UAB
Universitat Autònoma de Barcelona

Determinants and Consequences of Growth in Young Firms: An Analysis of Innovation and Environmental Factors

Alexandra Masó Llorente

Universitat Autònoma de Barcelona

Doctoral Thesis

PhD in Entrepreneurship and Management (IDEM)

Department of Business

Determinants and Consequences of Growth in Young Firms: An Analysis of Innovation and Environmental Factors

Author:

Alexandra Masó Llorente

Supervisor:

Joan-Lluís Capelleras

Universitat Autònoma de Barcelona (UAB)

Barcelona, September 2024

Preface

Young firms are vital to any economy, acting as market drivers, generators of ideas and job creators. The capacity for growth is a defining characteristic of young firms, as they are typically associated with the dynamic progress and innovative energy that drives economic development. Nevertheless, despite the acknowledgement of their pivotal role as catalysts for growth, a significant knowledge gap persists regarding the precise mechanisms underlying this growth and, more crucially, the subsequent consequences.

This dissertation aims to expand our understanding of how young firms grow and the long-term implications of this growth. While the dynamism of young firms makes them attractive, the path to stabilising and making profitable their growth is fraught with challenges and uncertainties that require in-depth exploration to inform effective policies and strategies that can maximise their potential.

When discussing growth in the context of young firms, two key factors often emerge: innovation and uncertainty. These forces not only shape growth but also help explain and challenge it. By analysing the impact of innovation and uncertainty on growth, growth persistence and profitable growth, this dissertation aims to deepen our academic and practical understanding of these factors, thereby bridging the gap between theoretical insights and practical applications in the study of firm growth.

First and foremost, I would like to express my deepest gratitude to my thesis director, Joan-Lluís Capelleras, whose guidance, support and endless hours of dedication have been instrumental in the development of this dissertation. I also would like to thank to the Department of Business Economics at Universitat Autònoma de Barcelona for their academic and administrative support throughout my doctoral journey.

I am also profoundly grateful to Kim Klyver, who kindly agreed to host me during my doctoral exchange. His unique perspective has significantly influenced my research, and his enthusiasm and unwavering support have opened new avenues, marking a significant turning point in my doctoral journey. I would also like to express my gratitude to the members of the Syddansk Universitet (SDU) in Kolding for their warm welcome and support; I felt right at home there.

I would like to thank my family and friends for their unwavering support, which has been instrumental in keeping me focused and motivated throughout this journey. Their

encouragement has been crucial in helping me stay on track, finish this dissertation, and—most impressively—maintain my sanity (or at least most of it) intact.

I would also like to acknowledge the Tecnocampus and especially the team at the Business Department, who encouraged me to pursue this doctoral path and have continually supported me along the way.

Lastly, I would like to express my general gratitude to everyone who, in one way or another, has contributed to this dissertation. Your support, whether large or small, has been greatly appreciated.

Abstract

The growth of young firms plays a pivotal role in the contemporary economy, fostering innovation, job creation and economic vitality. As a result, this topic has increasingly captured the attention of researchers, policy makers and practitioners alike. The present doctoral thesis employs a multi-lens theoretical approach, including the resource-based view, the performance feedback theory and the contingency approach, to examine the determinants, persistence and consequences of their growth within the context of innovation and environmental changes.

The dissertation includes three main chapters, each examining a specific aspect of young firm growth and its link with innovation: (I) the antecedents of growth, (II) the persistence of growth, and (III) the growth-profitability relationship. A quantitative approach is employed, drawing upon a representative panel of data encompassing Spanish manufacturing firms less than ten years over a period of 26 years.

The first paper challenges the conventional wisdom that innovation is a guaranteed catalyst for the growth of young firms, demonstrating that such firms may experience negative sales growth after implementing process innovation. However, the results show that in competitive or dynamic environments, young firms focusing on process innovation might achieve positive growth. The second paper addresses the persistence of growth in young firms. The findings demonstrate that these firms tend to reverse negative growth results and sustain positive ones, thereby illustrating the growth-seeking dynamic of young firms. The analysis expands on the role of product innovation on growth persistence, highlighting differences when innovation is implemented persistently on a continuous basis as opposed versus sporadically. The third paper examines the relationship between growth and profitability, demonstrating that internal factors, such as R&D investment, and external circumstances, such as economic crises, enhance the profitability of young growing firms.

These findings have both theoretical and practical implications, providing further insights into the role of innovation in young firm growth, growth persistence, and profitable growth. Furthermore, the thesis underscores the importance of challenging environments in shaping the growth of young firms.

Keywords: Young firms · growth · growth persistence · profitable growth · innovation · environmental turbulence · uncertainty

JEL Classification: L25 · L26 · O31 · C33 · D22 · D81 · O32

Content

List of Tables

List of Figures

1. CHAPTER I: GENERAL OVERVIEW OF THE DISSERTATION

1.1. Problem statement and motivation

Young firms play an essential role in today's economy. However, in order to make a meaningful contribution, they should not only ensure their survival but also prioritise their growth. In the contemporary era of information and globalisation, young firms face an unrelenting race to achieve, sustain, and efficiently transform growth into profitability. This challenge has become the focus of extensive academic and practical debate due to its critical impact on the long-term growth of young firms. Despite the increase in research over the last decade focusing on the growth of young firms (Anyadike-Danes & Hart, 2018; Coad, Daunfeldt, et al., 2018; Coad, Frankish, et al., 2013), a notable gap remains in our understanding of growth dynamics. Particularly in identifying key determinants of young firm growth (Coad et al., 2020), examining the persistence of this growth (Chen & Song, 2022; Erhardt, 2021; McKelvie et al., 2017; McKelvie & Wiklund, 2010) and understanding how this growth translates into profitability (Ben-Hafaïedh & Hamelin, 2022; Davidsson et al., 2009; Federico & Capelleras, 2015).

The theoretical discourse on young firm growth is dominated by two primary perspectives. The first perspective assumes that randomness is the primary determinant of growth (Gibrat, 1931). This implies that the growth trajectories of firms are predominantly shaped by random factors rather than systematic factors such as market conditions, firm strategies, or resources (Stam, 2010). Furthermore, the Gambler's Ruin theory (Wilcox, 1971) suggests that even if a young firm has favourable long-term growth expectations, it can still "ruin" or fail if it encounters a series of unfavourable outcomes. This underscores the vulnerability of firms, particularly the young ones, to the risks of depleting resources before attaining sustainable growth (Coad, Frankish et al., 2013).

This view contrasts with other theories suggesting that growth is significantly influenced by specific characteristics and decisions inherent to the firm. This second set of theories also distinguishes between internal and external factors explaining the growth of young firms. Internally, the Resource-Based View (RBV) emphasizes the importance of identifying the resources defining growth trajectories (Barney & Clark, 2007; Penrose, 1959), with the identification and use of valuable, rare, inimitable, and no substitutable resources (VRIN) (Barney, 1997), and the versatility to adapt these resources (Penrose, 1959) being key to achieve competitive advantage. In addition, performance feedback theory (Cyert & March, 1965; Greve, 2003) provides insights into the role of a firm's growth history, highlighting the

impact of internal feedback mechanisms on future growth strategies. In addition, theoretical frameworks such as dynamic capabilities (Teece et al 1997; Eisenhardt & Martin, 2000) or evolutionary economics (Nelson & Winter, 1982; Dosi, 1982) emphasise the necessity for a continuous adaptation to market dynamics. From an external standpoint, contingency theory (Burns & Stalker, 1961; Lawrence & Lorsch, 1967) also indicates that young firms need to carefully align their organizational structure and management practices with the specific demands of their external environment. Thus, in contrast to the more random approaches, both the internal and external growth approaches emphasise the importance of the strategic choices made by the firm in relation to its resources and the environment.

In addition to the theoretical heterogeneity, the empirical research also presents a complex picture. While some studies highlight a tendency towards the randomness of young firms' growth (Coad et al., 2015; Coad, Frankish, et al., 2013), a broader consensus focuses on identifying specific firm-level drivers and barriers. Factors such as structural characteristics, strategic decisions, and environmental context are highlighted, yet the literature remains fragmented (Cowling, 2004; Ketchen et al., 1993; Miller, 1990; Roper, 1999). For instance, while firm size has been extensively debated as a determinant of growth (e.g Greeve, 2008; Storey, 1994; Coad, 2009; Davidsson et al, 2010), there is increasing recognition of firm age as a crucial structural characteristic (Pugliese et al., 2022; Stinchcombe, 1965). Empirical findings indicate that high-growth firms often skew younger (Daunfeldt et al., 2014; Schreyer, 2000; Senderovitz et al., 2016). Additionally young firms exhibit a higher propensity for growth (Anyadike-Danes & Hart, 2018; Capelleras & Federico, 2024). However, the "liability of newness" (Stinchcombe, 1965) complicates the role of age, suggesting that a more holistic approach may be needed to fully understand young firm growth.

Innovation is widely recognised as a critical factor in the growth of young firms, aligning with the Schumpeterian perspective (Schumpeter, 1934). Young firms are often at the forefront of adopting novel strategies and innovations while seeking growth (Bianchini & Pellegrino, 2019; Bottazzi et al., 2001; Deschryvere, 2014; McKelvie et al., 2017). However, the impact of innovation on growth is still debated, partly due to the scarcity of evidence that distinguishes between different types of innovation, such as product versus process innovation (Guarascio & Tamagni, 2019; McKelvie et al., 2017). While new products and processes point to a high relevance for the growth of young firms (Rosenbusch et al., 2011; Wolff & Pett, 2006), the scarcity of evidence due to the focus on analysing innovation inputs as R&D investment and the tendency to use composite measures of innovation outputs (i.e. merging product and process innovation in a single measure) hinders a comprehensive view of growth patterns in young firms. Furthermore, combining product and process innovation

in a single measure tends to produce insignificant results, making it challenging to assess the distinct roles of innovation inputs and outputs in growth (Guarascio & Tamagni, 2019; McKelvie et al., 2017; Stam & Wennberg, 2009). The impact of innovation on the growth of young firms remains a topic of debate, indicating a surprising lack of consensus (McKelvie et al., 2017; Pugliese et al., 2022).

Moreover, the role of environmental factors, is increasingly recognised as shaping the growth trajectories of young firms (Aliasghar et al., 2023; Nason et al., 2019; Whittaker et al., 2020). In this sense, the strategic role of environment defining young firm growth has begun to receive renewed interest, especially in the face of changing environments (Davidsson et al., 2023). Aspects such as environmental dynamism, competitive intensity and crises can be considered not only as control variables, but also as factors explaining the growth of young firms. As Cooper et al. (2000) posit, the uncertainty inherent in these unfavourable environments can serve as a catalyst for young firms to capitalise on the opportunities presented therein. Nevertheless, as Davidsson et al. (2023) contend, there has been a persistent failure to identify the diverse environment as an explanatory factor for the success of young firms.

Consequently, it is not surprising that this amalgam of concepts leads to a predominant view of the growth of young firms as 'complex' and 'diffuse' (Delmar & Wiklund, 2008; McKelvie et al., 2017). In order to explain this complexity, it may be useful to distinguish between different aspects to this growth (McKelvie & Wiklund, 2010). At least three elements should be considered: (1) the antecedents of growth, (2) the persistence of growth and (3) the effect of growth on profitability. Each of these elements is influenced by both internal factors, such as innovation strategies, and external factors, such as environmental conditions.

First, in examining the antecedents of growth, the role of process innovation in explaining the growth of young firms is worthy of consideration. Previous studies have identified differences between product and process innovation in their contribution to the growth of young firms, mainly comparing the effects of product and process innovation (Colombelli et al., 2016; Santi & Santoleri, 2017). However, the growing relevance of digitisation processes and the adoption of new technologies in young firms has prompted a renewed interest in process innovation and its influence on growth (Bruno et al., 2023; Matalamäki & Joensuu-Salo, 2022; Schlichter et al., 2021). In examining the relationship between innovation and growth in young firms, environmental factors have emerged as a crucial element in creating opportunities for young firms (Acs et al., 2013; Alvarez & Barney, 2000; Anning-Dorson, 2017; Jansen et al., 2006; Rosenbusch et al., 2011; Schumpeter, 1934; Tsai & Yang, 2014).

The sensitivity of young firms to environmental influences means that factors such as competitive intensity or market dynamics can determine their growth (Alcalde & Guerrero, 2016; Cowling et al., 2020; Nicolas, 2022; Zahra & Bogner, 2000). However, as Pugliese et al. (2022) note *"context-, industry- and market-related drivers, tend to remain in a central limbo lacking consistency and achieving unclear net effects"*. As a result, although dynamism and adaptability are commonly ascribed to young firms, research into how these qualities manifest in the marketplace and their impact on different aspects of young firm growth remains scarce.

Second, while much attention has been given to the determinants of growth, less focus has been placed on its consequences (Davidsson et al., 2006; Gilbert et al., 2006). In this context, two key areas are becoming increasingly prominent in academic discourse: growth persistence and growth profitability (Anyadike-Danes & Hart, 2018; Capelleras & Federico, 2024; Chen & Song, 2022; Coad, Daunfeldt, et al., 2022; Esteve-Pérez et al., 2022). In terms of growth persistence, while young firms are more likely to grow, they also face a greater risk of decline and failure (Anyadike-Danes & Hart, 2018; Coad, 2018). This reality highlights the need to distinguish between positive and negative growth as a starting point for the persistence of growth in young firms (Chen & Song, 2022). Furthermore, the analysis of innovation decisions is of particular importance for young firms when examining the persistence of growth, given that innovation represents a crucial source of competitive advantage for such firms (Alvarez & Barney, 2007; Schumpeter, 1934, 1942) Therefore, analysing how strategic decisions on product innovation affect the persistence of growth is fundamental to understanding growth outcomes (Bianchini & Pellegrino, 2019; Coad, Segarra-Blasco, et al., 2021). Moreover, recent research has begun to pay attention to the impact of different decisions (Coad, Daunfeldt, et al., 2022; McKelvie & Wiklund, 2010; Senderovitz et al., 2016), as sustaining growth when firms already are experiencing high growth may adopt a more conservative approach while to reverse negative growth more adaptive strategies may be fundamental (Greve, 2008; Posen et al., 2018). This opens the door to questions about how strategic decisions about innovation can affect the persistence of growth in young firms.

Third, in examining the growth profitability relationship, a key question among young firms remains whether growth is beneficial for profitability (Ben-Hafaïedh & Hamelin, 2022; Davidsson et al., 2009; Federico & Capelleras, 2015; Mansikkamäki, 2023). This inquiry leads to the further question of whether additional factors might influence this relationship. Some scholars have proposed that the growth-profitability relationship can be adequately explained not by the isolated analysis of a single factor, but rather by the consideration of

multiple factors (Cowling, 2004; Roper, 1999). These factors converge into two primary categories: internal factors related to organizational dynamics and external factors or market-related factors. In this context, the identification of strategic decisions, such as investments in R&D, is crucial for understanding the profitability of growth in young firms (Steffens et al., 2009). Furthermore, the profitability associated with growth is often contingent on environmental conditions, with young firms frequently demonstrating resilience and adaptability in unstable and recessionary environments.

In summary, the growth of young firms is a multifaceted phenomenon influenced by a complex interplay of internal and external factors. Understanding this growth requires an integrated approach that considers the antecedents, persistence, and profitability of growth, as well as the roles of innovation and environmental dynamics.

1.2. Purpose and research objectives

The main objective of this dissertation is to enrich our understanding of the growth dynamics of young firms by examining both the determinants and consequences of their growth. This investigation includes an examination of internal factors such as product and process innovation and R&D investment, as well as an examination of external influences such as market forces and economic crises. The specific objectives of the dissertation are outlined below:

- To explore the impact of process innovation upon growth and how environmental factors affect this relationship.
- To assess the persistence of growth - both positive and negative – and how the product innovation influences such persistence
- To investigate the relationship between growth and profitability and how R&D investment and external crises moderate this relationship.

By addressing these objectives, this dissertation aims to provide a comprehensive perspective on the growth of young firms; by exploring the influence of innovation inputs and outputs and environmental contingencies, this research aims to contribute with valuable insights to enrich the academic discourse, but also to provide valuable insights for entrepreneurs, managers and policy makers involved in promoting the development and resilience of young firms.

1.3. General theoretical framework of the study

The theoretical framework around firm growth is currently divided into two positions. The first asserts that growth is the result of random stochastic processes (Gibrat, 1931). A second set of theories argues that growth is influenced by identifiable factors (Greve, 2003; Gupta, 1981; Penrose, 1959). The stochastic process literature compares firms to players in a card game, where decisions are influenced by the resources currently available and the unpredictable elements that shape the firm's actions, as illustrated by the Gambler's Ruin Theory (Coad et al., 2015; Coad, Frankish, et al., 2013). As Coad et al. (2013) argue, Gambler's Ruin is particularly applicable to the newest and smallest firms, which can be thought of as corks in the ocean, subject to a plethora of uncontrollable external forces. Thus, in a stochastic framework, the early stages of a firm - when it is both small and newly established - represent a period of heightened unpredictability. Growth during this phase is determined by a complex interplay of decisions based on immediate conditions and the influence of random external factors.

In contrast to stochastic models, a second set of theories posits that the growth of young firms is influenced by a variety of discernible factors, thereby rendering the complex and multifaceted nature of business expansion evident (Anyadike-Danes & Hart, 2018). These alternative perspectives argue that factors such as internal resources (Penrose, 1959), the ability to learn from past developments (Greve, 2003), the realisation of economies of scale (Gupta, 1981), and the impact of external factors or contingencies (Burns & Stalker, 1961; Lawrence & Lorsch, 1967) may play significant roles in shaping firm growth.

In light of the second set of theories and the calls for a more integrated approach to capturing the complexity of young firm growth (Anyadike-Danes & Hart, 2018; Coad, Mathew, et al., 2021; Senderovitz et al., 2016), this thesis incorporates firm growth antecedents and consequences, as well as two additional dimensions of analysis: innovation and uncertainty, which have been identified as fundamental drivers of entrepreneurship (Alvarez & Barney, 2000, 2005). As such, the chapters of this dissertation build on different theoretical underpinnings to explore both the drivers and outcomes of growth in young firms.

Theoretical perspectives within this framework suggest an instrumental approach, whereby each theory is applicable to specific domains. Consequently, the framework integrates firm-level theories, market-centric theories, and intermediate approaches that combine both firm and market-level perspectives (Guerras-Martín et al., 2014; Hoskisson & Hitt, 1999). Firm-level theories, such as the Resource-Based View (Barney, 1991; Wernerfelt, 1984) and performance feedback theory (Cyert & March, 1965; Greve, 2003) enable the

examination of an organization's internal strengths and weaknesses. Market-level perspectives, such as contingency theory (Burns & Stalker, 1961; Lawrence & Lorsch, 1967) facilitate the analysis of external opportunities and threats. Moreover, the inclusion of the Schumpeterian perspective (Schumpeter, 1934, 1942) allows for a better understanding of the challenges faced by young firms in their pursuit of growth.

Chapter II focuses on the antecedents of young firms' growth, drawing on a Schumpeterian perspective that highlights innovation as a central driver (Schumpeter, 1934, 1942), According to this view, firm growth is shaped by the combined influence of innovation efforts and market interactions. In addition to innovation, external factors such as market dynamics and competition are recognized as key to achieving growth. To provide a more nuanced understanding, Chapter II also integrates contingency theory (Lawrence & Lorsch, 1967), which suggests that firm growth depends not only on internal factors but also on the firm's ability to adapt to external uncertainties, such as shifts in the market dynamism and competitive intensity. By linking these two theoretical perspectives, this chapter underscores that both internal innovation and external adaptability are essential for young firms to achieve sustained growth.

Chapter III examines the persistence of growth in young firms, which refers to the repeated occurrence of a particular growth pattern over time. This chapter explores both positive persistence (growth above the norm) and negative persistence (growth below the norm) (Mueller, 1977). Drawing on performance feedback theory (Cyert & March, 1965; Greve, 2003) and the RBV (Penrose, 1959), to examine the impact of internal strategic decisions on growth persistence. In particular, it emphasises the influence of a firm's prior growth trajectory on the capacity of young firms to sustain consistent growth (Chen & Young, 2021; Capelleras et al., 2019), adopting a historical lens on performance feedback theory (Greve, 1998; Greve, 2003).The focus on internal or past performance of the firm provides insights into why, when and how firms initiate or discontinue certain strategies (Kotiloglu et al., 2021; Posen et al., 2018). Negative growth outcomes combined with unmet aspirations drive firms toward riskier strategies aimed at reversing the trend, whereas positive outcomes allow for a more relaxed approach, enabling diversification and sustained growth through alternative pathways (Greve, 2008; Kotiloglu et al., 2021).

Firms' strategies are closely linked to the resources they possess (Barney, 1991; Penrose, 1959; Wernerfelt, 1984). According to the resource-based view, competitive advantage can be achieved through the effective acquisition, development, and exploitation of unique, valuable resources that are difficult for competitors to replicate (Barney, 1991; Penrose,

1959). Sustained growth, in this context, is seen as an accumulative process driven by internal dynamics and continuous resource optimization (Penrose, 1959, p. 1). Firms with greater resource endowments are thus better positioned to achieve more stable and sustainable growth over time (Barney, 1997).

Chapter IV explores the challenge of achieving profitable growth in young firms. While sustaining growth is important, ensuring that this growth is profitable presents additional complexities. To explore the relationship between growth and profitability, this chapter adopts a multifaceted theoretical perspective, combining internal factors such as resource management (Barney, 1991; Penrose, 1959) with external market influences (Dosi, 1982; Nelson & Winter, 1982). This approach incorporates two complementary perspectives: the 'inside-out' view, which emphasizes the role of internal resources such as R&D and unique capabilities (Barney, 1991; Schumpeter, 1934), and the 'outside-in' view, which highlights firms' ability to leverage market opportunities through adaptability and strategic positioning (Delmar et al., 2013; Lee, 2014). For instance, models like minimum efficient scale (Gupta, 1981) and firm adaptability to market conditions (Senderovitz et al., 2016) suggest that profitable growth is contingent on aligning internal resources with external market realities (Davidsson et al., 2009).

