conditions of risk, where people can make decisions based on known probabilities, uncertainty refers to situations where probabilities are either unavailable or inherently unknowable (Knight, 1921). This is often the case in entrepreneurial contexts, where ventures operate in nascent markets, face rapidly evolving competitive dynamics, or launch novel products. In such situations, entrepreneurs cannot base their choices on objective information. Instead, they rely on subjective interpretations of incomplete or ambiguous signals (Savage, 1972). The lack of reliable, objective information in these settings can significantly undermine accurate belief formation. When uncertainty is high, individuals have greater flexibility to interpret new information, often resulting in biased beliefs. For example, instead of adjusting their beliefs when faced with contradictory evidence, individuals may hold on to prior expectations. In contrast, under conditions of risk, there is less room for subjective interpretation. Thus, uncertainty increases the likelihood that cognitive biases such as overconfidence, optimism, or escalation of commitment will shape behavior (Busenitz & Barney, 1997). Empirical evidence supports this claim, showing that high-uncertainty environments frequently result in biased beliefs (Ackert & Athanassakos, 1997; Athanassakos & Kalimipalli, 2003; Chang & Choi, 2017).

One prominent bias is optimism, which can lead entrepreneurs to overestimate the likelihood of favorable outcomes and underestimate the likelihood of failure (de Meza & Southey, 1996; Weinstein & Klein, 1996). Optimism is especially prevalent among entrepreneurs (Coelho et al., 2004). Optimistic entrepreneurs observing declining financial returns might discount the objective facts, believing any decline to be temporary. This can persuade them to wait when realists would acknowledge reality and exit; it also induces optimistic entrepreneurs to exit later than the optimal time (cf. Lowe & Ziedonis, 2006). I therefore propose the following:

Hypothesis 4. An optimistic entrepreneur operating under conditions of uncertainty will tend to exit late, i.e., when expected income in the next period is negative.

3.3 Experimental design

The experiment comprises three studies which all share a common structure and so are discussed together for brevity. Study 1 (called the "Main" study) contains two manipulations—one varying information disclosure (to compare uncertainty with risk) and the other varying the size of the exit cost. Study 2 (called the "High initial income" study) differs from Main study only by using a higher initial income ($y_0 = \$40$ relative to Study 1, where $y_0 = \$30$), to check the sensitivity of decisions to starting points. Study 3 (called the "High previous investment" study) differs from Main only by providing a verbal framing of the venture context emphasizing high prior investments. Participants were told that they had invested 9 million dollars and 32 months into their business. This explores the sensitivity of decisions to framing choices (Tversky & Kahneman, 1981), since sunk costs may affect entrepreneurial persistence decisions (DeTienne et al., 2008; Mattingly et al., 2016; Staw, 1981). To verify whether participants perceived the commitment levels as intended, they were asked at the end of the experiment to rate their perceived commitment to the business on a scale from 1 to 10. In all other respects, studies 2 and 3 replicate the design and procedures of the main study.

3.3.1 Implementation

The experiment has a few basic components: income, probability, and sunk exit-cost. Let y denote stochastic income (see process (P1) in Appendix A for the formal specification of the declining income process). In each period, it can change from its current level either by a positive or a negative value, denoted by $\Delta y^+$and Δy^-, respectively, where $\Delta y^+ > 0 > \Delta y^-$. The probability of a positive value is p, where $0 < p < 1$; the probability of a negative value is $1 - p$. An individual's choice does not influence their future income realizations. The experiment features a nested structure that includes treatments, games, parameter sets, and income trajectories. Figure 2(a) provides an overview of the experimental design, whose details will be discussed below.

First, let's consider the treatments. I manipulate two within-subject factors—*information disclosure* and *exit cost*—resulting in four decision-making treatments, i.e., a 2(information disclosure) × 2(exit cost) design. The first factor, information disclosure, refers to the two decision-making situations of risk and uncertainty. In the case of risk, values of $(p, \Delta y^+, \Delta y^-)$ are all known, so individuals can compute their expected income at time *t* as $E(y_t) = y_{t-1} + p\Delta y^+ + (1 - p)\Delta y^-$. In the case of uncertainty, values of $(p, \Delta y^+, \Delta y^-)$ are not known but exit decisions need to be made, nonetheless. In both cases, participants face repeated decisions to continue or exit a venture. Provided the venture's income y_t remains above a lower bound, $B < 0$, the decision to continue provides an option to continue to the next period, guarantees another income draw y_{t+1}, and ensures the subject faces the same exit decision once again. If a subject continues until $y_t \leq B$, which is set to $-\$50$ in all games, the game is forced to exit ("closure"), terminating all future income draws in that game and incurring the exit cost C. Here, C is the second within-subject factor. The manipulation of the exit cost involves two conditions: a low exit cost of $20 and a high exit cost of $40. In all treatments, initial income y_0 is known, and future income values are not discounted. In all treatments, participants were told initial income, the exit cost, and the closure rule. There was no discounting in any experiment to simplify the decision and conserve the sample size.[12]

Next, within each treatment, participants play three games: Game 1, Game 2, and Game 3. Each game corresponds to a different parameter set, with parameter set 1 used for Game 1, parameter set 2 for Game 2, and parameter set 3 for Game 3 (see below). Participants play three games in all four treatments, resulting in a total of 12 games per player. To prevent any potential systematic order effects, both the order of the treatments between high and low exit costs and the order of the games within each treatment were randomized across participants. Since the risk treatment discloses information, the uncertainty treatments preceded the risk treatments.[13]

The parameter sets correspond to different values of the probability, p, of a favorable change in income, Δy^{+}, rather than an unfavorable change in income, Δy^{-}.

[12] Discounting typically applies to decisions involving longer time horizons, where future rewards are perceived as less valuable than immediate ones (see Frederick et al., 2002 for a review). However, given that the average time participants spent on the experiment was 27.43 minutes (Table 8), the perceived difference between immediate and delayed outcomes is negligible, suggesting that the timeframe is insufficient to trigger participants' time preferences. For discounting to play a meaningful role, the experiment would need to make the timing of rewards salient (e.g., receiving a reward immediately vs. after five days).

[13] I acknowledge that the order of conditions might introduce learning effects across the games. That is, participants might learn from their experiences in the Uncertainty games and adjust their strategies, potentially leading to improved exit decisions in the Risk games. To address this concern, I add to the experiment an additional group that follows a reversed order of conditions, i.e., starting with the Risk conditions and then proceeding to the Uncertainty conditions. By comparing the results of this reversed order group with those of the group that plays the Uncertainty conditions first and then the Risk conditions, I can systematically examine and assess any potential order effects. This approach will allow me to isolate the impact of the experimental conditions from any confounding influence of learning across games.

Varying these parameters within subjects allowed me to explore the effects of changes in risk (see the penultimate row of Table 2). Parameter values were selected to yield the same change in expected income each period (see the final row of Table 2). This not only avoided a “confound” of comparing games with different economic values but also enabled a mean-preserving spread (MPS: see Definition A.2 of Appendix A) to be operationalized. See Table 2 for a summary of each parameter set.

Table 2. Parameter values

Symbol	**Description**	**Parameter set 1**	**Parameter set 2**	**Parameter set 3**
y_0	Initial income	\$30 (Experiments 1 and 3) \$40 (Experiment 2)		
y^+	Positive change in income	\$12	\$24	\$12
y^-	Negative change in income	-\$8	-\$8	-\$16
p	Probability of positive income change	1/5	1/8	3/7
$1-p$	Probability of negative income change	4/5	7/8	4/7
$V(y_t)$	Variance of income change (“risk”)	64	112	192
$E(y_t)$	Expected change in income	-\$4		

Finally, for each parameter set, I draw four income trajectories labeled A, B, C, and D. These trajectories capture various patterns of income changes that participants encounter throughout the games, including trajectories characterized by “steady declining income changes” as well as ones featuring “declining income changes with temporary recoveries.” Appendix B lists the exact trajectories used. In each game, subjects were randomly assigned one of the four trajectories,[14] without being told what those

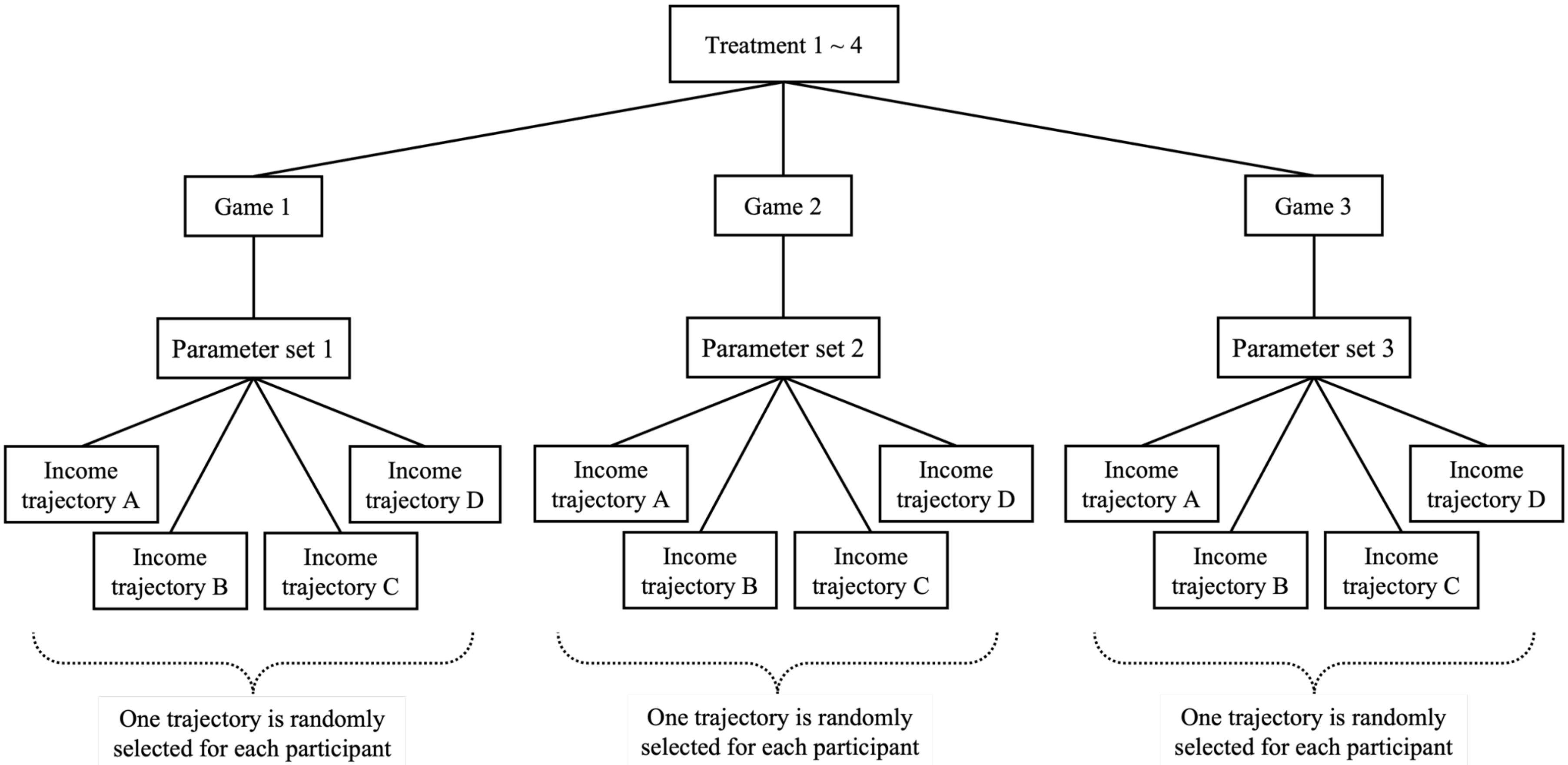
[14] This approach was preferred to random generation of different trajectories every game to a) guarantee everyone ultimately encountered negative income if they continued for long enough, b) reduce noise to

trajectories are. For example, in Game 1, some participants may be assigned trajectory A from parameter set 1, while others may receive trajectory D. Similarly, in Game 2, some participants may experience trajectory C from parameter set 2, while others may encounter trajectory A. The same random assignment process applied to Game 3 as well. To ensure balanced representation and to prevent any single trajectory from dominating the sample, each trajectory was evenly distributed, with approximately 25% of participants

more easily detect systematic behavioral patterns, and c) facilitate between-treatment comparisons. See parts B.1 and B.2 of Appendix B for further details.

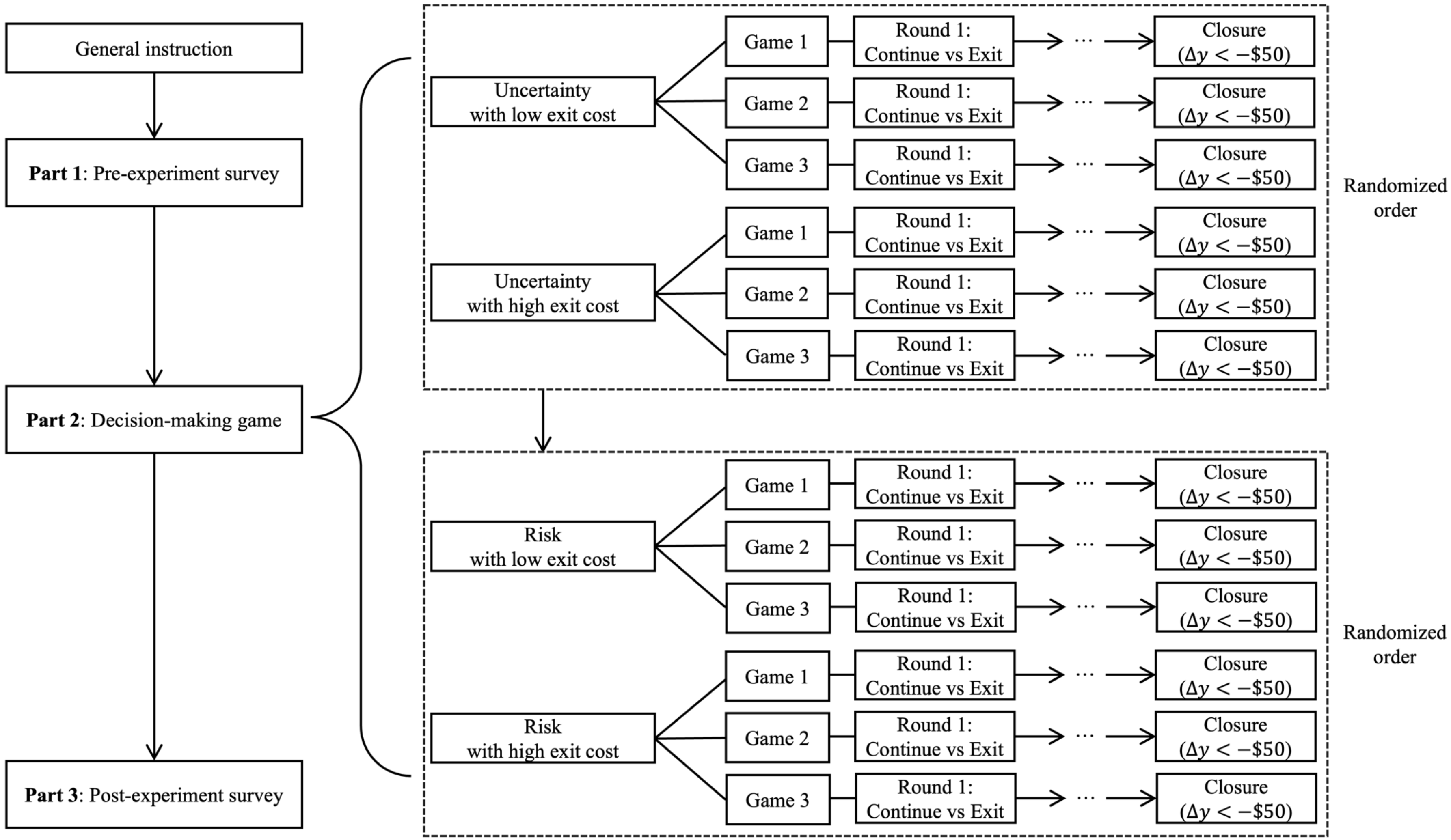
Figure 2.Visual description of the basic experimental design and procedure

(a) Experimental design



Notes: Figure 2(a) illustrates the interrelationships among treatments, games, parameter sets, and income trajectories. Within each treatment, there are three games. Each game is constructed using a specific parameter set that contains distinct values for relevant parameters relating to income outcomes and probabilities. Each parameter set has four income trajectories, one of which is randomly assigned to each participant per game.

(b) Experimental procedure



Notes: Figure 2(b) illustrates the procedure of Studies 1, 2, and 3. "Randomized order" occurs within each dotted box: the upper dotted box precedes the lower dotted box; otherwise, the risk condition reveals information that precludes the uncertainty condition.

being randomly assigned to each trajectory. I deliberately used a limited number of trajectories to generate more precise data on decisions—in contrast to what would happen with generating different random trajectories each time, where, for example, there would be 2^{30} = 1,073,741,824 different possible trajectories in a 30-round game (see Appendix B for further discussion).

3.3.2 Procedures

The pre-registered[15] experiment was conducted on Prolific Academic using oTree, an online program designed for conducting behavioral experiments (Chen et al., 2016). The design was informed by two prior pilot studies—the first based on 100 student subjects in early 2022, and the second based on 580 students in early 2023. Appendix C provides details about the pilot studies and how they influenced the design of the main experiment.

All recruited participants were randomly assigned to one of the three studies. Each study comprised three parts: a pre-experiment survey, 12 decision-making games, and a post-experiment survey (see Figure 2(b)). Once participants consented to participate in a study, they read a general description of its structure, before completing the pre-experiment survey. The main variables collected in this survey were *Financial risk tolerance* and *Optimism* (see below for details). In each decision-making game, participants were asked to play the role of an owner of a for-profit venture and maximize the total value of the business over its lifetime.

Before starting the first game where they made exit decisions, participants were asked to read a detailed game instruction describing the decision-making problem and the rules of the game. Participants were told that the game was incentivized. The use of

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[15] The preregistered study design is available at https://aspredicted.org/LHT_NDP. The study was approved by the Research Ethics Board of the lead author's institution.

incentives aligns with assumptions underlying EUT. Incentives took the form of a bonus, explained to all participants at the outset. Bonuses were given to (a randomly selected) 5% of all participants; if selected, one game from the participant was chosen at random. These recipients would receive a flat payment plus a portion of their terminal business value earned from the randomly chosen game after deducting the exit cost. This bonus scheme was designed to ensure that participants treated each game independently and tried their best in each game. The better they performed, the greater the positive bonus they received—giving them incentives to do well. The mean bonus payment was over £28, with a maximum of £48. This was substantial relative to the flat participation fee of £5. See Appendix D for further explanation and detailed summary statistics of the bonus payments.

Next, participants were required to answer three comprehension check questions to assess their understanding of key aspects of the experiment. These questions focused on identifying their role in the experiment and performing an expected value calculation. The instruction was displayed on the same page while they answered. Each participant had up to three chances to provide a correct answer for each question. If they failed to answer correctly, they were not permitted to continue with the experiment (see Figure E.3 of Appendix E for the questions). Consistent with the 2x2 within-subject design, participants who passed the comprehension check proceeded to play the 12 games across four treatment conditions: *Uncertainty with low exit cost; Uncertainty with high exit cost; Risk with low exit cost;* and *Risk with high exit cost* (see Figure 2(b)). Appendix E presents screenshots of the game screens.

In each round of a given game, participants had to decide whether to continue or exit. If they chose to continue, their incomes changed according to their predetermined income trajectory, and they were reminded of the income they had earned in the previous round, the total business value accumulated throughout the game, and the total business value they would receive after deducting the exit cost if they were to exit in the next round. In any case, updated information about their total business value after deducting the exit cost was always presented on the screen. After the completion of the last game, participants answered several closed- and open-ended questions asking about their decision-making logic. Upon completion of all experiments, participants were rewarded with £5 for their participation and any incentive payment they won through their play. There was no deception in any aspects of the experiment.

3.4 Data sample and variables

3.4.1 Sample

I sampled U.S. residents aged 18-64 who were active in the labor force. Only participants with a prior approval rate greater than 95% on the platform were recruited to ensure reliable and high-quality answers. The participant sample was comprised of entrepreneurs and non-entrepreneurs. For the entrepreneur group, I selected both individuals who are currently running their businesses and those who owned their businesses in the past. This selection criterion was appropriate because it recruited respondents with firsthand experience of actual venture exit decisions. The non-entrepreneur group was selected to match the entrepreneur group in terms of demographic factors. I was interested in whether there were any differences between these groups.

I initially recruited 516 participants. Of these, 500 participants[16] who successfully passed the comprehension test were included in the analysis: 200 each in Studies 1 and 2, and 100 in Study 3. Figure E.5 of Appendix E also describes two attention checks. The number of subjects failing either attention check was 26, 28, and 19 in Studies 1, 2, and 3, respectively. These subjects were dropped from the sample. I also dropped 5 participants from Study 3 who gave incorrect ratings about the investment size in that context. The total final sample size was therefore 422 adults. A power analysis using G*Power 3.1 revealed that this sample size is more than sufficient to achieve 90% power to detect a small-to-medium-sized effect (see Appendix F for the power analysis).

3.4.2 Variables

Dependent variables. The main dependent variable used in the analysis below uses an indicator E_{igr} of whether subject *i* exits game *g* at round *r*—conditional on having continued up to this point. If so, this variable takes the value 1, and 0 if they continue. The (latent) dependent variable, which is the conditional probability of exit, is denoted by

$$E^*_{igr} = \Pr\left(E_{igr} = 1 | E_{igr-1} = 0\right)$$

Independent variables. I specified several independent variables to test Hypotheses 1-4. First, for Hypotheses 1a, 2a, 3a, and 4, I operationalized exit timing using three binary indicator variables that categorize subjects' exit behaviors relative to the optimal exit

[16] The pre-registration outlined a target of 900 participants, but I was able to recruit 600 participants, distributed as follows: 200 for Study 1, 200 for Study 2, 100 for Study 3, and 100 for the robustness checks (ordering and learning effect tests). The difference was primarily due to financial constraints caused by exchange rate fluctuations. Since Prolific supports payments in British pounds while our institution's account for this research operates in another currency, the unfavorable exchange rate significantly increased the cost of participant recruitment. This financial limitation made it unfeasible to recruit the intended sample size.

round (R^*). Let r_{ig} be the round when subject *i* is observed to exit game *g*. Since trajectories were known to the researcher, I knew the optimal round R_g^* for that game. One can then define the following indicator variables for every round of a given game. The first variable, D_{igr}^o, represents the optimal exit round ($r_{ig} = R_g^*$), taking the value 1 for that round and 0 for all others. The second variable, D_{igr}^e, identifies rounds that occur before the optimal exit round ($r_{ig} < R_g^*$), taking the value 1 for these rounds and 0 otherwise. The third variable, D_{igr}^l, captures rounds occurring after the optimal exit round ($r_{ig} > R_g^*$), taking the value 1 for these rounds and 0 otherwise:

$$D_{igr}^o = \begin{cases} 1 & for\ r_{ig} = R_g^* \\ 0 & otherwise \end{cases}, \quad D_{igr}^e = \begin{cases} 1 & if\ r_{ig} < R_g^* \\ 0 & otherwise \end{cases},$$

$$D_{igr}^l = \begin{cases} 1 & if\ r_{ig} > R_g^* \\ 0 & otherwise \end{cases}$$

Hypothesis 1a posits that risk-neutral entrepreneurs will exit at the optimal round. In this case, D_{igr}^o should strongly predict exits for risk-neutral entrepreneurs. Hypothesis 2a suggests that risk-averse entrepreneurs exit early. Here, D_{igr}^e should predict exits for risk-averse entrepreneurs. Hypothesis 3a proposes that risk-seeking entrepreneurs exit late, meaning that D_{igr}^l should predict their exits.

Second, the between-subject design of the experiment facilitates testing of Hypotheses 1b, 2b, and 3b—which examine the effect of higher exit costs, define a treatment dummy variable $T_{igH} = 1$ for games played in the high-cost treatment H, and code $T_{igH} = 0$ in the low-cost treatment L. Hypothesis 1b predicts insignificant effects of T_{igH} on E_{igr}^*, unlike Hypothesis 2b (resp., 3b) which predicts significant positive (resp., negative) effects.

Third, for Hypotheses 1c, 2c, and 3c, I can also specify dummy variables to test the effects of greater risk, i.e., mean-preserving spreads (MPS), on exit behavior. As noted in Table 2, all games use one of three parameter sets, either $PS1$, $PS2$, or $PS3$, where risk increases from $PS1$ to $PS2$ and from $PS2$ to $PS3$. Hence, create a dummy variable $D_{ig\in PS2}$ that takes the value of 1 if *i*'s game *g* is from $PS2$ ($g \in PS2$), and 0 otherwise. The dummy variable $D_{ig\in PS3}$ is defined analogously. The base category is for games from $PS1$. Hypothesis 1c predicts insignificant effects of $PS2$ and $PS3$ variables on E^*_{igr}, unlike Hypothesis 2c (resp., 3c) which predicts significant positive (resp., negative) effects.

Covariates. I included dummy variables $\boldsymbol{D}_{iS}$ to control for whether *i* was assigned to studies 2 or 3 relative to Main study 1.

Pre-experiment survey questions. I measured financial risk tolerance using the Grable Lytton Risk Tolerance Scale (GL-RTS; Grable & Lytton, 2001) that captures three distinct components of risk tolerance: investment risk, financial risk, and speculative risk. The scores were based on the respondents' self-reported answers to questions capturing their perception of financial risk tolerance (e.g., "If you unexpectedly received $20,000 to invest, what would you do?" and "In terms of experience, how comfortable are you investing in stocks or stock mutual funds?"). The overall risk tolerance score is computed by adding up the individual scores from the 13 questions, where higher scores indicate greater risk tolerance. (See Figure G.1 in Appendix G for a screenshot of the pre-survey question.)

I also measured optimism, defined as generalized positive expectations regarding future events, which can influence people's willingness to persist with a declining venture (Scheier & Carver, 1985; Carver & Scheier, 1998). I used the Life Orientation Test-Revised (LOT-R) scale developed by Scheier et al. (1994). Participants rated ten statements (e.g., "In uncertain times, I usually expect the best.") on a five-point Likert scale (0 = strongly disagree, 4 = strongly agree). To calculate optimism scores, the four filler items, which are neutrally phrased (e.g., "It's easy for me to relax."), were excluded. The remaining six items contributed to the overall optimism score, which ranges from 0 to 24. Higher scores indicate higher levels of dispositional optimism. (See Figure G.2 in Appendix G for a screenshot of the pre-survey questions on optimism.)

Post-experiment survey questions. To gain insight into the reasoning and decision-making processes behind participants' exit decisions, I also asked six questions at the end of the experiment. I chose a mixture of closed and open-ended questions to obtain sharp answers to specific questions thereby delving deeper into participants' thought processes regarding their exit decisions. For example, participants were asked "Did you attempt to calculate the expected value of your income in games when information on probabilities and income values were NOT provided?" and "When incomes started declining, were you motivated to remain playing until you restored your original income flow?" In addition to these structured questions, I also included two open-ended questions to delve deeper into participants' emotions and thought processes regarding their exit decisions. Specifically, participants were asked, "While playing the games, have you thought that you decided to exit too late or too early? If so, please describe what you were thinking at that time," and, "What factors were important in making the exit decisions?" (See Figure E.6 of Appendix E for the complete list.)