In light of the complexity in explaining growth, persistence of growth, and profitable growth, this thesis incorporates another dimension of analysis: innovation. Innovation encompasses the scientific, technological, operational, financial, and commercial activities that lead to the development and introduction of new or improved products and processes (OECD, 2005, 2018). According to the Schumpeterian perspective (Schumpeter, 1934, 1942), it is innovation that facilitates growth and engenders creative destruction. Schumpeter (1934) identified multiple sources of innovation beyond R&D investment, including product and process innovations, all of which are critical to the growth of young firms.

Chapter II introduces the role of process innovation in analysing the growth of young firms. Process innovation is defined as the introduction of new methods or substantial improvements in production, logistics and administrative processes to create or improve production and delivery methods (OECD/Eurostat, 2005,49; Wang & Ahmed, 2004, p.305; Utterback & Abernathy, 1975). While process innovation is widely recognized for its impact on efficiency and productivity enhancements (Damanpour & Gopalakrishnan, 2001; Klepper, 1996; Piening & Salge, 2015), has received comparatively less attention than R&D investment or product innovation as a growth driver (Colombelli et al., 2016; Hervas-Oliver et al., 2014; Huergo & Jaumandreu, 2004). From a Schumpeterian perspective, however,

process innovation not only boosts efficiency but also creates new market opportunities, enabling firms to respond to evolving demands and achieve higher growth rates (Schumpeter, 1942, p. 119). Nevertheless, young firms often face challenges when implementing process innovations due to limited resources and market knowledge (Stinchcombe, 1965), which can delay tangible growth outcomes (Aldrich & Auster, 1986; Freeman et al., 1983; Stinchcombe, 1965; Zahra & George, 2002). Additionally, the implementation of new processes often necessitates a period of market adaptation (Schumpeter, 1942, p. 105).

Chapter III examines the phenomenon of growth persistence in young firms. In light of the intricate nature of process innovation and the theoretical arguments highlighting difficulties in attaining consistent, long-term growth, this chapter shifts its focus to product innovation and its impact on growth persistence. Product innovations, involves introducing novel products or services to address previously unmet customer needs (Damanpour, 1991). According to the European Commission (2022, p. 2), product innovations constitute a principal catalyst for growth. This is consistent with Schumpeter's (1934) differentiation between the innovation stage and the dissemination stage. Chapter III focuses on the dissemination stage, exploring how product innovation contributes to sustaining growth and whether the continuous introduction of new products can enable ongoing growth in young firms.

Furthermore, from a Penrosean perspective (1959), the achievement of persistent growth requires the continuous optimization of resources (Penrose, 1959, p. 17). While this process is often associated with mature firms that have substantial resources (Garnsey et al., 2006), Penrose emphasises that young firms must choose activities that align with their specific abilities and resources (Penrose, 1959, p.82). In this context, product innovation may emerge as a key strategic response for young firms, since in the absence of abundant resources, it can facilitate the constant adjustment of available resources to adapt to the inevitable rise in costs associated with sustained growth. However, since persisting in negative growth is not the same as persisting in positive growth, Chapter III explores these perspectives further by distinguishing between adaptive decisions to invest in product innovation in the short run and more conservative strategies that persistently invest in new products in the long run.

While Chapter III focuses on how product innovation sustains growth, Chapter IV shifts its attention to the complex relationship between growth and profitability in young firms. In particular, it explores how R&D intensity, rather than product or process innovation alone, plays a pivotal role in driving profitable growth. As previously indicated, the relationship between profitability and growth in young firms is complex and multifaceted. Therefore,

approaches that focus solely on profitable growth through product or process innovation may be incomplete and restrictive, as they often overlook the flexibility needed to reflect the dynamic and variable reality of profitable growth (Nason et al., 2019; Wang et al., 2019). In this context, R&D investment represents a more flexible form of innovation, enabling firms to achieve profitable growth by transforming knowledge into new competencies and technological capabilities (Cohen & Levinthal, 1990; J.G. March, 1991; Zahra & George, 2002). Young firms that invest in R&D are better positioned to capitalise on profitable growth opportunities (Nason et al., 2019). Therefore, a multifaceted approach to innovation, facilitated by R&D investment, is essential for addressing the challenges discussed in Chapter IV and explaining how young firms can sustain profitable growth.

In addition to innovation, this thesis considers another critical dimension in the analysis of young firms' growth: uncertainty. Uncertainty arises both internally, through the innovation process itself, and externally, from fluctuating market conditions and competitive pressures (Audretsch & Belitski, 2021; Knight, 1921). While innovation drives growth, it simultaneously introduces internal uncertainty, as firms face unpredictable outcomes from new products and processes (Audretsch & Belitski, 2021). Externally, uncertainties such as market volatility and competitive intensity further complicate the strategic planning necessary for sustained growth (Buchko, 1994; Milliken, 1987). This dimension of uncertainty is integral to understanding how young firms navigate the complex environments in which they operate.

Chapter II examines the role of process innovation within the context of external uncertainty. Schumpeter (1934, 1942) highlights that the success of innovation is heavily influenced by the business environment, particularly by the dynamic market forces and competitive pressures that create uncertainty (Dess & Beard, 1984; Duncan, 1972; Jaworski & Kohli, 1993). Drawing on contingency theory (Burns & Stalker, 1961; Lawrence & Lorsch, 1967), the chapter explores how young firms adapt their process innovations to these uncertain conditions, turning unpredictability into opportunities for growth (Jansen et al., 2006; Zahra & Bogner, 2000).

In Chapter III, the focus shifts to internal uncertainty, specifically the challenges that arise from product innovation. Performance feedback theory (Cyert & March, 1965), suggests that firms use past performance to navigate uncertainty, adjusting their strategies to reduce risks and capitalize on growth opportunities. While product innovation introduces an element of uncertainty, performance feedback theory posits that it not only drives growth but also

serves as a mechanism for managing and reducing uncertainty over the long term by continuously adapting to evolving market needs (Greve, 2003; Saraf et al., 2022).

Chapter IV addresses the dual impact of internal and external uncertainties on the growth-profitability relationship. Internally, it suggests that while R&D investment may introduce uncertainty, it could also facilitate a pathway to sustained profitability by enabling firms to develop new capabilities (Estrada & Dong, 2020; March, 1991; Roper, 1999). Externally, economic crises and other market shocks introduce unpredictability, but young firms that can swiftly adapt to these conditions are well-positioned to leverage uncertainty as a growth driver (Miklian & Hoelscher, 2022; Rauch & Hulsink, 2021). Young firms, distinguished by their flexibility and tendency to actively seek new opportunities (Kelly & Amburgey, 1991; Lee, 2014; Steffens et al., 2009), are particularly well positioned to take advantage of these circumstances. By capitalizing on both internal innovation strategies and external market dynamics, young firms can navigate uncertainty to achieve sustained profitability.

1.4.Structure and main findings

The dissertation is divided into three distinct papers, each of which focuses on specific aspects of both growth. Chapter II addresses the factors influencing growth, with a particular focus on the specific role of process innovation in young firms and their growth. The subsequent chapters examine the effects of growth. Chapter III analyses the impact of growth on its persistence, considering the moderating effect of product innovation and its persistence in explaining continued growth. Chapter IV examines the impact of growth on the profitability of young firms, considering the influence of R&D investment and crisis environments affect the growth of these firms.

For all three articles, the ESEE database (Encuesta Sobre Estrategias Empresariales) from the SEPI foundation (a state-owned holding company) was utilized. This is a representative panel database covering the Spanish manufacturing sector by tracking 1,800 firms in each year. The present dissertation utilises ESEE data on firms that were less than 10 years old at the time of the survey, from 1990 to 2016, which encompasses a 26-year period. The definition of "young" firms varies across the literature, with some studies considering firms as young up to 15 years old (Anyadike-Danes & Hat, 2018; Hamilton, 2011) while others restrict this classification to firms aged 5-7 years Grazzi & Moschella, 2018). However, in growth analysis, a 10-year threshold is commonly used, as firms under 10 years often exhibit distinct growth patterns (Barba Navaretti et al., 2014; Capelleras & Federico, 2024;

Coad, Daunfeldt, et al., 2018; Decker et al., 2014). Therefore, this thesis adopts a 10-year cut-off to analyze growth patterns in young firms, aligning with established research practices.

Given the unbalanced nature of the panel, the sample sizes and observations per analysis vary in each chapter due to differences in response rates, data availability and the specific criteria required for each study. The ESEE database, which uses a questionnaire of 107 questions covering 500 specific areas ranging from the financial status of the company, to changes in its life cycle, to decisions taken by companies in different areas such as innovation, provides a rich dataset on business decisions. Overall, the ESEE information is oriented towards the capture of data pertaining to the strategies employed by firms in relation to their competition variables. This wealth of data makes ESEE, together with its longitudinal nature, an ideal database for this study. In order to complement the results, this thesis also presents Eurostat data on annual GDP growth.

Previous studies have already employed the ESEE database for the investigation of innovation as a determinant of growth (Bolívar-Ramos et al., 2020; Golovko & Valentini, 2011; Guarascio & Tamagni, 2019; Triguero et al., 2014), young firms and the innovation-growth relationship (García-Quevedo et al., 2014; Huergo & Jaumandreu, 2004), the persistence of growth (Esteve-Pérez et al., 2022) the persistence of growth and product innovation impact on growth (Bianchini & Pellegrino, 2019; Guarascio & Tamagni, 2019; Triguero et al., 2014) as well as to analyse the growth profitability relationship (Fuertes-Callén & Cuellar-Fernández, 2019).

In exploring the growth of young firms, the two most common metrics for assessing growth in young firms are sales growth and employee growth (Pugliese et al., 2022). Although these metrics often develop together, they provide insights into different aspects of growth (Shepherd & Wiklund, 2009; Miller et al., 2013). This thesis focuses on sales growth as the key measure of growth for at least three reasons. First, sales growth can be considered a more versatile measure of growth than employee growth. While employee growth is often discussed in an academic context, sales growth is a more widely used measure in both academic and business settings, making it a common language for describing firm growth (Achtenhagen et al., 2010). Furthermore, when dealing with young firms, sales growth is a prevalent metric for evaluating financial performance and market success (Shane & Heights, 2012), offering versatility at both the microeconomic and macroeconomic levels. Secondly, as sales growth is identified as a precursor to employee growth in young firms (Coad et al., 2017), and employee growth is recognised as a driver of sales growth (Coad, 2010), sales growth represents the optimal measure as it indicates an early sign of business performance

and a marker of market success. Third, maintaining sales growth as the primary measure throughout the thesis ensures consistency across analyses (Miller et al., 2013), enhancing the comparability and coherence of the results.

Chapter II analyses data from 1,193 responding young firms per year, for a total of 4,966 observations. According to previous research we consider young firms those ones from 0 to 10 years of age (Audretsch & Mahmood, 1995; Coad, 2018; Gilbert et al., 2006) as this 10-year threshold is commonly regarded as a point at which firms have attained a degree of stability in the market, while still retaining substantial growth potential. Methodologically, this paper employs a Generalised Method of Moments (GMM) model to examine the relationship between process innovation at t-1 and t-2 and its effects on contemporaneous sales growth. Broadly speaking, the results of this article show that while process innovation has a negative impact on the growth of young firms in the first year after innovation, this impact is reversed in the second year after innovation. Furthermore, the results suggest that the lagged effect of process innovation on sales growth of young firms accelerates when competitive intensity or environmental dynamism intensifies, leading to an increase in sales growth among young firms in the following year. To provide a more comprehensive understanding of the short-term effects of process innovation on growth, the chapter also includes an analysis of the impact of process innovation on growth with a fixed effects model, incorporating robust standard errors to ensure the absence of serial correlation (Wursten, 2018). The results are consistent with main analysis results, while also indicating that the inverse relationship between process innovation and the growth of young firms undergoes a reversal in the second year, suggesting that the positive effect of process innovation on growth may be delayed. It can be argued that a longer-term perspective is more appropriate when young firms develop new processes. This is less the case in environments of uncertainty or rapid market change, where process innovation may be a means of ensuring growth.

The second part of the thesis (Chapter III) is concerned with the effects of past sales growth on current sales growth. It distinguishes between initial growth that was positive or negative and considers the moderating effect of product innovation and product innovation persistence on growth persistence. The study includes a sample of 1,607 firms with 6,931 observations. A two-stage system GMM model with robust standard errors is employed to control for autocorrelation, which is a particular concern in autoregressive contexts such as this analysis (Coad & Hölzl, 2009). The primary findings indicate that negative growth can readily transition into positive growth and that positive growth tends to persist in young firms. Moreover, the findings on product innovation offer valuable insights into strategic decision-

making in young firms. The findings indicate that a strategy of intensive product innovation in one period, without continuity, is likely to hinder the persistence of positive growth. Conversely, if innovation persists over time, a young firm experiencing positive growth can maintain this trajectory, but faces challenges in reversing negative growth. The results of this chapter indicate that young firms should consider adapting their innovation strategies to align with their historical growth patterns. This entails maintaining a commitment to product innovation when experiencing positive growth outcomes while acknowledging the constraints of innovation as a means of reversing negative growth trends.

Chapter IV of this thesis examines the relationship between growth and profitability in young firms, including 1,375 firms over 26 years, with a total of 5,884 observations. The methodology employed for the analysis is two-step system GMM. This method is particularly suited to the control of potential endogeneity between growth and profitability, and vice versa. The introduction of moderating variables, such as R&D, and in particular crises, allows for the positing of a potentially endogenous relationship between crises and the profitability of young firms. This approach reduces endogeneity and limits serial correlation through the choice of instrumental variables. The principal findings of this study corroborate previous research indicating a positive correlation between growth and profitability of young firms (Cowling, 2004; Delmar et al., 2013; Federico & Capelleras, 2015; Kachlami & Yazdanfar, 2016; Senderovitz et al., 2016; Steffens et al., 2009). Furthermore, this dissertation provides new insights into the mechanisms underlying profitable growth. It demonstrates that both R&D investments and crises contribute to profitability in scenarios where young firms are experiencing growth. These findings suggest that while profitability is often challenging for young firms, it may become more attainable during periods of growth. Moreover, young firms that are already experiencing growth should view R&D investments not merely as expenses, but as vital drivers of profitable growth. Additionally, they should recognise crises as potential opportunities to enhance profitable growth.

Table 1.1. provides a summary of the structure and the main content of this thesis, showing the correspondence between the objectives, the theoretical background, the methodology and the results of the three papers.

Table 1.1: Structure and contents of the thesis

Chapter	Content	Focus/objective	Main theoretical background	Sample	Methodology	Main results
I	Introduction	Summary of the main purposes, motivations, theoretical backgrounds, structure of the dissertation and empirical foundations.				
II	Study 1	Process innovation - growth relationship in young firms; moderating role of competitive intensity and demand dynamism	Schumpeterian view *(Schumpeter, 1934; 1942)* Contingency theory *(Burns & Stalker, 1961; Lawrence & Lorsch, 1967)*	4,966 observations from 1,193 firms up to 10 years old, in Spanish Manufacturing industry covering 1990-2016	Fixed effects panel regression, two-stage system-GMM.	Process innovation have a positive but delayed effect on the growth of young firms Environmental dynamism and competition positively moderate the process innovation-growth relationship
III	Study 2	Persistence of growth in young firms; moderating role of product innovation strategies.	Performance Feedback Theory *(Cyert & March, 1965; Greve, 2003)* Penrosean View *(Penrose, 1959)* RBV *(Wernerfelt, 1984; Barney, 1991)*	6,931 observations from 1,607 firms up to 10 years old, in Spanish Manufacturing industry covering 1990-2016	Two-stage system-GMM Discrete-time Hazard model	Positive and negative growth is likely to persist in young firms. Intensive new product introduction hinders sustained positive growth. Product innovation persistence supports continued positive growth and makes reversing negative growth harder.
IV	Study 3	Impact of young firms growth on profitability; moderating role of R&D investment and crises periods	Inside-out perspectives *(Penrose, 1959; Barney, 1991)* & Outside-in perspectives *(Burns & Stalker, 1961; Lawrence & Lorsch, 1967)*	5,884 observations from 1,375 firms up to 10 years old, in Spanish Manufacturing industry covering 1990-2016	Two-stage system-GMM	Growth positively impacts young firms' profitability Young firms that invest in R&D as they grow tend to show higher profitability. Young firms that grow during economic crises tend to show higher profitability.
V	Conclusions	Stylized summary of the main findings, theoretical and practical implications, limitations and future research agenda				

2. CHAPTER II: PROCESS INNOVATION EFFECTS ON YOUNG FIRMS SALES GROWTH AND THE MODERATOR EFFECT OF ENVIRONMENTAL CONTINGENCIES

2.1. Introduction

In the current context of uncertainty, characterised by global crises and intense competition, young firms are looking for competitive advantages and ways to adapt to the changing environment. Process innovation, which involves the introduction of new methods or significant improvements in production, logistics and administration, (Gopalakrishnan et al., 1999; Utterback & Abernathy, 1975), is emerging as a key to growth in this uncertain environment (Cui et al., 2005; Reed, 2020; Tsai & Yang, 2013).

According to a Schumpeterian (1942) view, process innovation allows young firms to render obsolete the processes of existing competitors and ultimately achieve higher growth outcomes. However, there are concerns that process innovation, while can enhance efficiency, does not always contribute to young firms immediate growth and could potentially delay their growth in the short term (Aghion & Howitt, 1990; Frésard et al., 2023; Romer, 1986). Empirical evidence is also mixed. While some studies indicate a positive impact of process innovation on the growth of young firms (Jo & Jang, 2022; Kim, 2022; Santi & Santoleri, 2017), others point to a negative or insignificant translation of process innovation into meaningful growth (Bianchini et al., 2018; Pellegrino & Piva, 2020), making it not entirely clear how the process innovation may affect young firms' growth.

In addition to these theoretical and empirical inconsistencies, the impact of process innovation on young firms growth needs to be analysed for at least three reasons. First, because process innovation in young firms may be oriented towards ensuring efficiency rather than increasing it (Colombelli et al., 2016), suggesting that its impact on growth may be different. Second, the limited resources and experience of young firms (Stinchcombe, 1965) may dilute the effectiveness of process innovation strategies in promoting growth (Jansen et al., 2005). Third, despite the recognition of its importance, process innovation has received less attention than other types of innovation, such as product innovation, especially in the context of young firms (Colombelli et al., 2016; Hervas-Oliver et al., 2014; Huergo & Jaumandreu, 2004). Thus, process innovation, which is essential but often overshadowed by product innovation, is crucial to the innovation strategy of young firms, although its own potential is not always recognised.

While research is divided on the impact of process innovation on the growth of young firms, the environment in which these firms operate may provide additional clues. Young firms, which are highly sensitive to their environment (Alcalde & Guerrero, 2016; Zahra & Bogner, 2000), face various forms of uncertainty. Contingency theory suggests that uncertainty strongly influences the relationship between innovation and growth (Burns & Stalker, 1961; Dess & Beard, 1984; Duncan, 1972; Gupta & Govinarajan, 1984). In particular, it shows how the dimensions of competitive intensity and environmental dynamism have a significant impact on the ability of young firms to innovate and grow (Jansen et al., 2006; Rosenbusch et al., 2011; Tsai & Yang, 2014). Indeed, recent studies show that innovation can drive sales growth in complex environments (Aliasghar et al., 2023; Nason et al., 2019; Whittaker et al., 2020), and that young firms are particularly resilient and innovative in these uncertain contexts (Audretsch & Belitski, 2021; McKelvie et al., 2011; Protogerou et al., 2017).

Hence, this study focuses not solely on the relationship between process innovation and sales growth in young firms, but also on how this relationship is affected by environmental turbulence. In light of the conflicting empirical evidence and the distinctive challenges confronting young firms, this research aims to determine whether process innovation precipitates immediate growth setbacks or fosters longer-term gains. The study specifically aims to analyse how market dynamism and competitive intensity moderate this relationship, with the potential to accelerate or hinder the positive outcomes of process innovation over time. In order to achieve these objectives, we examine the long-term relationship between innovation and growth in 1528 young manufacturing firms over 26 years, from 1991 to 2016. In order to ensure the robustness of our findings, we employ advanced econometric techniques such as the System Generalized Method of Moments (GMM) estimator, complemented by a fixed-effects model and Average Partial Effects. In doing so, this study makes a contribution to a deeper understanding of how young firms can leverage process innovation to navigate uncertain environments and achieve sustainable growth.

This chapter makes at least three contributions by analysing the relationship between process innovation and growth in young firms. First, this chapter advances the Schumpeterian view by examining the specific impact of process innovation in the context of the growth of young firms. Second, by incorporating the dynamic demands and competitive intensity, this chapter provides a more detailed understanding into the Schumpeterian perspective, emphasising the pivotal influence of external uncertainties on the growth potential of young firms that innovate in processes. Thirdly, it enhances our comprehension of the influence of

contingencies on growth, particularly in the context of young firms engaged in process innovation (Goni, 2022).

2.2. Theoretical background and hypotheses

2.2.1. Process innovation and the growth of young firms

According to OECD, process innovation involves the introduction of new production methods, new management approaches or new technologies to create or improve production and delivery methods (OECD/Eurostat, 2005,49). This concept is characterised by a more internal focus on enhancing the efficiency of production and delivery processes (Utterback & Abernathy, 1975). Additionally, Schumpeter's theory (1934, 1942), asserts that the implementation of process innovations serves to enhance the efficiency of firms, thereby facilitating sales growth. However, as Schumpeter (1934) identified, the innovation process comprises three distinct stages: ideation, innovation, and dissemination. The ideation stage is concerned with the generation of new ideas, the innovation stage with the implementation of these ideas, and the dissemination stage with the spreading of these innovations in the market. Consequently, a dissemination stage may not necessarily occur concurrently with the innovation stage (Henrekson et al., 2024), particularly in the context of process innovation, which is characterised by an internal focus and a primary objective of enhancing product quality and increasing value delivery to customers (Hammer & Champy, 1993; Uhlaner et al., 2013)

The age-dependence of young firms must also be taken seriously into consideration in this relationship (Stinchcombe, 1965; Yang & Aldrich, 2017). While process innovation may result in increased efficiency and higher productivity, this does not guarantee immediate sales growth for young firms (Ferguson, 1988; Frésard et al., 2023). This indicates that the relationship between efficiency and growth per young firms may be less direct than initially believed, as prioritizing process innovation can shift resources from manufacturing to research, potentially impeding immediate growth in young firms (Aghion & Howitt, 1990; Ferguson, 1988; Romer, 1986). It is also noteworthy that, although the Schumpeterian view (Schumpeter, 1934) initially attributed a pioneering role to young firms as drivers of growth, the latest Schumpeterian model (1942) suggests that large corporations are the primary drivers of innovation through a process of creative destruction. This shift in perspective may indicate that the relative novelty of young firms presents them with a distinctive set of challenges (Stinchcombe, 1965). These challenges include constraints on knowledge resources, difficulties in managing innovation costs and risks, a lack of established organisational routines, and greater challenges in rapidly translating innovations into sales

growth (Acs & Sanders, 2013; Aldrich & Auster, 1986; Dosi et al., 2002; Freeman et al., 1983; Stinchcombe, 1965; Zahra & George, 2002).