3.5 Econometric methods

To test Hypotheses 1-3, I estimated the following random-effects probit model, using observations only for the treatments assigned under conditions of risk:

$$E^*_{igr} = \Phi(\beta_o D^o_{igr} + \beta_e D^e_{igr} + \beta_l D^l_{igr} + T_{igH}[\gamma_0 + \gamma_1 D^e_{igr} + \gamma_2 D^l_{igr}] +$$
$$D_{ig\in PS2}\left[\delta_0 + \delta_1 D^e_{igr} + \delta_2 D^l_{igr}\right] + D_{ig\in PS3}\left[\theta_0 + \theta_1 D^e_{igr} + \theta_2 D^l_{igr}\right]$$
$$+ \boldsymbol{D}_{iS}\Gamma + \alpha_i) \tag{1}$$

Here, Φ is the probit link function, and α_i are random effects.

If subject i is risk neutral, I would expect a high positive correlation between the time i exits, i.e., when $E_{igr} = 1$, and the time when exit is optimal, i.e., when $D^o_{igr} = 1$. The same argument applies to the other exit dummy variables. Hence Hypotheses 1a, 2a, and 3a predict, respectively, $\beta_o > 0, \beta_e > 0$, and $\beta_l > 0$. The larger a given β coefficient, the greater the incidence of risk preferences corresponding to that coefficient that one can infer among the general population. These parameter restrictions can each be checked individually by performing three one-tailed tests of the null hypothesis of a zero or negative coefficient, against a positive coefficient. Failure to reject the null for a given coefficient would not support the associated hypothesis. Multiple positive and significant β coefficients would indicate heterogeneous risk preferences, which *would* be consistent with EUT.

Hypotheses 1b, 2b, and 3b can be tested by exploring the impacts on exit outcomes of high exit costs, which arise when $T_{igH} = 1$. Hypothesis 1b predicts all the γ coefficients in (1) should be jointly 0; Hypothesis 2b predicts $\gamma_1 > 0$; and Hypothesis 3b predicts $\gamma_2 < 0$. Similarly, when exploring the effects of greater risk, Hypothesis 1c predicts all the δ and θ coefficients in (1) should be jointly 0; Hypothesis 2c predicts $\delta_1, \theta_1 > 0$; and Hypothesis 3c predicts $\delta_2, \theta_2 < 0$.

Finally, for the case of uncertainty, one can estimate

$$E_{igr}^{*} = \Phi(\beta_l^O D_{igr}^l + \boldsymbol{D}_{iS}\Gamma + \alpha_i) \qquad (2)$$

Hypothesis 4 implies one should reject the null hypothesis of a zero or negative coefficient β_l^O, against the alternative of a positive coefficient. Failure to reject this null would not support Hypothesis 4, which links optimism under uncertainty to late exits.

Table 3 summarizes the predictions of the hypotheses and the testable restrictions they imply on the specifications in (1) and (2).

Table 3. Hypothesis summary

	a) β	b) γ	c) δ	c) θ
Hypothesis 1: Optimal exit under risk	$\beta_o > 0$	$\gamma_1, \gamma_2, \gamma_3 = 0$	$\delta_1, \delta_2, \delta_3 = 0$	$\theta_1, \theta_2, \theta_3 = 0$
Hypothesis 2: Early exit under risk	$\beta_e > 0$	$\gamma_1 > 0$	$\delta_1 > 0$	$\theta_1 > 0$
Hypothesis 3: Late exit under risk	$\beta_l > 0$	$\gamma_2 < 0$	$\delta_2 < 0$	$\theta_2 < 0$
Hypothesis 4: Late exit under uncertainty	$\beta_l^O > 0$			

3.6 Results

3.6.1 Descriptive statistics

Table 4 presents descriptive statistics on variables collected in the pre-experiment survey. Apart from gender, there are balanced responses across the three studies. Although men were more likely to fail the attention checks in Study 3, this appears to be a random outcome. Since these variables are orthogonal to the treatment conditions, they are excluded from the regressions below.

Table 4. Descriptive statistics

	Study 1: Main (N = 174)	**Study 2: High initial income** (N = 172)	**Study 3: High previous investment** (N = 76)	**F-value**
Group (1=Entrepreneur)	0.506 (0.501)	0.517 (0.501)	0.5 (0.503)	0.04
Age	40.632 (9.681)	42.047 (10.612)	40.553 (10.255)	1.02
Gender (1=Male)	0.667 (0.473)	0.599 (0.492)	0.487 (0.503)	3.66*
Marital (1=Married)	0.466 (0.500)	0.459 (0.500)	0.480 (0.503)	0.04
Education (1=Higher education)	0.695 (0.462)	0.686 (0.468)	0.707 (0.466)	0.05
Optimism (0-24)	14.977 (5.592)	15.273 (5.088)	16.487 (4.420)	2.29
Risk tolerance[a] (0-47)	24.256 (4.730)	24.036 (5.085)	24.859 (5.389)	0.68

*Notes:*p < 0.05, **p < 0.01, ***p < 0.001.“Main” Study 1: Initial income of $30. “High initial income” Study 2: As Main Study 1 but initial income of $40. “High previous investment” Study 3: As Main Study 1 but with prior investment framing. Cell entries are means, with standard deviations beneath in parentheses. Numbers in parentheses beneath variable names in the first column give a range of admissible values.*

[a] *For risk tolerance, the number of observations in the three studies are 164, 166, and 71, respectively, owing to slightly lower response rates for these questions.*

Table 5. Exit outcomes across the three studies

Study	(1) Always optimal (Risk neutral)	(2) Always early (Risk-averse)	(3) Always late (Risk-seeking)	(4) Early & Optimal	(5) Late & Optimal	(6) Early & Late	(7) Early, Late & Optimal
1	0	12	25	6	13	29	89
2	0	18	12	6	18	50	68
3	0	2	7	4	3	21	39
Sum	**0**	**32**	**44**	**16**	**34**	**100**	**196**

Notes: Fisher Exact Test in contingency table of first three columns compared with last four columns: p=0.00. "Late" exits include "No exits."

Table 6. Exit outcomes: ANOVA results

Source	Partial SS	Df	MS	F	Prob > F
Model	46,983.273	432	108.758	8.99	0.0000
Participant	44,051.722	421	104.636	8.65	0.0000
Game	3,097.350	11	281.577	23.28	0.0000
Residual	53,853.415	4,453	12.094		
Total	100,836.69	4,885	20.642		
Statistics	N = 4,886; RMSE = 3.478; $R^2 = 0.466$; $\bar{R}^2 = 0.414$				

Notes: SS is sum of squares and MS is mean square; Df is degrees of freedom; RMSE is root mean square error; and F is the F statistic testing the null hypothesis of equality of treatment means.

Define an outcome variable "Exit Delay," D_{ig}, as the actual round that subject *i* exited in game *g* minus the round associated with optimal exit. Thus, occurrences of $D_{ig} = 0$ are associated with optimal exit; negative values are associated with early exit; and positive values with late exit. Table 5 displays the frequency of different exit types across each of the three studies. Allowing for heterogeneous risk preferences, EUT predicts that the first three columns of this table should exhaust the entire count of within-subject exit behaviors. Although some participants sometimes exited optimally in each of the three studies, column (1) of Table 5 shows that *nobody did so consistently in* *any* of the three studies.[17] Further, while columns (2) and (3) of Table 5 indicate greater consistency for early and late exits, these accounted for only 7.5% (=32/422) and 10.4% (=44/422) of participants. Thus, *the overwhelming majority (82%) of subjects did not behave consistently according to EUT.* [18] This is borne out by the ANOVA results in Table 6, which reveal predominant within-subject variation in exit decisions (Additional exploratory results on exit behaviors under different manipulations can be found in Appendix I.) Against this background, I now conduct formal tests of Hypotheses 1-4.

3.6.2 Hypothesis testing

Table 7 presents the results of estimating (1) by random effects probit for the case of risk. All estimations were performed using STATA MP version 16. The first three columns estimate the specification with the various terms entered in groups. First, column (1) includes only the exit timing dummies together with covariates. Column (2) adds the high-exit cost variable, with interactions. Column (3) replaces these terms with the increasing risk variables ("Parameter set 2" and "3") in levels and interactions. Column (4) includes all variables together.

The results in column (1) reveal negative and significant coefficients for optimal and early exit round indicators. This holds for all four risk specifications in the table, and so (referring to Table 3) leads me to reject Hypotheses 1a and 2a. In contrast, the coefficient on the late exit round indicator is positive and significant (β_l = 0.36, p < .001),

[17] Figure H.1 in Appendix H displays the distribution of exit types for each study and each of the four treatment conditions: risk and low exit cost (RL), risk and high exit cost (RH), uncertainty and low exit cost (UL), and uncertainty and high exit cost (UH).

[18] These findings also cast doubt on theories of "status quo" bias (Samuelson & Zeckhauser, 1988), "escalation of commitment" (Staw, 1981), and "need for cognitive closure" (Kruglanski & Webster, 1996; Lin et al., 2022). All these constructs predict that people become impervious to additional information and stick with previous choices.

consistent with Hypothesis 3a. I go on to check this hypothesis further in column (2), where the high exit cost treatment interacts with the late exit round dummy. However, I cannot reject the null hypothesis that exits are invariant to exit costs—consistent with Hypothesis 1b but not Hypothesis 3b (see column γ in Table 3).

I test Hypothesis 3c in column (3) of Table 7 (where consistent with Table 3), that greater risk associated with parameter set 2 induces those in late exit situations to exit later (δ_2 = -0.26, $p < .05$). However, the same pattern is not found for higher levels of risk associated with parameter set 3 (θ_2 = 0.13, $p > .10$)—refuting Hypothesis 3c. These results remain stable when all regressors are included [column (4)].[19] I then tested whether more risk-tolerant people exited later, as EUT suggests. I explored correlations between Risk Tolerance variable and both early and late exit outcomes. However, contrary to EUT, I observed a *positive* and significant correlation between risk tolerance and early exits (corr = 0.054, $p < 0.01$) and a negative but insignificant correlation between risk tolerance and late exits (corr = -0.020, p = 0.34). This casts further doubt on EUT as an explanation of exit decisions.

Column (5) of Table 7 presents the results of estimating (2) by random effects probit for the case of uncertainty. The results confirm a significantly positive coefficient (β_l^O= 1.39, $p < .001$), consistent with Hypothesis 4 (see Table 3). However, since optimism is not the only possible mechanism that might explain late exits under uncertainty (e.g., Chen et al., 2018), I correlated Optimism, measured in the pre-experiment survey, with early and late exit outcomes. Contrary to expectations, I

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[19] The results are also robust when (1) is estimated using a mixed-effects probit specification, which explicitly model heterogeneous responses to the dummy variables of interest in (1) (results available from the authors on request).

observed a *positive* and marginally significant correlation between optimism and early exits (corr = 0.039, $p < 0.10$) and a negative but insignificant correlation between optimism and late exits (corr = -0.016, $p = 0.41$). Hence, I do not find strong support for Hypothesis 4, either.

Are these results different for entrepreneurs compared with non-entrepreneurs? To explore this possibility, I reran the specifications in Table 7 separately for both groups. The results, reported in Appendix J, are similar to those reported in Table 7. The main difference is that disaggregating the sample in this way removed the statistical significance of the δ_2 and θ_2 coefficients—further weakening support for Hypothesis 3c.

Overall, it appears that exit behavior of my participants deviates significantly from the predictions of EUT.[20] However, before seeking alternative explanations, I must first respond to a possible objection that participants did not understand, or did not take seriously, the experimental tasks they were given.

[20] I performed two robustness checks to examine potential learning effects in our experiment (detailed results available on request). First, I tested the ordering effect of our approach, which always assigned the uncertainty treatment before the risk treatment in the main experiments. In this robustness check, I reversed the order by assigning the risk treatment before the uncertainty treatment. Using a smaller sample of 50 entrepreneurs, 43 of whom passed the two attention checks, I found similar results. Second, I tested whether entrepreneurs learn and make better decisions across repeated identical games. This experiment involved 50 entrepreneurs, 40 of whom passed the two attention checks, playing three identical games for each of the four treatments (i.e., a total of 12 games). To assess learning, I compared exit timing across repeated games within each treatment condition. Specifically, I tested whether participants exited significantly closer to the optimal time in later rounds compared to earlier ones, by measuring the difference between their actual and optimal exit timing. The results showed no significant improvement across rounds in any of the treatments. The findings indicate no significant learning effects across the games.

Table 7. EUT: Regression results

	Risk				Uncertainty
Variables	(1)	(2)	(3)	(4)	(5)
Optimal (D_{igr}^{o})	-0.49***	-0.47***	-0.54***	-0.52***	
	(0.09)	(0.10)	(0.11)	(0.12)	
Early (D_{igr}^{e})	-1.59***	-1.55***	-1.44***	-1.40***	
	(0.08)	(0.08)	(0.09)	(0.09)	
Late (D_{igr}^{l})	0.36***	0.46***	0.38***	0.46***	1.39***
	(0.09)	(0.09)	(0.09)	(0.10)	(0.03)
High initial income	0.31**	0.31**	0.32**	0.32**	-1.44***
	(0.11)	(0.12)	(0.12)	(0.12)	(0.09)
High previous investment size	0.18	0.18	0.18	0.18	-1.64***
	(0.15)	(0.15)	(0.15)	(0.15)	(0.14)
High exit cost (T_{igH})		-0.03		-0.03	
		(0.08)		(0.08)	
Early X High exit cost		-0.04		-0.04	
		(0.09)		(0.09)	
Late X High exit cost		-0.14		-0.14	
		(0.10)		(0.10)	
Parameter set 2 ($D_{ig \in PS2}$)			0.34***	0.34***	
			(0.10)	(0.10)	
Parameter set 3 ($D_{ig \in PS3}$)			-0.18	-0.18	
			(0.11)	(0.11)	
Early X Parameter set 2			-0.49***	-0.49***	
			(0.11)	(0.11)	
Early X Parameter set 3			-0.16	-0.16	
			(0.12)	(0.12)	
Late X Parameter set 2			-0.26*	-0.24*	
			(0.12)	(0.12)	
Late X Parameter set 3			0.13	0.15	
			(0.12)	(0.12)	
lnsig2u	0.04	0.04	0.09	0.09	0.36***

	(0.09)	(0.09)	(0.09)	(0.09)	(0.07)
Observations	18,810	18,810	18,810	18,810	22,918
Number of Participants	422	422	422	422	422
Log Likelihood	-5776	-5768	-5731	-5723	-7123
Prob > chi2	0.000	0.000	0.000	0.000	0.000

Notes: Dependent variable is exit, E_{igr}, which takes the value of 1 if a participant exits and 0 otherwise. Base category for study type: Main (study 1). "High initial income" and "High previous investment size" are dummy variables for studies 2 and 3. Method of estimation: Random effect probit model.
$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

3.6.3 Did participants understand and engage with the experiment?

EUT remains a popular theory in the economics of entrepreneurship (Parker, 2018), so I need to be sure that it is tested "fairly." For example, participants might depart from the nostrums of EUT if they do not understand the games or if they do not take them seriously. Below, I assess participants' understanding of and engagement in my experiments.

First, as noted above, I conducted a comprehension test in all three studies. The test comprised three questions (reproduced in Figure E.3 in Appendix E), which cover critical aspects of the experiment, namely, identifying the task, calculating cumulative incomes, and understanding income changes from one round to the next. I uncovered a high level of understanding among the participants of the experiments with 97% (a total of 500) passing the test and going on to participate in the experiment.

Second, I conducted a validation test on a sub-sample of 70 participants *after* they had finished their involvement in the experiment. These participants were asked directly when the optimal exit time was.[21] I found that 86% (60) of participants correctly

[21] Question 1 was, "Considering the income changes over 8 rounds shown in the image below, in which round should you exit to maximize your total business value?" Question 2 was, "Now, consider the following income history. In which round should you exit to maximize your total business value?"

answered at least one of the two comprehension questions, and 79% (55) correctly answered both questions. Hence, most subjects understood the instructions and could make informed decisions. In fact, further analysis (reported in Appendix K) revealed that understanding the game mechanics did not significantly impact exit behaviors in any case.

Even if participants understood the experiment tasks, and even though the sample I analyzed passed two attention checks, one could argue that they might have been disengaged, finishing the games very quickly (e.g., exiting in the first round of each game). In fact, the median completion time was 22.21 minutes; 91.5% of participants (386 participants) took between 5.41 minutes (mean -1 std) and 49.45 minutes (mean +1 std) to complete all 12 games. This suggests that most subjects engaged with and completed the tasks in a deliberate and serious way. Additionally, the presence of only 36 participants with relatively short (1 participant: < mean -1 std) or long (35 participants: > mean +1 std) durations confirms that inattentiveness was minimal. Also, not one participant exited in the first round in all games. See Table 8 for summary statistics of participation durations and Figure K.3 of Appendix K for a histogram.

Table 8. Summary of experiment duration (minutes)

	Mean	Median	SD
All three studies	27.43	22.21	22.02
Study 1: Main	28.81	23.93	16.23
Study 2: High initial income	24.55	21.10	12.76
Study 3: High previous investment	30.80	21.63	41.34

Taken together, these findings suggest that participants in the experiment both understood and engaged mindfully with their tasks. Therefore, violations of EUT cannot simply be brushed off as an anomaly caused by a confusing or boring experimental design.

3.6.4 Can existing theories explain the findings?

Participants demonstrated understanding and engagement with the experimental task, yet their decisions often deviated from what EUT would predict. The same individuals sometimes exited ventures earlier than the optimal point and in other cases, exited later. While such within-individual inconsistency might suggest the need for a new theoretical explanation, it is important first to ask whether existing theories can account for these behavioral patterns. Although a comprehensive theoretical analysis is beyond the scope of this dissertation, this section offers a brief discussion of whether existing theories explain the observed exit.

The first candidate theory is PT (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992), one of the most influential frameworks in behavioral decision-making. This theory posits that individuals evaluate outcomes relative to a reference point and become risk-seeking in losses and risk-averse in gains (see Section 2.2.4 for a more detailed discussion), thereby producing the same predictions as Hypotheses 2 and 3 in my experiment (see Section 3.2.1). Most notably, PT is fundamentally a static model, designed for discrete, one-shot decisions (Barberis, 2013; Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). It does not accommodate the sequential and intertemporal nature of decisions where individuals continually assess performance over time, as in my experiment. As a result, the theory cannot provide a framework for understanding how individuals may have evaluated ongoing performance over time or chosen the timing of their exits.

Another potential framework is threshold theory (Gimeno et al., 1997). This theory proposes that entrepreneurs continue operating ventures as long as performance remains above a *single* performance threshold, shaped by individual circumstances such as opportunity costs (see Section 2.3.1). While the model captures the idea that exit decisions are not based solely on absolute performance levels, it assumes that this threshold is stable and fixed within individuals, emphasizing variation across individuals rather than within them. That is, it explains why some people exit earlier than others but not why the same individuals exit early in some cases and late in others.

Aspiration-based models, rooted in the behavioral theory of the firm (e.g., March & Shapira, 1987, 1992; Greve, 1998), propose that individuals evaluate outcomes relative to aspiration levels and adjust their behavior accordingly. When performance falls below aspiration, they are more likely to take risks; when performance exceeds aspiration, they tend to become risk-averse and continue their current course of action. These models assume continuation as the default response; for example, in Greve's performance–feedback model (1998), poor performance typically triggers problematic search, innovation, restructuring, or other strategic changes to restore performance rather than exit. Exit is typically treated as a failure outcome or last resort, not a deliberate, adaptive response. More fundamentally, these models are more effective explaining whether individuals change behavior or risk attitudes in response to performance gaps than they are about explaining why the timing of action varies across similar situations. They offer little insight into how long an individual will persist before acting, or why the same individual might act immediately in one case but delay in another even under comparable decision-making conditions. This limitation becomes more apparent in dynamic decision-making contexts like the one studied here, where participants have to decide not only whether to exit, but also when to exit.

Lastly, one might argue that escalation of commitment could explain the delayed exits observed in the experiment (see Section 2.3.3). However, this framework is not applicable to my findings for two reasons. First, it predicts a *consistent* tendency to persist in failing courses of action due to prior investment. However, such a pattern, even in Study 3, which explicitly manipulated high prior investment, was not observed. Second, the experimental tasks in Studies 1 and 2 did not involve prior investments in the traditional sense. While exits incurred a small cost ($20 or $40), this was fixed across rounds and known in advance unlike real sunk costs that accumulate and increase psychological pressure to continue. As such, there was little motivation for escalating commitment based on prior expenditures.

Taken together, these theoretical limitations highlight a gap in our understanding of entrepreneurial exit behavior—specifically, how and when individuals choose to exit. This gap calls for a new framework that can better explain the observed patterns of exit behavior.

3.6.5 Qualitative evidence from the post-survey questionnaire

The post-survey questionnaire (Figure 2(b)) revealed three salient factors that people stated as drivers of their exit decisions: the existence of psychological thresholds, the perceived importance of recent trends in income draws, and the neglect of probability.

First, over one-quarter (n = 110) of participants explicitly mentioned that their decisions were influenced by whether they expected their income to evolve above or below thresholds. For instance, some participants declared that they preferred to exit when their incomes approached zero or before turning negative, as reflected in statements such as the following: "*I wanted to exit before crossing the zero threshold*," "*I strove to avoid making decisions that would put me in the negative*," and "*The thing that drove me to quit for all of the rounds was when the profits reached below $6.*" Intriguingly, participants were aware this meant they were "leaving money on the table," via statements like "*As long as there is some profit, I did not feel bad about exiting" and* "*I always felt like I exited too early, but any positive payment in my mind is better than being penalized*." These statements all highlight, as triggers for exit, the expectation that income would fall below some idiosyncratic psychological threshold.

Second, nearly two-fifths (n = 167) of participants mentioned that they closely monitored how their income had been changing and chose to exit once they observed a downward trend in their incomes. This response was reflected in statements such as "*I watched for any incremental increase and continued," "If I lost money in two consecutive rounds I often exited,"* "(*I exited*) *if income consecutively decreased in value,*" and "*I exited once I observed a downward trajectory*." These strategies seem to be rooted in the belief that when their income began to decline, any downward trend was likely to persist. Participants expressed this perspective through statements like, "*As soon as it started to go down, I assumed it would probably continue in that direction. So, I withdrew my participation*." These responses imply that individuals, observing past experiences and trends, aimed to anticipate how their income values would develop in the future.[22]

Third, I asked participants whether they used probabilities to calculate expected values and used them to make exit decisions (see Figure E.6, Appendix E for the question). While most participants stated they used probabilities to guide their decisions (Figure 3), their actual behavior did not support this claim. If participants were actively using expected value logic, I would expect risk preferences to systematically affect exit timing; for example, risk-seekers exit later as risk increased **(**from PS1 to PS3). However, the results showed that exit behavior was not systematically related to the level of risk (see Section 3.6.2 for detailed results), undermining the idea that participants made decisions based on expected values. This discrepancy may indicate that participants reported what they believed was the "correct" strategy, rather than what they used.

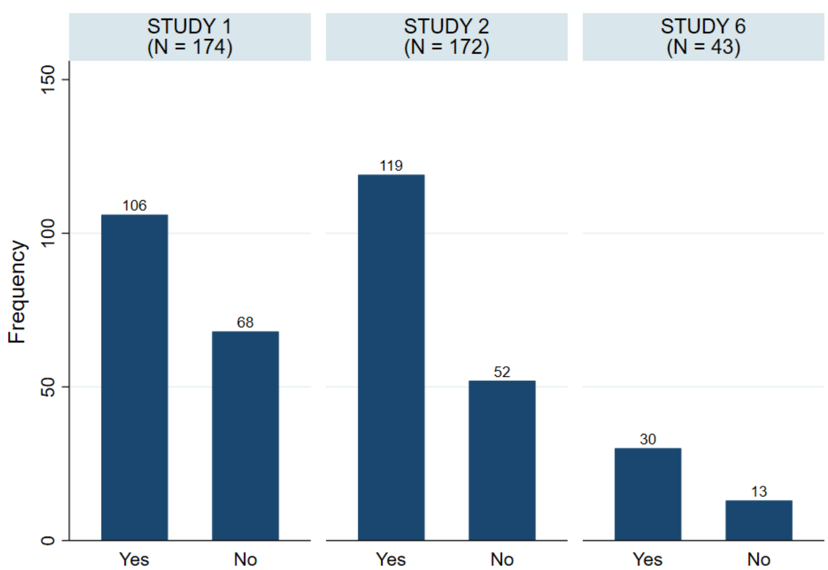
Open-ended post-experiment responses provide deeper insight into the decision-making strategies participants used. Although some participants indicated that probability information was helpful, their comments imply that it shaped how they felt about the decision rather than how they used it. For instance, participants made comments like: *"It was easier to make decisions when I knew the odds"* and "*When the probability information was not provided, I was less risk-averse and wanted to continue more often to further rounds."* Instead, participants mentioned that factors like the income trend or a likely income in the next round played a more significant role in shaping their decisions than the detailed information about game parameters. This perspective is expressed

[22] This aligns with so-called "recency bias" (Arnold et al., 2000; Phillips-Wren et al., 2019) whereby decision-makers give greater weight to recent events and believe recent trends will continue. It also connects with "gambler's ruin" behavior: see below for further discussion of this point.

through statements like the following: *"The statistics that you gave me didn't really factor into my decision making all that much;" "Once I started noticing the money consistently going down, I typically exited. These factors had the same importance even in games where information on probabilities and income values wasn't provided;"* and "*When I saw that my income was a negative, I decided to exit to not lose any more money. I used that factor for each game regardless of whether information of probabilities was mentioned."*

These sentiments echo my quantitative finding that participants' exit timing seemed not to be affected by the parameter sets employed in the study. That is, people pay limited or no attention to probabilities and outcomes when making exit-timing decisions. This can explain why EUT and PT are unable to explain the behavior uncovered by the experiments.

Figure 3. Self-reported use of probability information



Notes: Participants were asked, "In the games where such information was available, did you calculate the expected value of your income?"

3.7. Abduction: towards the genesis of a new theory

I have tested an established theory of decision-making behavior in the context of when to stop a declining venture. Having failed to support it, I tentatively propose a new theory of decision-making which is to adopt an "abductive" approach (Sætre & Van de Ven, 2021) to build the simplest and most plausible theoretical explanation by starting from observations of exit behavior. I call this "Dual Threshold Theory" (DTT).

Reinhardt Selten, a renowned Nobel Prize winner, advocated running experiments to generate salient findings that can be used to develop new theory (Gonzalez, 2003). Adopting Selten's advice, I identify three salient findings from the experimental results. First, the post-study survey suggested that many subjects wanted not only to attain some "satisfactory" positive performance outcome (Simon, 1982), but also to avoid a lower performance outcome. Second, participants paid particular attention to the most recent sequences of income draws, especially declining ones. Third, the evidence also suggests that participants did not use probabilities when deciding when to exit.

Taking this together, I abductively propose the following ingredients of a new theory. First, agents possess not one, but two, idiosyncratic thresholds—an upper and a lower threshold—defined as follows:

Definition 1. Upper and lower thresholds:

The upper threshold, $\overline{y}$, is a positive income level, $\overline{y} > 0$, such that an agent derives satisfaction from achieving it; the lower threshold $\underline{y}$ is an income level below which the agent receives too little satisfaction to want to continue.