Theoretical uncertainties are reflected in empirical findings. In the innovation stage, young firms engage in a continuous process of learning as they innovate, thereby requiring a greater allocation of resources (Estrin et al., 2022, p. 289). Consequently, the efficiency route to achieving growth is not always a viable alternative for young firms, as it can be costly (Frésard et al., 2023; Utterback & Abernathy, 1975). During the dissemination stage, the role of process innovation in achieving growth is not entirely clear, as it is typically considered a supplementary element to product innovation (Bianchini et al., 2018; Bottazzi et al., 2010).

Furthermore, empirical evidence suggests that the liability of newness and inexperience inherent to young firms can impede their ability to translate novel processes into sales growth (Coad et al., 2016; Estrin et al., 2022; Grillitsch et al., 2019). Young firms are still developing their production systems without standard routines or sufficient knowledge (Peterson & Wu, 2021; Winter, 2003), and due to inexperience and resource constraints, they face challenges in effectively implementing new processes to achieve positive growth outcomes, at least in the short-term (Jin et al., 2019). Therefore, we expect an initial negative relationship between process innovation and sales growth for young firms, as the innovation in processes does not necessarily lead to the immediate dissemination of these innovations across the market. Moreover, the enhanced efficiency achieved through the implementation of new processes may not immediately translate into increased growth, as the primary objective of process innovation – to ensure production efficiency – is particularly challenging for these firms to achieve and translate into sales growth.

An initial negative relationship however, does not imply a permanent negative relationship. The implementation of effective process innovation is a complex and costly endeavour (Gopalakrishnan et al., 1999; Guarascio & Tamagni, 2019). However, empirical evidence suggests that it plays a significant role in enabling competitive advantage in young firms (Colombelli et al., 2016; Santi & Santoleri, 2017). As Raalskov et al. (2024) posit, young firms are unable to achieve growth by simultaneously taking risks and earning efficiency through processes. Instead, as young firms become more familiar with the intricacies of their new processes, they learn to meet the demands and growth in sales (Coad & Guenther, 2014). Hence, while the relative youth of these firms may present additional challenges to the immediate qualification and facilitation of key resources for ensuring sales growth, it eventually results in increased sales over time. In light of the aforementioned arguments, we put forth the following proposition:

H1: *The impact of process innovation on young firm growth is initially negative but becomes positive over time*

2.2.2. Environmental dynamism and competitive intensity moderator effect

In the context of Schumpeterian perspectives on innovation-based growth, the experimental nature of the economy is identified as a key factor (Schumpeter, 1934, 1942), highlighting the significant influence of uncertainty on the trajectory of innovation and subsequent growth (Henrekson et al., 2024). According to Brouwer (2000) "*uncertainty spurs diffusion and improves the utilization of human capital*". In such uncertain scenarios, innovations assume a leading role, as firms proactively seek to capitalise on opportunities and innovation is crucial to maintain competitiveness (C. Freeman, 2019). This understanding aligns with contingency theory (Burns & Stalker, 1961; Lawrence & Lorsch, 1967), which posits that to optimise growth performance, firms must adapt their strategies to the dynamics environments in which they operate (Burns & Stalker, 1961). This uncertainty is multifaceted and can arise from different sources, being environmental dynamism and competitive intensity the main constructs of uncertainty (Dess & Beard, 1984; Duncan, 1972; Gupta & Govindarajan, 1984). In the context of environmental contingencies, young firms need to adapt (Lawrence & Lorsch, 1967). The increased pressure on young firms to respond to changing customer expectations or an intensified competition results in more innovative solutions (Freel, 2005). In this context, process innovation assumes a double relevance, as the development of new processes frequently gives rise to new production outputs and new organisational forms in young firms (Nambisan et al., 2019). Consequently, process innovation represents not merely a response of young firms to their internal needs, it is also a response to adapt to the environmental contingencies, thereby creating opportunities for sales growth that would be difficult to achieve in other circumstances (Lawrence & Lorsch, 1967; McKelvie et al., 2011).

Focusing on environmental dynamism, it refers to the degree of turbulence present in a market and implies a high volatility of consumer preferences and a constant demand for novelty (Dess & Beard, 1984). An acceleration of changes in consumer preferences drives young firms to innovate more (Chen et al., 2015; Protogerou et al., 2017; Zahra & Bogner, 2000), but they are often quickly copied by competitors (Grant, 2019). Process innovations, however, are much more difficult to detect, as they involve internal changes that are more likely to go unnoticed by competitors (Jayaram et al., 2014). Therefore, in dynamic environments, process innovation provides a more sustainable advantage, especially for

young firms that are more agile and adaptable than their more mature counterparts (Coad et al., 2016), enabling revenue growth through process innovation.

In dynamic environments, information is often fragmented and volatile, creating uncertainty (Dess & Beard, 1984). However, young firms tend to use this uncertainty to access knowledge that is difficult to obtain in other contexts (Aliasghar et al., 2023; McKelvie et al., 2011; Zahra & Bogner, 2000). In these context of incomplete information, young firms are able to adopt less usual strategies, such as process innovation, with positive results for growth (Bradley et al., 2011; Cefis & Marsili, 2019). Also, young firms tend to build relationships with market players and competitors that would be unthinkable in less turbulent environments (Alcalde & Guerrero, 2016), thus creating opportunities to develop more effective process innovations and ultimately achieve higher rates of sales growth.

We argue that lower organisational complexity, and greater adaptability to uncertainty, allows young firms to apply knowledge more quickly when dealing with high environmental dynamism, and to efficiently translate and maintain sales growth from process innovations. Moreover, since process innovations are less visible to the market, young firms that innovate in processes are less noticed by competitors, making them particularly effective in driving sales growth in dynamic environments. We therefore hypothesise that:

H2. Environmental dynamism positively moderates the relationship between process innovation and sales growth on young firms.

A second dimension of uncertainty is competitive intensity, characterised by a large number of competitors and fierce competition for market share (Boyd, 1995; Dess & Beard, 1984; Scherer & Ross, 1990). In this environment, cost differentiation is critical to the competitiveness of firms (Wiggins & Ruefli, 2005) as well as increased innovation efforts to maintain and grow market share (Bachmann et al., 2021; Katila & Shane, 2005; Whittaker et al., 2020). However, in this environment, process innovation poses unique challenges for young firms, given their lack of experience and information due to their youth (Stinchcombe, 1965), and the complexity and trial-and-error nature of process innovation (Nason et al., 2019; Un & Asakawa, 2015). A highly competitive environment also implies fierce competition for market share.

Nevertheless, we argue that the moderating effect of competitive intensity counteracts the negative effect of process innovation on sales growth for at least two reasons. First, despite these challenges, a highly competitive environment offers young firms numerous role models and opportunities for learning (Whittaker et al., 2020). Their agility and adaptability allow

young firms to better integrate information (Bettinelli et al., 2016), leading to more efficient process innovations and cost reductions that, when reflected in prices, can drive growth in these price-sensitive, highly competitive markets.

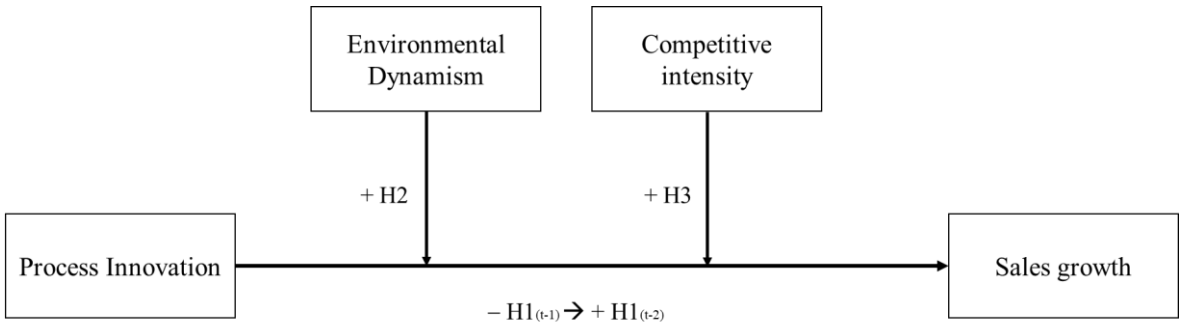
Second, although product innovation is a strategy that young firms tend to use to increase their market share (Bonanno & Haworth, 1998; Boone, 2000; Kurtmollaiev et al., 2022), in highly competitive markets, launching new products may require increased advertising, distribution and marketing efforts (Porter, 1980), which can lead to negative outcomes (Zahra & Bogner, 2000). In contrast, process innovation can improve product quality and reduce costs/prices (Bianchini et al., 2018; Colombelli et al., 2016), allowing these firms to offer substantial improvements that can satisfy the market and reduce the pressure for constant novelties.

Thus, we argue that in highly competitive markets, where firms seek cost differentiation and innovation, young firms gain an advantage from the increased availability of competitor information and their own agility in gathering and adapting this information. This enables young firms not only to gather and use competitor information more effectively in new processes, but also to reduce costs and improve product quality through process innovation, leading young firms to efficient innovation and growth in price-sensitive markets. For all these reasons we state that:

H3. Competitive intensity positively moderates the relationship between process innovation and sales growth on young firms.

To sum up the three hypotheses, the conceptual model is shown in Figure 2.1.

Figure 2.1. Conceptual model



2.3. Method

2.3.1. Data

This analysis is based on data sourced from the *Encuesta Sobre Estrategias Empresariales* (ESEE), conducted by the SEPI foundation, a state-owned holding company.

The ESEE database has been extensively utilized in prior research, offering insights into various aspects of business innovation and growth. Key areas of previous research using the ESEE database include innovation impact on growth (Bolívar-Ramos et al., 2020; Golovko & Valentini, 2011; Guarascio & Tamagni, 2019; Triguero et al., 2014), young firms and innovation- growth relationship (García-Quevedo et al., 2014; Huergo & Jaumandreu, 2004) and the consideration of environmental factors as a moderator of innovation's results on a firm growth (Á. Martínez-Sánchez et al., 2019).

For the present study, we focus on new ventures and firms up to 10 years old, resulting in an unbalanced panel comprising 1,193 responding firms per year, resulting in a total of 4,966 observations for empirical analysis[1]. The data spans from 1990 to 2016, covering a period of 26 years. This extended duration is crucial in order to identify long-term trends not observable in shorter datasets. It also allows for controlling unobserved heterogeneity by tracking firms with the same characteristics over time, thereby enhancing the statistical power and reliability of the results.

2.3.2. Variables

The dependent variable is the annual rate of sales growth (Coad, 2007; Coad et al., 2016), which represents a firm's sales growth rate *i* at time *t* (concerning time *t-1*):

$$Growth_{it} = log(sales_{i,t}) - log(sales_{i,t-1}) \quad (1)$$

The growth measure is annual sales, and the actual annual value of sales is a key variable to determine the firm evolution considering its environment (Dess & Beard, 1984). We use sales growth as a measure of growth because it has been shown to be more closely related to innovation performance outcomes (Coad & Rao, 2008) than other measures (i.e. employee growth).

The independent variable *process innovation* measures whether a firm has made significant changes to its production process, assigning a value of 1 to firms that have done so, and a value of 0 otherwise, which is consistent with previous literature (Colombelli et al., 2016; Pellegrino & Piva, 2020; Santi & Santoleri, 2017) . This variable has been extracted from the ESEE database, which complies with international standards and is equivalent to innovation surveys conducted in other countries.

In our analysis, we employ two moderating variables specifically designed to address

[1] Firms that disappear, change their main activity, or close is replaced by firms with similar characteristics.

the dimensions of environmental uncertainty: dynamism and competitive intensity (Dess & Beard, 1984). The moderator variable *Environmental Dynamism* is operationalised as instability in sales growth measured by the standard error of the regression slope of sales divided by the mean value of shipments using a moving five-year average before the panel year (Dess & Beard, 1984), following the same measure as previous analysis in the same field (Baron & Tang, 2011; Bradley et al., 2011; Edelman & Yli-Renko, 2010; Mishina et al., 2004; Nielsen, 2015):

$$ED_{id,t} = \frac{\beta_{t,se}}{\bar{V}_{id,t}} \quad (2)$$

Where $\bar{V}_{id,t}$ is the mean sales for each firm in a 5-year window ending in year *t*, and $\beta_{t,se}$ is the standard error of the regression slope coefficient for a 5-year window ending in year *t*.

The moderating variable *Competitive intensity* has been calculated as the inverse of Herfindahl-Hirschmann score (i.e., 1-Herfindahl score)[2]. The Herfindhal-Hirschman Index (HHI) is the sum of absolute changes in market shares by industry sector (Hirschman, 1964; Hymer & Pashigian, 1962), following the model of previous studies in the same vein (Delmar et al., 2013; Giachetti & Torrisi, 2018; Miller & Shamsie, 1999) and being considered one of the main constructs to measure competitive Intensity (Kwieciński, 2017):

$$\sum_{i=1}^{n} \left| \left(FS_{ijt} / \sum_{i=1}^{n} FS_{ijt} \right) - \left(FS_{ij} / \sum_{i=1}^{n} FS_{ijt} - 1 \right) \right| \quad (3)$$

We use the inverse measure in order to make the results clearer, as a positive result is interpreted as higher intensity and a negative result as lower intensity. To control for diverse factors that may affect firm growth, we introduce several control variables in our analysis. First, we use an *employee instability* variable to measure the 5-year standard deviation of average employment growth in firms, which reflects the impact of job instability on knowledge acquisition, product development, and growth performance in turbulent environments (Audretsch et al., 2014). We also introduce a variable to measure *R&D intensity*, as innovation performance can differ based on R&D investment (Kirner et al., 2009). This variable is calculated by dividing R&D investment in period *t* by sales in period *t*.

[2] The Herfindahl-Hirschman Index (HHI) calculations presented in this study are based on a sample comprising 3,900 observations over 21 years per each of the 20 activity sectors incorporated in ESEE database. As suggested by previous authors, the results of a HHI should be interpreted with caution, considering the potential limitations of extrapolating sample-based HHI calculations to the broader market context (Diallo & Tomek, 2015; Djolov, 2013; Schmalensee, 1987; Sutton, 1991)

To control for firm size impact on growth, we use the natural logarithm of the average number of employees (Coad, Frankish, et al., 2013). We also introduce a variable to measure *product innovation* (Reichstein & Salter, 2006), indicating the number of new products launched during a year, as well as a variable to measure *product standardization*, which reflects the time required for producing highly standardized products compared to complex products (Kirner et al., 2009). To control for the impact of firm age on growth, we include a *firm age* variable that is lagged by one period. We also differentiate between firms with foreign equity participation and those without, because foreign participation brings in external knowledge, which is particularly important for process innovation (Bolivar-Ramos et al., 2020; Aliasghar et al., 2022). To control for possible innovation differences between industries, we include a dummy variable for each industry (Cohen & Levin, 1989). We also introduce a dummy variable for each region to control for the stability of the territory. A detailed description of these variables can be found in Table 2.1.

Table 2.1. Definition of the variables

Variables	Definition
Sales growth	Logarithmic difference between sales at time *t* and sales at time *t-1*. A positive value indicates an increase in sales, a negative value indicates a decrease in sales. The use of logarithmic difference helps to capture proportional changes in sales, rather than absolute changes. This variable is based on the model proposed by Coad et al. (2007)
Process Innovation	Binary variable which indicates if the firm introduced process innovations or not, taking value of 1 if firm introduced new processes and 0 otherwise. Lagged 1 year.
Environmental Dynamism	Environmental dynamism (Dess & Beard, 1984): standard error of regression coefficient (S_{b1}) of **sales** divided by mean value $\bar{Y}$; for 5 years mean. Lagged 1 year
Competitive intensity	Herfindahl index, calculated as the sum of squared market shares of all ESEE firms in each three- digit CNAE-09 codes to 20 manufacturing firms. As has been calculate as the inverse of Herfindahl-Hirschmann score (i.e., 1-Herfindahl score), higher values indicate lower concentration and higher product market competitiveness. Lagged 1 year
Firm size	Total number of employees per year (i) of a firm expressed in natural logarithm (ln), lagged 1 year.
Employee instability	Employment instability (Dess & Beard, 1984): standard error of regression coefficient (S_{b1}) of **employees** divided by mean value $\bar{Y}$. Lagged 1 year
R&D intensity	R&D intensity is a measure of a firm's investment in research and development relative to its total sales revenue. It is calculated by dividing the firms R&D expenditure by its total sales revenue, lagged 1 year
Product standardization	Binary variable which indicates whether the products manufactured by the firms are mostly very standardized. Taking value 1 when is a highly standardised product and 2 otherwise, lagged 1 year
New products	Number of new products that a firm has introduced during the year. Variable lagged 1 year.

Firm age	Calculated with foundation year minus the present year, expressed in natural logarithm (ln), lagged 1 year.
Activity sector	Dummy variable indicating the activity sector. The following sectors are included: meat products, food and tobacco, beverages, textiles and clothing, leather, fur and footwear, timber, paper, printing, chemicals and pharmaceuticals, plastic and rubber products, nonmetal mineral products, basic metal products, fabricated metal products, machinery and equipment, computer products, electronics and optical, electric materials and accessories, vehicles and accessories, other transport equipment, furniture, and other manufacturing.
Autonomous community	A dummy variable indicating the autonomous community in Spain. Considering the following autonomous communities; Andalucia, Aragon, Asturias, Baleares, Canarias, Cantabria, Castilla-La Mancha, Castilla-León, Catalunya, C. Valenciana, Extremadura, Galicia, Madrid, Murcia, Navarra, País Vasco and La Rioja.

2.3.3. Empirical approach

To test our hypotheses, we investigate the lagged effects of process innovation on sales growth over a two-year period, while also considering the influence of environmental dynamism and competitive intensity on this relationship. To control for potential biases and the intrinsic dynamics of firms that may affect process innovation outcomes, we incorporate lagged sales growth as control variables for both the first and second years.

Due to the potential endogeneity and temporal persistence present in the interactions between sales growth and process innovation, we employ the system GMM estimator. This estimator effectively addresses these issues by utilizing internal instruments to reduce biases from omitted variables and reverse causality, thereby enhancing the reliability of our results (Arellano & Bover, 1995; Blundell & Bond, 1998). We implement a two-step estimation procedure to increase efficiency (White, 1982) and apply Windmeijer's (2005) finite-sample correction for robust standard errors, ensuring reliable model estimation. Our instruments include lagged values of growth, size, productivity, and R&D investment to account for historical influences. Process innovation and R&D investment are treated as predetermined variables and are instrumented accordingly. Additionally, we incorporate exogenous factors such as regional, and sector-specific variables to further refine our analysis.

In order to visualize the correlation evolution between growth and process innovation considering the moderator effect of environmental dynamism and competitive intensity over 26 years, we introduced a graphic showing the coefficients between turbulence interactions with process innovation and sales growth, and how they change over time, revealing the moderator effect of environmental dynamism and competitive intensity in the process innovation-growth relationship of young firms.

To confirm the findings derived from the SYS-GMM model, we apply a fixed-effects (FE) model as an alternative specification. The fixed-effects model is particularly useful for controlling unobserved heterogeneity that remains constant over time within each unit. This simpler model enables us to verify the consistency of results while allowing for straightforward interpretation of the immediate effects without the complexity introduced by an additional year of lagged variables. The Wooldridge-Drukker test (Wooldridge, 2010), confirmed the absence of serial correlation. Additionally, variance inflation factors (VIFs) were used to assess multicollinearity, with a maximum VIF of 2.29, indicating negligible multicollinearity (Kleinbaum et al., 2013). To further explore the interaction coefficients related to the presence or absence of process innovation and uncertainty dimensions, we introduce an Average Partial Effect (APE) in our analysis.

2.4. Results

2.4.1. Descriptive statistics

Table 2.2. reports the mean, standard deviation and correlation coefficients for quantitative variables extracted for the study constructs. Table 2.2. shows that sales growth negatively correlates with firm age ($r = –0.0210$, $p< 0.001$), as well as a positive correlation between sales growth and employee instability ($r = 0.0769$, $p < .001$). This indicates that an increase in employee turnover may be associated with an increase in sales growth. The most significant Pearson correlation among the predictor variables is between environmental dynamism and employee instability ($r = 0.5575$, $p < .001$), which is below the threshold of 0.70 and suggests an absence of multicollinearity problems in the predictors.

Table 2.2. Descriptive statistics and correlation matrix

	Variable	Mean	Std. Dev.	1	2	3	4	5	6	7
1	Sales growth(ln)	0.04	0.46	1						
2	Environmental dynamism	0.16	0.18	0.011	1					
3	competitive intensity	0.95	0.05	0.0168	0.0603*	1				
4	Firm size(ln)	3.76	1.41	0.0103	–0.0704*	0.0651*	1			
5	Employee instability	0.21	0.30	0.0769***	0.5575***	0.1297***	–0.0954***	1		
6	R&D intensity	0.01	0.04	0.1288***	0.0127	0.0232**	0.0973***	0.0192*	1	
7	Foreign equity invest	12.82	32.04	0.0427***	–0.0360***	0.0704***	0.4866***	–0.0339**	0.0614***	1
8	Firm age	6.16	2.57	–0.0210**	–0.3572***	–0.1659***	-0.0032	–0.3009***	–0.0094	–0.0240**
9	New products	2.00	17.41	0.0026	–0.0241*	–0.0200*	0.0415***	–0.0209*	0.0133	0.0402***

*Significances are represented by *** p < 0.01. ** p < 0.05. * p < 0.1.*

2.4.2. Main analysis

The results of the System GMM regression model are presented in Table 2.3. Model 1 introduces control variables into the regression equation, Model 2 adds the independent variable of process innovation, Models 3 and 4 in Table 2.3 introduce the moderating effects of environmental dynamism and competitive intensity on the relationship between process innovation and growth. Model 5 presents the full set of interactions, which corroborates the findings of the previous models. According to Model 1 in table Table 2.3, lagged sales growth has a positive effect on current sales (β=0.141, p<0.01), but we find no significant results for the second lag, so the existence of sustainable growth cannot be confirmed (Chen & Song, 2022). The results of Model 2 indicate that process innovation has a negative effect on sales growth in the subsequent year (β = -0.0245, p < 0.1), but a positive impact on sales growth of young firms in the second year following process innovation (β = 0.0240, p < 0.1). These results lend support to hypotheses 1a and 1b, indicating that young firms experience a delayed benefit from process innovation, with negative sales growth initially before increasing after two years.

The results of Model 3 indicate that for young firms engaged in process innovation, higher environmental dynamism in the preceding year has a positive moderating effect on subsequent year growth (β = 0.439, p < 0.05). However, when the dynamism occurs two periods prior, no significant impact on growth is observed (β = –0.091, p > 0.1). Therefore, Hypothesis 2 is supported, indicating that the initially observed negative relationship becomes positive under higher levels of environmental dynamism. However, the lack of significance for the second lagged year indicates that this result cannot be corroborated over the long term.

Model 4 in Table 2.3. also demonstrates that competitive intensity in the preceding year exerts a positive moderating influence on sales growth for young firms that have innovated in processes (β = 1.363, p < 0.05). This suggests that the initially observed negative relationship between process innovation and sales growth becomes positive under higher levels of competitive intensity. Furthermore, as with the moderating effect of environmental dynamism, no significant results on young firms sales growth emerge when the competitive intensity and process innovation are taken two years earlier (β = –1.007, p > 0.1). This confirms Hypothesis 3 but also highlights the challenges of sustaining growth through process innovation in uncertain environments over a longer period. Consequently, even though both environmental dynamism and competitive intensity positively affect the process innovation-

growth relationship in the short term, it remains uncertain whether this relationship will persist in the long term.

Table 2.3. Regression results: SYS-GMM regression. Sales growth as dependent variable

Variable		Model 1	Model 2	Model 3	Model 4	Model 5
Growth (ln) $_{t-1}$	*Coef*	0.141***	0.130***	0.262***	0.248***	0.235***
	S.E.	(0.0503)	(0.0464)	(0.0550)	(0.0562)	(0.0530)
Growth (ln) $_{t-2}$	*Coef*	−0.0350	−0.0316	−0.0242	−0.0159	−0.0126
	S.E.	(0.0261)	(0.0263)	(0.0330)	(0.0356)	(0.0356)
Employee Instability $_{t-1}$	*Coef*	0.116**	0.0908**	−0.156**	−0.114	−0.0954
	S.E.	(0.0455)	(0.0406)	(0.0659)	(0.0890)	(0.0893)
R&D intensity $_{t-1}$	*Coef*	2.155**	2.646***	1.342	1.524	1.805
	S.E.	(0.851)	(1.002)	(1.359)	(1.168)	(1.269)
Foreign equity investment $_{t-1}$	*Coef*	0.00105*	0.000986*	0.00119	0.00121	0.000937
	S.E.	(0.000584)	(0.000569)	(0.000822)	(0.000802)	(0.000828)
Product standardisation$_{t-1}$	*Coef*	−0.000119	0.0223	0.0352	0.0376	0.0220
	S.E.	(0.0266)	(0.0246)	(0.0360)	(0.0347)	(0.0343)
New products $_{t-1}$	*Coef*	0.000176	0.000415	0.000316	0.000368	0.000388
	S.E.	(0.000493)	(0.000463)	(0.000954)	(0.000747)	(0.000770)
Firm size(ln) $_{t-1}$	*Coef*	−0.0282*	−0.0231*	−0.0352*	−0.0226	−0.0301
	S.E.	(0.0166)	(0.0135)	(0.0190)	(0.0168)	(0.0184)
Firm age $_{t-1}$	*Coef*	0.000495	0.000274	0.00121	0.000398	0.000701
	S.E.	(0.00119)	(0.00105)	(0.00103)	(0.000968)	(0.00100)
Activity sector		*Included*	*Included*	*Included*	*Included*	*Included*
Region		*Included*	*Included*	*Included*	*Included*	*Included*
Process innovation $_{t-1}$	*Coef*		−0.0245*	−0.0614**	−1.317**	−1.417**
	S.E.		(0.0148)	(0.0291)	(0.601)	(0.577)
Process innovation $_{t-2}$	*Coef*		0.0240*	0.0353*	0.966*	1.084**
	S.E.		(0.0131)	(0.0211)	(0.543)	(0.524)
Environmental dynamism $_{t-1}$	*Coef*			0.373*	0.284	0.200
	S.E.			(0.223)	(0.217)	(0.233)
Environmental dynamism $_{t-2}$	*Coef*			−0.0320	−0.0175	−0.0108
	S.E.			(0.0990)	(0.114)	(0.117)
Competitive intensity $_{t-1}$	*Coef*			1.984*	0.495	0.471
	S.E.			(1.087)	(0.338)	(0.400)
Competitive intensity $_{t-2}$	*Coef*			−3.209*	−0.446	−0.698
	S.E.			(1.673)	(0.481)	(0.476)
Process innovation $_{t-1}$* Environmental dynamism $_{t-1}$	*Coef*			0.439**		0.332*
	S.E.			(0.203)		(0.198)
Process innovation $_{t-2}$* Environmental dynamism $_{t-2}$	*Coef*			−0.0910		−0.0443
	S.E.			(0.0674)		(0.0620)
Process innovation $_{t-1}$* Competitive intensity $_{t-1}$	*Coef*				1.363**	1.433**
	S.E.				(0.635)	(0.612)
Process innovation $_{t-2}$* Competitive intensity $_{t-2}$	*Coef*				−1.007	−1.121
	S.E.				(0.571)	(0.551)
Constant	*Coef*	0.0995	0.0940	1.040	−0.0433	0.226
	S.E.	(0.0672)	(0.0631)	(0.637)	(0.254)	(0.387)
Observations		3,900	3,900	3,900	3,900	3,900

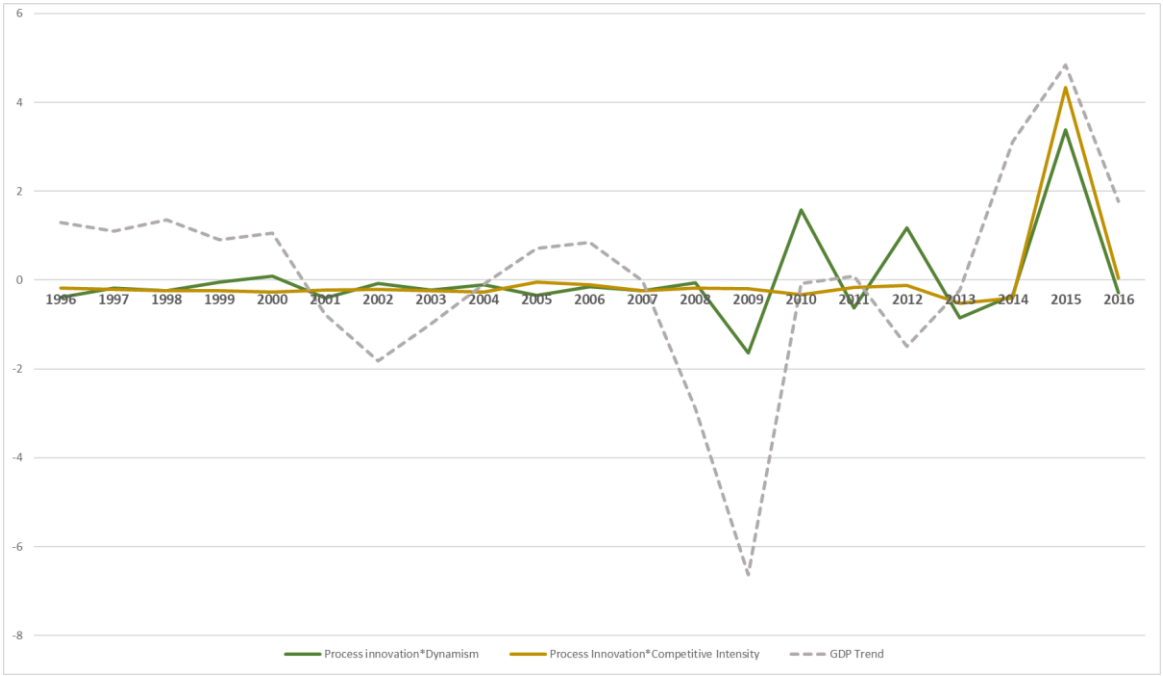
Number of id	1,001	1,001	1,001	1,001	1,001
AR(1) z test (*p* value)	−7.97 (0.000)	−8.24 (0.000)	−7.97 (0.000)	−7.46 (0.000)	−7.64 (0.000)
AR(2) z test (*p* value)	1.23 (0.218)	1.05 (0.296)	1.08 (0.280)	0.84 (0.399)	0.69 (0.490)
Hansen test (*p* value)	31.26 (0.146)	29.63 (0.239)	30.68 (0.482)	40.77 (0.268)	39.66 (0.310)

*System GMM estimation implemented using a robust two-stage estimator. Robust standard errors in parentheses. The xtabond2 STATA module was used. Hansen J test of overidentifying restrictions. AR (1) and AR (2): z-statistics for first-order and second-order autocorrelation. *p-value <0.1, **p-value <0.05, ***p-value <0.01.*

2.4.3. Additional analysis

In order to gain insight into the longitudinal effects of process innovation on firm growth, it has been considered appropriate to examine the moderating influence of environmental dynamism and competitive intensity. A plot has therefore been created (Figure 2.2) which spans the years from 1996 to 2016. In order to ascertain the impact of market dynamism and competitive intensity on the relationship between process innovation and growth, the annual standardised regression coefficients have been calculated. Particularly, from 2008 onwards, coinciding with the economic crisis, shows a notable rise in variance for the process innovation-growth correlation in young firms under environmental dynamism, unlike the more consistent effect seen in highly competitive settings. Additionally, it has been introduced the 3-year average of Spanish GDP growth during the same period, offering a macroeconomic context for the observed patterns. Notably, significant deviations, such as those in 2009 and 2015, align with global economic events, suggesting that the relationship between process innovation and growth may be influenced by factors beyond competitive intensity and environmental dynamism.

Figure 2.2. Correlations of process innovation effects on growth when moderated by environmental dynamism and competitive intensity over 20 years.



Due to the initial negative impact of process innovation on sales growth, alongside positive moderating effects from competitive intensity and environmental dynamism, we used a fixed-effects regression to analyse unobserved factors affecting young firms' growth in the first year. The results of the FE models, presented in Table 2.4, reinforce the main findings, demonstrating a negative and statistically significant direct effect of process innovation on growth ($\beta = -0.02602$, $p < 0.05$) on sales growth, which remains significant in all the models. Moreover, the results of Models 3 and 4, respectively, demonstrate the positive and significant impact of environmental dynamism ($\beta = 0.11867$, $p < 0.05$) and competitive intensity ($\beta = 0.75485$, $p < 0.01$) on the sales growth of young firms engaged in new processes. This confirms that environmental dynamism and competitive intensity, respectively, exert a positive moderating effect on the relationship between process innovation and growth in young firms.

Table 2.4. Fixed effects regression results: hierarchical regression analysis. Sales growth as dependent variable.

Variable		Model 1	Model 2	Model 3	Model 4	Model 5
Firm size(ln) $_{t-1}$	*Coef*	-0.18276***	-0.18061***	-0.18110***	-0.18191***	-0.180***
	S.E	*0.0158*	*0.0158*	*0.0168*	*0.0168*	(0.0168)
Employee Instability $_{t-1}$	*Coef*	-0.00456	-0.00364	-0.09885**	-0.09868**	-0.0990**
	S.E	*0.0186*	*0.0186*	*0.039*	*0.039*	(0.0390)
R&D intensity $_{t-1}$	*Coef*	2.39917***	2.43826***	2.30517***	2.29364***	2.296***
	S.E	*0.2847*	*0.2851*	*0.2949*	*0.2948*	(0.295)
Foreign equity investment $_{t-1}$	*Coef*	0.00057*	0.00058*	0.0005	0.0005	0.000497
	S.E	*0.0003*	*0.0003*	*0.0003*	*0.0003*	(0.000331)
Product standardisation	*Coef*	-0.0069	-0.00602	-0.00896	-0.00862	-0.00830
	S.E	*0.0175*	*0.0175*	*0.0192*	*0.0192*	(0.0191)
New products	*Coef*	0.00007	0.00016	0.00019	0.00025	0.000246
	S.E	*0.0004*	*0.0004*	*0.0005*	*0.0005*	(0.000494)
Firm age	*Coef*	0.00054	0.00065	0.00232	0.00261	0.00252
	S.E	*0.0033*	*0.0033*	*0.0036*	*0.0036*	(0.00358)
year		*Included*	*Included*	*Included*	*Included*	*Included*
activity sector		*included*	*included*	*included*	*included*	*included*
Region		*Included*	*Included*	*Included*	*Included*	*Included*
Process innovation $_{t-1}$	*Coef*		-0.02602**	-0.03164**	-0.72768***	-0.735***
	S.E		*0.0113*	*0.0152*	*0.2737*	(0.274)
Environmental dynamism $_{t-1}$	*Coef*			0.63533**	0.44443*	0.138*
	S.E			*0.2505*	*0.2593*	(0.0745)
Competitive intensity $_{t-1}$	*Coef*			0.13451*	0.17340**	0.462*
	S.E			*0.0745*	*0.0724*	(0.259)
Process innovation $_{t-1}$* Environmental dynamism $_{t-1}$	*Coef*			0.11867**		0.116**
	S.E			*0.0573*		(0.0572)

Process innovation $_{t-1}$* Competitive intensity $_{t-1}$	*Coef*				0.75485***	0.743**
	S.E				*0.2886*	(0.289)
Constant	*Coef*	0.67335***	0.66457***	-0.16255	0.04451	0.311
	S.E	*0.209*	*0.2089*	*0.2818*	*0.2906*	(0.342)
Observations		4966	4966	4966	4966	4966
Nº of ID		1193	1193	1193	1193	1193
R2		9.49%	9.60%	10.04%	10.10%	10.20%
Difference R2		9.49%	0.11%	0.45%	0.51%	0.10%
VIF		1.84	1.83	2.27	2.29	3.91

*Standard errors in parenthesis. Significances are represented by *** p < 0.01. ** p < 0.05. * p < 0.1.*

To visually capture the results of the moderator effects, we provide an average estimate showing how environmental dynamism and competitive intensity affect the growth of young firms. Figures 2.3 and 2.4 illustrate the impact of environmental dynamism and competitive intensity on sales growth, according to whether or not the firms in question had introduced process innovations. Figure 2.3, specifically reveals a positive correlation between sales growth and medium to high environmental dynamism in young firms that innovate, with a more pronounced effect at higher dynamism levels. Figure 2.4 indicates that sales growth in young, process-innovating firms positively correlates with medium to highly competitive intensity, intensifying in highly competitive environments. This suggests that process innovation boosts sales growth, especially in dynamic or highly competitive environments.

Further analysis was conducted to compare the performance of young firms in low- and medium-high-tech sectors with those in high-tech sectors within the manufacturing industry. The results demonstrated a similar outcome. In particular, low-tech firms displayed a more pronounced moderating effect of environmental dynamism, whereas high-tech firms exhibited a positive moderation of competitive intensity on the relationship between process innovation and growth. For purposes of comparison, a regression analysis was also conducted with established firms. For a comprehensive overview of these findings, please refer to Appendix A.

Figure 2.3: Environmental dynamism level by process innovation or not and its association with young firm sales growth.

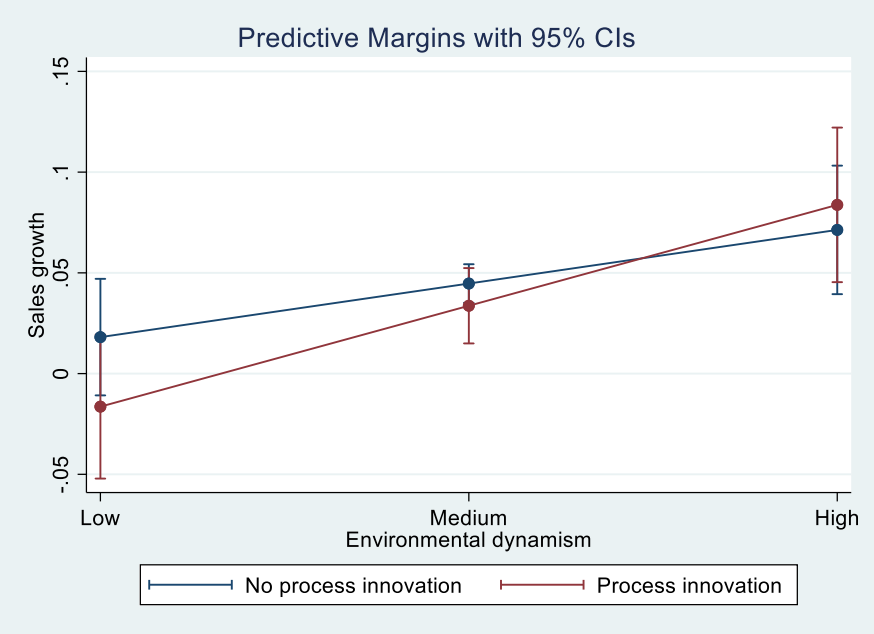
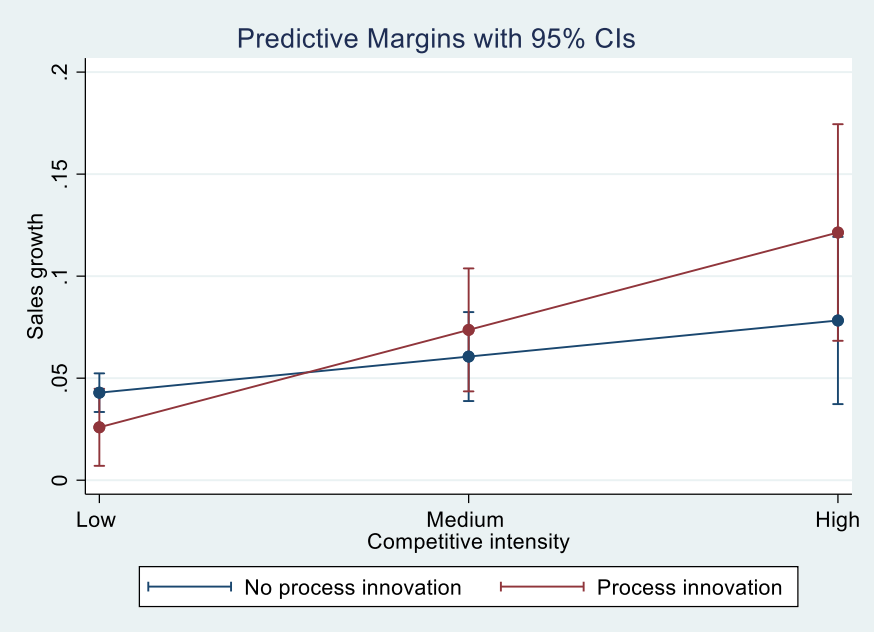


Figure 2.4: Competitive intensity level by process innovation or not and its association with young firm sales growth



2.5. Discussion

To grow in sales is a key objective for young firms in order to increase market share and consolidate market position in the early stages of their life. This study examined the impact of process innovation on the young firms' sales growth over a span of 26 years, as well as the moderating effect of uncertainty through environmental dynamism and competitive intensity.

Our results, indicate that young firms initially face a decline in sales growth after process innovation. However, this trend shifts to positive growth in the second year, suggesting a delayed benefit and a need for more time to effectively translate process innovations into sales growth.

This delay in sales growth due to process innovation could stem from young firms limited knowledge in applying innovation for market growth, their lack of established processes, or the lag in efficiency gains translating into sales. Nevertheless, process innovation remains valuable, not necessarily for immediate sales growth, but for other performance goals such as improved productivity (Hervas-Oliver et al., 2014; Piening & Salge, 2015) or increased survival chances in the early years (Colombelli et al., 2016).

In addition, we test how the uncertainty – result of environmental dynamism and competitive intensity – act as accelerators, speeding up the positive effect of process innovation on young firms' sales growth. The findings indicate that, in dynamic environments characterised by high volatility in demand, young firms tend to transition from process innovation to sales growth at a faster rate. Process innovation has the potential to improve existing products and support new product development. Previous studies have shown how this product diversification leads to higher sales when the young firm is operating in dynamic environments (Baptista et al., 2020; Senyard et al., 2015). We therefore argue that volatile markets are conductors of positive sales growth when young firms innovate in process, accelerating the impact of process innovation on sales growth in young firms.

Highly competitive environments also show a positive moderating effect on process innovation relationship with young firms' sales growth. Indeed, increased competition means that young firms can benefit from having access to more models, technological and otherwise, from which to learn and imitate (Lévesque et al., 2009; Whittaker et al., 2020). This enables the acquisition of greater knowledge and enhanced efficiency (Tsai & Yang, 2013), thereby providing the impetus for fledgling firms to capitalise on this expanded knowledge base[3].

Hence, our analysis highlights the ability of young firms to adapt and modulate their strategies in the face of environmental dynamism and competitive intensity, a distinctive ability that allows them to benefit in uncertain contexts. This agility is in line with the observations of Klyver et al. (2023), who point to the benefits that young firms derive from external constraints. This study therefore shows that process innovation is not an immediate

[3] This affirmation is confirmed by results of additional analysis showing how in highly competitive environments, young firms in high-tech sectors are more likely to achieve higher sales growth rates through process innovation in dynamic environments.

driver of growth in young firms, but it can be a driver of growth under uncertain environments.