Note that the lower threshold is not restricted to be positive or negative.[23]

Second, agents make decisions by extrapolating recent sequences of income draws, not by using probabilities, e.g., to calculate expected values. This is defined as follows:

Definition 2. A declining recent n-sequence of draws:

A declining recent n-sequence of draws, $\{y\}_{-n}$, *is a sequence* $y_t < y_{t-1} \ldots < \cdots\ y_{t-n}$, *where* $n \leq t$ *is the length of the sequence used by the agent.*

Note that *n* may differ across agents; that is, some people attend to only one or two declining draws while others condition their behavior on longer sequences.[24]

With both ingredients in place, I propose that agents suffer a psychic loss if their incomes—having hit their upper threshold—subsequently decline to breach it. This psychic loss is expected to persist if they observe a recent declining sequence of income draws. I also hypothesize that they suffer a psychic loss if their incomes breach their lower threshold—also expected to persist if they observed a recent declining sequence of draws. Agents want to avoid both kinds of psychic losses and so choose to exit when either of these outcomes occur.

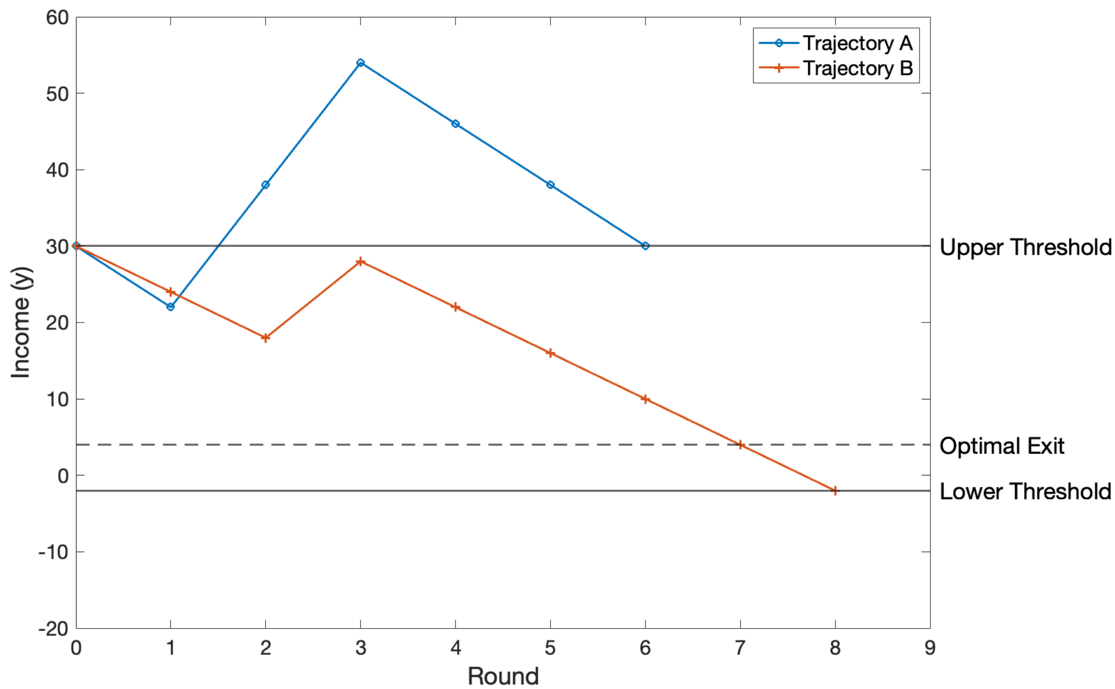
To illustrate, suppose for example that an agent receives a sequence of *increasing income* draws which breach $\overline{y}$ from below for the first time. DTT predicts continuation; but, if some time after having attained $\overline{y}$, a declining sequence of draws persuades the

[23] For expositional simplicity, both thresholds are taken to be fixed over the complete sequence of draws {y} comprising a game. This assumption can be easily relaxed without adding any extra insights.

[24] One can also define an *increasing recent sequence of draws*, $\{y\}_{+}$, as a sequence such that $y_t > y_{t-1} \ldots > \cdots\ y_{t-s}$. This pertains to the “disposition effect” (Magnani, 2015)—see on for a discussion.

agent that their income is on a downward path, DTT predicts they will exit the first time their income drops to hit $\overline{y}$ from above. The blue line in Figure 4 (Trajectory A) illustrates with (early) exit at round 6, following a declining 3-sequence of draws.

Figure 4. Illustration of DTT



In a scenario where income trajectories are generally declining, as in failing businesses and my experiment, many agents will never attain their upper threshold. In this case, DTT predicts that agents will continue as long as incomes remain above their lower threshold, even if this is negative. However, as their incomes approach their lower threshold and they observe a declining n-sequence of declining recent draws, agents choose to exit. Crucially, this type of exit is distinct from the previous, more favorable, type of exit since these agents might never achieve their upper threshold. The red line in Figure 4 (Trajectory B) illustrates, with (late) exit occurring at round 8.

To summarize, DTT predicts two types of exits: one at the upper and one at the lower threshold. The particular case where $\overline{y} > 0 > \underline{y}$ has parallels in the entrepreneurship literature suggesting that both favorable and unfavorable exits are observed in practice (e.g., trade sale or liquidation: Wennberg et al., 2010; Yusuf, 2012). Thus, consider a given agent who plays the same game (i.e., a game with the same parameter set) several times. Randomness will generate different trajectories in these games. In some, they obtain an initially positive sequence of income draws, which then decline, inducing them to exit at the positive upper threshold. These are classified as early exits. In other games, they face an ongoing decline, inducing them to continue until they hit their lower threshold. If these are negative, they are classified as late exits.

DTT addresses a distinct aspect of exit decision-making compared to existing models, such as the threshold theory proposed by Gimeno et al. (1997). Gimeno et al. (1997) explain differences in exit timing between individuals, attributing early or late exits to variations in their performance thresholds. In this framework, each individual is assumed to have one performance threshold. Thus, individuals are likely to exhibit consistent exit behavior across scenarios, either consistently early or consistently late. However, as we saw from Tables 4 and 5, the evidence rejects this prediction of Gimeno et al.'s (1997) model. DTT, in contrast, focuses on within-individual differences. Introducing upper and lower thresholds can explain why the same individual may exhibit early exits in some scenarios and late exits in others, even under comparable conditions—thus providing a more nuanced understanding of exit decision-making.

I summarize these arguments in the following prediction, which distinguishes DTT from EUT/PT and optimism under uncertainty:

Hypothesis 5. If entrepreneurs behave according to the DTT, early and late exits may be observed for the same agent running similar ventures at different times.

Evidently, Hypothesis 5 accords with the evidence of exit behavior observed in Tables 4 and 5. And while one might object that having two thresholds yields sufficient flexibility for a model to fit (or even overfit) the data perfectly, this is not the case. Consider for example an alternative dual threshold model associated with the so-called "disposition effect," according to which investors "sell winners early and ride losers too long" (Shefrin & Statman, 1985; Barber & Odean, 2013; Magnani, 2015). The disposition effect predicts agents will exit (i.e., sell a stock) at an upper asset price threshold following an *increasing* sequence of recent stock prices and continue holding the stock until a lower stock price threshold is reached, whereupon they sell. This theory is applicable to stock prices that do not follow a generally declining trajectory. If, however, a declining asset price trajectory occurs, disposition theory predicts late exits ("riding losers too long"). That is, of course, the opposite of what I found in my data where stochastically declining business values rose.[25]

Table 9. Income sequences prior to exits

	Exit follows negative most recent draw	Exit follows sequence of 2 negative draws	Exit follows sequence of 3 negative draws	Exit follows sequence of 4 or more negative draws	Exit follows positive most recent draw	Exit follows sequence of 2 or more	Total exit cases

[25] Note too that DTT differs from aspiration theories proposed in behavioral theories of the firm. For example, Cyert and March (1992) define an "aspiration level" of firm performance, AL, such that a manager chooses the first option that attains this level. The value of AL itself may depend on specific actions that managers take. Actions continue until performance reaches AL. However, this theory does not explicitly discuss exits, since the maintained assumption is that the firm continues operating after the aspiration is met (see Section 3.6.4).

						positive draws	
No. (%) cases	572 (12.92%)	670 (15.00%)	770 (17.24%)	1,893 (42.39%)	437 (9.79%)	119 (2.66%)	4,466

Notes: Cases of "No exit" and "exits in round 1" (i.e., exiting a game immediately before experiencing an income sequence) are excluded.

One can compare disposition theory with DTT. Disposition effect's assumption of responsiveness to increasing sequences of draws is also refuted by qualitative responses from my post-experiment survey identifying responsiveness to *decreasing*, not increasing, sequences of draws. This aspect of behavior can be explored more thoroughly by tabulating data from my participants on the actual sequences of recent income draws which preceded exits. The first four columns of Table 9 count the number of games where exits followed declining n-sequences for $n = 1$ to $n = 4$ or more; the last two do so for exits following increasing n-sequences. If most people follow DTT, the first four columns should comprise over 50% of cases, whereas if most people behave according to disposition effect theory, the last two columns in the table should comprise over 50% of cases. Table 9 shows that the underlying assumption of DTT holds in over 87% of games. I now test the theory formally by using the same econometric approach deployed earlier to test EUT.

3.7.1 DTT prediction testing

3.7.1.1 Variables and estimation

To assess whether recent declining sequences of incomes are a good predictor of exit behavior, I once again estimate the random-effects probit model whose dependent variable is a binary indicator of whether individual i exits at round r in game g. However, the independent variables in this analysis are now indicators of declining income sequences. Thus, define a dummy variable $D2_{igr}$ taking the value of 1 if income for individual *i* in game *g* was declining in the two previous rounds *r*, and 0 otherwise. Similarly, define dummy variables for income declines over the previous three and four consecutive rounds:

$$D2_{igr} = \begin{cases} 1 & for\ \{y\}_{-2} \\ 0 & otherwise \end{cases}, \qquad D3_{igr} = \begin{cases} 1 & for\ \{y\}_{-3} \\ 0 & otherwise \end{cases},$$

$$D4_{igr} = \begin{cases} 1 & for\ \{y\}_{-4} \\ 0 & otherwise \end{cases}$$

The random-effects probit model is specified as follows:

$$E^{*}_{igr} = \Phi(\beta_{D2}D2_{igr} + \beta_{D3}D3_{igr} + \beta_{D4}D4_{igr} + \boldsymbol{D}_S\Gamma + \alpha_i) \qquad (3)$$

The DTT predicts positive values of the β coefficients, whose values reflect the average weight that participants place on the various declining income sequences. As above, this model is estimated both by combining data from entrepreneurs and non-entrepreneurs, and separately by group to explore possible differences in their decision-making processes.

3.7.1.2 Results

Table 10 presents estimates of the random-effects probit model (3). Column (1) shows that, consistent with the predictions of the DTT, the coefficients for 2, 3, and 4 consecutive negative incomes are consistently positive and statistically significant [β_{D2} = 0.41 (se = 0.03), p < 0.001; β_{D3} = 0.85 (se = 0.03), p < 0.001; β_{D4} = 1.37 (se = 0.02), p < 0.001]. Hence, the likelihood of exit increases as subjects experience more negative income sequences. Columns (2) and (3) are strikingly similar, suggesting that consecutive negative income trends are strong predictors of exit behavior, regardless of whether one has been an entrepreneur or not.

Table 10. DTT: Regression results

Variables	(1) Full Sample	(2) Entrepreneurs	(3) Non Entrepreneurs
Two consecutive negative incomes	0.41***	0.41***	0.42***
	(0.03)	(0.04)	(0.04)
Three consecutive negative incomes	0.85***	0.83***	0.88***
	(0.03)	(0.04)	(0.04)
Four consecutive negative incomes	1.37***	1.37***	1.36***
	(0.02)	(0.03)	(0.03)
High initial income	-1.54***	-1.52***	-1.57***
	(0.09)	(0.13)	(0.13)
High previous investment size	-1.53***	-1.58***	-1.47***
	(0.13)	(0.19)	(0.19)
$\ln \sigma_u^2$	0.28***	0.31**	0.26*
	(0.07)	(0.10)	(0.10)
Observations	41,728	21,565	20,163
Number of Participants	422	215	207
Log Likelihood	-13436	-6843	-6592
Prob > χ^2	0.000	0.000	0.000

Notes: Dependent variable is exit, E_{igr}, which takes the value of 1 if a participant exits and 0 otherwise. Method of estimation: Random effect probit model.
**p < 0.05, **p < 0.01, ***p < 0.001*

Based on these results, I conclude that DTT appears to explain entrepreneurial exit decisions in settings where ventures are stochastically declining and where financial factors are at the forefront of entrepreneurs' minds when deciding when to exit.

Chapter 4. Discussion and Conclusion

4.1 Theoretical and practical implications

This dissertation examined entrepreneurial exit as a dynamic decision-making process, shifting the focus from the binary question of whether entrepreneurs exit to when they exit (see Section 2.8 for further discussion). Using incentivized experiments that simulate repeated decisions under deteriorating financial conditions, this dissertation investigated how entrepreneurs decide whether to continue or terminate a venture which they either know (under conditions of risk) or may come to learn (under conditions of uncertainty) yields a (stochastically) declining sequence of net returns. In doing so, this study examined whether entrepreneurial decisions follow the predictions of EUT under risk and whether optimism explains behavior under uncertainty.

To explore this, I conducted a controlled experiment that offered participants valuable financial incentives for maximizing firm value. Participants were adults, and approximately half were entrepreneurs. The experiment emphasized and incentivized financial performance as an outcome and deliberately abstracted from confounds relating to emotional and other non-financial considerations. These are conditions that would lead me to expect subjects to use probabilities when making decisions—whether following EUT or PT. In view of the enduring popularity of EUT in the economics of entrepreneurship and the marked simplicity (especially compared with previous work) of the decision-making task in the experiments, rational choice models should have predicted behavior; this was not the case. I found that the majority of subjects did not behave according to EUT under conditions of risk. They tended to exit “too early” or “too late.” Notably, participants did not take probabilities into account when making decisions, and measured risk preferences (or optimism under uncertainty) did not correlate with their actual behavior. These findings are particularly striking given that some prior experimental studies have reported behavior broadly consistent with optimizing models—specifically, exit patterns broadly aligned with real-options logic—albeit in more complex decision settings than the one studied in the present paper (e.g., Elfenbein et al., 2017; Sandri et al., 2010).

I suspect that my findings differ because in those other experiments, (student) subjects were presented with decision problems in which income draws came from a stable distribution. Exit imperatives might be less salient in settings like those, and that may have predisposed students to solve games similarly to how they had been taught in their programs. In contrast, I deliberately gave my (adult) participants a stochastically declining trajectory of income draws. Having to deal with ongoing income declines should have focused my participants' attention more closely on exit—an aspect that was emphasized to subjects in the introductory presentation of my experiment. Given that my findings were observed among students (in the pilot studies) and among adult entrepreneurs and non-entrepreneurs in my experiments, I doubt that the different results are attributable to the specific subject pools used in other studies.

Defenders of EUT cannot argue that other confounds muddy the waters, since these were excluded from the experiments by design. Yet they could contend that experimental subjects did not understand or engage with the experiment, in part because they did not have any "skin in the game." However, a careful analysis of within-experiment and post-experiment responses casts doubt on these objections. Subjects did indeed seem to understand the structure of the games they played; almost all of them took the games seriously enough to play many more rounds than they would if they were indifferent to the outcomes. Therefore, EUT seems to have really been tested fairly, yet still failed to account for observed behavior. Moreover, the evidence pinpoints the reason why EUT and PT are not supported: adults simply do not seem to use probabilities when making exit decisions.

This carries several implications for scholarship on entrepreneurial exit. First, it suggests that risk preferences might be less relevant for understanding entrepreneurial exit choices than has been commonly believed. Furthermore, if people are not using probabilities to make exit decisions, as seems to be the case in my experiments, doubt might be cast on the applicability of PT as well as EUT for analyzing entrepreneurial exit (Holmes et al., 2011). This calls for non-probabilistic models of exit-timing decisions. My findings also challenge the conventional wisdom that optimism can explain sub-optimal exit choices under conditions of uncertainty. These experimental results therefore reveal several important gaps in our understanding of how entrepreneurs make exit decisions and call for a reassessment of models of entrepreneurial exit behavior even in cases where rationality would be expected to predominate.

A second finding from my experiment is that, relative to the financial optimum, many people "left money on the table" by *knowingly* exiting too early. This finding was also unexpected because it contrasts with a strong emphasis on delayed exits in the literature (see e.g., Elfenbein et al., 2017), which lacks a framework for capturing the full spectrum of exit behaviors—particularly premature or early exit (see Section 2.8 for further discussion). The prevalence of early exits is also hard to explain since the most popular explanation for early exit in the entrepreneurship literature is opportunity cost, whereby entrepreneurs rationally close down successful ventures if a better alternative comes along (Gimeno et al., 1997). I removed this confound from my experiment but still observed a tendency for early exits. Other findings from the experiment led me to suspect that people value not only money but also performance above some psychological targets or thresholds. This has far-reaching implications for our understanding of entrepreneurial exit. Future research in this area may need to acknowledge the possibility that a high percentage of "successful" business closures cannot be completely explained by opportunity-cost logic and might reflect avoidance of breaching subjective psychic thresholds instead.

My experiments enabled me to unearth a salient heuristic that experimental subjects *do* seem to use, in place of expected utility maximization—one that, to my knowledge, is new to the literature and which I formulated abductively as "Dual Threshold Theory" (DTT). DTT is a non-rational, non-axiomatic theory which, rather than assuming people maximize or calculate with probabilities, proposes that they heuristically base exit decisions on the most recent declining sequence of incomes in relation to two subjective exit thresholds.[26] Being non-probabilistic, DTT applies to conditions which conventionally might be labeled as ones of "risk" as well as ones of "uncertainty." Interestingly, heuristics—a shortcut non-optimizing decision process—are usually justified on the grounds that information is scarce and too cognitively costly to process. However, that is not the case in my experiment where information was made freely available and easy to understand. The fact that heuristics were still preferred

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[26] DTT thereby answers a call "for an alternative non-axiomatic approach to normative analysis focused on veridical descriptions of decision process and a matching principle—between behavioral strategies and the environments in which they are used" (Berg & Gigerenzer, 2010: 133).

suggests that people might find heuristics more appealing than calculating expected values, even when real money is at stake.[27] A preference for heuristic-based decision-making is echoed in studies on entrepreneurial persistence (e.g., Chen et al. 2018; Lin et al., 2022). One of my principal contributions is to give a precise form to the specific heuristic driving exit-timing choices, which promises to extend our knowledge of when and why entrepreneurs exit their businesses when trading conditions decline.

More generally, I believe that future research should move beyond the notion of trying to understand entrepreneurial exit in terms of one threshold (e.g., Gimeno et al., 1997) and instead think of two, as in DTT.[28] Perhaps the theories I tested and found wanting were being asked to do too much with too little. After all, exits are known to fall on a continuum, ranging from unsuccessful failures (lower threshold) all the way to successful trade sales (upper threshold). As Wennberg et al. (2010) put it, "entrepreneurs exit from both firms in financial distress and firms performing well." Perhaps I should be surprised if theories proposing only one exit threshold were able to capture this diversity. From this perspective, having a second threshold, as per DTT, might be the very least that is needed. My evidence shows that two thresholds are necessary to explain why the same individual might exit early or late depending on the specific venture trajectory they followed; Gimeno et al.'s (1997) model is unable to account for this. More generally, future research may need to acknowledge the possibility that a high percentage of "successful" business closures cannot be completely explained by opportunity-

[27] This finds a parallel in gambling, since gamblers appear to prefer using heuristics than using probabilities (Stetzka & Winter, 2023). For example, conditioning continuation at the roulette table on prior outcomes is not rational and can lead to "Gambler's Ruin." See also Coad et al. (2013) for an application to entrepreneurial growth and exit.

[28] DTT also differs from Gimeno et al.'s (1997) theory in two other respects. One is that Gimeno et al.'s model is based on expected utility theory and does not predict that exit follows a declining sequence of draws—unlike DTT.

cost logic and might reflect reaction to breaching subjective psychic thresholds instead.

My experimental findings proved to be robust within and across the three studies, generating additional insights which may be of separate interest to entrepreneurship scholars. For example, problem-framing effects and entrepreneurial experience made little difference to exit-timing decisions. On a practical note, the last point might reassure researchers who are conducting experimental research on entrepreneurial tasks but are lacking access to entrepreneur subjects—at least when exit-timing decisions are being studied, as they are here.

My findings might also have implications for scholarship in other areas of management. For example, consider a manager deciding whether to continue or terminate a legacy product line which is gradually becoming obsolete and overtaken by rivals (Harrigan, 2003) or a head office deciding whether to continue operating a subsidiary facing declining performance for reasons outside the control of head office, e.g., increasing expropriation by politicians in the host country (Berry, 2013; Gonchar & Greve, 2022). These examples also entail exogenous performance decline, where decision makers can decide when and whether to discontinue but can do little to stave off the decline itself. In all these cases, my experimental findings lead me to expect the following: deviations from optimal behavior; a mixed record of closure timing by managers facing similar problems at different times; and exits that follow a sequence of declines in trading conditions.

4.2 Limitations and directions for future research

This paper is subject to several limitations. First, although I framed the experiment as an entrepreneurial task, obtained a sample of entrepreneur participants, and implemented a plausible representation of a declining venture in a way that was simple enough for respondents to understand, questions of external validity inevitably remain. Participants were asked to put themselves in the shoes of a real owner-manager, but they still did so in the context of a hypothetical, not a real, enterprise. Moreover, most entrepreneurs operate, at most, only one venture throughout their lives, not a sequence of them, as in my experiment (Parker, 2013). In practice, real entrepreneurial exit decisions are made over periods of weeks and months, not seconds and minutes as in my experiment.[29] On the other hand, had I analyzed real-time decisions about real businesses instead, my analysis would have been vulnerable to the problem of introducing multiple unobserved time-dependent confounds, which would likely obscure the decision-making process that is of central (and possibly more general) interest here.

A second and related objection relates to my finding that people did not optimize. A criticism of prior experiments testing EUT and PT is that they tend not to investigate "whether people who deviate from axiomatic rationality face economically significant losses" (Berg & Gigerenzer, 2010: 133). While I did investigate this and found evidence that they do, my findings still run into the principled objection that non-optimizers are vulnerable to being endlessly "money pumped" by others who can exploit their mistakes (Cubitt & Sugden, 2001). Relatedly, I need to acknowledge that the incentives in my experiments may have been too weak to motivate optimizing behavior. In the workplace,

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[29] These limitations do, of course, also apply to other experimental analyses of entrepreneurial exit, including Elfenbein et al. (2017), Lin et al. (2022), and Sandri et al. (2010).

where substantial sums of money and livelihoods are at stake, people might behave differently. Yet, it is also worth pointing out that non-optimization in my experiment did not tend to involve losses but rather smaller gains than were possible; there was no scope for money pumping in my setting. Besides, employees or others who are vulnerable to financial exploitation might know this and presumably avoid putting themselves into situations where they expose themselves to it.

Third, although DTT posits that exit behavior is driven by income trajectories in relation to two subjective thresholds, these thresholds were not directly measured or manipulated in this study. Instead, the empirical test focuses solely on declining income trends. Given that DTT was developed inductively to explain puzzling behavioral patterns, and because subjective thresholds are unobservable and were not directly measured or manipulated, focusing on declining income trends was the most practical way to examine the theory's core logic. Nevertheless, the experiment incorporated a variety of income trajectories, including steady declines and declines with partial recoveries. This allows me to explore how the same individual responds differently across income trajectories, offering indirect evidence that can be used to infer the presence of upper and lower thresholds. For example, I could compare decisions in games with early gains followed by decline versus those with steady declines. If DTT is correct, participants should exit early in the former and late in the latter. While not formally analyzed here, the existing design provides ample behavioral variation to explore the core mechanisms of DTT in future studies. Future research could also test DTT more directly by asking participants to report their personal thresholds during the task. Comparing these self-reported thresholds to actual exit behavior could reveal whether decisions align with the dual-threshold mechanism proposed by DTT.

Building on this, several additional avenues of future research emerge. First, I call for independent tests of DTT in future experiments and in different settings. Second, individual behavior is generally sensitive to the nature of the decision task presented to experimental subjects. Future work should vary and adapt the stopping problem to better understand the boundary conditions pertaining to DTT. Thus, while I found direct evidence against EUT in this paper, that theory seems to do a better job of explaining other decision problems where mean payoffs are stable (Elfenbein et al., 2017; Sandri et al., 2010). Third, it would be desirable to use even larger sample sizes than those used here to increase the power of the statistical tests I conducted.

Finally, future work could also explore the more benign context of exogenous venture growth rather than venture decline; I studied the unsuccessful type of venture exit, but the successful type also deserves analysis. For example, consider a founder deciding when to sell the business to an incumbent or continue growing the venture themselves (Arora et al., 2021; Cotei & Farhat, 2018). Would the underlying behavior detected in my experiment carry over to a growth setting? Or would the lower threshold of the DTT cease to apply and disposition theory do a better job at explaining behavior? This line of research promises to expand our understanding of entrepreneurial exit behavior to a broader set of contexts.

4.3 Conclusion

This thesis advances entrepreneurial exit research by exploring when entrepreneurs exit their declining ventures. A review of the literature in Chapter 2 highlighted that while much research has examined why and whether entrepreneurs exit, less is known about how they time their exits—particularly under conditions of risk and uncertainty. Seeking to advance understanding in this area, this study used an experimental method to provide empirical evidence that challenges EUT, revealing that entrepreneurs do not necessarily maximize expected financial value when making exit decisions under risk, nor do they conform to predictions based on over-optimism under uncertainty. Instead, the findings suggest that entrepreneurs neglect probability information under risk or attempt to estimate it under uncertainty, deviating from traditional economic models of rational behavior.

A key contribution of this research is the development of DTT, which explains how entrepreneurs make exit decisions based on income trends relative to two subjective thresholds, rather than explicit probability assessments. This framework provides a new perspective on exit timing, complementing and extending prior threshold-based models.

In conclusion, this dissertation contributes to the literature on entrepreneurial exit by offering new empirical insights and a novel theoretical framework. By highlighting the cognitive mechanisms shaping exit-timing decisions, it lays the groundwork for future research on the psychological and behavioral factors influencing entrepreneurial exit.

References

Ackert, L. F., & Athanassakos, G. (1997). Prior uncertainty, analyst bias, and subsequent abnormal returns. Journal of Financial Research, 20(2), 263–273. https://doi.org/10.1111/j.1475-6803.1997.tb00248.x

Adams, G., Prescher, J., Beehr, T., & Lepisto, L. (2002). Applying work-role attachment theory to retirement decisions. *International Journal of Aging and Human Development*, 54 (2), 125–137. https://doi.org/10.2190/JRUQ-XQ2N-UP0A-M432

Adomako, S., Danso, A., Uddin, M., & Damoah, J. O. (2016). Entrepreneurs' optimism, cognitive style and persistence. *International Journal of Entrepreneurial Behavior & Research,* 22(1), 84–108. https://doi.org/10.1108/IJEBR-07-2015-0158

Ahl, H. (2004). *The scientific reproduction of gender inequality*. Abingdon: Marston Book Services.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes,* 50(2), 179–211. https://doi.org/10.1080/10410236.2018.1493416

Alarcon, G. M. (2011). A meta-analysis of burnout with job demands, resources, and attitudes. *Journal of Vocational Behavior*, 79(2), 549–562. https://doi.org/10.1016/j.jvb.2011.03.007

Aldrich, H. (2015). Perpetually on the eve of destruction? Understanding exits in capitalist societies at multiple levels of analysis. In D. DeTienne & K. Wennberg (Eds.), *Research handbook of entrepreneurial exit* (pp. 11–42). Cheltenham: Edward Elgar Publishing.