2.5.1. Theoretical implications:

This chapter builds upon existing literature on the Schumpeterian view (Schumpeter, 1934; 1942) by exploring the relationship between process innovation and the growth of young firms, while considering the influence of dynamic environments. One initial theoretical implication is the distinction between the various outputs of innovation and their potential impact on the sales growth of young firms. Schumpeter (1908) broadened the scope of innovation outputs to encompass process innovation, organisational innovation, supply-side innovation and new market entry (Henrekson et al., 2024). In alignment with this approach, this chapter emphasises the examination of process innovation in the context of firm growth, as evidenced by the findings which indicate that growth through process innovation is achieved, albeit with a two-period delay. One potential explanation can be related to the three stages of innovation as outlined by Schumpeter (1934). The dissemination stage is not immediate or straightforward when a new process is applied in the innovation stage, particularly in the context of process innovation. This underscores the importance of distinguishing between the innovation stage and the dissemination stage when examining the impact of process innovation on the growth of young firms.

A second theoretical implication concerns the role of uncertainty in the context of young firms innovating in processes. It is worthy of note that the initial Schumpeterian perspective (Schumpeter, 1934) emerged during a period characterised by economic uncertainty, political and social tensions, and volatile markets. In other words, it emerged during a time of high uncertainty. The findings of this article thus serve to corroborate the initial Schumpeterian perspective on the role of young firms and their growth, integrating the influence of uncertain environments. Process innovation does not necessarily lead to an immediate sales growth in young firms. In fact, young firms often struggle with an unstable market position due to their newness, forcing them to favour growth over efficiency. While investments in process innovation may enhance efficiency, the immediate impact on sales growth may not be evident.

Additionally, from a contingency perspective, these findings contribute to our understanding of the impact of external uncertainty on the specific relationship between process innovation and growth in young firms. The observed positive growth in sales when young firms introduce new processes while navigating uncertain environments underscores the significant influence of contingencies on their performance outcomes, thereby reinforcing

the contingency theory approach. Although previous empirical studies have demonstrated a positive correlation between product innovation and dynamic environments (McKelvie et al., 2011; Miller & Toulouse, 1986; Temel & Forsman, 2022), extending this understanding to process innovation, particularly in the context of young firms, provides further insight into the external uncertainties that shape the growth trajectories of these firms.

2.5.2. *Managerial and policy implications*

On the basis of the results obtained, we recommend that managers of young firms consider the objectives and the context when implementing process innovation strategies. If the intention is to increase sales in short term, process innovation might not be the optimal strategy unless it is implemented in a turbulent environment. Moreover, in highly competitive or dynamic environments, process innovation can be the guarantor of sales growth. Introducing process innovation in this uncertain environment not only allows young firms to adapt more quickly and effectively to change, but also ensures a more flexible organisation, which in turn can lead to positive sales growth and strengthen the overall business.

Policymakers can use these findings to create more favourable conditions for process innovation by providing support to young firms to develop process innovation capabilities in highly competitive markets or when market demand is changing. This will help young firms to keep growing under these circumstances, which, as Fritsch and Storey (2014) confirm, can contribute to driving economic growth and development.

2.6. Limitations and future research

Although this study contains various theoretical and managerial implications, it has some limitations which provide future research opportunities. First, our choice of the binary variables of product and process innovation may offer a limited view of the impact of innovation outputs on growth in turbulent environments.

A difficulty when analysing young firms is their underrepresentation in databases (Coad, Daunfeldt, et al., 2018; Headd & Kirchhoff, 2009). The analysed database was focused on firms with at least 10 employees in Spain; hence, further analysis could include new ventures and young firms with fewer than 10 employees. Also interesting could be an analysis of the reality in other countries to determine how the present findings can apply in other contexts.

Considering the relevance of sales growth for young firms, we focus our attention on the measure of sales growth, but future research should consider other measures of performance. Even employee and sales growth measures are often interchangeable (Shepherd & Wiklund,

2009), previous research has shown how process innovation can be detrimental to employment growth due to its labour-saving nature (Vivarelli, 2014).

Although we found a similar moderating effect of both competitive intensity and environmental dynamism, future studies could include other dimensions, such as technological turbulence – given the growing importance of new technologies in process innovation – as well as analyse whether the radicality or intensity of innovation process outputs varies according to the origin of the turbulence. Additionally, an investigation into the long-term effects of uncertainty on the growth of young innovative firms represents another avenue for further investigation.

2.7. Conclusion

In conclusion, this study underscores the delayed yet significant impact of process innovation on the sales growth of young firms. Process innovation initially has a negative impact on the growth of young firms, but it turns positive as time progresses. Importantly, the moderating effects of environmental dynamism and competitive intensity accelerate this positive impact, illustrating how external uncertainties can serve as catalysts for young firms to leverage process innovation more effectively. This research highlights the importance of adaptability for young firms, enabling them to navigate uncertainty and capitalise on process innovations for sustained growth. The findings underscore that, for young firms, success in uncertain markets is not only a function of innovation itself but also of the external conditions that shape how these innovations are leveraged.

3. CHAPTER III: GROWTH PERSISTENCE IN YOUNG FIRMS: THE MODERATOR EFFECT OF PRODUCT INNOVATION STRATEGIES

3.1. Introduction

The study of the persistence of growth in young firms has gained renewed interest in the last decade (Anyadike-Danes & Hart, 2018; Capelleras & Federico, 2024; Chen & Song, 2022; Coad, Daunfeldt, et al., 2018; Coad et al., 2020; Esteve-Pérez et al., 2022), as it is not only important for young firms to grow, but also to ensure the viability of the firm through sustained growth over time. While previous chapter focuses on achieving growth, this chapter moves on to consider the persistence of that growth—whether positive or negative—and the factors that allow young firms to maintain or reverse their growth trajectories.

Recent studies such as Chen and Song (2022) have highlighted the importance of distinguishing between negative and positive growth rates in explaining the growth persistence of young firms. Although both positive and negative past growth have a direct influence on the future actions of the young firm, the decision-making process in response to a negative growth result may differ from that of a positive result. In the case of negative growth, the focus is often on corrective actions to reverse the trend, whereas maintaining positive growth typically involves predictive and stabilising strategies (Cyert & March, 1965; Greve, 2003). This chapter aims to analyse the persistence of growth in young firms by distinguishing between negative and positive growth rates (Chen & Song, 2022). Additionally, while Chapter II explored the relationship between process innovation and firm growth, this chapter shifts its focus to product innovation. The move from process to product innovation is driven by the recognition that product innovation is more directly tied to market demand and is often a key strategy for young firms looking to either sustain positive growth or reverse negative growth (Mckelvie et al., 2017; Schumpeter, 1934).

Theories on firm growth offer diverse perspectives. The Gibrat model (1931), suggests that firm growth follows a stochastic, unpredictable path (Coad, Frankish, et al., 2013; Guarascio & Tamagni, 2019). In contrast, the resource-based view (Barney, 1991; Penrose, 1959; Wernerfelt, 1984) and the performance feedback theory (Cyert & March, 1965; Greve, 2003), propose that firm growth is patterned and influenced by specific factors. From a Resource Based View, reversing negative growth rates implies a reallocation of resources, while the persistence of sustained growth depends on the maintenance of these resources (Barney, 1991; Penrose, 1959). According to the performance feedback theory, negative growth rates are easier to reverse and positive results can be sustained, although to a lesser

extent (Greve, 2008). But young firms present additional challenges due to their 'liability of newness' (Stinchcombe, 1965) and a higher risk of failure (Coad et al., 2020). These additional challenges likely explain why research on the persistence of growth in young firms has become polarised in two directions. On the one hand, research has concentrated on the persistence of growth in young firms that are already experiencing high growth rates (Anyadike-Danes & Hart, 2018; Erhardt, 2021; Hart et al., 2021; Senderovitz et al., 2016), on the other, a problemistic search approach has been adopted to analyse how to reverse negative growth in young firms (Greve, 2008; Posen et al., 2018). Recently, however, new voices have emerged, calling for greater attention to be paid to the joint study of both negative and positive growth in young firms (Chen & Song, 2022). This study leverages performance feedback theory to explain how young firms react differently based on past performance, with negative growth triggering adaptive responses and positive growth encouraging predictive strategies. Simultaneously, resource-based view provides a framework for understanding how these strategic decisions are grounded in the firm's resource allocation.

For a thorough understanding of the dynamics of positive and negative growth in young firms, it is essential to distinguish between decisions that shape positive and negative growth, as they are fundamentally different (Cyert & March, 1965; Greve, 2003). Negative growth outcomes force young firms to adapt their behaviour, leading them to make decisions designed to change their trajectory. In this situation, adaptive decisions are crucial. Conversely, positive growth outcomes often encourage young firms to adopt a more conservative, predictive approach, focusing on maintaining and sustaining their success. One of the key strategic decisions for young firms to maintain their growth is product innovation (Mckelvie et al., 2017; Schumpeter, 1934). Product innovation plays a dual role in this context: in the event of negative growth, it serves as an adaptive strategy aimed at reversing the negative trend, whereas in the context of positive growth, it becomes a predictive strategy to sustain and build upon the existing success of the firm. However, despite the theoretical importance of innovation decisions in accordance with the initial growth position, the theory of performance feedback still presents difficulties in reconciling the adaptive and predictive roles of innovation (Cyert & March, 1965; Greve, 2003).

From an empirical standpoint, recent years have seen a growing interest in understanding the impact of strategic decisions on the growth trajectory of young firms (Coad, Daunfeldt, et al., 2022; Senderovitz et al., 2016). This interest has led to a heightened awareness of the necessity to distinguish between strategic approaches that are characterised by greater levels of volatility, that is to say, more adaptive decisions, and those that prioritise stability and long-term persistence, displaying a more predictive pattern (Coad, Daunfeldt, et al., 2022;

McKelvie & Wiklund, 2010; Senderovitz et al., 2016). Recent findings demonstrate that young firms frequently adopt a reactive, survival-focused approach, aiming to reverse these trends (Chen & Song, 2022; Greve, 2008; Posen et al., 2018). Conversely, empirical evidence suggests that the maintenance of positive growth tends to validate previous strategic choices and can lead to a diversification of decisions across various areas, combining measures related to sustaining growth with others not directly related to sustaining growth (Coad, Daunfeldt, et al., 2022; Greve, 2008; McKelvie & Wiklund, 2010). Nevertheless, it remains unclear whether the impact of these strategic decisions can be extended and applied to product innovation in young firms. In light of the aforementioned theoretical foundations and the identified empirical gap, this study seeks to examine the influence of past performance and strategic decisions in product innovation on the growth persistence of young firms.

To that end, this research examines data from the *Encuestra Sobre Estrategias Empresariales* (ESEE), analysing a sample of 1,607 firms with a maximum age of 10 years from 1991 to 2016. The methodology used distinguishes between periods of negative and positive growth, applying a dynamic approach through system GMM analysis, which allows controlling for potential autocorrelation in growth trajectories. To further investigate the impact of product innovation on the persistence of growth, we introduce a variable that measures the volume of innovations per firm on an annual basis, as well as an index that measures the persistence of these innovations. This allows us to distinguish between short-term strategies based in more adaptive decisions, which focus on number of new products launched in a single period, and long-term strategies or more predictive decisions, which focus on the persistence of product innovation. The results of the main analysis are also validated, specifically using a discrete time duration model.

Our study aims to contribute on at least two fronts. First, in extending our understanding of the nature of growth persistence in young firms (Anyadike-Danes & Hart, 2018; Capelleras & Federico, 2024; Coad, Frankish, et al., 2013), by comparing historical negative and positive performance with current performance. Second, in advancing the understanding of how product innovation decisions affect the persistence of sales growth in young firms. Our results show that young firms are growth-keepers, demonstrating the ability to reverse negative past growth patterns and maintain positive growth. The influence of product innovation on growth persistence varies significantly depending on whether a firm initially experiences negative or positive growth. In particular, our findings indicate that persistence in product innovation may, in fact, prove counterproductive for firms experiencing negative growth. Conversely, it appears to be an enabling factor for young firms with a history of positive growth. These

results reveal that the decision-making processes surrounding product innovation exhibit a tendency to align with those observed in other decision-making contexts based on historical performance. The findings contribute to both Performance Feedback Theory and the Resource-Based View by providing new insights into the decision-making processes of young firms, particularly in product innovation. Overall, the findings emphasise the significance of considering the growth context when making strategic innovation decisions (McKelvie & Wiklund, 2010; Senderovitz et al., 2016).

3.2. Theoretical background and hypotheses

3.2.1. Growth persistence in young firms

Although the growth and persistence of firms is a topic of significant interest in the field of business literature, consensus on this subject remains elusive. In line with the classification proposed by Stam (2010), we can divide the different theoretical approaches according to the view of randomness or strategy that explains firm growth trajectories. A first group, based on Gibrat's Law (1931), highlights the importance of randomness in business growth, including the "Gambler's Ruin" theory (Coad, Frankish, et al., 2013), which examines the impact of randomness and uncontrollable external factors on business growth, leading to erratic growth patterns.

A second group of theories sees the persistence of growth as the result of strategic business decisions. In this context, the resource-based view argues that firms with more valuable resources have a greater ability to reverse negative growth rates and sustain positive rates (Barney, 1991; Penrose, 1959), with the ability to innovate being the main competitive advantage of young firms, guaranteeing them sustained growth (Alvarez & Busenitz, 2001; Barney, 1991; Schumpeter, 1934). Similarly, performance feedback theory suggests that firms optimise their growth trajectory by comparing their current performance with historical performance and with peers (Cyert & March, 1965; Greve, 2003), pursuing growth more aggressively when results are below expectations, and relaxing the intensity of the pursuit of growth when results are above expectations. In the case of young firms, historical aspiration represents a preferable approach to social or peer-based aspiration, as historical aspiration "*relies on information generated inside the organization, it is based on information with properties that are better understood by the decision makers than external information would be*" (Greve, 2003, p. 42).

The main challenge, however, lies precisely in the empirical domain: despite efforts to enrich the theory, the empirical evidence on the growth trajectories of young firms remains

an underexplored area, characterized by a predominant focus on the structural factors of firms. Despite various empirical results confirming the findings of random growth patterns in young firms (Coad et al., 2015; Coad, Frankish, et al., 2013; Derbyshire & Garnsey, 2014; Schneck et al., 2021), the complexity of young firm trajectories suggests that explaining growth trajectories on the basis of randomness falls short (Anyadike-Danes & Hart, 2018; Derbyshire & Garnsey, 2014). We argue that negative sales growth in young firms is likely to reverse and positive growth is likely to persist, for at least three reasons:

First, young firms are inclined to grow and tend to grow at a faster rate than their more mature counterparts (Anyadike-Danes & Hart, 2018; Coad, 2018; Coad, Frankish, et al., 2013; Wennberg et al., 2016). According to Coad et al. (2020), while young firms have a higher level of mortality, surviving firms have positive turnover growth that declines with age. The empirical analysis of Anyadike-Danes and Hart (2018) comes to similar conclusions, classifying the phase between 0 and 5 years as 'turbulent', but showing expansion rates in the early years of a firm, and also in the case of negative sales growth results, gross losses tend to remain stable (Coad et al., 2020), with contraction rates accelerating again at the age of 10 (Anyadike-Danes & Hart, 2018).

Second, when young firms show negative growth results, they are motivated to improve their results and reduce the gap between achieved and desired results (Chen & Song, 2022; Greve, 2008; Posen et al., 2018). Thus, in the face of negative growth, young firms bet on continued growth, even when the situation becomes complicated and they are faced with complex decisions (Chen & Song, 2022; Wennberg et al., 2016). Young firms are also more likely to take risks (Desai, 2008), to pay more attention to how they organise available resources, and to be more agile in the face of adverse growth situations (Wiklund et al., 2010; Wiklund & Shepherd, 2003).

Third, a growing body of empirical evidence confirms that young firms with positive growth are more likely to maintain that growth trajectory (Anyadike-Danes & Hart, 2018; Coad, Daunfeldt, et al., 2018; Coad, Segarra, et al., 2013; Federico & Capelleras, 2015; Greve, 2003). Some research indicates that the implementation of a more conservative strategy by young firms with positive growth enables them to sustain a stable growth trajectory (Anyadike-Danes & Hart, 2018; Greve, 2003), while other studies argue that it is the exploitation of new opportunities that allows young firms with positive growth to remain on this trajectory (Coad, Daunfeldt, et al., 2018; Coad, Segarra, et al., 2013; Federico & Capelleras, 2015). Although there is some disagreement about which type of decisions best

promote this persistence of growth, the empirical evidence points to a tendency to capitalise on past growth in order to maintain the growth trajectory.

In short, while young firms have a tendency to pursue growth (Coad, 2018), strategic decisions around growth may differ significantly depending on whether growth is negative or positive (Chen & Song, 2022). Under conditions of negative growth, young firms focus efforts on actively seeking ways to reverse negative growth outcomes and ensure viability. In contrast, when positive growth is achieved, this growth serves to validate the strategic choices made and to have a wider range of strategies to foster this growth, not just limited to strategies directly focused on growth. Therefore, we propose the following hypotheses:

H1a. *Negative sales growth is likely to reverse in young firms, such that negative growth in previous years will be associated with positive current growth.*

H1b. *Positive sales growth is likely to persist in young firms, such that positive growth in previous years will be associated with positive current growth.*

3.2.2. New product introduction and young firm growth persistence

In order to gain a full understanding of the factors influencing the persistence of growth, it is essential to consider the strategic decisions made in relation to other resources that are influencing the growth trajectory (Greve, 2003; Senderovitz et al., 2016). According to Senderovitz et al. (2016), "*the growth strategy should not be perceived or evaluated in isolation from the rest of the strategies pursued by the firm*". In the case of young firms, innovation strategies are of particular relevance (Alvarez & Busenitz, 2001; Barney, 1991; Schumpeter, 1934), with product innovation playing a fundamental role in innovation strategies in young firms (McKelvie et al., 2017; Pellegrino & Piva, 2020). For young firms, the need to constantly adapt to keep growing makes product innovation a key strategy (Bianchini & Pellegrino, 2019; McKelvie et al., 2017; Pugliese et al., 2022). When firms seek to solve performance problems, product innovation facilitate improvement (Greve, 2003, p. 94). Also, the strategic utilisation of product innovation over time can facilitate the attainment of a competitive advantage, the displacement of competitors and the promotion of sustainable growth (Barney, 1991; Schumpeter, 1942; Wernerfelt, 1984),

From the perspective of performance feedback theory, adaptive decisions, such as the launch of a large number of new products in a short period of time, may be designed to solve specific problems and reverse negative growth (McKelvie et al., 2017). In contrast, continuous product innovation may be more effective in maintaining sustained growth, acting as a predictive decision that allows the firm to continue exploiting new opportunities (Ciriaci

et al., 2012; Deschryvere, 2014; Greve, 2003). However, the incorporation of adaptive and predictive decision-making processes surrounding innovation may present a challenge to attaining sustainable growth if not adequately addressed (Cyert & March, 1965; Greve, 2003). Young firms may exhibit a myopic response to feedback, by prioritising the exploitation of past successes over the exploration of new opportunities (Levinthal & March, 1993), or by being resistant to change and unable to adapt their decisions (Sørensen, 2001). It is therefore essential to differentiate between the effect of adaptive and predictive decisions in the context of innovation in young firms, as opting for a more adaptive decisions of launching new products in a single period may diverge from a long-term approach based on more predictive decisions through persistent innovation (Bianchini & Pellegrino, 2019; Guarascio & Tamagni, 2019).

Focusing on adaptive decisions, sustaining growth and constantly adapting through intensive new product launches can prove challenging for young firms. As Schumpeter (1942) observes, "*many new products are at first introduced in an experimental and unsatisfactory form, in which they could never conquer their potential markets*" (Schumpeter, 1942a, p. 92). Additionally, Penrose (1959) posits that the introduction of an extensive range of products without a continuous strategy may not be compatible with sustainable growth for young firms, as they need to manage their resources effectively, balancing needs with short- and long-term strategic decisions (Penrose, 1959, p. 17). Thus, we propose that the higher the number of new products launched, the greater the ability to reverse negative growth, but also the more difficult will be to maintain positive growth, for at least three reasons:

First, risk assumption in product innovation may differ with negative or positive growth, which affects the subsequent growth trajectory. When young firms are experiencing negative growth, they are more likely to take greater risks by seeking alternative ways to grow (Desai, 2008; H. R. Greve, 2008), thereby promoting positive growth (Chen & Song, 2022). This could involve innovative emulation of successful competitors or seizing attractive market opportunities (Park, 2007). Conversely, younger firms have a lower risk appetite as their sales grow (Chen & Song, 2022; Greve, 2008). A larger number of new product introductions can involve higher risks, leading to disorder or business entropy (Gali et al., 2024). As a result, positive growth combined with a higher number of new product introductions increases business risks and potentially leads to a decline in sales.

Second, in periods of negative growth, the focus shifts to survival, with product innovation aimed at addressing identified problems (Parker et al., 2017). Senyard et al. (2014) find that resource-constrained young firms excel at bricolage innovation. Conversely, when

young firms have positive sales growth in the previous year, introducing numerous products can lead to negative sales growth the following year (Coad & Guenther, 2013). Penrose (1959) argues that the goal should not merely be growth for its own sake but the exploitation of opportunities. Therefore, unclear goals and abundant perceived opportunities can lead to underdeveloped products that fail to consolidate positive growth (Parker et al., 2017).

Third, young firms, often lacking in market positioning knowledge, may struggle to convey their value proposition (Covin et al., 1990; Hisrich, 1992; Stinchcombe, 1965; Wiklund et al., 2010). While introducing more products broadens market reach and drives positive growth, high rates of new product introduction can compromise product quality and jeopardise established standards (Bayus, 1997; Cohen et al., 1996). Therefore, when a firm has negative sales growth, the launch of new products can facilitate access to new markets and stimulate positive growth. However, during positive growth phases, introducing new products may impact existing product quality by diverting resources or withdrawing already successful products (Coad & Guenther, 2013; Parker et al., 2017).