Alvarez, S. A., & Parker S. C. (2009). Emerging firms and the allocation of control rights: A Bayesian approach. *Academy of Management Review*, 34(2), 209-227. https://doi.org/10.5465/amr.2009.36982616

Anderson, B. S., Wennberg, K., & McMullen, J. S. (2019). Editorial: Enhancing quantitative theory-testing entrepreneurship research. *Journal of Business Venturing*, 34(5), 105928. https://doi.org/10.1016/j.jbusvent.2019.02.001

Anderson, P., & Tushman, M. L. (2001). Organizational environments and industry exit: The effects of uncertainty, munificence and complexity. *Industrial and Corporate Change*, 10(3), 675–711. https://doi.org/10.1093/icc/10.3.675

Anglin, A., Kincaid, P., Short, J., & Allen, D. (2022). Role theory perspectives: Past, present, and future applications of role theories in management research. *Journal of Management*, 48(6), 1469–1502. https://doi.org/10.1177/014920632210814

Arkes, H. R., & Blumer, C. (1985). The psychology of sunk cost. *Organizational Behavior and Human Decision Processes*, 35(1), 124–140. https://doi.org/10.1016/0749-5978(85)90049-4

Arnold, V., Collier, P.A., Leech, S.A., & Sutton, S. G. (2000). The effect of experience and complexity on order and recency bias in decision making by professional accountants. *Accounting and Finance*, 40(2), 109-134. https://doi.org/10.1111/1467-629X.00039

Arora, A., Fosfuri, A., & Rønde, T. (2021). Waiting for the payday? The market for startups and the timing of entrepreneurial exit. *Management Science*, 67(3), 1453-1467. https://doi.org/10.1287/mnsc.2020.3627

Arrow, K. J. (1951). Alternative approaches to the theory of choice in risk-taking situations. *Econometrica*, 19(4), 404-437. https://www.jstor.org/stable/1907465

Asante, E. A., Danquah, B., Oduro, F., Affum-Osei, E., Twumasi, M. A., Azunu, C., & Li, C. (2022). Entrepreneurial career persistence of hybrid entrepreneurs: The opposing moderating roles of wage work-to-entrepreneurship enrichment and entrepreneurship-to-wage work enrichment. *Journal of Vocational Behavior*, 132, Article 103660. https://doi.org/10.1016/j.jvb.2021.103660

Åstebro, T., Herz, H., Nanda, R., & Weber, R. A. (2014). Seeking the roots of entrepreneurship: Insights from behavioral economics. *The Journal of Economic Perspectives*, 28(3), 49–69. https://doi.org/10.1257/jep.28.3.49

Åstebro, T., Jeffrey, S. A., & Adomdza, G. K. (2007). Inventor perseverance after being told to quit: The role of cognitive biases. *Journal of Behavioral Decision Making*, 20(3), 253–272. https://doi.org/10.1002/bdm.554

Athanassakos, G., & Kalimipalli, M. (2003). Analyst forecast dispersion and future stock return volatility. Quarterly Journal of Business and Economics, 42(1/2), 57–78. https://www.jstor.org/stable/40473364

Bahrami, H., & Evans, S. (1995). Flexible re-cycling and high-technology entrepreneurship. *California Management Review*, 37(3), 62–89. https://doi.org/10.2307/41165799

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Banks, J, Olson, M., & Porter, D. (1997). An experimental analysis of the bandit problem. *Economic Theory*, 10(1), 55–77. https://www.jstor.org/stable/25055024

Barber, B. M., & Odean, T. (2013). The behavior of individual investors. In Handbook of the Economics of Finance, 2, 1533-1570. https://doi.org/10.1016/B978-0-44-459406-8.00022-6

Barberis, N. (2013). Thirty years of prospect theory in economics: A review and assessment. *Journal of Economic Perspectives*, 27(1), 173-195. https://doi.org/10.1257/jep.27.1.173

Baribault, B., Donkin, C., Little, D. R., Trueblood, J. S., Oravecz, Z., Van Ravenzwaaij, D., ... & Vandekerckhove, J. (2018). Metastudies for robust tests of theory. *Proceedings of the National Academy of Sciences*, 115(11), 2607-2612. https://doi.org/10.1073/pnas.1708285114

Barthauer, L., Kaucher, P., Spurk, D., & Kauffeld, S. (2020). Burnout and career (un)sustainability: Looking into the black box of burnout-triggered career turnover intentions. *Journal of Vocational Behavior*, 117, Article 103334. https://doi.org/10.1016/j.jvb.2019.103334

Bates, T. (2005). Analysis of young, small firms that have closed: Delineating successful from unsuccessful closures. *Journal of Business Venturing*, 20(3), 343–358. https://doi.org/10.1016/j.jbusvent.2004.01.003

Baù, M., Sieger, P., Eddleston, K. A., & Chirico, F. (2017). Fail but try again? The effects of age, gender, and multiple–owner experience on failed entrepreneurs' reentry. *Entrepreneurship Theory and Practice*, 41(6), 909–941. https://doi.org/10.1111/etap.12233

Baum, J. R., & Locke, E. A. (2004). The Relationship of Entrepreneurial Traits, Skill, and Motivation to Subsequent Venture Growth. *Journal of Applied Psychology*, 89(4), 587–598. https://doi.org/10.1037/0021-9010.89.4.587

Bennett, A. A., Lanivich, S. E., Moeini Gharagozloo, M. M., & Akbulut, Y. (2021). Appraisals matter: Relationships between entrepreneurs' stress appraisals and venture-based outcomes. *International Journal of Entrepreneurial Behavior & Research*, 27(4), 970–988. https://doi.org/10.1108/IJEBR-03-2020-0133

Berg, N., & Gigerenzer, G. (2010). As-if behavioral economics: Neoclassical economics in disguise? *History of Economic Ideas*, 18(1), 133-166. http://dx.doi.org/10.2139/ssrn.1677168

Berrone, P., Cruz, C., & Gomez-Mejia, L. R. (2012). Socioemotional wealth in family firms: Theoretical dimensions, assessment approaches, and agenda for future research. *Family Business Review*, 25(3), 258–279. https://doi.org/10.1177/0894486511435355

Berrone, P., Cruz, C., Gomez-Mejia, L. R., & Larraza-Kintana, M. (2010). Socioemotional wealth and corporate response to institutional pressures: Do family-controlled firms pollute less? *Administrative Science Quarterly*, 55(1), 82–113. https://doi.org/10.2189/asqu.2010.55.1.82

Berry, H. (2013). When do firms divest foreign operations? *Organization Science*, 24(1), 246–261. https://doi.org/10.1287/orsc.1110.0724

Biddle, B. J. (1986). Recent developments in role theory. *Annual Review of Sociology*, 12, 67–92. https://doi.org/10.1146/annurev.so.12.080186.000435

Billingsley, K. D., Waehler, C. A., & Hardin, S. I. (1993). Stability of optimism and choice of coping strategy. *Perceptual and Motor Skills*, 76(1), 91-97. http://dx.doi.org/10.2466/pms.1993.76.1.91

Bingham, C. B., & Eisenhardt, K. M. (2011). Rational heuristics: The 'simple rules' that strategists learn from process experience. *Strategic Management Journal*, 32(13), 1437–1464. https://doi.org/10.1002/smj.965

Bird, B. (1988). Implementing entrepreneurial ideas: The case for intention. *Academy of Management Review*, 13(3), 442–453. https://doi.org/10.2307/258091

Bird, G. (2005). Over-optimism and the IMF. *The World Economy*, 28(9), 1355–1373. https://doi.org/10.1111/j.1467-9701.2005.00737.x

Bird, M., & Wennberg, K. (2016). Why family matters: The impact of family resources on immigrant entrepreneurs' exit from entrepreneurship. *Journal of Business Venturing*, 31(6), 687–704. http://dx.doi.org/10.1016/j.jbusvent.2016.09.002

Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, 59(1), 20–28. https://doi.org/10.1037/0003-066X.59.1.20

Boyd, D. P., & Gumpert, D. E. (1983). Coping with entrepreneurial stress. *Harvard Business Review*, 61(2), 44–52.

Brachert, M., Hyll, W., & Titze, M. (2017). On the simultaneity bias in the relationship between risk attitudes, entry into entrepreneurship and entrepreneurial survival. *Applied Economics Letters*, 24(7), 477-480.https://doi.org/10.1080/13504851.2016.1203056

Brealey, R., Myers, S., & Marcus, A. (2007). *Fundamentals of corporate finance*. London, UK: McGraw-Hill.

Brigham, K., De Castro, J., & Shepherd, D. (2007). A person–organization fit model of owner-managers' cognitive style and organizational demands. *Entrepreneurship Theory and Practice*, 31(1), 29–51. https://doi.org/10.1111/j.1540-6520.2007.00162.x

Brockner, J. (1992). The escalation of commitment to a failing course of action: Toward theoretical progress. *Academy of Management Review*, 17(1), 39–61. https://www.jstor.org/stable/258647

Bromiley, P. (2010). Looking at prospect theory. *Strategic Management Journal*, 31(12), 1357-1370. https://doi.org/10.1002/smj.885

Brown, G., Lawrence, T. B., & Robinson, S. L. (2005). Territoriality in Organizations. *Academy of Management Review*, 30(3), 577–594. https://doi.org/10.2307/20159145

Brüderl, J., Preisendörfer, P., & Ziegler, R. (1992). Survival chances of newly founded business organizations. *University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship*. https://ssrn.com/abstract=1504471

Brush, C. G. (1992). Research on women business owners: Past trends, a new perspective and future directions. *Entrepreneurship Theory and Practice*, 16(4), 5–30. https://doi.org/10.1177/104225879201600401

Brush, C. G., Edelman, L. F., Manolova, T., & Welter, F. (2019). A gendered look at entrepreneurship ecosystems. *Small Business Economics*, 53(2), 393–408. https://doi.org/10.1007/s11187-018-9992-9

Burgelman, R. (1994). Fading memories: A process theory of strategic business exit in dynamic environments. *Administrative Science Quarterly*, 39(1), 24–56. https://doi.org/10.2307/2393493

Busenitz, L. W., & Barney, J. B. (1997). Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making. *Journal of Business Venturing*, 12(1), 9-30. https://doi.org/10.1016/S0883-9026(96)00003-1

Buttner, E. H. (1992). Entrepreneurial stress: Is it hazardous to your health? *Journal of Managerial Issues*, 4(2), 223–240.

Caliendo, M., Fossen, F. M., & Kritikos, A. S. (2010). The impact of risk attitudes on entrepreneurial survival. *Journal of Economic Behavior and Organization*, 76(1), 45–63. https://doi.org/10.1016/j.jebo.2010.02.012

Caliendo, M., Goethner, M., & Weißenberger, M. (2020). Entrepreneurial persistence beyond survival: Measurement and determinants. *Journal of Small Business Management*, 58(3), 617-647. https://doi.org/10.1080/00472778.2019.1666532

Caliendo, M., Kritikos, A. S., Rodríguez, D., et al. (2023). Self-efficacy and entrepreneurial performance of start-ups. *Small Business Economics*, 61, 1027–1051. https://doi.org/10.1007/s11187-022-00728-0

Camerer, C. F., & Lovallo, D. (1999). Overconfidence and excess entry: An experimental approach. *American Economic Review*, 89, 306–318. https://www.jstor.org/stable/116990

Cardon, M. S., & Kirk, C. P. (2015). Entrepreneurial passion as mediator of the self–efficacy to persistence relationship. *Entrepreneurship Theory and Practice*, 39(5), 1027–1050. https://doi.org/10.1111/etap.12089

Cardon, M. S., Wincent, J., Singh, J., & Drnovsek, M. (2009). The nature and experience of entrepreneurial passion. *Academy of Management Review*, 34(3), 511–532. https://doi.org/10.5465/AMR.2009.40633190

Cavanaugh, M. A., Boswell, W. R., Roehling, M. V., & Boudreau, J. W. (2000). An empirical examination of self-reported work stress among US managers. *Journal of Applied Psychology*, 85(1), 65–74. https://doi.org/10.1037/0021-9010.85.1.65

Cefis, E., Bettinelli, C., Coad, A., & Marsili, O. (2022). Understanding firm exit: A systematic literature review. *Small Business Economics*, 59, 423–446. https://doi.org/10.1007/s11187-021-00480-x

Cervellati, E. M., Pattitoni, P., & Savioli, M. (2022). Do overconfident and over-optimistic entrepreneurs invest too much in their companies? Theory and evidence from Italian SMEs. *Strategic Entrepreneurship Journal*, 16(4), 769-800. http://doi.org/10.1002/sej.1421

Chadwick, I. C., & Raver, J. L. (2018). Psychological resilience and its downstream effects for business survival in nascent entrepreneurship. *Entrepreneurship Theory and Practice*, 44(2), 233–255. https://doi.org/10.1177/1042258718801597

Chang, J. W., & Choi, H. M. (2017). Analyst optimism and incentives under market uncertainty. The Financial Review, 52(3), 307–345. http://dx.doi.org/10.2139/ssrn.2667450

Chen, D. L., Schonger, M., & Wickens, C. (2016). oTree—An open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance*, 9, 88-97. https://doi.org/10.1016/j.jbef.2015.12.001

Chen, J. S., Croson, D. C., Elfenbein, D. W., & Posen, H. E. (2018). The impact of learning and overconfidence on entrepreneurial entry and exit. *Organization Science*, 29(6), 989-1009. https://doi.org/10.1287/orsc.2018.1225

Chevalier, S., Fouquereau, E., Gillet, N., & Bosselut, G. (2018). Unraveling the perceived reasons underlying entrepreneurs' retirement decisions: A person-centered perspective. *Journal of Small Business Management*, 56, 513–528. https://doi.org/10.1111/jsbm.12312

Chevalier, S., Fouquereau, E., Gillet, N., & Demulier, V. (2013). Development of the reasons for entrepreneurs' retirement decision inventory and preliminary evidence of its psychometric properties in a French sample. *Journal of Career Assessment*, 21(3), 1–15. https://doi.org/10.1177/1069072712475288

Chirico, F., Gómez-Mejía, L. R., Hellerstedt, K., Withers, M., & Nordqvist, M. (2020). To merge, sell, or liquidate? Socioemotional wealth, family control, and the choice of business exit. *Journal of Management*, 46(8), 1342–1379. https://doi.org/10.1177/0149206318818723

Cho, I., & Orazem, P. F. (2021). How endogenous risk preferences and sample selection affect analysis of firm survival. *Small Business Economics*, 56(4), 1309-1332. https://doi.org/10.1007/s11187-019-00288-w

Choi, Y. R., Lévesque, M., & Shepherd, D. A. (2008). When should entrepreneurs expedite or delay opportunity exploitation? *Journal of Business Venturing*, 23(3), 333–355. https://doi.org/10.1016/j.jbusvent.2006.11.001

Chuang, Y., & Schechter, L. (2015). Stability of experimental and survey measures of risk, time, and social preferences: A review and some new results. *Journal of Development Economics*, 117, 151-170. https://doi.org/10.1016/j.jdeveco.2015.07.008

Coad, A. (2014). Death is not a success: Reflections on business exit. *International Small Business Journal*, 32(7), 721-732. https://doi.org/10.1177/0266242612475104

Coad, A., & Storey, D. J. (2021). Taking the entrepreneur out of entrepreneurship. *International Journal of Management Reviews*, 23(4), 541–548. https://doi.org/10.1111/ijmr.12249

Coad, A., Frankish, J., Roberts, R. G., & Storey, D. J. (2013). Growth paths and survival chances: An application of Gambler's Ruin theory. *Journal of Business Venturing*, 28(5), 615–632. https://doi.org/10.1016/j.jbusvent.2012.06.002

Coelho, M., de Meza, D., & Reyniers, D. (2004). Irrational exuberance, entrepreneurial finance and public policy. *International Tax and Public Finance*, 11, 391-417. https://doi.org/10.1023/B:ITAX.0000033985.96539.65

Collewaert, V. (2012). Angel investors' and entrepreneurs' intentions to exit their ventures: A conflict perspective. *Entrepreneurship Theory and Practice*, 36(4), 753–779. https://doi.org/10.1111/j.1540-6520.2011.00456.x

Connor, K. M., & Davidson, J. R. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety*, 18(2), 76–82. https://doi.org/10.1002/da.10113

Coombs, C. H. (1975). Portfolio theory and the measurement of risk. In M. F. Kaplan & S. Schwartz (Eds.), *Human judgment and decision processes* (pp. 63–86).

Cooper, C. L., Flint-Taylor, J., & Pearn, M. (2013). *Building resilience for success: A resource for managers and organizations.* Basingstoke: Palgrave Macmillan. http://dx.doi.org/10.1057/9781137367839

Coppens, K., & Knockaert, M. (2022). Committed to the venture or the family? A study of entrepreneurial persistence in distressed ventures. *Small Business Economics*, 58(1), 263–280. https://doi.org/10.1007/s11187-021-00486-5

Corner, P. D., Singh, S., & Pavlovich, K. (2017). Entrepreneurial resilience and venture failure. *International Small Business Journal: Researching Entrepreneurship*, 35(6), 687–708. https://doi.org/10.1177/0266242616685604

Cotei, C., & Farhat, J. (2018). The M&A exit outcomes of new, young firms. *Small Business Economics*, 50, 545-567. https://www.jstor.org/stable/44697315

Coucke, K., Pennings, E., & Sleuwaegen, L. (2007). Employee lay-off under different modes of restructuring: Exit, downsizing or relocation. *Industrial and Corporate Change*, 16, 161–182. https://doi.org/10.1093/icc/dtm002

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior.* Cambridge: Cambridge University Press.

Cubitt, R. P., & Sugden, R. (2001). On money pumps. *Games and Economic Behavior*, 37(1), 121-160. https://doi.org/10.1006/game.2000.0834

Cueto, B., Suárez, P., & Mayor, M. (2021). Effects of human capital and regional context on entrepreneurial survival. *The Annals of Regional Science*, 66(2), 331-357. https://doi.org/10.1007/s00168-020-01023-0

Cyert, R. M., & March, J. G. (1992). *A Behavioral Theory of the Firm* (2nd ed.). Cambridge, MA: Blackwell.

De Blasio, G., De Paola, M., Poy, S., & Scoppa, V. (2020). Massive earthquakes, risk aversion, and entrepreneurship. *Small Business Economics*, 57(1), 295-322. https://doi.org/10.1007/s11187-020-00327-x

De Meza, D., & Southey, C. (1996). The borrower's curse: Optimism, finance and entrepreneurship. *Economic Journal*, 106(435), 375–386. https://www.jstor.org/stable/2235253

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology*, 86(3), 499–512. https://doi.org/10.1037/0021-9010.86.3.499

DeTienne, D. R. (2010). Entrepreneurial exit as a critical component of the entrepreneurial process: Theoretical development. *Journal of Business Venturing*, 25(2), 203–215. https://doi.org/10.1016/j.jbusvent.2008.05.004

DeTienne, D. R., & Cardon, M. S. (2012). Impact of founder experience on exit intentions. *Small Business Economics*, 38, 351–374. https://doi.org/10.1007/s11187-010-9284-5

DeTienne, D. R., & Chirico, F. (2013). Exit strategies in family firms: How socioemotional wealth drives the threshold of performance. *Entrepreneurship Theory and Practice*, 37(6), 1297–1318. https://doi.org/10.1111/etap.12067

DeTienne, D. R., McKelvie, A., & Chandler, G. N. (2015). Making sense of entrepreneurial exit strategies: A typology and test. *Journal of Business Venturing*, 30, 255–272. https://doi.org/10.1016/j.jbusvent.2014.07.007

DeTienne, D. R., Shepherd, D. A., & De Castro, J. (2008). The fallacy of only the strong survive: The effects of extrinsic motivation on the persistence decisions for under-performing firms. *Journal of Business Venturing*, 23(5), 528-546. https://doi.org/10.1016/j.jbusvent.2007.09.004

DeTienne, D. R., & Wennberg, K. (2016). Studying exit from entrepreneurship: new directions and insights. *International Small Business Journal*, 34(2), 151-156. https://doi.org/10.1177/0266242615601202

Dixit, A. (1989). Entry and exit decisions under uncertainty. *Journal of Political Economy*, 97, 620–638. https://www.jstor.org/stable/1830458

Dixit, A. (1992). Investment and hysteresis. *The Journal of Economic Perspectives*, 6, 107–132. https://www.jstor.org/stable/2138376

Dixit, A., & Pindyck, R. (1994). *Investment Under Uncertainty*. Princeton, NJ, USA: Princeton University Press.

Eagly, A. H. (1987). *Sex differences in social behavior: A social-role analysis*. Hillsdale, NJ: Erlbaum.

Eagly, A. H., & Karau, S. J. (2002). Role congruity theory of prejudice toward female leaders. *Psychological Review*, 109, 573–598. https://doi.org/10.1037/0033-295X.109.3.573

Eagly, A. H., & Wood, W. (2012). Social role theory. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (Vol. 2, pp. 458–476). Thousand Oaks, CA: Sage.

Einhorn, H. J., & Hogarth, R. M. (1981). Behavioral decision theory: Processes of judgment and choice. *Annual Review of Psychology*, 32, 53–88. https://doi.org/10.2307/2490959

Elbanna, S. & Child, J. (2007). The influence of decision, environmental and firm characteristics on the rationality of strategic decision-making. *Journal of Management Studies*, 44(4), 561-591. https://doi.org/10.1111/j.1467-6486.2006.00670.x

Elfenbein, D. W., & Knott, A. M. (2015). Time to exit: Rational, behavioral, and organizational delays. *Strategic Management Journal*, 36(7), 957–975. https://doi.org/10.1002/smj.2262

Elfenbein, D. W., Knott, A. M., & Croson, R. (2017). Equity stakes and exit: An experimental approach to decomposing exit delay. *Strategic Management Journal*, 38(2), 278-299. https://doi.org/10.1002/smj.2493

Elshaer, I. A., & Saad, S. K. (2021). Entrepreneurial resilience and business continuity in the tourism and hospitality industry: The role of adaptive performance and institutional orientation. *Tourism Review*, 77(5), 1365–1384. https://doi.org/10.1108/TR-04-2021-0171

Evans, D. S., & Jovanovic, B. (1989). An estimated model of entrepreneurial choice under liquidity constraints. *Journal of Political Economy*, 97(4), 808–827. https://www.jstor.org/stable/1832192

Evans, D. S., & Leighton, L. S. (1989). The determinants of changes in U.S. self-employment, 1968–1987. *Small Business Economics*, 1, 111–119. https://doi.org/10.1007/BF00398629

Falk, A., & Heckman, J. J. (2009). Lab experiments are a major source of knowledge in the social sciences. *Science,* 326(5952), 535-538. https://doi.org/10.1126/science.1168244

Feldman, D. C. (1994). The decision to retire early: A review and conceptualization. *Academy of Management Review*, 19, 285–311. https://doi.org/10.2307/258706

Feng, B., & Chen, M. (2020). The impact of entrepreneurial passion on psychology and behavior of entrepreneurs. *Frontiers in Psychology*, 11, 1733. https://doi.org/10.3389/fpsyg.2020.01733

Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology*, 50(5), 992–1003. https://doi.org/10.1037/0022-3514.50.5.992

Foss, L., Henry, C., Ahl, H., et al. (2019). Women's entrepreneurship policy research: A 30-year review of the evidence. *Small Business Economics*, 53(2), 409–429. https://www.jstor.org/stable/48702016

Fox, S., & Spector, P. E. (1999). A model of work frustration-aggression. Journal of *Organizational Behavior*, 20(6), 915–931. https://doi.org/10.1002/(SICI)1099-1379(199911)20:6<915::AID-JOB918>3.0.CO;2-6

Frederick, S., Loewenstein, G., & O'Donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature*, 40(2), 351–401. https://doi.org/10.1257/002205102320161311

Fu, K., Wennberg, K., & Falkenhall, B. (2020). Productive entrepreneurship and the effectiveness of insolvency legislation: A cross-country study. *Small Business Economics*, 54(2), 383–404. https://doi.org/10.1007/s11187-018-0040-6

Gänser-Stickler, G. M., Schulz, M., & Schwens, C. (2022). Sitting on the fence—Untangling the role of uncertainty in entrepreneurship and paid employment for hybrid entry. *Journal of Business Venturing*, 37(2), Article 106176. https://doi.org/10.1016/j.jbusvent.2021.106176

Garland, H. (1990). Throwing good money after bad: The effect of sunk costs on the decision to escalate commitment to an ongoing project. *Journal of Applied Psychology*, 75(6), 728–731. https://doi.org/10.1037/0021-9010.75.6.728

Gianetti, M., & Simonov, A. (2004). On the determinants of entrepreneurial activity; social norms, economic environment and individual characteristics. *Swedish Economy Policy Review*, 11(2), 269-313. http://dx.doi.org/10.2139/ssrn.554511

Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly*, 42(4), 750-783. https://www.jstor.org/stable/2393656

Gómez-Mejía, L. R., Haynes, K. T., Núñez-Nickel, M., Jacobson, K. J. L., & Moyano-Fuentes, J. (2007). Socioemotional wealth and business risks in family-controlled firms: Evidence from Spanish olive oil mills. *Administrative Science Quarterly*, 52, 106–137. https://doi.org/10.2189/asqu.52.1.106

Gonchar, K., & Greve, M. (2022). The impact of political risk on FDI exit decisions. *Economic Systems*, 46(2), 100975. https://doi.org/10.1016/j.ecosys.2022.100975

Gonzalez, W. J. (2003). Rationality in experimental economics: An analysis of Reinhard Selten's approach. In *Observation and Experiment in the Natural and Social Sciences*, 237, 71-83. Dordrecht: Springer Netherlands. https://doi.org/10.1007/0-306-48123-5_5

Gottlieb, J., Oudeyer, P.-Y., Lopes, M., & Baranes, A. (2013). Information seeking, curiosity and attention: Computational and neural mechanisms. *Trends in Cognitive Sciences*, 17(11), 585–596. https://doi.org/10.1016/j.tics.2013.09.001

Grable, J. E., & Lytton, R. H. (2001). Assessing the concurrent validity of the SCF risk tolerance question. *Financial Counseling and Planning*, 12(2), 43-52.

Greenhaus, J. H., & Allen, T. D. (2011). Work-family balance: A review and extension of the literature. In J. C. Quick & L. E. Tetrick (Eds.), *Handbook of occupational health psychology* (Vol. 2, pp. 165–183). Washington, DC: American Psychological Association.

Grekou, D., & Liu, H. (2018). *The entry into and exit out of self-employment and business ownership in Canada*. Economic Analysis Division, Statistics Canada. https://www150.statcan.gc.ca/n1/pub/11f0019m/11f0019m2018407-eng.html

Guercini, S., & Milanesi, M. (2020). Heuristics in international business: A systematic literature review and directions for future research. *Journal of International Management*, 26(4), 100782. https://doi.org/10.1016/j.intman.2020.100782

Gupta, V. K., Turban, D. B., Wasti, S. A., & Sikdar, A. (2009). The role of gender stereotypes in perceptions of entrepreneurs and intentions to become an entrepreneur. *Entrepreneurship Theory and Practice*, 33(2), 397–417. https://doi.org/10.1111/j.1540-6520.2009.00296.x

Harrigan, K. R. (2003). *Declining demand, divestiture, and corporate strategy*. Washington, DC: Beard Books.