Thus, when faced with negative growth, the young firm is aware of its costs and prioritises the goal of reversing negative growth, with product innovation being a key way to reverse it. Conversely, if the young firm is already growing, an increased number of new product launches can be disruptive as growth targets become broader, increasing costs and reducing commitment to an already lucrative market. For all these reasons, we argue that:

H2: Intensively introducing product innovations is more likely to (a) reverse past decline and (b) reverse past growth.

3.2.3. Product innovation persistence and young firm growth trajectories

Persistence in new product introductions goes beyond intensive product innovation and involves the regular introduction of new products, which promotes the development of valuable knowledge resources and turns into a predictive decision characterised by continuity. However, the impact of sustained product innovation on growth persistence differs depending on whether it is preceded by positive or negative growth. At least three reasons can be identified for this distinction:

First, maintaining product innovation involves significant costs and is closely linked to increased R&D (Labeaga et al., 2021; Raymond et al., 2010). In periods of negative growth, the losses associated with persistence in innovation may result in higher costs due to the limited resources of young firms (Audretsch et al., 2014; Coad et al., 2016; Segarra & Teruel, 2014). By persevering, the same investment of time and money creates, among other things,

an incentive to continue innovating, reinforcing the commitment based on the perceived costs associated with abandonment (Gabay-Mariani et al., 2023). On the contrary, a large operation size is essential to exploit opportunities (Penrose, 1959). Hence, sustaining innovation when revenues are already high promotes growth (Markman et al., 2005).

Second, the persistence of product innovation is conditioned by the initial level of the young firm's ability to innovate and learn (Antonelli et al., 2013; Penrose, 1959; Stiglitz, 1987; Teece et al., 1997). When firms grow negatively by launching products with low acceptance, they accumulate unhelpful experience that hinders profitable investment opportunities (Penrose, 1959). On the contrary, when young firms persist in innovation while maintaining positive growth, they accumulate knowledge, uninterrupted routines and validation of marketing strategies that allow them to sustain positive growth (Antonelli et al., 2013; Desai, 2008; Parker et al., 2017; Triguero et al., 2014).

Third and as consequence, persistence in product innovation helps to maintain cost advantages and create market barriers (Porter, 1980; Schumpeter, 1942). However, when young firms face negative growth, it may be difficult to maintain these advantages through persistence in product innovation, as reduced activity due to lack of sales limits the opportunities for efficiency and learning from innovation that are essential for creating competitive advantage. Instead, long-term strategic decisions when growing positively, allow firms to create sustainable cost advantages and barriers to entry (Coad, Daunfeldt, et al., 2022). Steady product introductions improve consumer benefits and generate more value as young firms grow (Wales et al., 2023), enabling the development of competitive advantages and barriers to further growth for the young firm.

In essence, persistence in product innovation when the young firm is dealing with negative growth results, knowledge is accumulated from negative experiences, limiting its usefulness and increasing innovation costs, perpetuating negative sales growth of young firms. On the contrary, persistence in product innovation when a young firm is experiencing positive growth results will allow knowledge to be reused, costs to be reduced, competitive advantage to be created and a positive growth rate to be maintained. We therefore propose the following hypothesis:

H3: Persistently introducing product innovations is more likely to (a) maintain past decline and (b) maintain past growth.

3.3. Method

3.3.1. Data

In order to test the hypotheses, this paper uses firm-level data extracted from ESEE database, sponsored by the Spanish Ministry of Industry and carried out by the Fundación SEPI. The sample is representative, at the industry-level, of the population of Spanish manufacturing firms employing at least ten workers.

In this paper, we refer to data obtained between 1991 and 2016, covering 26 years. Because our focus on young firms, from the initial sample at our disposal, we discard all firms older than 10 years[4]. A total of 3026 firms are observed. The use of the ESEE database is consistent with previous empirical studies that have explored the persistence of growth (Esteve-Pérez et al., 2022), and the impact of product innovation persistence on growth trajectories (Bianchini & Pellegrino, 2019; Guarascio & Tamagni, 2019; Triguero et al., 2014).

3.3.2. *Variables*

The dependent variable, which represents the primary focus of this study, is the firm's *sales growth* rate, which is defined as follows:

$$Sales\ Growth_{i,t} = \log\left(Sales_{i,t}\right) - \log\left(Sales_{i,t-1}\right) \quad (1)$$

Where $Sales_{i,t}$ is the amount of sales for one year, in euros. Since we are not only interested in measuring the growth rate variation, but also in distinguishing when young firms have positive and negative growth rates, we create two independent variables measuring positive and negative growth. We follow the same logic of decomposing past growth as Chen & Song (2022), by disaggregating positive and negative growth as follows:

$$\begin{cases} Growth, Negative_{t-1} = \begin{cases} Growth_{t-1} & if\ Growth_{t-1} < 0 \\ 0 & if\ Growth_{t-1} \geq 0 \end{cases} \\ Growth, Positive_{t-1} = \begin{cases} 0 & if\ Growth_{t-1} < 0 \\ Growth_{t-1} & if\ Growth_{t-1} \geq 0 \end{cases} \end{cases} \quad (2)$$

To measure *new product introductions*, we use the total number of new products introduced by a firm per year t, which is one of the most established measures of new product

[4] Although some studies use the cut-off age of 6 years, while others extend the consideration of Young firms until 15 years (Anyadike-Danes & Hart, 2018), we have chosen a cut-off age of 10 years for two reasons: first, because the general dynamic in studies dealing with sales growth of young firms is to use an cut-off age of 10 years (Coad, Holm, et al., 2018; Coad & Guenther, 2013; Schneck et al., 2021). Secondly, since we include new and young enterprises, taking into account stems younger than 10 years may lead to a higher representation of young enterprises as opposed to young enterprises, as well as in the opposite case. In both cases this leads to biased results.

introductions (Coad & Guenther, 2013; Pugliese et al., 2022). It is considered a product innovation when the innovation results from the incorporation of new components or intermediate products, the incorporation of new materials, or the adoption of new functions performed by the product. We categorize a firm as a product innovator if it meets at least one of the stated criteria.

To measure the *persistence of product innovation*, we follow the empirical approach of Bianchini and Pellegrino (2019), and develop a synthetic indicator of innovation persistence. Using a binary variable indicating the presence or absence of product innovation, we construct an indicator of product innovation persistence, defining a "spell" as the consecutive years during which a firm innovates continuously. The duration of the innovation spell is contingent upon the number of consecutive years in which a firm engages in product innovation. An innovation spell is terminated in year *t* if the firm does not innovate in the subsequent year, *t+1*. The dependency on duration is modelled by considering intrinsic factors such as firm size and external determinants such as industry dynamics and time trends. To determine the likelihood that a firm will persist in its product innovation, we use a discrete-time hazard model with frailty, mathematically formulated as[5]:

$$\lambda_{i,t} = \lambda_{0,t} exp\left(\mathrm{Z}'_{i,t}\beta + \theta_i\right) \tag{3}$$

This model represents the longevity of an innovation spell for a given firm up to a given point in time (Bianchini & Pellegrino, 2019). Where $\lambda_{i,t}$ is the hazard function for the firm *i* at time *t* and represents the probability of a firm's ending the innovation in products beyond time t. $\lambda_{0,t}$ is the base hazard at time *t*. For our model, the natural logarithm of time ln(t) is used as the base hazard, *exp* is the exponential function and $Z'_{i,t}$ it is a vector of covariates for the firm *i* including firm characteristics such as size, industry and time trends. β is a vector of parameters, and θ_i is a random variable that is assumed to be independent of $Z'_{i,t}$ and represents the "frailty" of the model, introducing non observed heterogeneity among subjects, given that baseline hazard can be systematically higher or lower in some firms due to unobserved random factors.

[5] In this study, a Weibull distribution was employed, although a log-logistic model yielded comparable results and statistical significance. While the log-logistic model, as employed by Bianchini & Pellegrino (2019), anticipates a peak in loss over the initial 10 years of the firm's existence, the Weibull model assumes a monotonic change in loss, with an increase or decrease occurring in a consistent manner. The latter model is more consistent with the observed trend that the innovation capacity of companies declines as they mature.

The innovation spells can be characterized by censored survival times. The right-censoring is not a problem in this analysis, as we work with firms between 0 and 10 years old, and even if the firm continues with a period of innovation at eleven years or more, it is no longer a subject of analysis for this study. The main concern is left censoring, given that observed young firms can enter the sample at ages between 0 and 10 years but not explicitly in their 0 year. For this reason, young enterprises that entered the sample at an age of 1 years or more have been carefully excluded from the sample[6].

We also consider additional explanatory variables to take into account factors that may influence the propensity for sales growth (negative or positive) in young firms. We control for the effect of *firm size* on growth, which is introduced as the logarithm of the total number of employees. *Technological effort* is the ratio of total R&D expenditure and technology imports to total sales, expressed in logarithm. Since we are analysing the impact of product strategies through product innovation, we control for the variation of *main product sales*, a proportion of the firms' total sales that corresponds to the main product or group of products. We also introduce a variable taking into account the *export propensity* representing the value of exports per each firm *i* for each period *t,* expressed in logarithm. We control for the age of the firm and also for macroeconomic effects through a binary variable for each year.

The definitions, labels, and basic descriptive statistics of the variables employed in this study are presented in Table 3.1.

Table 3.1. Definition of the variables

Variable	Description
Sales growth	Difference between the logarithm of sales in *t-1* and the logarithm of sales in *t*.
Negative sales growth	Binary variable taking the growth value if growth is negative or equal to 0: $Growth, Negative_{t-1} = \begin{cases} Growth_{t-1} & if\ Growth_{t-1} < 0 \\ 0 & if\ Growth_{t-1} \geq 0 \end{cases}$
Positive sales growth	Binary variable taking the growth value if growth is positive or equal to 0: $Growth, Positive_{t-1} = \begin{cases} 0 & if\ Growth_{t-1} < 0 \\ Growth_{t-1} & if\ Growth_{t-1} \geq 0 \end{cases}$
New product introductions	Number of new products launch per firm and year

[6] In order to test the sensitivity of our results, we created a dummy variable equal to 1 if the first year in which the young firm innovated was not year 0. This was done in order to control for left-censored spells. The results are essentially the same to those presented in this article.

Persistence in product innovation	Product innovation hazard rate, as described in section 3.2.1
Firm size	The logarithm of the total number of employees.
Technological effort	Ratio of total R&D expenditure and technology imports to total sales per each firm *i* for each period *t.* Expressed in logarithm.
Main product sales	Ratio of the firms' total sales that corresponds to the main product or group of products.
Export propensity	Percentage which the exports made by the firm represent of total sales
Firm age	The value of exports per each firm *i* for each period *t.* Expressed in logarithm.
Year	Dummy variable per each year from 1990 to 2016
Activity sector	Dummy variable indicating the activity sector. The following sectors are included: meat products, food and tobacco, beverages, textiles and clothing, leather, fur and footwear, timber, paper, printing, chemicals and pharmaceuticals, plastic and rubber products, nonmetal mineral products, basic metal products, fabricated metal products, machinery and equipment, computer products, electronics and optical, electric materials and accessories, vehicles and accessories, other transport equipment, furniture, and other manufacturing.

3.3.3. Empirical approach

We employed a two-step GMM estimator with robust standard errors to estimate the effects of past negative and positive sales growth on current sales growth, and to analyse the moderating effect of product innovation sales growth persistence. This model is considered the most appropriate as the independent variables are not strictly exogenous. To address endogeneity, we introduced lagged negative and lagged positive growth as instruments, assuming that these lagged terms are related to current growth only through past growth. The validity of the instruments is ensured by the over-identification test using the Hansen J statistic, which confirms the validity of our instruments. In addition, the Arellano and Bond (1991) test for second-order autocorrelation (AR (2)) in the residuals was carried out to assess the specification of the model. The system GMM was estimated using a two-step estimator to increase robustness to heteroskedasticity.

To ensure the validity of the results, we conducted two exercises as robustness tests adopting duration model techniques, Following the model of previous research on the same

topic (Bianchini & Pellegrino, 2019; Esteve-Pérez et al., 2022). The first exercise contrasts the results in terms of positive and negative growth persistence (hypotheses 1a and 1b), and the second tests the effects of product innovation and product innovation persistence on negative and positive growth (hypotheses 2 and 3). To quantify the hazard rates for negative and positive sales growth, we introduced 'growth spells'—sequential periods of either negative or positive growth. These spells, described by equations (1) and (2), focus on the duration of sustained negative or positive growth, respectively. We refer to them as "growth spells", indicating the number of consecutive years a firm shows negative (positive) growth rates. To assess positive growth persistence, a spell begins in year t if the firm did not experience grow in $t-1$ and ends in year t if growth stops after consecutive years of positive sales growth. For negative growth persistence, a spell starts if the firm has negative results in year t but positive growth in t-1, ending in year T when the firm stops decreasing after consecutive years of negative sales growth.

3.4. Results

3.4.1. Descriptive statistics

One of the main interests is to measure the persistence of negative and positive growth in young firms, Table 3.2 examines the relationship between past and current growth rates. The average growth rate for young firms with negative past growth is 3.2%, indicating that negative growth rates tend to reverse over time, while the average current growth rate for firms with positive past growth is 4.52%, indicating a predominance of positive growth, which is stronger for young firms that grow positively over time.

Table 3.2. From past to current growth

	Current growth		
Past growth	N	Mean	SD
Negative	2,517	0.032	0.38
Positive	4,525	0.048	0.257
Overall	7,042	0.042	0.307

Table 3.3 reports descriptive statistics and correlations. As shown, average growth rate is roughly 0.8%. When we decompose the growth into negative and positive, we see that the average negative growth is -2.7%, while the average positive growth is roughly 9.8%. In terms of correlations, the number of product innovations has a significant positive correlation

with growth (0.012, p<0.01), indicating that firms with more product innovations tend to have higher growth.

For descriptive purposes, table 3.4 shows the distribution of product innovation. We have defined two categorical variables with three different categories according to the degree of persistence in product innovation. A firm is categorised as 1 if it does not engage in product innovation, corresponding to a persistence value of 0. It is categorised as 2 for moderate levels of product innovation ($0 < \text{Pers Inno} \leq 0.5$) and as 3 for high levels of persistence in these activities (Pers Inno > 0.5). Young, non-innovative firms are smaller, incur higher costs in developing new technologies, concentrate their sales on a smaller number of products and show a lower export propensity. In contrast, the group of young firms with a higher persistence in product innovation are larger, technological development is less costly, sales are spread over more products and they have a higher export propensity.

Considering the absolute growth results, young firms with the highest persistence of innovation have the highest turnover growth. However, the group that shows a higher value of negative growth is the low product innovation persistence group. The non-innovators and the high product innovation persistence group show similar negative growth. It is interesting to note that the scores for positive growth do not differ much among groups.

Table 3.3. Descriptive statistics and correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11
1. Growth (ln)	1										
2. Negative Growth (ln)$_{t-1}$	-0.031***	1									
3. Positive growth (ln) $_{t-1}$	0.018***	0.156***	1								
4. Number of product innovations $_{t-1}$	0.010**	0.013***	0.002	1							
5. Persistence Product innovation $_{t-1}$	0.040***	-0.042***	0.012**	0.227***	1						
6. Technological effort (ln) $_{t-1}$	0.048***	0.047***	0.023***	0.102***	0.402	1					
7. Size employees (ln) $_{t-1}$	0.039***	0.094***	0.039***	0.063***	0.268	0.527	1				
8. R&D investment$_{t-1}$	0.038***	0.056***	0.025***	0.097***	0.417***	0.921***	0.592***	1			
9. ROS $_{t-1}$	-0.064***	0.063***	0.028***	0.005	0.013***	0.016***	0.013***	0.020***	1		
10. Export propensity $_{t-1}$	0.011**	0.030***	0.028***	0.043***	0.163***	0.352***	0.392***	0.365***	0.001	1	
11. Age $_{t-1}$	-0.028***	-0.014***	-0.058***	0.015***	0.115***	0.224***	0.345***	0.250***	-0.004	0.165***	1

Mean	0.008	-0.027	0.098	2.053	0.056	-5.851	4.192	4.356	7.715	19.136	23.989
SD	0.369	0.156	0.206	17.002	0.208	4.542	1.508	6.036	39.169	26.852	20.342

Notes: N=7042. *** p<0.01, ** p<0.05, * p<0.1. Observations for the positive growth spell were excluded from the correlation calculation, as the construction of the variable itself implies the exclusion of negative growth observations, just as observations for the positive growth spell implies the exclusion of positive growth observations.

Table 3.4. Distribution of persistence of product innovation - growth spell lengths and maximum spell lengths

	Product innovation		
	Non-Inn	Low Pers.	High Pers.
Sales growth	0.020	0.094	0.097
	(0.488)	(0.291)	(0.293)
Negative sales growth	-0.045	-0.056	-0.044
	(0.257)	(0.151)	(0.110)
Positive sales growth	0.129	0.153	0.149
	(0.236)	(0.207)	(0.237)
Total employees (ln)	3.569	3.877	4.373
	1.290	1.505	1.643
Tech. Effort (ln)	-7.459	-5.077	-3.602
	3.678	4.739	4.844
Main product sales	88.025	83.886	84.890
	17.378	19.940	18.316
Export propensity	5.568	8.254	10.064
	7.008	7.107	7.146

Note: Mean and SD (in brackets)

3.4.2. Main analysis

To test the hypotheses, we use a system-GMM estimator and present the results using a hierarchical regression approach as shown in Table 3.5. Hypothesis 1a, which states that there is a relationship between negative growth in the previous year and positive growth in the current year, is corroborated by Model 5 in Table 3.5. We use model 5 from Table 3.6 as it is the most complete model. This model indicates that the negative growth observed in the previous year is negatively associated with the current year growth rate ($\beta = -0.759$, $p < 0.01$). This suggests that negative growth results have a negative trend to persist, indicating that negative growth is rapidly reversed over time. The mean value of negative growth for young firms is 2.7% in the preceding year. This suggests that in the subsequent year, as indicated by the coefficients in Table 3.5, these firms will demonstrate a growth of 2.05%. Hypothesis 1b is also validated, showing that positive sales growth in the previous year is positively correlated with the current year's sales growth ($\beta = 0.418$, $p < 0.05$), indicating a consistent upward trajectory in sales performance year over year. In the same line as previous results,

the mean value of positive growth for young firms is 9.8% in the preceding year. This suggests that these firms will demonstrate a growth of 4.1% in the current year.

To test Hypothesis 2, we interact past negative and positive growth with number of product innovations. Hypothesis 2a predicts that larger number of product innovations are likely to reverse negative sales growth results. According to model 5 of Table 3.5, we cannot validate Hypothesis 2a, as the interaction between negative past growth and number of product innovations is not significant (β=0.002, p>0.1), suggesting that negative past growth when launching new products does not neither persist or reverse. Hypothesis 2b predicts that a greater number of product innovations is likely to reverse positive past sales growth results and turn them into negative. According to model 5 in Table 3.5, hypothesis 2b is supported. The interaction between positive past growth and number of product innovation is negative and significant (β= –0.003, p<0.01). The results demonstrate that for each additional product innovation introduced by a firm that experienced positive sales growth in the preceding period *t-1*, there is an associated reduction in sales growth of 0.283% in the current period. Therefore, if a young firm invests in product innovation, it may experience a decline of 0.03% in sales growth in the current year, rather than the expected 4.1% positive growth in the absence of product innovation.

Table 3.5. Regression results: GMM estimation results.

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5
H1a: Sales growth, negative $_{t-1}$	–0.797**	–0.979***	–0.889***	–0.997***	–0.759***
	(0.336)	*(0.349)*	*(0.337)*	*(0.349)*	*(0.285)*
H1b: Sales growth, positive $_{t-1}$	0.415**	0.521**	0.474**	0.582**	0.418**
	(0.195)	*(0.205)*	*(0.196)*	*(0.229)*	*(0.181)*
N.of product innovations $_{t-1}$		–0.00119	0.000399	–0.00112	0.000408
		(0.00101)	*(0.00103)*	*(0.00109)*	*(0.000735)*
Persistence in product innovation $_{t-1}$		0.0832**	0.0811**	0.203***	0.163***
		(0.0338)	*(0.0344)*	*(0.0705)*	*(0.0563)*
H2a: Sales growth, negative $_{t-1}$ * N. of product innovations $_{t-1}$			0.00326		0.00184
			(0.0180)		*(0.00191)*
H2b: Sales growth, positive $_{t-1}$ * N.of product innovation $_{t-1}$			–0.00357*		–0.00283***
			(0.00209)		*(0.000810)*
H3a: Sales growth, negative $_{t-1}$ * persistence in product innovation $_{t-1}$				0.883**	0.721**
				(0.383)	*(0.340)*
H3b: Sales growth, positive $_{t-1}$ * persistence in product innovation $_{t-1}$				–0.534**	–0.359*
				(0.270)	*(0.203)*
Technological effort $_{t-1}$	–0.0236*	–0.0257*	–0.0249*	–0.0292**	–0.0201
	(0.0134)	*(0.0141)*	*(0.0141)*	*(0.0135)*	*(0.0139)*

Firm size in employees $_{t-1}$	0.123	0.0910	0.0984	–2.55e-05	0.0798
	(0.0843)	*(0.0854)*	*(0.0859)*	*(0.000443)*	*(0.0557)*
R&D investment $_{t-1}$	0.00782	0.00681	0.00655	0.00916	0.00608
	(0.0102)	*(0.0104)*	*(0.0106)*	*(0.0103)*	*(0.0108)*
ROS $_{t-1}$	0.000220	0.000436	0.000386	3.04e-05	4.30e-05
	(0.00108)	*(0.00110)*	*(0.00111)*	*(0.00115)*	*(0.000997)*
Export propensity $_{t-1}$	–0.00342*	–0.00264	–0.00294	–0.00269	–0.00220
	(0.00198)	*(0.00197)*	*(0.00197)*	*(0.00205)*	*(0.00167)*
Process innovation $_{t-1}$	0.0161	0.00408	0.00748	0.00531	0.00176
	(0.0200)	*(0.0207)*	*(0.0211)*	*(0.0205)*	*(0.0195)*
Firma age $_{t-1}$	–0.000677	–0.00112	–0.000995	–0.000328	–0.000639
	(0.000826)	*(0.00125)*	*(0.00124)*	*(0.00123)*	*(0.000883)*
year	*Included*	*Included*	*Included*	*Included*	*Included*
Activity sector	*Included*	*Included*	*Included*	*Included*	*Included*
Constant	–0.609*	–0.546	–0.545	–0.214	–0.453**
	(0.341)	*(0.349)*	*(0.356)*	*(0.156)*	*(0.214)*
Observations	6,931	6,931	6,931	6,931	6,931
Number of id	1,607	1,607	1,607	1,607	1,607
AR(2) p value	0.128	0.079	0.073	0.262	0.144
#instruments	36	38	42	42	63
Hansen test	0.140	0.286	0.243	0.242	0.191

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The effect of innovation persistence on positive and negative growth persistence is shown in models 4 and 5 in Table 3.5. Since innovation persistence is measured in terms of hazard, a negative (positive) coefficient is interpreted as a decrease (increase) in the hazard rate or an increase (decrease) of the expected duration of persistence in product innovation. The first notable result is the positive and significant coefficient for the interaction of persistence in product innovation and negative sales growth in t-1 (β= 0.721, p<0.05). This result shows that a firm experiencing negative growth, if it increases the hazard of ceasing to innovate in products (and thus reduces the chances of persistent product innovation), will show higher growth rates in the following year, so that greater persistence in innovation implies lower growth in the following year. It is important to keep in mind that a positive relationship between negative past growth and current growth indicates a persistence of past decline. Hence, hypothesis 3a is supported. The results demonstrate that an increase of one unit in the probability of ceasing to persist in product innovation for young firms that have already demonstrated negative results in the previous year is indicative of a persistence of the negative trend, with a negative growth of 72.1% in the current year. In other words, if the mean negative growth in the previous year was 2.7%, continuing to innovate will result in negative growth of 1.94% in the current year.