Harris, J. A., Saltstone, R., & Fraboni, M. (1999). An evaluation of the job stress questionnaire with a sample of entrepreneurs. *Journal of Business and Psychology*, 13(3), 447–455. https://doi.org/10.1023/A:1022938719353

Haveman, H. A., & Khaire, M. V. (2004). Survival beyond succession? The contingent impact of founder succession on organizational failure. *Journal of Business Venturing*, 19(3), 437–463. https://doi.org/10.1016/S0883-9026(03)00039-9

Hayward, M. L. A., Forster, W. R., Sarasvathy, S. D., & Fredrickson, B. L. (2010). Beyond hubris: How highly confident entrepreneurs rebound to venture again.

Journal of Business Venturing, 25(6), 569–578. https://doi.org/10.1016/j.jbusvent.2009.03.002
Heilman, M. E. (2001). Description and prescription: How gender stereotypes prevent women's ascent up the organizational ladder. *Journal of Social Issues*, 57, 657–674. https://doi.org/10.1111/0022-4537.00234
Hessels, J., Grilo, I., Thurik, R., & van der Zwan, P. (2011). Entrepreneurial exit and entrepreneurial engagement. *Journal of Evolutionary Economics*, 21(3), 447–471. https://doi.org/10.1007/s00191-010-0190-4
Hessels, J., Rietveld, C. A., Thurik, A. R., & van der Zwan, P. (2018). Depression and entrepreneurial exit. *Academy of Management Perspectives*, 32(3), 323–339. https://doi.org/10.5465/amp.2016.0183
Hmieleski, K. M., & Baron, R. A. (2009). Entrepreneurs' optimism and new venture performance: A social cognitive perspective. *Academy of Management Journal*, 52, 473–488. https://doi.org/10.5465/AMJ.2009.41330755
Hoang, H., & Gimeno, J. (2010). Becoming a founder: How founder role identity affects entrepreneurial transitions and persistence. *Journal of Business Venturing*, 25(1), 41–53. https://doi.org/10.1016/j.jbusvent.2008.07.002
Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist*, 44(3), 513–524. https://doi.org/10.1037/0003-066X.44.3.513
Holland, D. V., & Shepherd, D. A. (2013). Deciding to persist: Adversity, values, and entrepreneurs' decision policies. *Entrepreneurship Theory and Practice*, 37(2), 331–358. https://doi.org/10.1111/j.1540-6520.2011.00468.x
Holmes, R. M., P. Bromiley, C. E. Devers, T. R. Holcomb, & J. B. McGuire. (2011). Management Theory Applications of Prospect Theory: Accomplishments, Challenges, and Opportunities. *Journal of Management*, 37(4), 1069-1107. https://doi.org/10.1177/014920631039486
Holmes, T. J., & Schmitz, J. A. Jr. (1995). On the turnover of business firms and business managers. *Journal of Political Economy*, 103(5), 1005–1038. https://doi.org/10.1086/262011
Holt, C. A., & Laury, S. K. (2002). Risk aversion and incentive effects. *American Economic Review*, 92(5), 1644–1655. https://doi.org/10.1257/000282802762024700
Holtz-Eakin, D., Joulfaian, D., & Rosen, H. S. (1994). Sticking it out: Entrepreneurial survival and liquidity constraints. *Journal of Political Economy*, 102(1), 53-75. https://www.jstor.org/stable/2138793
Howard, S., & Johnson, B. (2004). Resilient teachers: Resisting stress and burnout. *Social Psychology of Education*, 7(4), 399-420. https://doi.org/10.1007/s11218-004-0975-0
Hsu, D. K., Shinnar, R. S., & Anderson, S. E. (2019). "I wish I had a regular job": An exploratory study of entrepreneurial regret. *Journal of Business Research*, 96, 217–227. https://doi.org/10.1016/j.jbusres.2018.11.006
Hsu, D. K., Wiklund, J., Anderson, S. E., & Coffey, B. S. (2016). Entrepreneurial exit intentions and the business–family interface. *Journal of Business Venturing*, 31, 613–627. https://doi.org/10.1016/j.jbusvent.2016.08.001

Huang, M.-J., Li, Z.-B., & Su, X.-F. (2022). Anticipated regret, entrepreneurial cognition, and entrepreneurial persistence. *Frontiers in Psychology*, 13. https://doi.org/10.3389/fpsyg.2022.788694

Hung, Y., Huang, H. J., & Gosling, M. (2011). Deviation and escalation: Decision-making pitfalls illustrated. *Journal of Organizational Change Management*, 24(5), 695–711. https://doi.org/10.1108/09534811111158930

Jamal, M. (1997). Job stress, satisfaction, and mental health: An empirical examination of self-employed and non-self-employed Canadians. *Journal of Small Business Management*, 35(4), 48–57.

Jayawarna, D., Marlow, S., & Swail, J. (2020). A gendered life course explanation of the exit decision in the context of household dynamics. *Entrepreneurship Theory and Practice*, 45(6), 1394–1430. https://doi.org/10.1177/1042258720940123

Jenkins, A., & McKelvie, A. (2016). What is entrepreneurial failure? Implications for future research. *International Small Business Journal*, 34(2), 176–188. https://doi.org/10.1177/0266242615574011

Jiao, H., Wang, T., & Alon, I. (2021). Financial wealth, socioemotional wealth, and founder exits: An empirical examination of Chinese IPOs. *Entrepreneurship and Regional Development*, 33, 208–226. https://doi.org/10.1080/08985626.2021.1872935

Justo, R., DeTienne, D. R., & Sieger, P. (2015). Failure or voluntary exit? Reassessing the female underperformance hypothesis. *Journal of Business Venturing*, 30(6), 775–792. https://doi.org/10.1016/j.jbusvent.2015.04.004

Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist*, 58(9), 697–720. https://doi.org/10.1037/0003-066X.58.9.697

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica,* 47(2), 263–291. https://www.jstor.org/stable/1914185

Kawai, N., Sibunruang, H., & Kazumi, T. (2023). Work-family conflict, entrepreneurial regret, and entrepreneurial outcomes during the COVID-19 pandemic. *International Entrepreneurship and Management Journal*, 19(2), 837–861. https://doi.org/10.1007/s11365-023-00846-5

Kerr W.R., & Nanda R. (2010). Banking deregulations, financing constraints, and firm entry size. *Journal of the European Economic Association*, 8(2-3), 582-593. https://doi.org/10.1111/j.1542-4774.2010.tb00528.x

Kiani, A., Ali, A., Biraglia, A., & Wang, D. (2021). Why I persist while others leave? Investigating the path from passion to persistence in entrepreneurship. *Journal of Small Business Management*, 61(6), 2818–2848. https://doi.org/10.1080/00472778.2021.1938097

Kier, A. S., McMullen, J. S., & Kuratko, D. F. (2021). How venture team recommendations influence undue entrepreneurial persistence: The impact of self-regulation and experience. *Entrepreneurship Theory and Practice*, 46(6), 1812–1842. https://doi.org/10.1177/10422587211049740

Kihlstrom, R. E., & Laffont, J. J. (1979). A general equilibrium entrepreneurial theory of firm formation based on risk aversion. *Journal of Political Economy*, 87(4), 719-748. https://www.jstor.org/stable/1831005

Kline, S. J., & Rosenberg, N. (2009). An overview of innovation. In N. Rosenberg (Ed.), *Studies on science and the innovation process* (pp. 173–203). World Scientific Publishing. https://doi.org/10.1142/9789814273596_0009

Knight, F. H. (1921). *Risk, Uncertainty and Profit*. New York: Houghton Mifflin.

Krueger, N. (2007). What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship Theory and Practice*, 31(1), 123–138. https://doi.org/10.1111/j.1540-6520.2007.00166.x

Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15(5–6), 411–432. https://doi.org/10.1016/S0883-9026(98)00033-0

Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind: "Seizing" and "freezing." *Psychological Review*, 103(2), 263-283. https://doi.org/10.1037/0033-295X.103.2.263

Landier, A., & Thesmar, D. (2009). Financial contracting with optimistic entrepreneurs. *Review of Financial Studies*, 22(1), 117–150. https://doi.org/10.1093/rfs/hhn065

LePine, J. A., Podsakoff, N. P., & LePine, M. A. (2005). A meta-analytic test of the challenge stressor–hindrance stressor framework: An explanation for inconsistent relationships among stressors and performance. *Academy of Management Journal*, 48(5), 764–775. https://doi.org/10.5465/AMJ.2005.18803921

Liguori, E. W., Bendickson, J. S., & McDowell, W. C. (2018). Revisiting entrepreneurial intentions: A social cognitive career theory approach. *International Entrepreneurship and Management Journal*, 14, 67–78. https://doi.org/10.1007/s11365-017-0462-7

Lin, N., Wilden, R., Chirico, F., Ghasrodashti, E., & DeTienne, D. R. (2022). Persist or let it go: Do rational entrepreneurs make decisions rationally? *Journal of Business Venturing*, 37(4), 106210. https://doi.org/10.1016/j.jbusvent.2022.106210

Lindblom, A., Lindblom, T., & Wechtler, H. (2020). Dispositional optimism, entrepreneurial success and exit intentions: The mediating effects of life satisfaction. *Journal of Business Research*, 120, 230–240. https://doi.org/10.1016/j.jbusres.2020.08.012

Litman, J. A. (2008). Interest and deprivation factors of epistemic curiosity. *Personality and Individual Differences*, 44(7), 1585–1595. https://doi.org/10.1016/j.paid.2008.01.014

Liu, J., Zhou, X., Wang, Q., Wu, Z., & Li, F. (2024). How corruption affects entrepreneurial exit: Micro-evidence from Chinese entrepreneurs. *International Public Management Journal*, 1–21. https://doi.org/10.1080/10967494.2024.2369681

Lowe, R. A., & Ziedonis, A. A. (2006). Overoptimism and the performance of entrepreneurial firms. *Management Science*, 52(2), 173-186. https://www.jstor.org/stable/20110497

Lundmark, E., Coad, A., Frankish, J. S., & Storey, D. J. (2020). The liability of volatility and how it changes over time among new ventures. *Entrepreneurship Theory and Practice*, 44(5), 933–963. https://doi.org/10.1177/1042258719867564

Ma, D., Mattingly, E. S., Kushev, T. N., Ahuja, M. K., & Manikas, A. S. (2018). Persistence decisions: It's not just about the money. *The Journal of Entrepreneurship*, 28(1), 121–143. https://doi.org/10.1177/0971355718810575

MacMillan, I. C., Zemann, L., & Subba Narasimha, P. N. (1987). Criteria distinguishing successful from unsuccessful ventures in the venture screening process. *Journal of Business Venturing*, 2, 123–137. https://doi.org/10.1016/0883-9026(87)90003-6

Magnani, J. (2015). Testing for the disposition effect on optimal stopping decisions. *American Economic Review*, 105(5), 371–375. https://doi.org/10.1257/aer.p20151039

Magnano, P., Craparo, G., & Paolillo, A. (2016). Resilience and emotional intelligence: Which role in achievement motivation. *International Journal of Psychological Research*, 9(1), 9–20. https://doi.org/10.21500/20112084.2096

Mahieu, J., Melillo, F., & Thompson, P. (2022). The long-term consequences of entrepreneurship: Earnings trajectories of former entrepreneurs. *Strategic Management Journal,* 43(2), 213-236. https://doi.org/10.1002/smj.3337

Malmendier, U., & Tate, G. (2005). CEO overconfidence and corporate investment. *Journal of Finance*, 60, 2661–2700. https://doi.org/10.1111/j.1540-6261.2005.00813.x

Markman, G. D., Baron, R. A., & Balkin, D. (2005). Are perseverance and self-efficacy costless? Assessing entrepreneurs' regretful thinking. *Journal of Organizational Behavior*, 26(1), 1–19. https://doi.org/10.1002/job.305

Mason, C. M., & Harrison, R. T. (2006). After the exit: Acquisitions, entrepreneurial recycling and regional economic development. *Regional Studies*, 40(1), 55–73. https://doi.org/10.1080/00343400500450059

Mattingly, E. S., Kushev, T. N., Ahuja, M. K., & Ma, D. (2016). Switch or persevere? The effects of experience and metacognition on persistence decisions. *The International Entrepreneurship and Management Journal*, 12(4), 1233-1263. http://dx.doi.org/10.1007/s11365-016-0391-x

McGrath, R. G. (1997). A real options logic for initiating technology positioning investments. *Academy of Management Review*, 22, 974–996. https://doi.org/10.2307/259251

McGrath, R. G. (1999). Falling forward: Real options reasoning and entrepreneurial failure. *Academy of Management Review*, 24(1), 13–30. https://doi.org/10.2307/259034

McKenzie, D., & Paffhausen, A. L. (2019). Small firm death in developing countries. *Review of Economics and Statistics*, 101(4), 645–657. https://doi.org/10.1162/rest_a_00798

Merrifield, D. B. (1987). New business incubators. *Journal of Business Venturing*, 2, 277–284. https://doi.org/10.1016/0883-9026(87)90021-8

Millán, J. M., Congregado, E., & Román, C. (2012). Determinants of self-employment survival in Europe. *Small Business Economics*, 38, 231–258. https://doi.org/10.1007/s11187-010-9260-0

Mitchell, W. (1994). The dynamics of evolving markets: The effects of business sales and age dissolutions and divestitures. *Administrative Science Quarterly*, 39, 575–602. https://doi.org/10.2307/2393772

Moore, D. A., & Cain, D. M. (2007). Overconfidence and underconfidence: When and why people underestimate (and overestimate) the competition. *Organizational Behavior and Human Decision Processes*, 103(2), 197–213. https://doi.org/10.1016/j.obhdp.2006.09.002

Moore, D. A., & Healy, P. J. (2008). The trouble with overconfidence. *Psychological Review*, 115, 502–517. https://doi.org/10.1037/0033-295X.115.2.502

Morris, M. H., Soleimanof, S., & White, R. J. (2020). Retirement of entrepreneurs: Implications for entrepreneurial exit. *Journal of Small Business Management*, 58(6), 1089–1120. https://doi.org/10.1111/jsbm.12476

Mosteller, F., & Nogee, P. (1951). An experimental measurement of utility. *Journal of Political Economy*, 59(5), 371–384. https://doi.org/10.1086/257257

Mousavi, S., & Gigerenzer, G. (2014). Risk, uncertainty, and heuristics. *Journal of Business Research,* 67(8), 1671–1678. https://doi.org/10.1016/j.jbusres.2014.02.013

Musshoff, O., Odening, M., Schade, C., Maart-Noelck, S. C., & Sandri, S. (2013). Inertia in disinvestment decisions: Experimental evidence. *European Review of Agricultural Economics*, 40(3), 463–485.

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5(2), 147–175. https://doi.org/10.1016/0304-405X(77)90015-0

Newman, A., Obschonka, M., Moeller, J., & Chandan, G. G. (2021). Entrepreneurial passion: A review, synthesis, and agenda for future research. *Applied Psychology: An International Review*, 70(2), 816–860. https://doi.org/10.1111/apps.12236

Newman, B. M., & Newman, P. R. (1995). *Development through life: A psychosocial approach* (6th ed.). Pacific Grove, CA: Brooks/Cole.

Newman, R. (2005). APA's resilience initiative. *Professional Psychology: Research and Practice*, 36(3), 227–229. https://doi.org/10.1037/0735-7028.36.3.227

O'Brien, J. P., Folta, T. B., & Johnson, D. R. (2003). A real options perspective on entrepreneurial entry in the face of uncertainty. *Managerial and Decision Economics*, 24(8), 515–533. https://doi.org/10.1002/mde.1115

Parker, S. C. (2013). Do serial entrepreneurs run successively better-performing businesses? *Journal of Business Venturing*, 28(5), 652-666. https://doi.org/10.1016/j.jbusvent.2012.08.001

Parker, S. C. (2018). *The economics of entrepreneurship* (2nd ed.). Cambridge University Press.

Parker, S. C., & van Praag, C. M. (2012). The entrepreneur's mode of entry: Business takeover or new venture start? *Journal of Business Venturing*, 27, 31–46. https://doi.org/10.1016/j.jbusvent.2010.08.002

Parker, S. C., & Van Praag, M. (2010). Group status and entrepreneurship. *Journal of Economics & Management Strategy*, 19(4), 919-945. https://doi.org/10.1111/j.1530-9134.2010.00280.x

Pearsall, M. J., Ellis, A. P. J., & Stein, J. H. (2009). Coping with challenge and hindrance stressors in teams: Behavioral, cognitive, and affective outcomes. *Organizational Behavior and Human Decision Processes*, 109(1), 18–28. https://doi.org/10.1016/j.obhdp.2009.02.002

Pennings, J. M., Lee, K., & van Witteloostuijn, A. (1998). Human capital, social capital, and firm dissolution. *Academy of Management Journal*, 41(4), 425–440. https://doi.org/10.2307/257082

Petriglieri, J. (2011). Under threat: Responses to and the consequences of threats to individuals' identities. *Academy of Management Review*, 36, 641–672. https://doi.org/10.5465/amr.2009.0087

Phillips-Wren, G., Daniel, J. P., & Manuel, M. (2019). Cognitive bias, decision styles, and risk attitudes in decision making and DSS. *Journal of Decision Systems*, 28(2), 63–66. https://doi.org/10.1080/12460125.2019.1646509

Pierce, J. L., Kostova, T., & Dirks, K. T. (2003). The state of psychological ownership: Integrating and extending a century of research. *Review of General Psychology*, 7(1), 84–107. https://doi.org/10.1037/1089-2680.7.1.84

Rocha, V., & van Praag, M. (2020). Mind the gap: The role of gender in entrepreneurial career choice and social influence by founders. *Strategic Management Journal*, 41(5), 841–866. https://doi.org/10.1002/smj.3135

Rönkkö, M., von Bonsdorff, M. E., & Mansikkamäki, S. (2024). From business owner to retiree: Understanding life satisfaction's impact on entrepreneurial exit. *International Journal of Entrepreneurial Behavior & Research*, 30(11). https://doi.org/10.1108/IJEBR-12-2023-1243

Rothschild, M., & Stiglitz, J. E. (1970). Increasing risk: a definition. *Journal of Economic Theory*, 2(3), 225-243. https://doi.org/10.1016/0022-0531(70)90038-4

Sætre, A. S., & Van de Ven, A. (2021). Generating theory by abduction. *Academy of Management Review*, 46(4), 684–701. https://doi.org/10.5465/amr.2019.0233

Samuelson, W., & Zeckhauser, R. J. (1988). Status quo bias in decision making. *Journal of Risk and Uncertainty*, 1, 7-59. https://www.jstor.org/stable/41760530

Sandri, S., Schade, C., Mubhoff, O., & Odening, M. (2010). Holding on for too long? An experimental study on inertia in entrepreneurs' and non-entrepreneurs' disinvestment choices. *Journal of Economic Behavior and Organization*, 76(1), 30–44. https://doi.org/10.1016/j.jebo.2010.02.011

Sanguineti, F., Majocchi, A., & Cavusgil, S. T. (2022). Founding entrepreneur's dilemma: Stay or exit the firm following an acquisition? An international comparison. *International Business Review*, 31, 101904. https://doi.org/10.1016/j.ibusrev.2021.101904

Sardeshmukh, S. R., Goldsby, M., & Smith, R. M. (2020). Are work stressors and emotional exhaustion driving exit intentions among business owners? *Journal of Small Business Management*, 59(4), 544–574. https://doi.org/10.1111/jsbm.12477

Savage, L. J. (1972). *The Foundations of Statistics*. Dover, New York.

Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: Assessment and implications of generalized outcome expectancies. *Health Psychology*, 4(3), 219–247. https://doi.org/10.1037//0278-6133.4.3.219

Scheier, M. F., Carver, C. S. & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology*, 67 (6), 1063–1078. https://doi.org/10.1037//0022-3514.67.6.1063

Scheier, M. F., Carver, C. S., & Bridges, M. W. (2001). Optimism, pessimism, and psychological well-being. In E. C. Chang (Ed.), *Optimism & pessimism: Implications for theory, research, and practice* (pp. 189–216). American Psychological Association. https://doi.org/10.1037/10385-009

Schildberg-Hörisch, H. (2018). Are risk preferences stable? *Journal of Economic Perspectives*, 32(2), 135-154. https://doi.org/10.1257/jep.32.2.135

Scott, S. G., & Bruce, R. A. (1995). Decision-making style: The development and assessment of a new measure. *Educational and Psychological Measurement*, 55, 818–831. https://doi.org/10.1177/0013164495055005017

Seale, D. A., & Rapoport, A. (1997). Sequential decision making with relative ranks: An experimental investigation of the "secretary problem. *Organizational Behavior and Human Decision Processes*, 69(3), 221–236. https://doi.org/10.1006/obhd.1997.2683

Shahid, S. (2023). Perceived barriers and entrepreneurial exit intentions: Moderating role of regular versus sustainable entrepreneurship. *European Business Review*, 35(1), 39–56. https://doi.org/10.1108/EBR-03-2022-0053

Shahid, S., & Kundi, Y. M. (2022). Feel dragged out: A recovery perspective in the relationship between emotional exhaustion and entrepreneurial exit. *Journal of Small Business and Enterprise Development*, 29, 203–220. https://doi.org/10.1108/JSBED-05-2021-0199

Shahid, S., Mei, M. Q., & Battisti, M. (2024). Entrepreneurial fear of failure and exit intention: The moderating role of a conducive social environment. *International Small Business Journal*, 42. https://doi.org/10.1177/02662426241229878

Shane, S., Locke, E. A., & Collins, C. J. (2003). Entrepreneurial motivation. *Human Resource Management Review*, 13(2), 257–279. https://doi.org/10.1016/S1053-4822(03)00017-2

Shefrin, H., & Statman, M. (1985). The disposition to sell winners too early and ride losers too long: Theory and evidence. *Journal of Finance*, 40(3), 777-790. https://doi.org/10.2307/2327802

Shelton, L. M., Danes, S. M., & Eisenman, M. (2008). Role demands, difficulty in managing work-family conflict, and minority entrepreneurs. *Journal of Developmental Entrepreneurship*, 13, 315–342. https://doi.org/10.1142/S1084946708000983

Shepherd, D. A., & Haynie, J. M. (2009). Birds of a feather don't always flock together: Identity management in entrepreneurship. *Journal of Business Venturing*, 24(4), 316–337. https://doi.org/10.1016/j.jbusvent.2007.10.005

Shepherd, D. A., Wiklund J., & Haynie, J. M. (2009). Moving forward: Balancing the financial and emotional costs of business failure. *Journal of Business Venturing*, 24(2), 134–148. https://doi.org/10.1016/j.jbusvent.2007.10.002

Siepel, J., Cowling, M., & Coad, A. (2017). Non-founder human capital and the long-run growth and survival of high-tech ventures. *Technovation*, 59, 34–43. https://doi.org/10.1016/j.technovation.2016.09.001

Simon, H. A. (1959). Theories of decision making in economics and behavioral science. *American Economic Review*, 49, 253–283. https://www.jstor.org/stable/1809901

Simon, H. A. (1982). *Models of Bounded Rationality*. Cambridge, MA: MIT Press.

Smith, B. R., Lawson, A., Dubard Barbosa, S., & Jones, J. (2023). Navigating the highs and lows of entrepreneurial identity threats to persist: The countervailing force of a relational identity with God. *Journal of Business Venturing*, 38(4), 106317. https://doi.org/10.1016/j.jbusvent.2023.106317

Song, M., Podoynitsyna, K., van der Bij, H., & Halman, J. I. M. (2008). Success factors in new ventures: A meta-analysis. *Journal of Product Innovation Management*, 25, 7–17. https://doi.org/10.1111/j.1540-5885.2007.00280.x

Souitaris, V., Zerbinati, S., Peng, B. G., & Shepherd, D. A. (2020). Should I stay or should I go? Founder power and exit via initial public offering. *Academy of Management Journal*, 63, 64–95. https://doi.org/10.5465/amj.2017.0420

Stam, E., Thurik, R., & van der Zwan, P. (2010). Entrepreneurial exit in real and imagined markets. *Industrial and Corporate Change*, 19(4), 1109–1139. https://doi.org/10.1093/icc/dtp047

Staw, B. M. (1976). Knee-deep in the big muddy: A study of escalating commitment to a chosen course of action. *Organizational Behavior and Human Performance*, 16(1), 27–44. https://doi.org/10.1016/0030-5073(76)90005-2

Staw, B. M. (1981). The escalation of commitment to a course of action. *Academy of Management Journal*, 6(4), 577-587. https://doi.org/10.2307/257636

Stetzka, R. M., & Winter, S. (2023). How rational is gambling? *Journal of Economic Surveys*, 37(4), 1432-1488. https://doi.org/10.1111/joes.12473

Stevenson, R., Allen, J., & Wang, T. (2022). Failed but validated? The effect of market validation on persistence and performance after a crowdfunding failure. *Journal of Business Venturing,* 37(2), 106175. https://doi.org/10.1016/j.jbusvent.2021.106175

St-Jean, E., & Audet, J. (2012). The role of mentoring in the learning development of the novice entrepreneur. *International Entrepreneurship and Management Journal*, 8(1), 119–140. https://doi.org/10.1007/s11365-009-0130-7

Stryker, S., & Serpe, R. T. (1994). Identity salience and psychological centrality: Equivalent, overlapping, or complementary concepts? *Social Psychology Quarterly*, 57(1), 16–35. https://doi.org/10.2307/2786972

Symeonidou, N., DeTienne, D. R., & Chirico, F. (2022). The persistence of family firms: How does performance threshold affect family firm exit? *Small Business Economics*, 59, 477–489. https://doi.org/10.1007/s11187-021-00482-9

Talaga, J. A., & Beehr, T. A. (1995). Are there gender differences in predicting retirement decisions? *Journal of Applied Psychology*, 80(1), 16–28. https://doi.org/10.1037/0021-9010.80.1.16

Taylor, M. P. (1999). Survival of the fittest? An analysis of self-employment duration in Britain. *The Economic Journal*, 109(454), C140–C155. https://doi.org/10.1111/1468-0297.00422

Thébaud, S. (2016). Passing up the job: The role of gendered organizations and families in the entrepreneurial career process. *Entrepreneurship Theory and Practice*, 40(2), 269–287. https://doi.org/10.1111/etap.12222

Trigeorgis, L. (1996). *Real options: Managerial flexibility and strategy in resource allocation*. Boston, MA: MIT Press.