Hypothesis 3b states that a firm showing positive growth and being persistent in product innovation will keep showing positive results. According to model 5 in Table 3.5 positive past growth when persisting in product innovation shows a negative significant result (β= –0.359, p<0.1). Therefore, if the persistence of innovation is reduced in t-1 when the firm has

positive sales growth, the firm will grow less in the following year, so greater persistence in product innovation as the firm grows implies greater persistence of growth. Thus, an increase of one unit in the probability of ceasing to persist in product innovation for young firms exhibiting positive growth in the previous year will result in a 35.9% probability of positive growth in the current year. Consequently, if the mean positive growth in the previous year was 9.8%, persisting in product innovation will result in positive growth of 3.52% in the current year.

For the sake of greater clarity, the results of the hypotheses are presented in tabular form in Table 3.6.

Table 3.6. Hypothesis results

Growth persistence		H1a: Negative growth $_{t-1}$ → (+) growth$_t$ *Supported*	H1b: Positive growth $_{t-1}$ → (+) growth$_t$ *Supported*
Interactions	**Product innovation**	H3a: Prodin$_{t-1}$ * Growth $_{t-1}$ → **(n.s)** growth$_t$ *Not supported*	H3b: Prodin$_{t-1}$ * Growth $_{t-1}$ → **(-)** growth$_t$ *Supported*
	Persistence innovation	H2a: Hazard Prodin$_{t-1}$ * N.Growth $_{t-1}$ → **(-)** growth$_t$ *Supported*	H2b: Hazard prodin$_{t-1}$ * P.Growth $_{t-1}$ →(+) growth$_t$ *Supported*

(+) positive relationship (-) negative relationship (n.s.) non-significant relationship

3.4.3 Robustness tests

To test the robustness of the results, we first replace the independent variables of negative and positive growth with two variables measuring the risk of negative and positive growth and spell length, respectively, to validate Hypothesis 1. To validate the results of hypotheses 2 and 3, we conducted a second exercise, a hazard analysis, a model previously used to assess growth persistence (Anyadike-Danes & Hart, 2018; Bianchini & Pellegrino, 2019). Our hazard analysis assesses both negative and positive growth risks of termination. The inclusion of hazard rates, particularly in the context of firm negative (or positive) growth, helps address potential challenges in the interpretation of coefficients. This serves as an extension to our

primary analyses of the interaction between product innovation and growth persistence, ensuring the reliability and validity of our results[7].

In order to describe the growth spell lengths, Table 3.7 shows the distribution of negative and positive growth spell length and the maximum spell length experienced by each firm for both conditions, negative and positive. Young firms show more frequent and longer positive growth spells (5,611) compared to negative spells (3,452), with a higher recurrence of positive spells, as the number of positive spells exceeds significantly the total number of enterprises in the sample (1,607). Although many firms experience at least one brief negative growth spell, most do not beat one year in duration and do not exceed seven years in duration at any time.

Table 3.7. Distribution of sales growth spell lengths and maximum spell lengths.

	Negative Growth spell				***Positive Growth Spells***			
	All spells		*Max spells*		*All spells*		*Max spells*	
Length	Freq.	%	Freq.	%	Freq.	%	Freq.	%
1	2313	67.00%	678	40.84%	2699	13.58	476	20.18
2	768	22.25%	659	39.70%	1383	6.96	600	25.43
3	264	7.65%	216	13.01%	681	3.43	523	22.17
4	77	2.23%	77	4.64%	364	1.83	330	13.99
5	24	0.70%	24	1.45%	214	1.08	184	7.8
6	5	0.14%	5	0.30%	123	0.62	124	5.26
7	1	0.03%	1	0.06%	69	0.35	67	2.84
8					44	0.22	24	1.02
9					18	0.09	18	0.68
10					16	0.09	16	0.64
Total	3452	1	1660	1	5611	100	2362	100

Table 3.7 shows the results for the GMM regression introducing the hazard variables for positive and negative growth. Results confirms hypothesis 1a and 1b. According to the results of model 2 in Table 3.7, the relationship between the negative growth hazard in t-1 and growth in t has a positive coefficient ($\beta = 0.268$, $p < 0.01$), suggesting that a decrease in the persistence of negative growth in t-1 is associated with stronger growth in the t-period. On the other hand, the results of model 4 in Table 3.8 show a negative coefficient of the positive growth hazard ($\beta = -0.503$, $p = 0.01$) indicates that a lower persistence of positive growth at t-1 is correlated with a reduction in growth in the t-period.

[7] The complete results can be found in Appendix B

Table 3.8. Robustness test: GMM estimation results by negative and positive growth.

VARIABLES	Model1	Model2	Model3	Model4
	Negative growth		Positive growth	
Negative growth Hazard $_{t-1}$	0.269***	0.268***		
	(0.0535)	(0.0572)		
Positive growth hazard $_{t-1}$			–0.465***	–0.503***
			(0.0404)	(0.0245)
N. of product innovations $_{t-1}$		0.000853		–0.00128**
		(0.00984)		(0.000606)
Product innovation persistence		–0.0259		0.0185
		(0.133)		(0.0414)
Technological effort (ln) $_{t-1}$	–0.0544*	–0.0408	–0.00522	–0.0114
	(0.0316)	(0.0296)	(0.0145)	(0.0107)
R&D intensity (ln) $_{t-1}$	0.0296	0.0225	–0.00416	0.00113
	(0.0257)	(0.0260)	(0.0109)	(0.00857)
Firm size (ln) $_{t-1}$	–0.0881	–0.0761	–0.606***	–0.146
	(0.236)	(0.239)	(0.220)	(0.107)
ROS $_{t-1}$	0.00331*	0.00299	–0.00153	–0.00162
	(0.00171)	(0.00187)	(0.00153)	(0.000988)
Export propensity $_{t-1}$	–0.0130**	–0.0132*	0.00285	0.00166
	(0.00534)	(0.00733)	(0.00237)	(0.00181)
Process innovation $_{t-1}$	–0.118	–0.139	–0.0165	0.00246
	(0.0958)	(0.104)	(0.0266)	(0.0238)
Firma age $_{t-1}$	–0.00157	–0.00152	0.000942	0.00168
	(0.00358)	(0.00395)	(0.00172)	(0.00142)
year	*Included*	*Included*	*Included*	*Included*
Activity sector	*Included*	*Included*	*Included*	*Included*
Constant	0.318	0.378	2.493***	0.710
	(0.943)	(0.924)	(0.905)	(0.454)
Observations	2,514	2,514	4,396	4,396
Number of id	1,203	1,203	1,416	1,416
AR(2) p value	0.127	0.66	0.419	0.485
#instruments	38	36	38	35
Hansen test	0.225	0.160	0.266	0.135

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.9 shows the effects of product innovation and persistence in product innovation on the hazard rate of negative and positive growth separately. According to the results of model 3 in Table 3.9, the effect of product innovation on the risk of negative growth remains insignificant, so that, as with the results of the main model, we can neither confirm nor reject hypothesis 2a. The results of hypothesis 2b, initially identified in the main analysis, are revalidated. The significant and positive coefficient on the number of new products (β=0.003, $p<0.1$) confirms that launching a greater number of products accelerates the risk of exiting a positive growth phase. Moreover, the results on product innovation persistence confirm hypotheses 3a and 3b: greater product innovation persistence reduces the probability of exiting a negative growth phase (β= –0.087, $p<0.1$). However, greater persistence in product

innovation also reduces the probability of exiting a positive growth phase (β= –0.239, p<0.01).

Table 3.9. Hazard model estimation results: negative growth persistence

	NEGATIVE GROWTH PERSISTENCE			POSITIVE GROWTH PERSISTENCE		
VARIABLES	Model1	Model2	Model3	Model4	Model5	Model6
Number of new products$_{t-1}$	0.000064		0.000650	0.00255*		0.00343*
	(0.00120)		(0.00148)	(0.00153)		(0.00180)
Persistence in product innovation $_{t-1}$		–0.126***	–0.0873*		–0.232***	–0.239***
		(0.0452)	(0.0483)		(0.0474)	(0.0518)
Total employes (ln) $_{t-1}$	0.0310**	0.0425***	0.0361***	–0.103***	–0.106***	–0.105***
	(0.0132)	(0.0129)	(0.0129)	(0.0127)	(0.0136)	(0.0140)
Age (ln) $_{t}$	–0.00427	0.0158	0.00983	0.0122	0.0226	0.0140
	(0.0265)	(0.0257)	(0.0258)	(0.0207)	(0.0226)	(0.0230)
Year (ln)	–36.60***	–34.08***	8.729	0.00335	0.00469	0.00600
	(4.454)	(5.438)	(8.677)	(0.00839)	(0.00892)	(0.00909)
Technological effort (ln) $_{t-1}$	–0.00477	0.000732	–0.00176	0.000313	0.000354	0.000358
	(0.00633)	(0.00631)	(0.00623)	(0.000359)	(0.000342)	(0.000345)
ROS $_{t-1}$	0.000186	0.000249	0.000315	0.0369	0.00972	0.00897
	(0.000418)	(0.000377)	(0.000386)	(0.0408)	(0.00757)	(0.00773)
R&D investment $_{t-1}$	0.0598	0.0754*	0.0797**	–0.00585	–0.0251	–0.0277
	(0.0402)	(0.0395)	(0.0397)	(0.0316)	(0.0342)	(0.0347)
Process innovation $_{t-1}$	0.0404	0.0197	0.0272	0.00136**	0.000526	0.000570
	(0.0343)	(0.0336)	(0.0335)	(0.000613)	(0.000670)	(0.000681)
Export intensity $_{t-1}$	0.000813	0.000611	0.000566	–54.77***	–36.70***	–36.55***
	(0.000638)	(0.000627)	(0.000613)	(4.574)	(4.166)	(4.227)
Constant	278.4***	259.1***	–65.90	416.7***	279.2***	278.1***
	(33.84)	(41.31)	(65.93)	(34.75)	(31.65)	(32.11)
year	Included	Included	Included	*Included*	*Included*	*Included*
Activity sector	Included	Included	Included	*Included*	*Included*	*Included*
Variance of the firm	0.0166*	0.0278***	0.0139*	0.0108	0.0180*	0.0198*
	(0.00847)	(0.00858)	(0.00803)	(0.00782)	(0.0100)	(0.0104)
Observations	3,232	3,232	3,232	5,245	5,245	5,245
Log Likelihood	–2,224.52	–2,205.86	–2,166.09	–1,833.37	2,021.28	–1,991.49
LR test (ρ=0)	4.69**	14.44***	3.59**	2.27**	4.10**	4.59**

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

3.5. Discussion:

3.5.1. Main findings

In our study examining the persistence of sales growth in young firms, we have drawn on resource-based view and performance feedback theory to analyse the dynamics of growth over time. By tracking 1,607 young Spanish manufacturing firms from 1991 to 2016 and employing a two-stage generalized least squares model to address data endogeneity, we have uncovered pivotal insights into growth trajectories in relation to product innovation strategy. To address the challenge of data endogeneity, a common problem in the search for growth

persistence, we used a two-stage generalised least squares model (Bond et al., 2001).

Consistent with previous research (Chen & Song, 2022), our results shows that young firms have a remarkable ability to recover from negative growth. Furthermore, our results suggest a persistence of positive growth, although this tendency is less intense compared to the ability to rebound when confronted with negative growth. These observations highlight the dynamic nature of young firms (Coad et al., 2018), suggesting that young firms are able to adapt to both negative and positive growth positions, prioritising growth during periods of negative growth and shifting focus to other strategic decisions when positive growth is achieved growth (Greve, 2003; Wennberg et al., 2016), but persisting in its focus on continuing to grow. Indeed, growth is a prerequisite for effectively exploiting growth opportunities (Penrose, 1959), especially for young firms.

In this sense, as argued by Haltiwanger et al. (2010), greater stability in growth should allow young firms to broaden their decision space to take advantage of other strategic opportunities that will allow them to grow further. In this sense, our research provides a new perspective on the role of product innovation decisions in the persistence of growth of young firm. Although we find no evidence that new product launches lead to a reversal of negative growth, our results suggest that the decision to continue launching product innovations can exacerbate negative growth. These findings reaffirm previous research suggesting that a decline in sales can undermine market interaction and complicate the validation of new products (Esteve-Pérez et al., 2023; Nuscheler et al., 2019). We therefore argue that a persistent focus on product innovation by diverting resources and attention away from activities to combat negative growth, may delay recovery from negative growth.

Conversely, young firms with positive growth do not benefit from adaptive decisions in product innovation by launching many products in a single year, but they do benefit from product innovation if they have a sustainable product innovation strategy with a more predictable behaviour. This confirms the conclusions of Bianchini and Pellegrino (2019), who find that occasional product innovation does not have the same impact on the persistence of growth as a continuous innovation strategy. Our results further elucidate this relationship by underscoring two pivotal factors in this dynamic. First, while a high number of new product introductions can be costly in terms of initial investment for young firms that already shows positive sales growth, a sustained product innovation effort can help to mitigate the costs of initial investment over time (Audretsch et al., 2014; Huergo & Moreno, 2011). One potential explanation is that innovation can facilitate the accumulation and reuse of knowledge, thereby optimising innovation processes and reducing the costs associated with new product

development, thereby facilitating the persistence of growth. Second, as Senderovitz et al. (2016) state, strategic thinking is crucial for firms pursuing sustained growth to ensure short-term consolidation and long-term sustainability. In this sense, Nuscheler et al. (2019) emphasise that for a new product to be successful, it should not only be innovative, but also aligned with the strategic direction of the firm and meet the needs and aspirations of the target market. We therefore show that the continuous integration of this feedback into the new product development process not only optimises the alignment of its products with consumer expectations, but also reinforces its long-term competitive strategy, facilitating sustainable and adaptive business growth.

3.5.2. Theoretical implications:

These findings constitute a notable contribution to both performance feedback theory and the resource-based view, particularly in the context of young firms. From the perspective of performance feedback theory, previous negative growth has been identified as a catalyst for positive growth in young firms, with adaptive behaviour playing a key role in this process (Greve, 2003; Chen & Song, 2022; Posen et al., 2018). Furthermore, when positive growth is achieved, young firms show a positive relationship by continuing to grow. The resource-based view has traditionally emphasised the importance of resource allocation in exploiting growth opportunities and sustaining growth in young firms that are already experiencing positive growth (Barney, 1991; Penrose, 1959). The overarching conclusion of this chapter is that young firms tend to be growth-keepers, highlighting the need to consider a range of theoretical perspectives when examining the persistence of growth in young firms. There is a need to integrate resource-based views with more behavioural and feedback-oriented approaches, as young firms appear to operate at the intersection of these two perspectives, integrating static resource allocation with dynamic, performance-based adjustments when analysing the growth persistence of young firms.

This chapter also makes a contribution to the understanding of the role of strategic decisions in young firms by providing insights into how these firms sustain growth while innovating products. The findings indicate that an intensive new product introduction during periods of positive growth can have adverse effects, whereas maintaining product innovation during periods of positive growth can be advantageous, although this approach may be disadvantageous when the young firm is experiencing negative results. This approach serves to reinforce the resource-based view by emphasising the importance of not only the allocation of resources and capabilities to product innovation, but also the strategic management of these resources and capabilities to achieve and ensure the sustainability of growth. In alignment

with this interpretation, Cefis et al. (2024) emphasised the significance of persisting as a learning process, which is a fundamental element for successful innovation. The findings are also consistent with performance feedback theory, which suggests that adaptive decisions are effective when a young firm is experiencing negative growth, and predictive decisions are effective when dealing with positive growth (Cyert & March, 1965; Greve, 2003). Furthermore, the results indicate that reversing the type of decision and introducing adaptive decisions in innovation when achieving positive results, as well as maintaining predictable decisions through continued innovation, is counterproductive in reversing negative growth or sustaining positive growth.

3.5.3. Managerial and policy implications:

Our research provides valuable insights for managers and policy makers on how young firms can manage and adapt their strategic decisions in response to different types of growth. Past performance, whether negative or positive, plays a pivotal role in shaping the future trajectory of the firm and given the ability of young firms to reverse negative growth and sustain positive growth, we underscore the legitimacy of expectations and policies aimed at encouraging the pursuit and maintenance of growth in young firms once it has been achieved. However, the circumstances in which this innovation is effective differ, necessitating that firms adopt an approach to innovation that is appropriate to the context of their past performance. Consequently, political and managerial decisions about product innovation need to distinguish between tactical and strategic applications. Encouraging or promoting product innovation to reverse negative growth may, therefore, prove counterproductive and ineffective. Conversely, encouraging or facilitating innovation persistence in young firms that are already growing can help them to sustain their growth.

3.6. Limitations and future research:

While this study provides new insights into the impact of strategic choices on the growth persistence of young firms, particularly in product innovation, we acknowledge several limitations. First, as our research is based on data from Spanish manufacturing firms, the generalisability of our findings to other sectors or geographical regions may be limited. Future studies could examine the growth dynamics and innovation strategies of young firms in different sectors and regions to extend these findings.

Second, existing literature on young firms often focuses on growth persistence in terms of sales (Capelleras & Federico, 2024; Chen & Song, 2022; Coad, Daunfeldt, et al., 2018;

Coad, Frankish, et al., 2013) or employment (Anyadike-Danes & Hart, 2018; Derbyshire & Garnsey, 2014; Haltiwanger et al., 2010). However, profitability, a crucial factor in the survival and consolidation of young firms, does not always correlate directly with growth (Ben-Hafaïedh & Hamelin, 2022; Davidsson et al., 2009) This situation is even more evident in the case of young firms that develop innovations, which are often associated with higher costs. Therefore, it is essential that future research includes the analysis of the persistence of performance in young firms in order to get a more complete picture of the factors that contribute to their sustained success.

Moreover, while our focus was primarily on product innovation, other strategic decision-making areas such as diversification, process innovation, or internationalization remain unexplored. Investigating whether persistence in these strategies also leads to growth persistence could provide a more comprehensive understanding of strategic management in young firms.

Finally, while our study emphasizes the importance of internal firm decisions in growth persistence, external factors also significantly influence the growth of young firms (Gartner & Liao, 2012; Giones et al., 2020). Future research should examine how competitive environments and market changes impact young firms' innovation decisions. This includes studying the influence of factors such as periods of crisis and stability, technological changes, and market pressures on both negative and positive growth persistence in young firms.

3.7. Conclusion

This study examined the persistence of growth in young firms, distinguishing between negative and positive growth. Drawing on performance feedback theory and the resource-based view, we analysed how young firms recover from negative growth and how they maintain positive growth through their strategic decisions, particularly with respect to product innovation. In this sense, while launching new products in a single period may not be effective in maintaining positive growth results, our results show that a persistent product innovation makes it difficult to reverse negative growth while sustaining positive growth. This article highlights the importance of distinguishing between negative and positive growth, enriching our understanding of the relationship between past and current growth, and providing new insights into the effect of product innovation strategies on growth persistence.

Our findings also contribute to the theoretical discourse on the impact of product innovation on the growth trajectories of young firms. In particular, we demonstrate that the

manner in which product innovation is undertaken – whether as an intense response or as a strategic decision – shapes the growth trajectories of young firms in different ways.

4. CHAPTER IV: THE GROWTH-PROFITABILITY RELATIONSHIP IN YOUNG FIRMS: THE MODERATOR ROLE OF INTERNAL R&D INTENSITY AND EXTERNAL CRISES

4.1. Introduction

While previous chapters have concentrated on the antecedents of growth and persistence of growth respectively, this section shifts the focus to the intricate relationship between growth and profitability in young firms. The aim of this chapter is to determine whether firms can translate their growth into profitability, which is a crucial factor in determining their long-term success and viability. Although most young firms remain small, those that grow contribute disproportionately to economic growth and regional development (Haltiwanger et al., 2016). Accordingly, governments and policy makers around the world implement policy measures to support growth (Audretsch et al., 2007; Bradley et al., 2021; Coad et al., 2022). Meanwhile, on the firm level, a key question among young firms remains whether growth is beneficial for profitability (Ben-Hafaïedh & Hamelin, 2022; Davidsson et al., 2009; Markman & Gartner, 2002), and despite a considerable volume of research into this growth—profitability relationship, there remains both theoretical discrepancies and empirical inconsistencies.