Tubre, T. C., & Collins, J. M. (2000). Jackson and Schuler (1985) revisited: A meta-analysis of the relationships between role ambiguity, role conflict, and job performance. *Journal of Management,* 26, 155–169. https://doi.org/10.1016/S0149-2063(99)00035-5

Tversky, A. (1969). Intransitivity of preferences. *Psychological Review*, 76(1), 31–48. https://doi.org/10.1037/h0026756

Tversky, A. & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211(4481), 453-458. https://www.jstor.org/stable/1685855

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(4), 297–323. https://doi.org/10.1007/BF00122574
Usero, B., Hernández, V., & Romaní, G. (2024). Unraveling gender differences in entrepreneurial exits: The role of human capital and family situation during an unprecedented crisis. *The International Journal of Entrepreneurship and Innovation*, 0(0). https://doi.org/10.1177/14657503241288997
Uy, M. A., Foo, M. D., & Song, Z. (2013). Joint effects of prior start-up experience and coping strategies on entrepreneurs' psychological well-being. *Journal of Business Venturing*, 28(5), 583–597. https://doi.org/10.1016/j.jbusvent.2012.04.003
Valeau, P. (2022). Commitment-based persistence in the face of venture decline: Towards a renewed approach to small business orientation. *Entrepreneurship & Regional Development*. https://doi.org/10.1080/08985626.2022.2152107
van Lieshout, L. L. F., de Lange, F. P., & Cools, R. (2020). Why so curious? Quantifying mechanisms of information seeking. *Current Opinion in Behavioral Sciences*, 35, 112–117. https://doi.org/10.1016/j.cobeha.2020.08.005
van Praag, C. M. (2003). Business survival and success of young small business owners. *Small Business Economics*, 21, 1–17. https://doi.org/10.1023/A:1024453200297
von Neumann, J., & Morgenstern, O. (1944). *Theory of games and economic behavior*. Princeton University Press. (2nd ed., 1947; 3rd ed., 1953). Section 3, Chapter I reprinted in Page, A. N. (Ed.). (1968). Utility theory: A book of readings (pp. 215–233). Wiley.
Weinstein, N. D. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology*, 39(5), 806–820. https://doi.org/10.1037/0022-3514.39.5.806
Weinstein, N. D., & Klein, W. M. (1996). Unrealistic optimism: Present and future. *Journal of Social and Clinical Psychology*, 15(1), 1-8. https://doi.org/10.1521/jscp.1996.15.1.1
Wennberg K., Delmar F., McKelvie A. (2016). Variable risk preferences in new firm growth and survival. *Journal of Business Venturing*, 31(4), 408-427. https://doi.org/10.1016/j.jbusvent.2016.05.001
Wennberg, K., & DeTienne, D. R. (2014). What do we really mean when we talk about 'exit'? A critical review of research on entrepreneurial exit. *International Small Business Journal*, 32(1), 4–16. https://doi.org/10.1177/0266242613517126
Wennberg, K., Folta, T. B., & Delmar, F. (2006). A real options model of stepwise entry into self-employment. *Frontiers of Entrepreneurship Research*, 26(3), 119–132.
Wennberg, K., Wiklund, J., DeTienne, D. R., & Cardon, M. S. (2010). Reconceptualizing entrepreneurial exit: Divergent exit routes and their drivers. *Journal of Business Venturing*, 25(4), 361-375. https://doi.org/10.1016/j.jbusvent.2009.01.001
Whyte, G., Saks, A. M., & Hook, S. (1997). When success breeds failure: The role of self-efficacy in escalating commitment to a losing course of action. *Journal of Organizational Behavior*, 18, 415–432. https://doi.org/10.1002/(SICI)1099-1379(199709)18:5<415::AID-JOB813>3.0.CO;2-G
Williams, D. W., Wood, M. S., Mitchell, J. R., & Urbig, D. (2019). Applying experimental methods to advance entrepreneurship research: On the need for and

publication of experiments. *Journal of Business Venturing*, 34(2), 215–223. https://doi.org/10.1016/j.jbusvent.2018.12.003
Xiao, J. J. (2008). *Handbook of consumer finance research*. New York: Springer.
Yamakawa, Y., & Cardon, M. S. (2017). How prior investments of time, money, and employee hires influence time to exit a distressed venture, and the extent to which contingency planning helps. *Journal of Business Venturing*, 32(1), 1–17. https://doi.org/10.1016/j.jbusvent.2016.10.002
Yang, T., & Aldrich, H. E. (2012). Out of sight but not out of mind: Why failure to account for left truncation biases research on failure rates. *Journal of Business Venturing*, 27, 477–492. https://doi.org/10.1016/j.jbusvent.2012.01.001
Yang, T., & Triana, M. C. (2019). Set up to fail: Explaining when women-led businesses are more likely to fail. *Journal of Management*, 45(3), 926–954. https://doi.org/10.1177/014920631668585
Yusuf, J. E. (2012). A tale of two exits: Nascent entrepreneur learning activities and disengagement from start-up. *Small Business Economics*, 39, 783-799. https://doi.org/10.1007/s11187-011-9361-4
Zhang, S. X., & Cueto, J. (2016). The study of bias in entrepreneurship. *Entrepreneurship Theory and Practice*, 41(3), 419–454. https://doi.org/10.1111/etap.12212
Zhang, W., & Wang, H. (2021). Entrepreneurial decisions with idiosyncratic risk and unknown profitability. *Economic Modelling*, 103, 105611. https://doi.org/10.1016/j.econmod.2021.105611
Zhao, H., Li, J., Gao, W., & Weng, Q. (2023). Why and when does person-entrepreneurship misfit promote entrepreneurial exit intention? A conservation of resources perspective. *Current Psychology*, 42, 19752–19766. https://doi.org/10.1007/s12144-022-03079-x
Zhu, F., & Burmeister-Lamp, K., & Hsu, D. K. (2017). To leave or not? The impact of family support and cognitive appraisals on venture exit intention. *International Journal of Entrepreneurial Behavior & Research*, 23(3), 566–590. https://doi.org/10.1108/IJEBR-04-2016-0110
Zhu, F., Hsu, D. K., Burmeister-Lamp, K., & Fan, S. X. (2018). An investigation of entrepreneurs' venture persistence decision: The contingency effect of psychological ownership and adversity. *Applied Psychology*, 67(1), 136–170. https://doi.org/10.1111/apps.12106
Zhu, F., Thornhill, S., & Hsu, D. K. (2021). When owner, family, and community roles intertwine: Examining entrepreneurs' persistence decisions and the gender effect. *Journal of Small Business Management*, 59(S1), S102–S133. https://doi.org/10.1080/00472778.2021.1883037

Appendix A. Formal Analysis of the Decision Problem

A.1 The Stopping Problem

An entrepreneur must decide at the start of each period whether to continue operating a venture or exit. If they exit, they do not return to the venture. Each period they continue, they receive an independent draw of a random variable which generally varies from period to period. Let V_t denote the value of a venture at time $t = 0,1,2,\ldots$ When an entrepreneur exits, at a chosen time τ, they receive a final draw of 0 with certainty and pay a known and constant exit cost $C > 0$. Hence, at the time of exit they receive $V_\tau - C$. The exit cost is incurred regardless of the date of exit, τ. For simplicity, there is no time discounting. Entrepreneurs all start with initial income and venture value $y_0 = V_0 > 0$. If the agent chooses to continue running the venture, they face a *mixed gamble*, such that their incomes change by the value of an independent random draw from $\widetilde{\varepsilon_t}$ each[30] period t they continue. This draw turns out to be "good," $y^+ > 0$ with probability p or bad (negative), $y^- < 0$, with probability $1 - p$. Since I focused on decision making for stochastically declining ventures, I set $p < \frac{1}{2}$ and $E\ (\widetilde{\varepsilon_t}) < 0$.

At time $t = 1$, the draw ε_1 determines an entrepreneur's next period operating income, y_1, yielding value of $V_1 = V_0 + y_1$. Again, the entrepreneur chooses at the start of this period whether to exit or continue. If they exit, they receive $V_1 - C$; otherwise, they continue until exit is chosen. The dynamic process (P1) is fully described by the following equations for $t = 1, \ldots, \tau$:

$$V_t = V_{t-1} + \tilde{y}_t$$

$$\tilde{y}_t = y_{t-1} + \widetilde{\varepsilon_t}$$

[30] A tilde (~) denotes a random variable, and values without a tilde indicate actual outcomes.

$$E\,(\tilde{\varepsilon}_t) = py^+ + (1-p)y^- < 0$$

and

(P1)

$$V_\tau = V_{\tau-1} - C$$

$$y_0 \;=\; V_0 > 0$$

The entrepreneur knows (y_0, V_0, C) with certainty. If they also know the parameters (p, y^+, y^-), I say that they operate under conditions of risk; if they do not, they operate under conditions of uncertainty.

A.2 Expected Utility Theory (EUT)

Consider first the case of risk, i.e., where all the parameters of process (P1) are known with certainty. According to EUT, individuals maximize a cardinal utility function, *U*, which is positive and strictly increasing in its argument. With no discounting, the agent's objective is to choose an exit time τ that maximizes expected utility of the value of the venture:

$$\max_\tau E\;U(\,V_\tau - C)$$

where *E* is the expectation conditioned on the true probabilities of the gamble. The simplest case is risk-neutral preferences, where *U* is a linear function of *V*. Then the objective is equivalent to $\max_\tau E\;V_\tau$. The first predictions then follow immediately:

Hypothesis 1: EUT: Optimal exit. If the agent is risk-neutral:

(a) τ *is the first* t *for which* $E(\tilde{y}_{t+1}) < 0$

(b) τ *is invariant to C.*

Hypothesis 1(a) provides a sharp, observable benchmark, enabling the following exit types to be defined:

Definition A.1. Different types of exit:

a. *Optimal exit* occurs at *t* on the first occasion that $E(\tilde{y}_{t+1}) < 0$.

b. *Late exit* is continuation at *t* when $E\left(\tilde{y}_{t+j}\right) < 0 \; \forall j \geq 0$.

c. *Early exit* is an exit at *t* when $E(\tilde{y}_{t+1}) > 0$.

Hypothesis 1(b) follows because, with no discounting, the exit cost $C > 0$ makes no difference to optimal behavior, as it is constant across, and must be paid in, all states.

If people are risk averse, utility is concave and increasing, and the values of both V_t and $\tilde{y}_t$ enter the utility function. It is convenient to define an "increase in risk" formally as follows:

Definition A.2. Mean preserving spread (MPS): Rothschild & Stiglitz (1970). An MPS of a probability distribution A is when a second probability distribution B is formed by spreading out one or more portions of A while leaving the expected value unchanged.

Consider a "pure gamble," for which even the least favorable draw yields positive income. Risk-averse agents will always take such a gamble because it dominates the alternative of 0 with certainty; however, they may decline a mixed gamble where the bad draw leaves them with a negative outcome, even if the expected value of the gamble is positive. They will rationally exit as soon as $EU(V_t - C + \tilde{y}_{t+1}) \leq U(V_t - C)$. The terminal income y_τ at which exit occurs will be greater under risk aversion than under risk-neutrality, since lower incomes cost risk-averse agents more than higher incomes reward them—a logic which does not apply to risk-neutral agents. This implies that all exits will be "early" when agents are risk averse, where early exits are defined in

Definition A.1c above. Moreover, the greater is *C,* the lower is marginal utility, so the more curved is the relevant part of the utility function for a given degree of risk aversion. In which case, I would expect higher *C* to result in more early exits and higher terminal incomes y_τ. Finally, the riskier the gamble, in terms of the mean-preserving spread (MPS) of Definition A.2, the higher the terminal income y_τ at which agents exit. Summaries follow here:

Hypothesis 2: EUT: Risk aversion. If the agent is risk averse

(a) All exits are early exits

(b) A higher exit cost hastens early exits and increases terminal income y_τ

(c) A MPS in incomes hastens early exits and increases terminal income y_τ

Next, consider the case where all agents are risk seeking. The utility functions of these agents are convex and increasing: they are willing to accept losses as the price to pay for gambling. The predictions for this case are the mirror image of those for risk aversion:

Hypothesis 3: EUT: Risk seeking. If the agent is risk seeking,

(a) All exits are late exits

(b) A higher exit cost delays late exits and decreases terminal income y_τ

(c) A MPS in incomes delays late exits and decreases terminal income y_τ

Appendix B. Trajectories

B.1 The trajectories

Study	Parameter		Trajectory
Study 1 (Initial income $30)	Set 1	A	30, 22, 14, 26, 18, 10, **2**, -6, -14, -22, -30, -38, -46, -34, -42, -50 (CLOSURE)
		B	30, 42, 34, 26, 18, 10, 22, 14, 6, 18, 10, **2**, -6, -14, -22, -30, -38, -46, -54 (CLOSURE)
		C	30, 22, 34, 26, 18, 10, **2**, -6, 6, 18, 10, 2, -6, -14, -22, -30, -38, -46, -34, -42, -50 (CLOSURE)
		D	30, 22, 34, 26, 18, 30, 22, 14, 6, 18, 10, **2**, -6, 6, -2, -10, 2, -6, -14, -22, -30, -38, -46, -54 (CLOSURE)
	Set 2	A	30, 22, 14, 6, 30, 22, 14, 6, **-2**, -10, -18, -26, -34, -42, -18, -26, -34, -42, -50 (CLOSURE)
		B	30, 54, 46, 38, 30, 22, 14, 38, 30, 22, 14, 6, **-2**, -10, -18, -26, -34, -42, -50 (CLOSURE)
		C	30, 22, 14, 38, 30, 22, 14, 6, **-2**, -10, 14, 6, -2, -10, -18, -26, -34, -42, -50 (CLOSURE)
		D	30, 22, 46, 38, 30, 22, 14, 6, **-2**, 22, 14, 38, 30, 22, 14, 6, -2, 22, 14, 6, 30, 22, 14, 6, -2, -10, -18, -26, -34, -42, -50 (CLOSURE)
	Set 3	A	30, 14, 26, 38, 22, 6, 18, **2**, -14, -30, -46, -62 (CLOSURE)
		B	30, 42, 26, 38, 50, 62, 74, 58, 42, 26, 10, **-6**, -22, -38, -54 (CLOSURE)
		C	30, 14, 26, 10, 22, 34, 18, **2**, -14, -2, 10, -6, -22, -38, -54 (CLOSURE)
		D	30, 14, 26, 38, 22, 6, **-10**, -26, -14, -2, 10, 22, 6, 18, 2, 14, -2, -18, -34, -50 (CLOSURE)
Study 2 (Initial income $40)	Set 1	A	40, 32, 24, 36, 28, 20, 12, 4, **-4**, -12, -20, -28, -36, -44, -32, -40, -48, -56 (CLOSURE)
		B	40, 52, 44, 36, 28, 20, 32, 24, 16, 28, 20, 12, 4, **-4**, -12, -20, -28, -36, -44, -52 (CLOSURE)
		C	40, 32, 44, 36, 28, 20, 12, 4, **-4**, 8, 20, 12, 4, -4, -12, -20, -28, -36, -44, -52 (CLOSURE)
		D	40, 32, 44, 36, 28, 40, 32, 24, 16, 8, **0**, 12, 4, -4, 8, 0, -8, 4, -4, -12, -20, -28, -36, -44, -52 (CLOSURE)
	Set 2	A	40, 32, 24, 16, 40, 32, 24, 16, 8, **0**, -8, -16, -24, -32, -40, -16, -24, -32, -40, -48, -56 (CLOSURE)
		B	40, 64, 56, 48, 40, 32, 24, 48, 40, 32, 24, 16, 8, **0**, -8, -16, -24, -32, -40, -48, -56 (CLOSURE)
		C	40, 32, 24, 48, 40, 32, 24, 16, 8, **0**, -8, -16, 8, 0, -8, -16, -24, -32, -40, -48, -56 (CLOSURE)

		D	40, 32, 56, 48, 40, 32, 24, 16, 8, **0**, -8, 16, 8, 32, 24, 16, 8, 0, -8, 16, 8, 32, 24, 16, 8, 0, -8, -16, -24, -32, -40, -48, -56 (CLOSURE)
	Set 3	A	40, 24, 36, 48, 32, 16, 28, 12, **-4**, -20, -36, -52 (CLOSURE)
		B	40, 52, 36, 48, 60, 72, 84, 68, 52, 36, 20, 4, **-12**, -28, -44, -60 (CLOSURE)
		C	40, 24, 36, 20, 32, 44, 28, 12, **-4**, 8, 20, 4, -12, -28, -44, -60 (CLOSURE)
		D	40, 24, 36, 48, 32, 16, **0**, -16, -32, -20, -8, 4, 16, 0, 12, -4, 8, -8, -24, -40, -28, -44, -60 (CLOSURE)

Notes: Optimal exit points for each trajectory are indicated in bold: in accordance with Definition A.1 in Appendix A, these are the first occasions when the expected value of next period's draw is less than +4 (since the expected change in income in the bottom row of Table 2 in the text is -4).

B.2 Rationale for assigning pre-determined trajectories

All the trajectories above were randomly generated using the parameters in Table 2 in the text. The alternative to using a fixed set of trajectories is to generate different ones randomly *for every game*. That approach has the advantage of establishing robustness for any behavioral pattern that emerges (see e.g., Baribault et al., 2018). In a 30-round game involving independent draws from a two-point distribution, there are 2^{30} = 1,073,741,824 different, possible trajectories.

The first problem with sampling from 2^{30} trajectories is that negative outcomes are not guaranteed when randomly generated trajectories are used. Consequently, many players may never have an incentive to exit in finite time, defeating the objective of the experiment. Second, random trajectories introduce substantial amounts of noise; consequently, they either require large numbers of participants—which would be prohibitively expensive—or even more rounds of the games per participant, which quickly becomes boring and likely reduces participant engagement in the games. This comes with the added problem of hindering replicability. Third, using pre-assigned trajectories generates cleaner between-treatment comparisons than using new trajectories every time.

On the other hand, one concern with our approach is that the trajectories displayed in B.1 above might not be representative. For example, they include more cases of multiple crossings of zero income than the expected number of such crossings based on the parameter values given in Table 2 in the text. This discrepancy is, of course, consistent with randomness in the generation of trajectories, but one might harbor concerns that a lack of "representativeness" might unduly influence exit choices. Below, Tables B.2.1 and B.2.2 report the results of a sensitivity analysis in which observations for these trajectories are dropped from the sample. Table B.2.1 replicates Table 7 in the text, while Table B.2.2 replicates Table 10. Comparing them reveals few differences.

Table B.2.1 EUT: Robustness check — Trajectory representativeness

	Risk				Uncertainty
Variables	(1)	(2)	(3)	(4)	(5)
Optimal	-0.48***	-0.45***	-0.48***	-0.47***	
	(0.09)	(0.10)	(0.12)	(0.12)	
Early	-1.59***	-1.55***	-1.44***	-1.41***	
	(0.08)	(0.08)	(0.09)	(0.09)	
Late	0.35***	0.46***	0.30**	0.40***	1.40***
	(0.08)	(0.09)	(0.10)	(0.10)	(0.04)
High initial income	0.31**	0.31**	0.29*	0.29*	-1.42***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.09)
High previous investment size	0.14	0.14	0.14	0.14	-1.65***
	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
High exit cost		-0.04		-0.02	
		(0.09)		(0.09)	
Early X High exit cost		-0.02		-0.04	
		(0.10)		(0.10)	
Late X High exit cost		-0.16		-0.18	
		(0.11)		(0.11)	
Parameter set 2			0.31**	0.31**	
			(0.12)	(0.12)	
Parameter set 3			-0.19	-0.19	
			(0.11)	(0.11)	
Early X Parameter set 2			-0.40**	-0.40**	
			(0.13)	(0.13)	
Early X Parameter set 3			-0.11	-0.11	
			(0.12)	(0.13)	
Late X Parameter set 2			0.01	0.02	
			(0.14)	(0.14)	
Late X Parameter set 3			0.19	0.21	
			(0.13)	(0.13)	
/lnsig2u	-0.09	-0.08	-0.04	-0.03	0.35***
	(0.09)	(0.09)	(0.09)	(0.09)	(0.08)
Observations	14,636	14,636	14,636	14,636	18,278
Number of Participants	422	422	422	422	422
Log Likelihood	-4590	-4583	-4551	-4544	-5781
Prob > chi2	0.000	0.000	0.000	0.000	0.000

*** p<0.001, ** p<0.01, * p<0.05

Table B.2.2 DTT: Robustness check — Trajectory representativeness

Variables	(1) Full Sample
Two consecutive negative incomes	0.42***
	(0.03)
Three consecutive negative incomes	0.83***
	(0.03)
Four consecutive negative incomes	1.38***
	(0.03)
High initial income	-1.55***
	(0.09)
High previous investment size	-1.53***
	(0.13)
/lnsig2u	0.28***
	(0.07)
Observations	32,914
Number of Participants	422
Log Likelihood	-10780
Prob > chi2	0.000

*** p<0.001, ** p<0.01, * p<0.05

Appendix C. Pilot Studies

C.1 Pilot Study 1

This pilot tried out a dynamic income process similar to the one ultimately adopted in the main experiment. The goal was to check whether subjects understood and were engaged in a sequence of games constituting the experiment, and whether they behaved according to the principles of rationality.

As in the main experiment, students faced a sequential continuation problem in a series of games and had to decide when to exit. I informed students about “their” hypothetical venture. I randomly assigned them to one of two settings: a for-profit and a not-for-profit firm. Subjects in the for-profit condition were encouraged to maximize the firm's financial income value, while those in the social enterprise group were directed to maximize benefits to society and the environment while generating profits. I dropped this distinction in subsequent experiments to gain greater focus on decision-making theory; observed behaviors turned out to be similar in the two settings in any case.

The experiment was conducted in February and March 2022 at the Behavioral Lab of Ivey Business School using oTree. One hundred student subjects who were enrolled in three business courses at the School took part. Of these, 50 students were randomly assigned to the for-profit firm condition, and the other 50 were assigned to the social enterprise condition. The pilot comprised three parts: a pre-experiment survey, the decision-making game, and a post-experiment survey. This feature also made it into the main experiment.

There were three treatments in the pilot: risk with low exit cost; risk with high exit cost; and uncertainty with low exit cost. This was of course expanded into a 2 x 2 design in the main experiment. Risk and uncertainty have the same meanings and implementation as described in the main text. Each participant played two identical games under each condition to assess whether they adapted their decision-making strategies over time (i.e., whether they learned). Thus, participants played a total of six games—comprised of 30 rounds. In each game, income draws were randomly generated from a two-point distribution with a given parameter set. See Tables C.1 and C.2 for more information about the experiment and the parameter values.

After completing the last game, participants answered an open-ended question asking about the decision-making logic they used when making their decisions ("What factors were important in making the exit decisions in previous EXIT games? Please describe the logic you used to decide when to exit."). After all experiments had been completed, the participants were rewarded with course credits for their participation. Participants spent an average of 20 minutes on the experiment.

Table C.1 Pilot study 1: Design

For profit firm	Social enterprise	Note
General instruction		
Pre-experiment survey: Optimism, Social preferences, Mathematical skill (including calculating NPV question)		
Game specific instruction	Game specific instruction	
Uncertainty with low exit cost Risk with low exit cost Risk with high exit cost		- Always Uncertainty situation first, then the order of Risk and Risk with high exit cost were randomized - Comprehension check questions were provided after completing the first game in the Uncertainty condition. - Two attention check questions were included at some point during the remaining games.
Post-experiment survey (decision-making logic)		

Table C.2 Pilot study 1: Parameter set

Initial income	$30	
Probability of a good draw	0.2	
Good draw yields	$15	
Bad draw yields	$-5	
Exit cost	High	$40
	Low	$20

Of the pilot sample, 39 participants who failed the two attention checks were dropped from the analyses, leaving 32 participants in the for-profit group and 29 in the social enterprise group. Our findings were that less than 10% of subjects behaved in accordance with expected value maximization, i.e., exiting at the optimal time. High exit costs caused 3% more subjects to exit close to the optimal time. A handful of within-treatment, cross-game differences were noted, but there was no strong evidence of learning effects.

While this first pilot study validated our general approach, I wanted to explore more deeply, with a larger sample of respondents, the reasons for non-optimizing behavior. This motivated our second pilot study, described next.

C.2. Pilot Study 2

The goal of the second pilot study, conducted from January to March 2023 at the same Behavioral Lab as Pilot 1, also using oTree, was to refine the experiment to better understand the decision-making behavior of participants. The main enhancements to the pilot were the following:

1. A larger sample size: 580 student subjects enrolled in three business courses at the Business School
2. A full 2x2 within-subject design of risk-versus-uncertainty and low-versus-high exit cost
3. Multiple studies capturing between-subject manipulations, including the following:
   a. prior investment framing (high versus low)
   b. performance framing (success versus failure)

c. pivot framing of additional games (yes or no)

d. time pressure (yes or no)

Like Pilot 1, the experiment consisted of three parts: a pre-experiment survey, the decision-making game, and a post-experiment survey. The pre-experiment survey collected data on optimism, resilience, and mathematical skills. Socio-demographic data, such as age and gender, were obtained from the lab's prescreening data. All participants were asked to make exit decisions and encouraged to maximize the firm's financial total cumulative value. Each decision-making situation involved two games, each with distinct parameter sets (see Table C.3). Therefore, participants played a total of eight games (=2x2x2), each comprising 30 rounds. As in Pilot Study 1, random income trajectories were generated anew for each game. The participants were rewarded with course credits for their participation. The participants spent an average of 25 minutes on the experiment. A total of 193 participants failed to pass two attention checks leaving the final sample size at 387.

The main results are included in the following paragraphs. First, participants showed a tendency to exit later under uncertainty than risk treatments. The post-experiment survey suggested that the motivation for some participants was to continue to identify a pattern in the returns. Second, the tendency to exit early under risk was more prevalent when the exit cost was high ($40) and the expected positive value was small ($7). There was already evidence that participants wanted to exit with a positive (or at least a non-negative) value.

Third, it was unclear whether framing the choice to terminate a game and start a new one as a pivot (rather than just moving to another game), made a difference to the results. Moreover, reflecting on the framing after the experiment led me to doubt whether this was a meaningful manipulation, since pivoting in practice usually involves repositioning a product, not closing a venture and starting another one. Consequently, I dropped this framing for the main experiment. I did, however, observe clearer effects from the prior investment framing, with longer times to exit for those given a high investment framing relative to those given a low investment framing. Neither performance framing nor shortening the time given to participants to make their closure decisions made any noticeable difference to observed behavior. Consequently, I did not use either of these manipulations in the main experiment.

Finally, although I used two different parameter sets (Table C.3), I concluded that there was insufficient variation in their values to fully probe their impact on behavior. I rectified that in the main experiment where three different parameter sets exhibiting greater variation were used to generate income trajectories. I also observed that many of the randomly generated income trajectories never dropped below 0, making it unsurprising that some players never chose to exit their game. I therefore decided to use a fixed number of randomly generated and randomly assigned trajectories in the main experiment, where optimal exit was meaningful in all games.

Table C.3 Pilot study 2: Parameter sets

		Parameter set 1	**Parameter set 2**
Initial income		$30	
Probability of a good draw		0.2	0.3
Good draw yields		$15	$7
Bad draw yields		$-5	$-5
Expected income		$-1	$-1.4
Exit cost	High	$40	
	Low	$20	

Appendix D. Incentives

First, I randomly selected 5% of all participants and if selected, one game from the participant was chosen at random. If the participant's total business income in the randomly chosen game, after deducting the exit cost, was positive, they received a flat bonus payment of £20, in addition to an extra 20% of that income. If the participant's total business income after deducting the exit cost was negative, their bonus payment was £20 minus 20% of that income, with a minimum prize of £0. This ensures that participants treated each game independently and tried their best in each game. No player, even one whose chosen game was the least successful, ended up losing money on the bonus; the better they performed, the greater the positive bonus they received—giving them incentives to do well.

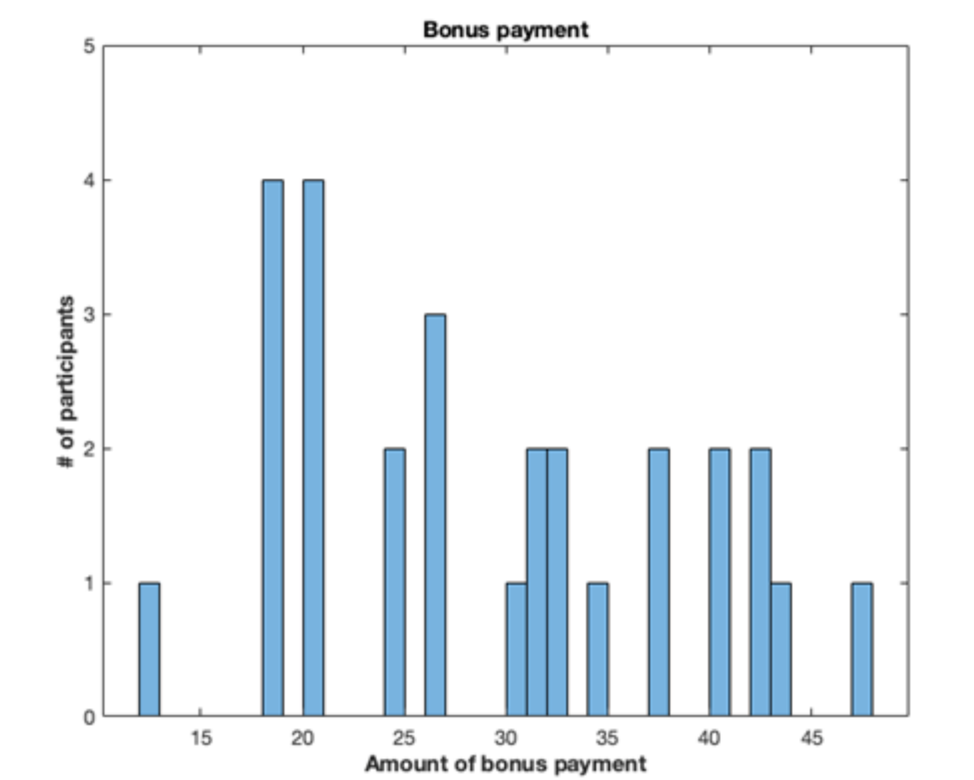
Table D.1 presents summary statistics of the value of the bonus payments (in £); Figure D.1 presents the histogram.

Table D.1

Obst	Mean	SD	Min	Max	Eligible Participants	Initial sample
28	28.89	9.60	£12	£48	470	550

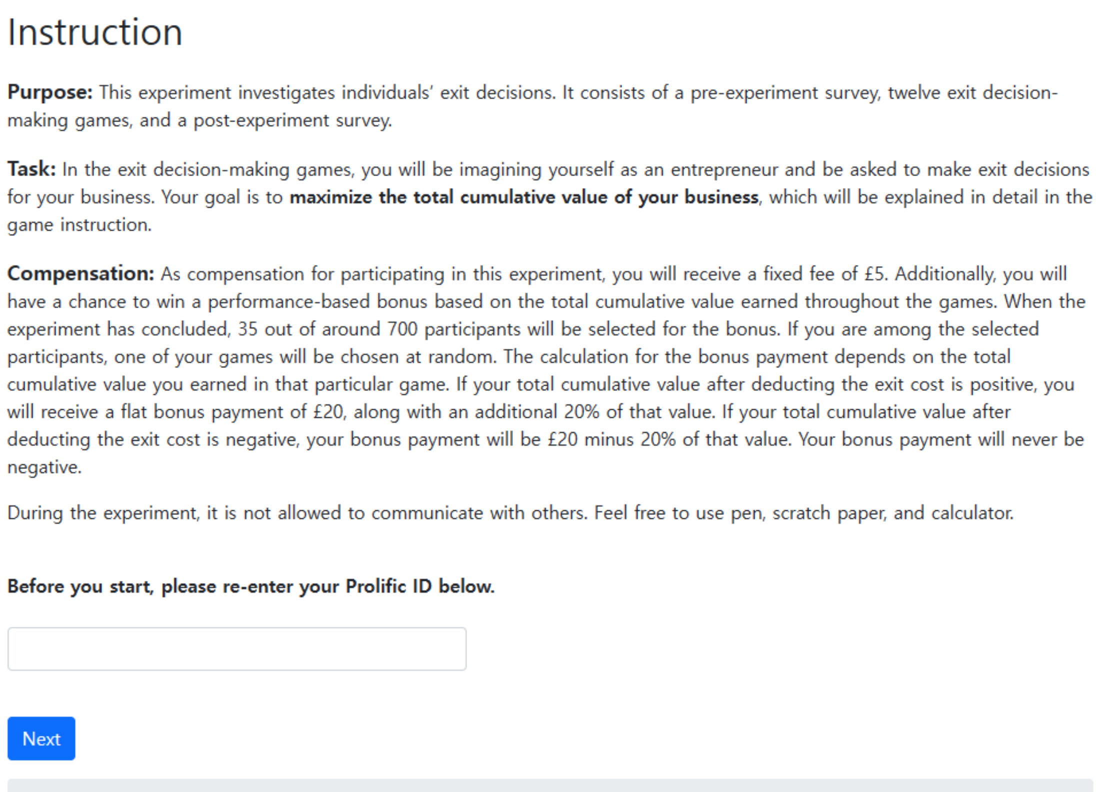
Notes: Eligible participants passed the two attention checks. The initial sample indicates the number of participants in Studies 1, 2, 3, as well as several others used in robustness checks. The number of participants selected to receive bonus payments was calculated as 5% of the initial sample size.

Figure D.1


Bonus payment
# of participants
Amount of bonus payment
0
1
2
3
4
5
15
20
25
30
35
40
45

Appendix E. Screenshots

Figure E.1 General instruction



Instruction

Purpose: This experiment investigates individuals' exit decisions. It consists of a pre-experiment survey, twelve exit decision-making games, and a post-experiment survey.

Task: In the exit decision-making games, you will be imagining yourself as an entrepreneur and be asked to make exit decisions for your business. Your goal is to **maximize the total cumulative value of your business**, which will be explained in detail in the game instruction.

Compensation: As compensation for participating in this experiment, you will receive a fixed fee of £5. Additionally, you will have a chance to win a performance-based bonus based on the total cumulative value earned throughout the games. When the experiment has concluded, 35 out of around 700 participants will be selected for the bonus. If you are among the selected participants, one of your games will be chosen at random. The calculation for the bonus payment depends on the total cumulative value you earned in that particular game. If your total cumulative value after deducting the exit cost is positive, you will receive a flat bonus payment of £20, along with an additional 20% of that value. If your total cumulative value after deducting the exit cost is negative, your bonus payment will be £20 minus 20% of that value. Your bonus payment will never be negative.

During the experiment, it is not allowed to communicate with others. Feel free to use pen, scratch paper, and calculator.

Before you start, please re-enter your Prolific ID below.

Next

Figure E.2

Decision-making game instruction

PART 2: Decision-making game

You will be asked to play 12 decision-making games, giving you the opportunity to learn and possibly change your decision strategy.

As the owner of the firm, you are responsible for deciding whether to continue or terminate the venture.

The primary goal of your company is to **maximize the total cumulative value** that is the sum of your incomes from all rounds you play. For example, let's assume you start with an initial income of $50. Each round, your income would increase by $15 or decrease by $10. Here's the breakdown of how your income changes:

- If you experience a $10 decrease in Round 1, your income for this round will be $40 ($50 - $10).
- If you experience a $15 increase in Round 1, your income for this round will be $65 ($50 + $15).

This pattern continues for subsequent rounds, with each income change being applied to the income from the previous round.

Now, let's say your income in Round 1 is $65, and you decide to exit in Round 2. If the exit cost is $10, then your total cumulative value is $65-$10 = $55. If your income in any round falls below -$50, your venture is unable to continue operating and that game terminates.

You can proceed to the next screen after 0 seconds.

Next

Figure E.3 Comprehension checks

Comprehension Check

Please answer a few questions about this study and the game before proceeding to the next games. You can refer to the instruction you've just read at the bottom of the screen if needed.

IMPORTANT: You will have **three chances** to provide the correct answers. If you fail this comprehension check, you will be requested to return your submission, and the experiment will be concluded.

You have 3 chance(s).

1. What is your task in this experiment?
- Find the best investment option
- Make exit decisions
- Show that I understand statistics

2. If you earn $10 in Round 1, 0 in Round 2, -$5 in Round 3, and decide to exit in Round 4, what is your total cumulative value after deducting the exit cost of $10?
- -$5
- -$2.5
- $0

3. Assume that the realized income after Round 2 is $60. Suppose you experience a $20 increase in Round 3. What will your income be in Round 3?
- $60
- $70
- $80

Figure E.4 Example of a decision-making game (Uncertainty with low exit cost condition)

PART 2: Decision-making game

For all games, you start with **a hypothetical income of $30**.

In each round, you may decide to

- Stay in the game (i.e. let your income change).

- Or leave the game.

If you leave the game, you will get the total cumulative value of the firm at the time of exit minus the exit cost. Once you leave a game, you cannot rejoin it, and a new game starts.

Next

E.4.1. Instruction

GAME 1 of 12

You start with a hypothetical income of $30.

In the next round (Round1) and any subsequent rounds(Round 2, 3, etc.),

- Your income equals the income you received in the previous round plus a random shock, which could be positive or negative.

- The exit cost is constant at **$20**.

Next

E.4.2 Choice

GAME 1: Round 1

- Income: what you received last period plus a random shock, which could be positive or negative

- Exit cost: $20

Do you want to keep running this firm?

- Continue
- Exit

Next

GAME 1: Round 2

Your income draw this period was **$22**. Added to the $30 it was worth last period, your business is now worth **$52**. If you exit in the next round, the total cumulative value of your business, after deducting exit costs, will be **$32**.

- Income: what you received last period plus a random shock, which could be positive or negative

- Exit cost: $20

Do you want to keep running this firm?

○ Continue
○ Exit

Next

History

Round number	Your choice	Result	Firm value
1	Continue	22	52

E.4.3 Result

GAME 1: Results

You have decided to exit. Therefore, the total cumulative value created by your business over its lifetime, after deducting exit costs, is **$32**.

This is the end of Game 1. Please proceed to the next screen.

Next

History

Round number	Your choice	Result	Firm value
2	Exit	None	32
1	Continue	22	52

Figure E.5 Attention checks

E.5.1 Attention check 1

Please select **'Green'** below.

	Red	Blue	Green	Orange	Brown
Q1	○	○	○	○	○

Next

E.5.2 Attention check 2

Q. What was the exit cost of the game you just played?

Next

Figure E.6 Post-experiment survey

PART 3. Post-Survey

Before you leave, and to retain the possibility of receiving an additional bonus, please answer the questions below.

Section 1: The questions below are about how you made your *EXIT* decisions.

1-1. Did you attempt to calculate the expected value of your income in games where information on probabilities and income values was NOT provided?

○ Yes
○ No

1-2. In the games where such information was available, did you calculate the expected value of your income?

○ Yes
○ No

2-1. When incomes started declining, were you motivated to remain playing until you restored your original income flow?

○ Yes
○ No
○ Partly

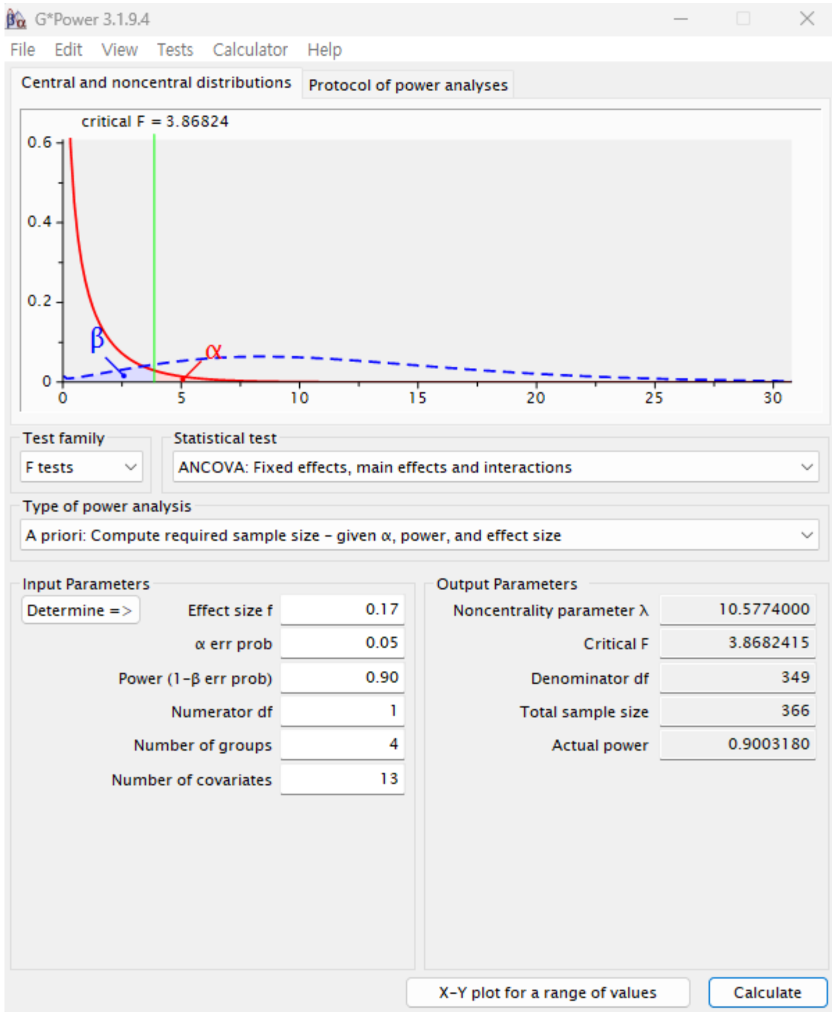
2-2. When incomes started declining, were you worried about losing what you had and so decided to quit earlier than you might otherwise have done?

○ Yes
○ No
○ Partly

3. What factors were important in making the exit decisions? (e.g., Initial income, exit cost, expected income value, etc.) Did the factors you mentioned have the same importance in games where information on probabilities and income values was NOT provided and games where such information was given?

4. While playing the games, have you thought that you decided to exit too late or too early? If so, please describe what you were thinking at that time.

Appendix F. Power Analysis



Appendix G. Risk Tolerance and Optimism Measures

Figure G.1 Risk tolerance

Please indicate your choice to each question below.

1. In general, how would your best friend describe you as a risk taker?

- ○ A real gambler
- ○ Willing to take risks after completing adequate research
- ○ Cautious
- ○ A real risk avoider

2. You are on a TV game show and can choose one of the following, which would you take?

- ○ $1,000 in cash
- ○ A 50% chance at winning $5,000
- ○ A 25% chance at winning $10,000
- ○ A 5% chance at winning $100,000

3. You have just finished saving for a "once-in-a-lifetime" vacation. Three weeks before you plan to leave, you lose your job. You would:

- ○ Cancel the vacation
- ○ Take a much more modest vacation
- ○ Go as scheduled, reasoning that you need the time to prepare for a job search
- ○ Extend your vacation, because this might be your last chance to go first-class

4. If you unexpectedly received $20,000 to invest, what would you do?

- ○ Deposit it in a bank account, money market account, or an insured CD
- ○ Invest it in safe high quality bonds or bond mutual funds
- ○ Invest it in stocks of stock mutual funds

5. In terms of experience, how comfortable are you investing in stocks or stock mutual funds?

- ○ Not at all comfortable
- ○ Somewhat comfortable
- ○ Very comfortable

6. When you think of the word "risk", which of the following words comes to mind first?

- ○ Loss
- ○ Uncertainty
- ○ Opportunity
- ○ Thrill

7. Some experts are predicting prices of assets such as gold, jewels, collectibles, and real estate (hard assets) to increase in value; bond prices may fall, however, experts tend to agree that government bonds are relatively safe. Most of your investment assets are now in high interest government bonds. What would you do?

- ○ Hold the bonds
- ○ Sell the bonds, put half the proceeds into money market accounts, and the other half into hard assets
- ○ Sell the bonds and put the total proceeds into hard assets
- ○ Sell the bonds, put all the money into hard assets, and borrow additional money to buy more

8. Given the best and worst case returns of the four investment choices below, which would you prefer?

- ○ $200 gain best case; $0 gain/loss worst case
- ○ $800 gain best case; $200 loss worst case
- ○ $2,600 gain best case; $800 loss worst case
- ○ $4,800 gain best case; $2,400 loss worst case

9. In addition to whatever you own, you have been given $1,000. You are now asked to choose between:

- ○ A sure gain of $500
- ○ A 50% chance to gain $1,000 and a 50% chance to gain nothing

10. In addition to whatever you own, you have been given $2,000. You are now asked to choose between:

- ○ A sure loss of $500
- ○ A 50% chance to lose $1,000 and a 50% chance to lose nothing

11. Suppose a relative left you an inheritance of $100,000, stipulating in the will that you invest ALL the money in ONE of the following choices. Which one would you select?

- ○ A savings account or money market mutual fund
- ○ A mutual fund that owns stocks and bonds
- ○ A portfolio of 15 common stocks
- ○ Commodities like gold, silver, and oil

12. If you had to invest $20,000, which of the following investment choices would you find most appealing?

- ○ 60% in low-risk investments, 30% in medium-risk investments, 10% in high-risk investments
- ○ 30% in low-risk investments, 40% in medium risk investments, 30% in high-risk investments
- ○ 10% in low-risk investments, 40% in medium-risk investments, 50% in high-risk investments

13. Your trusted friend and neighbor, an experienced geologist, is putting together a group of investments to fund an exploratory gold mining venture. The venture could pay back 50 to 100 times the investment if successful. If the mine is a bust, the entire investment is worthless. Your friend estimates the chance of success is only 20%. If you had the money, how much would you invest?

- ○ Nothing
- ○ One month's salary
- ○ Three month's salary
- ○ Six month's salary

Figure G.2 Optimism

PART 1. Pre-Survey

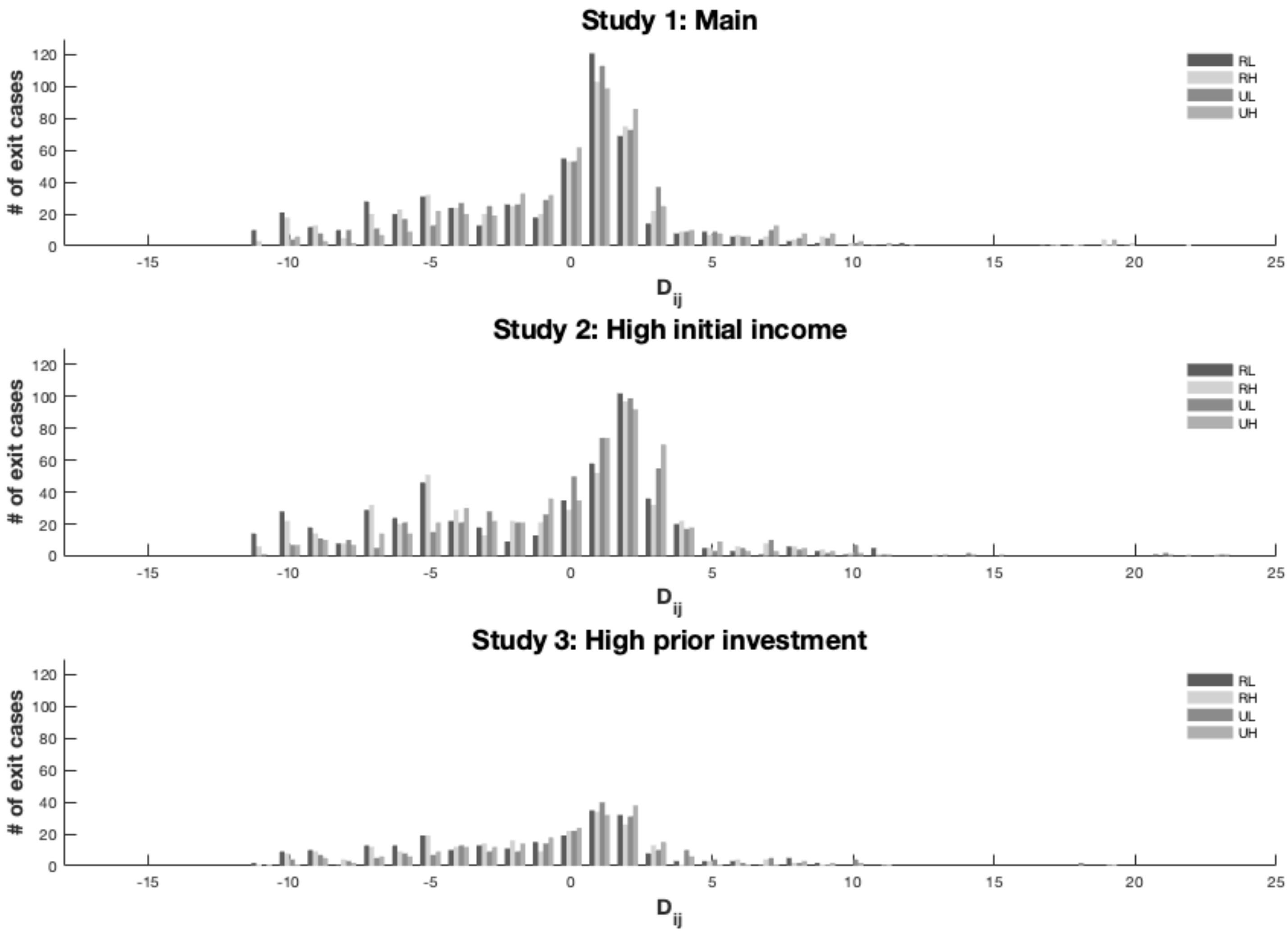
1. Please indicate how much you agree or disagree with the following statements.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
(1) In uncertain times, I usually expect the best.	○	○	○	○	○
(2) It is easy for me to relax.	○	○	○	○	○
(3) If something can go wrong for me, it will.	○	○	○	○	○
(4) I am always optimistic about my future.	○	○	○	○	○
(5) I enjoy my friends a lot.	○	○	○	○	○
(6) It is important for me to keep busy.	○	○	○	○	○
(7) I HARDLY ever expect things to go on my way.	○	○	○	○	○
(8) I do NOT get upset too easily.	○	○	○	○	○
(9) I RARELY count on good things happening to me.	○	○	○	○	○
(10) Overall, I expect more good things to happen to me than bad.	○	○	○	○	○

Next

Appendix H. Exit Delays

Figure H.1 Distribution of Exit Delay, *D*



Appendix I. Exploratory and Supplementary Analyses

I.1 Variables

Dependent variables. The two dependent variables are exit delay and terminal income. The first, exit delay, D_{ij}, is defined as the observed time individual i chose to exit in trajectory j minus the "optimal time" for that trajectory. As trajectories are known, so is the optimal exit time (by Definition A.1). For example, early exits are classified as occurrences when $D_{ij} < 0$ and late exits involve $D_{ij} > 0$. The number of early exits is denoted by $\#(D_{ij} < 0)$. The second dependent variable is terminal income, y_τ. Optimal exit has $y_\tau \approx 0$; $y_\tau > 0$ for early exits ("selling winners too early"), and $y_\tau < 0$ ("riding losers too long").

Covariates. The pre-experiment survey, conducted just before the games commenced, collected data on entrepreneurial status, age, gender, marital status, and education. It also included instruments for measuring *Optimism*, *Resilience*, *Curiosity*, and *Mathematical Skill*. Briefly, optimism is defined as generalized positive expectations regarding future events, which can influence people's willingness to persist with a declining venture (Scheier & Carver, 1985; Carver & Scheier, 1998). I measured resilience because I wanted to ensure that the experimental results are not driven by individual differences in this trait, which enables individuals to maintain a positive mindset, stay motivated, and persevere despite setbacks or failures (Howard & Johnson, 2004; Magnano et al., 2016). Similarly, I wanted to control for curiosity, which is defined as "the desire for knowledge that motivates individuals to learn new ideas, eliminate information-gaps, and solve intellectual problems" (Litman, 2008, p. 1586). In principle, this trait can also influence individuals' decision-making processes by driving them to explore potential outcomes and gather additional information before taking an action (Gottlieb et al., 2013; van Lieshout et al., 2020). Finally, since decision-making in the experiment may involve assessing probabilities and potential gains or losses, I asked two probability questions and one NPV calculation question to ensure people understood basic probability concepts and possessed financial calculation skills.

I also asked two sets of questions of participants, to assess their *risk attitudes*. First, I evaluated “financial risk tolerance,” a widely used 13-item scale designed to evaluate a person’s willingness to engage in a risky financial behavior (Grable & Lytton, 1999). Higher (or lower) values of this variable are associated with risk-seeking (averse) preferences. Second, I followed prior authors (e.g., Elfenbein et al., 2017; Holt & Laury, 2002) by inferring risk preferences from choices between a sure payoff of $1 and one of a set of 50-50 gambles along a positive risk/expected return locus. I asked two sets of risk questions because people sometimes give different responses to risk questions when making financial investment decisions (Xiao, 2008). As with the risk tolerance measure, higher (or lower) values of this variable are associated with risk-seeking (averse) preferences. Having multiple measures of risk attitudes imparts robustness to my analysis.

I.2 Results

I.2.1 Exit Types

Table I.1 presents summary statistics of the two dependent variables across within- and between-subject treatments. The table shows that, on average, participants exit earlier (between about 3 and 6 periods on average) than the time that would maximize business value—the stated objective of the task. Also, the large positive mean values of terminal income, y_τ, in Table I.1—especially in the high initial income and high previous investment studies—reveal that participants left substantial amounts of money on the table when they exited. In the high initial income study, for example, this amounted to nearly one-third of their initial income. Participants seem to have a desire to "quit while they're ahead." Moreover, while the means of exit timing deviations and terminal incomes vary somewhat across the treatments, this finding is remarkably robust, being present in all four within-subject treatments across all three between-subject studies. I next provide regression evidence to further investigate participants' decision-making behavior.

I.2.1 Regression-Based Evidence about Mechanisms

To test the theories further, Table I.2 presents regression results for both dependent variables under separate conditions of both risk and uncertainty.

First, column (1) of Table I.2 reveals a significant positive relationship between exit costs and exit time. This is inconsistent with both the risk-neutral and risk-averse versions of EUT—casting further doubt on those theories. Second, as noted above, dummy variables for Parameter sets 2 and 3 (relative to 1, the base category in the regression) capture the effect of mean-preserving spreads. The coefficients on both variables in column (1) of Table I.2 are insignificant.[31]

[31] The negative and significant coefficient on Parameter set 3 in column (3) is consistent with risk-seeking behavior. However, as noted earlier, risk-seeking behavior implies late exits; yet Table 5 records only 44 of the 422 participants consistently behaving in accordance with that theory.

Third, the risk-tolerance and risk-preference measures affect the two dependent variables in Table I.2 under the risk condition in opposite ways. Greater risk tolerance promotes exits at higher terminal incomes [$\hat{\beta} = 0.29$ ($se = 0.10$) in column (3)], consistent with risk aversion but not risk seeking. However, greater risk preference promotes late exits [$\hat{\beta} = 0.15$ ($se = 0.07$) in column (1)] and lower terminal incomes [$\hat{\beta} = -0.80$ ($se = 0.25$) in column (3)], consistent with risk seeking but not risk aversion. Consequently, I once again fail to find clear support for EUT with non-neutral risk preferences.[32] In addition, the survey measure of optimism exhibits a significant *negative* relationship with exit delay in column (2) of Table I.2, and a significant *positive* relationship with terminal income in column 4—also contrary to expectations. Both of these results confirm our earlier evidence rejecting the notion that optimism can explain exit behavior.

Fourth, the coefficients on the “High initial income” and “High previous investment” study variables in Table I.2 investigate initial income and framing effects. The results for “High initial income” show that participants starting with higher initial income tend to exit earlier and at a higher terminal income. People could possibly use initial incomes to formulate personal psychological performance thresholds which influence their exit decisions—a possibility explored further below. The “High previous investment” variable measures the effects of a framing manipulation where randomly assigned participants were informed that their hypothetical venture had committed a sizeable prior investment. Columns (1) and (3) of Table I.2 show that, under conditions

[32] These inconclusive findings on the effect of risk attitudes match those of studies using incentivized elicitation of risk preferences which do not correlate well with entrepreneurship status. For example, Cho & Orazem (2021) reported mixed and inconclusive associations between risk aversion and exit when risk preferences were measured after entry, as in our case.

of risk, participants exited earlier and with a higher terminal income. This result also suggests that participants had a psychological threshold below which they did not want to go, which was higher when greater business value was perceived to be at stake.[33]

Fifth, pairwise comparison of Table I.2's columns (1) with (2), and columns (3) with (4), enables behavior under risk to be compared with behavior under uncertainty. Prior entrepreneurship literature has focused more on how these conditions affect entry, rather than exit (e.g., Gänser-Stickler et al., 2022; O'Brien et al., 2003; Wennberg et al., 2006), so the results in Table I.2 add a different perspective to this scholarly debate. The values of the intercept in columns (1) and (2) of this table measure the conditional mean of D when all the covariates are zero: intercepts in columns (3) and (4) measure the conditional mean of y_τ when all the covariates are zero. Comparing these intercepts shows that, relative to risk, uncertainty is associated with earlier exit—all else being equal (compare the value -6.00 with -2.34) and a higher terminal income at exit (compare the value 24.46 with -3.50). I also see in the uncertainty setting, relative to risk, a greater scope for mathematical skill and higher education to affect behavior and a more muted impact of age. Interestingly, few other differences are observed.

Sixth, I can compare entrepreneurs with non-entrepreneurs. Column (3) shows that entrepreneurs tend to exit with a lower terminal income than non-entrepreneurs under conditions of risk. This moves them closer to the optimal benchmark (see Table I.1), possibly providing some limited evidence of "expert" behavior. Interestingly, however,

[33] This was borne out in qualitative statements in the post-survey questionnaire, where some Study 3 subjects observed for example: "*I had considered that the business had been running for over 2 years now and did have a significant investment, so I tried not to throw it all away*"; "(*Prior investment*) *may have led me to be more conservative because I didn't want to risk the history or lose the money;*" and "*It* (*the framing*) *definitely made me feel more cautious about how and when to exit*."

there is no difference between entrepreneurs and non-entrepreneurs under conditions of uncertainty, as the coefficient on the Entrepreneur indicator variable is insignificant in columns (2) and (4). Table I.3 presents separate regressions for entrepreneurs and non-entrepreneurs and counts of exit types calculated separately for entrepreneurs and non-entrepreneurs; these show similar patterns of behavior across participant type.

Seventh, I interpret the other covariates in Table I.2. No significant gender or marital status differences were observed, and there were only modest age effects, with older participants exiting slightly earlier on average and with a higher terminal income. Higher education was associated with slightly earlier exits at a higher terminal income under conditions of both risk and uncertainty. Resilience played no discernible role; Curiosity had only a limited negative effect on terminal income only and only under uncertainty. This allays a possible concern that participants chose to continue not because they wanted to achieve some objective, but because they simply wanted to see what happened as the games played out. Turning to mathematical skills, we might have expected these to move participant play closer to the optimal benchmark under conditions of risk, and to be insignificant under conditions of uncertainty. In fact, the results show the opposite. They had no significant role in the risk setting—once again consistent with the idea that people are not using probabilities when making decisions—and only a modest delaying effect in the uncertainty setting. None of the suggested theories has a ready explanation for this finding.

Finally, I performed a sensitivity check on our approach of always assigning the uncertainty treatment before the risk treatment. Using a smaller sample of 50 entrepreneurs, all but seven of whom passed the two attention checks, generated similar results (available on request). Study types and over-optimism had insignificant effects on exit behaviors. Overall, while I noticed some differences in the impact of covariates, such as mathematical skills being associated with earlier exits in the risk setting, these findings provide reassurance about the absence of a confound of within-subject order effects.

Table I.1 Exit Behavior Across the Three Studies

	Main Study				**High initial income Study**				**High previous investment Study**			
	Mean D_{ij}	Mean y_τ	No exit	N	Mean D_{ij}	Mean y_τ	No exit	N	Mean D_{ij}	Mean y_τ	No exit	N
Uncertainty with low exit cost	-3.12 (4.79)	3.79 (19.41)	26	496	-4.32 (5.09)	10.57 (22.09)	18	498	-3.16 (5.16)	4.99 (21.75)	14	214
Uncertainty with high exit cost	-2.85 (4.67)	3.78 (19.26)	34	488	-4.55 (4.99)	11.31 (22.53)	14	502	-3.69 (4.53)	6.00 (18.31)	15	213
Risk with low exit cost	-4.96 (5.27)	7.25 (18.71)	12	510	-6.35 (5.69)	16.59 (23.32)	11	505	-5.27 (5.30)	10.05 (19.71)	1	227
Risk with high exit cost	-3.94 (5.23)	5.95 (18.85)	17	505	-5.86 (5.63)	16.25 (23.36)	11	505	-4.96 (4.89)	10.48 (20.14)	5	223

Notes: D_{ij} is exit delay, defined as the observed time individual i chose to exit in trajectory j minus the "optimal time" for that trajectory. The variable y_τ is terminal income. "No exit" is the number of games where exit was never chosen before the game terminated in "bankruptcy." N is the total number of games per treatment. Standard deviations appear in parentheses.

Table I.2 Regression Results

Variables	**Deviations from optimal exits** D_{ij}		**Terminal income** y_τ	
	(1) Risk	(2) Uncertainty	(3) Risk	(4) Uncertainty
Entrepreneur	0.44 (0.24)	-0.12 (0.22)	-2.92** (0.93)	0.37 (0.93)
Age	-0.05*** (0.01)	-0.01 (0.01)	0.21*** (0.05)	0.07 (0.05)
Gender – Male	-0.19 (0.25)	-0.10 (0.23)	-0.44 (0.98)	-0.29 (0.96)
Marital – Married	0.22 (0.24)	-0.04 (0.22)	-0.74 (0.93)	-1.14 (0.93)

Education – Higher education	-0.78** (0.29)	-1.03*** (0.26)	3.05** (1.13)	3.92*** (1.11)
Resilience	-0.03 (0.05)	0.07 (0.05)	0.00 (0.20)	-0.26 (0.22)
Curiosity	0.18 (0.21)	0.33 (0.19)	-0.48 (0.81)	-2.42** (0.80)
Mathematical skill	-0.21 (0.17)	0.65*** (0.15)	-0.15 (0.64)	-3.53*** (0.65)
High initial income Study	-1.47*** (0.26)	-1.37*** (0.30)	9.06*** (0.99)	6.52*** (0.98)
High previous investment Study	-0.75* (0.33)	-0.54 (0.30)	4.01** (1.26)	1.24 (1.26)
High exit cost	0.63** (0.22)	0.00 (0.20)	-0.50 (0.85)	0.14 (0.85)
Parameter set 2	0.39 (0.27)		0.43 (1.04)	
Parameter set 3	0.49 (0.27)		-4.27*** (1.05)	
Risk tolerance	-0.03 (0.03)		0.29** (0.10)	
Risk preference	0.15* (0.07)		-0.80** (0.25)	
Optimism		-0.06* (0.02)		0.35*** (0.10)
Constant	-2.34 (1.45)	-6.00*** (1.26)	-3.50 (5.58)	24.46*** (5.31)
N	2,338	2,334	2,338	2,337
R^2	0.051	0.048	0.084	0.073
F	3.613	3.720	6.247	5.852

Notes: Dependent variables are exit delay, D_{ij} , and terminal income, y_τ. Method of estimation: Ordinary Least Squares. Participants' employment sectors (i.e., industry dummy variables) are included in all regressions, but their coefficient estimates are not reported.
**p < 0.05, **p < 0.01, ***p < 0.001*

Table I.3 Regression Results by Group

(a) Entrepreneurs

Variables	Deviations from optimal exits D_{ij}		Terminal income y_τ	
	(1) Risk	(2) Uncertainty	(3) Risk	(4) Uncertainty
Age	-0.06*** (0.02)	-0.02* (0.02)	0.26*** (0.06)	0.11 (0.07)
Gender – Male	-0.38 (0.38)	-0.50 (0.35)	1.20 (1.50)	1.09 (1.51)
Marital – Married	0.15 (0.36)	0.37 (0.33)	-0.39 (1.40)	-2.80 (1.45)
Education – Higher education	-0.52 (0.39)	-0.92** (0.35)	1.64 (1.51)	4.25** (1.51)
Resilience	0.00 (0.07)	-0.02 (0.07)	-0.04 (0.29)	-0.24 (0.32)
Curiosity	0.29 (0.32)	0.75* (0.29)	-1.44 (1.25)	-3.98** (1.28)
Mathematical skill	-0.38 (0.25)	0.47* (0.23)	0.42 (0.98)	-2.62* (1.01)
Study 2	-1.54*** (0.37)	-1.43*** (0.34)	8.68*** (1.46)	6.76*** (1.48)
Study 3	-0.62 (0.47)	0.13 (0.43)	2.54 (1.84)	-0.73 (1.89)
High exit cost	0.34 (0.31)	-0.09 (0.28)	-0.25 (1.20)	0.56 (1.23)
Parameter set 2	-0.13 (0.37)		1.81 (1.46)	
Parameter set 3	0.14 (0.38)		-3.97** (1.47)	
Risk tolerance	-0.01 (0.04)		0.19 (0.14)	
Risk preference	0.17 (0.09)		-0.95** (0.35)	
Optimism		-0.03 (0.03)		0.39** (0.14)
Constant	-7.75** (2.69)	-10.82*** (2.36)	21.22 (10.48)	44.54*** (10.35)
N	1,172	1,168	1,172	1,169
R^2	0.085	0.073	0.115	0.092
F	3.301	3.081	4.613	3.971

Notes: Dependent variables are exit delay, D_{ij} , and terminal income, y_τ. Method of estimation: Ordinary Least Squares. Participants' employment sectors (i.e., industry dummy variables) are included in all regressions, but their coefficient estimates are not reported.
**p < 0.05, **p < 0.01, ***p < 0.001*

(b) Non-entrepreneurs

Variables	**Deviations from optimal exits** D_{ij}		**Terminal income** y_τ	
	(1) Risk	(2) Uncertainty	(3) Risk	(4) Uncertainty
Age	-0.03 (0.02)	-0.01 (0.02)	0.18** (0.07)	0.06 (0.06)
Gender – Male	-0.37 (0.36)	0.01 (0.32)	-0.29 (1.35)	-0.64 (1.30)
Marital – Married	0.29 (0.34)	-0.30 (0.31)	-1.12 (1.28)	-0.12 (1.27)
Education – Higher education	-1.05* (0.48)	-1.14** (0.43)	4.31* (1.83)	3.47* (1.77)
Resilience	-0.14* (0.08)	0.13 (0.07)	0.43 (0.28)	-0.20 (0.30)
Curiosity	0.34 (0.30)	0.13 (0.26)	-0.86 (1.12)	-1.76 (1.07)
Mathematical skill	0.09 (0.24)	0.91*** (0.22)	-1.43 (0.89)	-4.51*** (0.88)
Study 2	-1.60*** (0.37)	-1.28*** (0.33)	10.19*** (1.39)	6.31*** (1.34)
Study 3	-1.02* (0.50)	-1.37** (0.43)	6.65*** (1.79)	3.84* (1.75)
High exit cost	0.94** (0.31)	-0.02 (0.28)	-0.76 (1.18)	-0.22 (1.14)
Parameter set 2	0.93* (0.38)		-0.96 (1.43)	
Parameter set 3	0.83* (0.38)		-4.58** (1.45)	
Risk tolerance	-0.07 (0.04)		0.40** (0.15)	
Risk preference	0.29** (0.10)		-1.20** (0.38)	
Optimism		-0.11** (0.03)		0.40** (0.14)
Constant	-0.56 (1.89)	-4.38** (1.62)	-14.57* (7.17)	16.68* (6.60)
N	1,166	1,166	1,166	1,168

R^2	0.079	0.081	0.123	0.100
F	3.131	3.592	5.129	4.517

Notes: Dependent variables are exit delay, D_{ij} *, and terminal income,* y_τ*. Method of estimation: Ordinary Least Squares. Participants' employment sectors (i.e., industry dummy variables) are included in all regressions, but their coefficient estimates are not reported.*
**p < 0.05, **p < 0.01, ***p < 0.001*

Appendix J. Separating Entrepreneurs and Non-Entrepreneurs

Table J.1 EUT: Regression Results by Group

(a) Entrepreneur sample

	Risk				Uncertainty
Variables	(1)	(2)	(3)	(4)	(5)
Optimal	-0.54***	-0.52***	-0.55***	-0.53**	
	(0.13)	(0.14)	(0.16)	(0.17)	
Early	-1.59***	-1.58***	-1.49***	-1.48***	
	(0.12)	(0.12)	(0.13)	(0.13)	
Late	0.36**	0.45***	0.39**	0.46***	1.46***
	(0.12)	(0.13)	(0.13)	(0.14)	(0.05)
High initial income	0.29	0.29	0.29	0.29	-1.45***
	(0.16)	(0.16)	(0.17)	(0.17)	(0.13)
High previous investment size	0.10	0.10	0.10	0.10	-1.72***
	(0.21)	(0.21)	(0.22)	(0.22)	(0.21)
High exit cost		-0.04		-0.03	
		(0.12)		(0.12)	
Early X High exit cost		0.01		0.01	
		(0.13)		(0.13)	
Late X High exit cost		-0.13		-0.13	
		(0.14)		(0.14)	
Parameter set 2			0.34*	0.34*	
			(0.14)	(0.14)	
Parameter set 3			-0.28	-0.28	
			(0.15)	(0.15)	
Early X Parameter set 2			-0.39*	-0.39*	
			(0.16)	(0.16)	
Early X Parameter set 3			-0.00	-0.00	
			(0.16)	(0.16)	
Late X Parameter set 2			-0.26	-0.25	
			(0.17)	(0.17)	
Late X Parameter set 3			0.21	0.23	
			(0.17)	(0.17)	
/lnsig2u	0.09	0.09	0.14	0.14	0.42***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.10)
Observations	9,804	9,804	9,804	9,804	11,761
Number of Participants	215	215	215	215	215
Log Likelihood	-2931	-2928	-2909	-2906	-3584
Prob > chi2	0.000	0.000	0.000	0.000	0.000

Notes: Dependent variable is exit, E_{igr}, which takes the value of 1 if a participant exits and 0 otherwise. Method of estimation: Random effect probit model.

**p < 0.05, **p < 0.01, ***p < 0.001*

(b) Non-entrepreneur sample

	Risk				Uncertainty
Variables	(1)	(2)	(3)	(4)	(5)
Optimal	-0.44***	-0.43**	-0.53**	-0.51**	
	(0.13)	(0.14)	(0.16)	(0.17)	
Early	-1.59***	-1.53***	-1.39***	-1.32***	
	(0.11)	(0.12)	(0.12)	(0.12)	
Late	0.36**	0.46***	0.37**	0.46***	1.33***
	(0.12)	(0.13)	(0.13)	(0.14)	(0.05)
High initial income	0.34*	0.33*	0.35*	0.34*	-1.44***
	(0.16)	(0.16)	(0.16)	(0.16)	(0.13)
High previous investment size	0.26	0.26	0.26	0.26	-1.55***
	(0.20)	(0.20)	(0.21)	(0.21)	(0.19)
High exit cost		-0.02		-0.03	
		(0.12)		(0.12)	
Early X High exit cost		-0.09		-0.09	
		(0.13)		(0.13)	
Late X High exit cost		-0.15		-0.16	
		(0.14)		(0.14)	
Parameter set 2			0.34*	0.34*	
			(0.15)	(0.15)	
Parameter set 3			-0.09	-0.09	
			(0.16)	(0.16)	
Early X Parameter set 2			-0.58***	-0.59***	
			(0.16)	(0.16)	
Early X Parameter set 3			-0.31	-0.31	
			(0.17)	(0.17)	
Late X Parameter set 2			-0.25	-0.23	
			(0.18)	(0.18)	
Late X Parameter set 3			0.06	0.07	
			(0.18)	(0.18)	
/lnsig2u	-0.02	-0.01	0.03	0.04	0.29**
	(0.12)	(0.12)	(0.12)	(0.12)	(0.11)
Observations	9,006	9,006	9,006	9,006	11,157
Number of Participants	207	207	207	207	207
Log Likelihood	-2844	-2839	-2818	-2812	-3536
Prob > chi2	0.000	0.000	0.000	0.000	0.000

Notes: Dependent variable is exit, E_{igr}, which takes the value of 1 if a participant exits and 0 otherwise. Method of estimation: Random effect probit model.
**p < 0.05, **p < 0.01, ***p < 0.001*

Appendix K. Validation Tests

The validation test is a simplified version of the main study. It replicated the core components of the main study, except for new comprehension check questions designed to directly assess participants' understanding of the game mechanics. It consisted of four parts: a general instruction, game instruction, 2 comprehension check questions, and 4 decision-making games. See Figure K.1 for screenshots (those for the decision-making games are similar to those in Appendix E and so have been suppressed for brevity).

Participants who consented to participate in the test first read the general description of the experiment and a detailed game instruction. Similar to the main study, participants had to remain on the game instruction page for at least 60 seconds to ensure sufficient time for reading. In the comprehension test, I presented two questions made up with income trajectories identical to those used in the main game. Detailed information (i.e., change in income each round, income each round, total business value each round) was also provided to help participants understand how their income changes during a game. Participants were then asked to select the optimal exit timings to maximize their total business values.

Following the comprehension test, participants played 4 randomly selected decision-making games that were also identical to those in the main study. Given my goal was to examine whether participants could understand the game mechanics and exhibit different decision-making patterns based on their understanding, I simplified the games by testing only scenarios involving low exit costs under both uncertainty and risk conditions.

A sample of 70 participants from the original experiment was recruited for this validation test. The results demonstrated that our instructions and experimental task were clear and understandable—78.7% (55 participants) correctly answered both comprehension questions. Figure K.2 below plots the distribution of exit choices for this sub-group.

To assess the impact of participants' understanding of game mechanics on their decision-making behaviors, I then conducted t-tests comparing the exit decisions of participants who passed the comprehension test with those who did not. Table K.1 below reveals that participants, regardless of their comprehension test performance, did not exhibit significantly different exit behaviors.

Figure K.1 Screenshots of Validation Test

K.1.1 General Instruction

Instruction

Purpose: This experiment investigates individuals' exit decisions. It consists of a comprehension test and four exit decision-making games. This study will take up to 10 minutes.

Compensation: As compensation for participating in this experiment, you will receive a fixed fee of £2.

During the experiment, it is not allowed to communicate with others. Feel free to use pen, scratch paper, and calculator.

Before you start, please re-enter your Prolific ID below.

K.1.2 Decision-Making Game Instruction

Game instruction

You will be asked to play four decision-making games, giving you the opportunity to learn and possibly change your decision strategy.

As the owner of the firm, you are responsible for deciding **whether to continue or terminate the venture**.

The primary goal of your company is to **maximize the total business value**, which is the sum of your income from all rounds you play, minus the exit cost incurred when you stop the business.

For example, let's assume you start with an initial income of $30. Each round, your income can either increase by $12 or decrease by $8: these income changes are random. Here's the breakdown of how your income changes:

- If you experience a $8 decrease in Round 1, the change in income for Round 1 is -$8, and your income for this round will be $22 ($30 - $8).
- If you experience a $12 increase in Round 1, the change in income for Round 1 is $12, and your income for this round will be $42 ($30 + $12).

This pattern continues for subsequent rounds, with each income change being applied to the income from the previous round.

Now, let's say your income in Round 1 is $42, and you decide to exit in Round 2. If the exit cost is $20, then your total business value is $42-$20 = $22. If your income in any round falls below -$50, your venture is unable to continue operating and that game terminates.

You can proceed to the next screen after 58 seconds.

K.1.3 Comprehension Test

PART 1: Comprehension test

You will now see two examples that illustrate how business income and total business value can change in each round. Please review the following examples carefully and answer the questions before proceeding to the main games.

Q1. Considering the income changes over 8 rounds shown in the image below, in which round should you exit to maximize your total business value? The exit cost is constant at $20, regardless of the round in which you choose to exit.

History

Round	Change in income	Income this round	Total business value this round
0		$30 (Initial income)	$30
1	-$8	$22	$52
2	-$8	$14	$66
3	$12	$26	$92
4	-$8	$18	$110
5	-$8	$10	$120
6	-$8	$2	$122
7	-$8	-$6	$116
8	-$8	-$14	$102

- ◯ Round 2
- ◯ Round 4
- ◯ Round 6
- ◯ Round 8

Q2. Now, consider the following income history. In which round should you exit to maximize your total business value? Here again, the exit cost is constant at $20, regardless of the round in which you choose to exit.

History

Round	Change in income	Income this round	Total business value this round
0		$30 (Initial income)	$30
1	-$8	$22	$52
2	$12	$34	$86
3	-$8	$26	$112
4	-$8	$18	$130
5	-$8	$10	$140
6	-$8	$2	$142
7	-$8	-$6	$136

- ○ Round 4
- ○ Round 5
- ○ Round 6
- ○ Round 7

Table K.1 Exit Behavior of Validation Test

		Pass comprehension test (N = 55)	**Fail comprehension test (N = 15)**	**t**
Uncertainty with low exit cost	Mean D_{ij}	-1.39 (2.88)	-2.1 (4.22)	-1.07
	Mean y_τ	9.21 (23.03)	9.2 (24.19)	-0.00
	No exit	3	0	
	N	107	30	
Risk with low exit cost	Mean D_{ij}	-6.57 (4.97)	-6.97 (6.00)	-0.37
	Mean y_τ	9.64 (20.76)	16.13 (20.47)	1.52
	No exit	0	0	
	N	110	30	

**** p<0.001, ** p<0.01, * p<0.05.* Standard errors in parentheses. D_{ij} is delay of person i in treatment j; y_τ is terminal income.

Figure K.2 Histogram of Exit Timing – Pass Comprehension Test (N = 55)

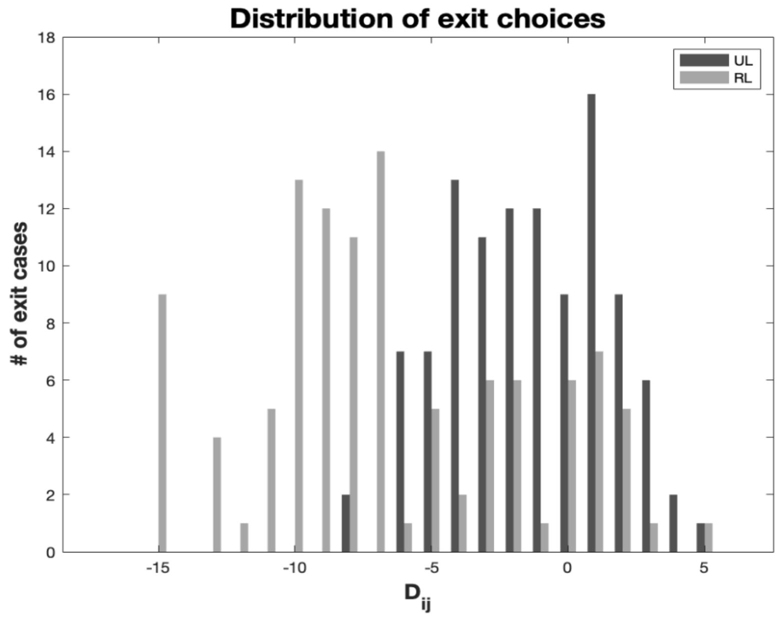
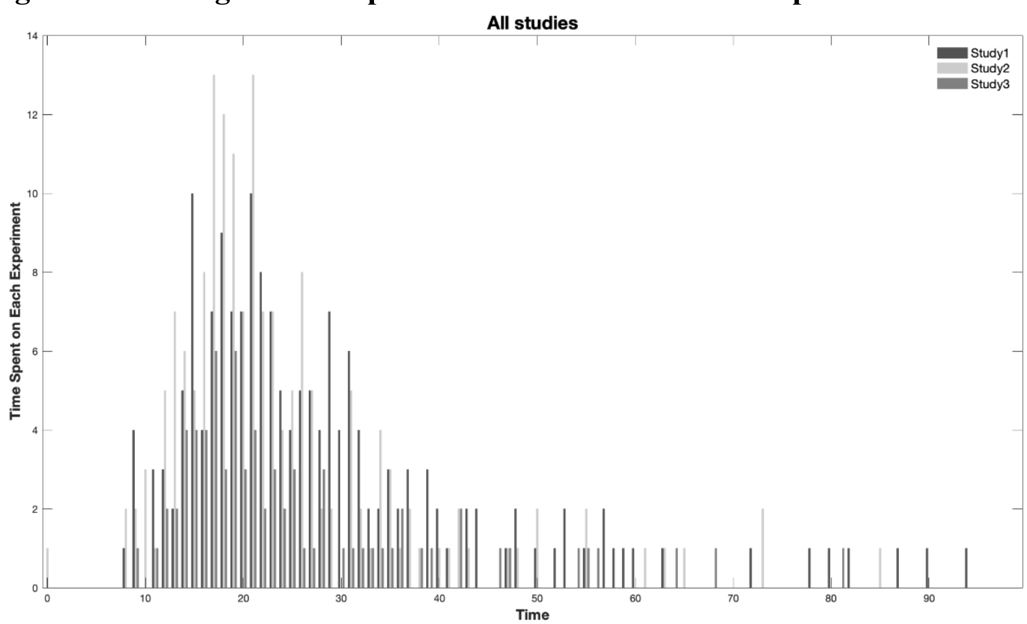


Figure K.3 Histogram of Experiment Durations – Full Sample



Appendix L. Ethics Approval for the Project

Western Research

Date: 31 January 2022

To: Professor Simon Parker

Project ID: 119685

Study Title: A behavioral investigation of entrepreneurial exit

Short Title: Entrepreneurs' exit decisions

Application Type: NMREB Initial Application

Review Type: Delegated

Full Board Reporting Date: March 4 2022

Date Approval Issued: 31/Jan/2022 14:36

REB Approval Expiry Date: 31/Jan/2024

Dear Professor Simon Parker

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. **All other required institutional approvals and mandated training must also be obtained prior to the conduct of the study.**

Documents Approved:

Document Name	Document Type	Document Date	Document Version
Survey	Online Survey	18/Nov/2021	1
Recruitment_Full-scale_v2	Recruitment Materials	01/Jan/2022	2
Recruitment Email_Pilot_v2	Recruitment Materials	01/Jan/2022	2
LOI_Full-scale_v2	Implied Consent/Assent	01/Jan/2022	2
LOI_Pilot_v2	Implied Consent/Assent	01/Jan/2022	2

No deviations from, or changes to the protocol should be initiated without prior written approval from the NMREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Kelly Patterson , Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).