From a theoretical point of view, some authors suggest that there is no meaningful relationship between growth and profitability. Coad et al. (2013) proposed that growth rates can be characterized as a close-to-random process and developed a framework based on the Gambler's Ruin theory (Wilcox, 1971) where growth is modelled as a game of chance and performance remains random and outside entrepreneurs' control. On the contrary, others argue for a meaningful relationship between growth and profitability. In this vein, Roper (1999) identified three categories of factors impacting the growth-profitability relationship: (1) the effects of initial market position such as firm age (Steffens et al., 2009), (2) the effects of firm initiatives such as market strategies (Senderovitz et al., 2016), and (3) the market condition effects such as innovation intensity in industries (Delmar et al., 2013) or external economic crises (Lee, 2014).

Together with theoretical discrepancies prior empirical results also show inconsistencies with studies providing contradictory profitability outcomes of growth; with both positive relation between firm growth and profitability (e.g., Senderovitz et al. 2016), no relation (e.g., Markman & Gartner, 2002), and negative relation (e.g., Davidsson et al., 2009). A recent replication and extension study of Davidsson et al. (2009), covering 40 % of all SMEs in EU,

by Ben-Hafaïedh & Hamelin (2022:1) shows that "profitability first rather than growth first is a preferable strategy for achieving high overall performance".

Despite this extensive study by Ben-Hafaïedh & Hamelin (2022), the theoretical discrepancies and the empirical inconsistencies, however, still suggest the growth—profitability relationship is nuanced and potentially heterogeneous depending on other factors. To solve the puzzle whether growth is profitable we suggest looking into different circumstances under which young firm growth might be profitable, rather than searching for the best solution. Particularly, we propose two circumstances related with uncertainty: one internal related to the organisation (i.e., R&D intensity) and one external related to external environment (i.e., external economic crisis). A situation of uncertainty is defined by a lack of knowledge (Audretsch & Belitski, 2021; Knight, 1921). Profitability and uncertainty have traditionally been linked to young firms (Knight, 1921), as these firms are more likely to confront uncertainty and achieve profitability by leveraging underutilised knowledge-development innovation initiatives (Acs et al., 2013; Knight, 1921) as well as capitalising on incomplete market information (Knight, 1921).

We focus our analysis on young firms as they are particularly vulnerable to unprofitable periods due to less resource slack (George, 2005; Sharfman et al., 1988) and liabilities of newness (Singh, Tucker & House, 1986; Schlichter, Klyver & Haug, 2021; Stinchcombe, 1965). According to Roper's (1999) classification, our focus of young firms represents the initial market position, while the R&D intensity and external economic crisis represent the firm initiatives and market condition effects, respectively.

We first argue that young firms might benefit from growth in terms of higher profitability. This happens due to their tendency to grow faster than their more mature counterparts (Phillips & Kirchhoff, 1989), greater flexibility and ability to adapt as they grow (Kelly & Amburgey, 1991; Lee, 2014), and constant search for new and profitable opportunities. Positive effect of growth on profitability is strengthened when the firm invests in R&D because the internally generated knowledge of young firms increases their chances of exploiting opportunities (Estrada & Dong, 2020; Wang et al., 2019). Finally, we suggest that the benefits of growth for profitability is higher in periods of an external economic crisis. During an external crisis (Miklian & Hoelscher, 2022; Rauch & Hulsink, 2021) where many firms suffer (Bartik et al., 2020), those young firms that are already experiencing growth are better positioned to pursue the opportunities that arises in the wave of the external disruptions (Klyver & Nielsen, 2021; Wenzel et al., 2021) making their growth profitable.

We test our hypotheses on a dataset consisting of 1,375 firms in an unbalanced panel with 5,848 observations from 1991-2016, collected as part of the Spanish Survey of Business Strategies (Encuesta Sobre Estrategias Empresariales - ESEE), and covering two Spanish external economic crises: the 1993-1994 crisis, and the financial crisis 2008-2014. We perform a system-GMM model and find support for our hypotheses. The study makes at least three important contributions. First, we contribute to the ongoing debate on the link between growth and profitability by showing that these two variables are positively related in the case of young firms. Thus, we show that this is a meaningful relationship. Second, we add to this literature that this is contingent on the level of internal investments in R&D, a previously unexplored moderator in this relationship (Senderovitz et al., 2016; Schlichter et al., 2021). Third, we demonstrate that young firms can also grow profitably by taking advantage of new opportunities that emerge during external crises. Since both R&D investment and crisis environments have in common uncertain future outcomes (Knight, 1921), our study shows that boundary conditions related to uncertainty tend to act as moderators of the growth-profitability link.

4.2. Theoretical background and hypotheses

4.2.1. The growth profitability relationship

Despite the substantial interest in the growth – profitability link, there is a lack of consensus on the nature of this relationship. While some theoretically argue that growth and profitability is a meaningless relationship (Santarelli et al., 2006), others support that they are indeed related (e.g., Roper, 1999; Senderovitz et al., 2016).

There are theoretical arguments denying any meaningful relationship between growth and profitability. According to Gibrat's (1931) law, or Law of Proportionate Effects, firm growth is independent of firm size, suggesting that growth is random rather than a function of firm or environmental characteristics (Stam, 2010). This further implies that firm initiatives such as investments in R&D or the economic conditions in which the firm operates should not have any systematic impact on growth and its potential profitability. In a similar vein, the Gambler's Ruin theory (Wilcox, 1971) suggests that firm growth does not follow any particular pattern and that firm performance is best understood as a result of a "random walk process" (Coad, Frankish, et al., 2013).

Conversely, other authors argue that a meaningful relationship between growth and profitability depends on the configuration of various factors (Cowling, 2004; Roper, 1999). Cowling (2004) proposes a combination of the classical market-oriented tradition with a managerial approach focused on strategic decisions and a revisionist perspective

(Schmalensee, 1985) that relies on structural differences to explain the relationship between growth and profitability. Roper (1999) – believing a meaningful relationship between growth and profitability – concluded that in "*any period small business growth and profitability will depend on the firm's operating environment, its initial market position and its choice of business strategy.*" Prior research has theoretically suggested that initial market conditions such as firm age (Steffens et al. 2009) matter for whether growth influences profitability.

In considering the role of age, a critical source of young firms' profitability stems from their ability to foster growth through innovation. By developing and efficiently translating innovation into the market, these firms can not only generate profits but also drive sustained growth (Knight, 1921; Penrose, 1959). However, the profitability of young firms is also closely tied to their ability to navigate markets characterized by imperfect information and unpredictability (Alvarez & Barney, 2005; Knight, 1921; Mcmullen Baylor & Shepherd, 2006), with growth being a relevant factor in efficiently navigating these environments (Penrose, 1959). While both –strategic decision and market conditions– contribute to the overall goal of achieving profitable growth, particularly for young firms, each appears to impact differently on the growth-profitability relationship (Roper, 1999).

This distinction is often conceptualised by scholars using two complementary orientations: the inside-out and outside-in approaches (Day, 1994, 2011; Saeed et al., 2015). The 'inside-out' perspective is an internally oriented strategic posture that emphasizes the role of internal resources and capabilities, such as innovation, in driving profitable growth. Firms that have developed and have access to unique resources in terms of valuable, rare, inimitable, and non-substitutable resources (Barney, 1991; Penrose, 1959) are in a better position to benefit from a profitable growth. Yet, developing competitive advantages through positioning in the market or through unique resources require organisational development and transition that potentially jeopardize any potential profitability of growth (Churchill & Lewis, 1983; Garnsey et al., 2006; Greiner, 1972).

On the other hand, the outside-in perspective examines how external market conditions and uncertainties influence a firm's ability to translate growth into profitability (Burns & Stalker, 1961; Lawrence & Lorsch, 1967). From this perspective, external conditions act as a source of uncertainty, the ability of firms to adapt to these conditions can lead to profitable growth (Dosi, 1982; Nelson & Winter, 1982). Hence, external conditions such as industry characteristics in terms of innovation intensity (Delmar et al. 2013) or external economic crises (Lee 2014) shape whether growth influences profitability. For instance, Schlichter, Klyver and Haug (2021) argued that "*growth has a positive effect on performance, because high-growth firms more easily capture premium segments, achieve economies of scale, set*

industry standards, and/or control distribution channels during their period of growth." Yet, developing competitive advantages through positioning in the market or through unique resources requires organisational development and transition that potentially jeopardize any potential profitability of growth (Churchill & Lewis, 1983; Garnsey et al., 2006; Greiner, 1972).

In addition to theoretical discrepancies, empirical evidence appears to be contradictory. Table 4.1, provides an overview of a relevant set of empirical studies on the relationship between growth and profitability among young firms or SMEs. It clearly shows the empirical inconsistencies; that is, some empirical papers find a positive relationship between growth and profitability (Cowling, 2004; Delmar et al., 2013; Federico & Capelleras, 2015; Kachlami & Yazdanfar, 2016; Senderovitz et al., 2016; Steffens et al., 2009), some find non-significant relationships (Bottazzi et al., 2010; Fitzsimmons et al., 2005; Lee, 2014, 2018; Markman & Gartner, 2002; Roper, 1999) and finally some find negative relationships (Ben-Hafaïedh & Hamelin, 2022; Brännback et al., 2009; Davidsson et al., 2009; Nason et al., 2019; Reid, 1995).

In this study, we propose that young firms tend to demonstrate a positive relationship between growth and profitability, and we suggest that the growth—profitability relationship among young firms is not generic but rather heterogeneous depending on internal and external circumstances. Accordingly, rather than searching solely for the generic effect of growth, we propose looking also at different circumstances under which growth may be profitable. Our suggestion here is that internal and external factors involving uncertainty will act as moderators in the growth-profitability link. Particularly, we focus on two circumstances connected to uncertainty (McMullen & Shepherd, 2006; Mckelvie et al., 2011): one internal related to the strategic decisions (i.e., R&D intensity), with endogenous uncertainty, and one external related to the environment (i.e., economic crisis), where uncertainty is exogenous. That is, R&D investment entails uncertainty related to cash outflows in the pursuit of performance that may not necessarily materialize (Karna et al., 2022), and an economic crisis entail uncertainty related to market and opportunities (Bamiatzi et al., 2016).

Table 4.1. Studies of growth-profit relationship in young firms and SME's

Paper/journal	$g \rightarrow \pi$	Theoretical Background	Sample (nº)	Contingencies / Moderators	Conclusion
Ben-Hafaïedh and Hamelin. *ETP* (2022)	–	not specified	European SME's. 2011 -2019 (664,629)	--	Replication study of Davidsson et al.(2009), confirming that growth orientation leads to worse profitability performance.
Bottazzi et al. *SBE* (2010)	0	Various theories from an industry dynamics perspective.	Italian and French Manufacturing firms < 20 employees. 1989-2004	--	Absence of relationship between growth and profitability
Brännback et al. *N Biotechnol* (2009)	–	not specified	Finish young firms. 2004-2006 (336)	--	Growth hampers profitable overcomes in young firms.
Cowling. *SBE* (2004)	+	non specified	UK <30 years old firms. 1991-1993 (204)	--	Growth and profits facilitate each other: profits facilitate growth and growth facilitates future profits, enabling continued increasing returns to scale.
Davidsson et al. *JBV*(2009)	–	Resource Based View	Swedish & Australian firms. 1995 -1998 (1,482)	--	Young firms seeking first growth rather than profitability, show negative profitability results. They suggest that firms seeking growth and also achieving positive returns are due to other contingencies.
Delmar et al. *Technovation* (2013)	+	Evolutionary economics	Swedish knowledge-intensive new ventures. 1995 -2002 (5,342)	Environmental innovation intensity: 0	Growth, reduces the likelihood of survival yet enhances the ability to profit. Profitable growth in new ventures is slow and profits increase in small amounts.
Federico and Capelleras. *SBE* (2015)	+	RBV Evolutionary economics	Spanish young firms. 1996-2010. (898)	--	Sales growth has a positive effect on profits, although the relationship between profitability and growth may differ according to the firm's economic environment.
Fitzsimmons et al. *Proceedings of AGSE Entrep.* (2005)	0	not specified	Australian SME's. 1994-1998. (2,923)	--	Replication study of Cowling (2004). However, this analysis did not find significant results for the relationship between growth and profitability.
Kachlami and Yazdanfar. *MRR*(2016)	+	RBV, but also: strategic adaptation perspective, motivation perspective, configuration perspective	Swedish SMEs 2009-2013. (13,548)	--	Growth has a positive effect on firms' profitability. Being more profitable when firms finance their growth with their own funds

Lee. SCED (2014)	0	Evolutionary economics	young and stablished South Korean firms. 1998-2008. (606)	**Firm age:** young firms: 0 old firms: +	Young firms' past sales growth shows no significant effect on future profitability. Only old firms show a positive relationship between profitability and growth.
Mansikkamäki, S. *JBVI* (2023)	0	Resource Based View	Finnish firms (66,000)	Firm age: – Firm size: –	Replication study of Davidsson et al.(2009), confirming that growth orientation reduces profitability, except in young, small firms. According firms increase size and age reduces de profitable growth.
Markman and Gartner. *ETP* (2002)	0	not specified	U.S. high-growth firms. 1992 – 1998 (45,525)	--	Firms with extraordinary high growth —in terms of sales and number of employees— are not related to firm profitability
Nason and Wiklund. *JBV* (2019)	–	Resource Based View	Swedish ITT (Information Technology & Telecom) new ventures. 2005-2010 (184)	--	New ventures with external R&D resources experiences sales growth, but due to the dependence on external resources, this growth fails to translate into higher profitability.
Reid . *SBE* (1995)	–	Gibrat's Law Life-Cycle model Managerial model	Scottish New microfirms. 1985-1986. (73)	--	In the short term, young micro-enterprises experience a trade-off between growth and profitability.
Roper, S. *SBE* (1999)	–		Irish SMEs. 1993-1994. (210)	**Groups of effects:** strategic initiatives: + market conditions: - Initial market position (firm age): -	Firms' growth and ROA are weakly correlated in the short run with negative ratios; and above average growth rates are no guarantee of high profitability.
Schlichter et al. *JSBM* (2021)	+	Resource Based View	Danish young SME's. 2015 (352)	**ERP Complexity** Low ERP complexity (+) Hich ERP Complexity (-)	The relationship between growth and profitability is positive for young firms, but when they invest in complex ERP systems, even with the growth of the firm, profitability is negative.
Senderovitz et al. *ISBM* (2016)	+	various theories contingency theory (moderator)	Danish Gazelle firms. 2004-2007. (964)	**Strategic Orientation:** broad Firm strategy: + niche firm strategy: -	Employee growth has a positive effect on the profitability of gazelle firms, with the effect being greater among gazelle firms with a broad strategy. However, the impact of growth on profitability is negative for firms pursuing a niche strategy among gazelles.
Steffens, P., Davidsson, P., & Fitzsimmons, J. *ETP* (2009)	+	multiple theories; highlighting configuration approach	Australian SMEs. 1995-1998. (3,500)	**firm age:** young firms: + old firms: +	Even the growth-profitability relationship is positive, young firms pursuing high-growth strategies early on their lives may perform poorly in terms of profits.

4.2.2. The growth–profitability relationship in young firms

Despite the contradictory evidence on the growth-profitability relationship, we argue that growth will positively affect profitability among young firms for several reasons. First, young firms tend to grow faster than established firms (Phillips & Kirchhoff, 1989). Fast growth rates are a reinforcing process in which young firms in short time increase to a size that enables them to reduce their structural costs through economies of scales (Teece, 1993). At the same time, they increase production capacity and their negotiation power with market stakeholders (Markman & Gartner, 2002), providing them a better chance to achieve higher profitability (Delmar et al., 2013; Wiklund & Shepherd, 2005).

A second reason why young firm growth benefits profitability is related to flexibility. Young firms are still in process of designing the organizational structure (Churchill & Lewis, 1983; Garnsey et al., 2006; Greiner, 1972), not constrained by organizational inertia (Sirén et al., 2017), but rather have momentum to flexibly apply new knowledge and achieve the most profitable results (Kelly & Amburgey, 1991; Lee, 2014; Steffens et al., 2009). Furthermore, young firms follow a learning-by-doing approach (Arrow, 1962; Chang et al., 2002) and are often more proactive than established firms in acquiring new knowledge and facilitating the transition to valuable resources that generate competitive advantage (Capasso et al., 2015; Wales et al., 2013). This enables them to achieve profit while growing by optimizing their resource use (Federico & Capelleras, 2015).

Finally, young firms are often opportunity and advantage seekers (Steffens et al., 2009). As continued growth and profitability is a complex and uncertain path, young growing firms will often diversify their actions by looking for opportunities beyond their current market as a chance to extend their competitive advantage. Furthermore, Fonseca et al.(2021) show that as young firms grow, they simultaneously increase their investments in order to improve profitability. Consequently, young firms may demonstrate a heightened sense of confidence when undergoing growth (Davidsson, 2015), perceiving opportunities that can potentially lead to enhanced profitability. In the light of these considerations, we suggest the following hypothesis:

Hypothesis 1: *Growth has a positive impact on profitability among young firms.*

4.2.3. The moderating role of R&D intensity

So far, we have argued that the growth–profitability relationship is positive among young firms. However, this relationship is not generic but varies depending on internal firm initiatives (Roper, 1999; Cowling, 2004). We argue that internal R&D intensity is a crucial

internal firm initiative among young firms that strengthens the growth—profitability relationship; that is, the impact of growth on profitability is stronger when young firms increase their internal investment in R&D. In contrast with the emphasis on process and product innovation in Chapters II and III, this chapter analyses R&D investment as a more flexible and long-term innovation strategy.

Young firms can overcome uncertainty by transforming ideas into new knowledge (Knight, 1921), with R&D investment being a primary source of knowledge for young firms (Acs et al., 2013; Alvarez & Barney, 2005; Audretsch & Belitski, 2021). Indeed, innovation, and by extension R&D investment, is crucial for the growth of young firms (Schumpeter, 1934), enabling profitable growth when innovation is managed effectively (Brouwer, 2000). The challenge hence, is to manage R&D effectively so that the resulting knowledge can turn growth into profitable growth.

Different studies have identified the impact of R&D intensity in young firms' growth (Clarysse et al., 2011; Coad et al., 2016; McKelvie et al., 2017), and on profitability (Deeds, 2001; Larrañeta et al., 2017). Moreover, some studies have separately investigated the influence of R&D on both growth and profitability in young firms, examining these two critical dimensions in isolation (Nason et al., 2019; Wang et al., 2019). This evidence of the impact of R&D on the growth and profitability of young firms provides a solid basis for exploring how the interaction between these two factors can be modulated or influenced by strategic R&D investment. Following March (1991), balanced R&D investment is key to profitable growth, identifying three factors that determine profitable growth when young firms invest in R&D: (1) R&D origin, (2) R&D integration and (3) R&D feedback.

First, young firms can gain new knowledge either by generating it internally or acquiring it externally (Lewin et al., 2011). However, often young firms face higher costs when innovation is based on external R&D investment, which may lead to unprofitable growth (Estrada & Dong, 2020; McKelvie et al., 2018). In addition, the cost of knowledge assimilation is higher because the available knowledge in the market often differs from the specific knowledge needed (Cohen & Levinthal, 1990) and can be misaligned with young firm's need to grow profitable (Hsu & Cohen, 2020). In contrast, when young firms invest in internal R&D, the resources are owned by the firm itself. This reduces or even eliminates the costs associated with resource dependence and guarantees continued access to these knowledge resources at no additional cost (LiPuma et al., 2013; Nason et al., 2019; Unger et al., 2011), and thereby securing profitable growth independent of third parties.

Second, young firms' existing knowledge and their control of the knowledge creation process enable them to become more efficient in new product and process developments, which enables them to achieve higher profitability when growing. On the one hand, top management teams and employees in young firms are not a blank canvas but have prior knowledge that is applicable in the new venture (Agarwal et al., 2007; Rajshree Agarwal & Shah, 2014). They also tend to have prior sector experience and may have acquired some of the competitive values of their new venture (King & Slotegraaf, 2011). This allows young firms to capture critical knowledge more efficiently and thus enables them to grow more profitable (Wang et al., 2019). On the other hand, the process control helps to speed up and facilitate the application of product and process developments (Deeds, 2001; Grant, 1996; Kogut & Zander, 1992; Solow, 1957), as well as accelerates the implementation of improvements in firms' production processes (Coad et al., 2021; Hsu & Cohen, 2020). As a result, it allows young firms to become more efficient and more profitable in their transactions when growing.

Finally, when this knowledge is transferred to the market in the form of new products and processes, young firms maintain an adaptive and flexible approach (Sarasvathy, 2001; Senyard et al., 2014), thus creating the conditions for profitable growth. Internal development of R&D allows them to process information more thoroughly and carefully (Kahneman, 2013), making it easier for young firms to respond more effectively to new challenges and opportunities as they receive market feedback. This feedback – whether it relates to the acceptance of new products and processes, a better understanding of customer preferences, industry trends, or organisational capabilities – provides key answers to the coherence of applied knowledge (Chaparro et al., 2021; Solano et al., 2020). Such coherence is a critical element in the profitable growth, as it synchronises existing knowledge with new knowledge acquired through R&D, accelerating firms' ability to seize new market opportunities (Audretsch et al., 2014; King & Slotegraaf, 2011), differentiate themselves from competitors, and build customer loyalty (Rosenbusch et al., 2011).

Therefore, it can be argued that internal R&D investment has a multiplying strengthening effect on the growth—profitability relationship among young firms. In addition to eliminating dependency on third parties and facilitating cost reduction, internal R&D investment forces young firms to pay more attention to current challenges and to align their existing knowledge with R&D results. Furthermore, the confidence gained from investing in R&D while growing bolsters the positive correlation between growth and profitability. Thus, the young firm that invests in internal R&D works with a deliberate and opportunity-conscious approach, as

investment in R&D becomes a key driver of growth and profitability for young firms. Based on these arguments, we suggest that:

Hypothesis 2: *Internal R&D intensity positively moderates the growth-profitability relationship among young firms.*

4.2.4. The moderating role of external economic crises

The positive growth–profitability relationship among young firms not only vary with firms' R&D intensity but also with external factors such as market conditions as argued by Roper (1999). Crises are radical expressions of external uncertainty and dynamic environments (Miklian & Hoelscher, 2022). From an outside-in perspective, the capacity to adapt and compete effectively in response to changing conditions is a key determinant of profitable growth (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Nelson & Winter, 1982; Teece & Pisano, 1998), with younger firms being more able to adapt to the environmental challenges, and orient themselves towards more profitable growth (Delmar et al., 2013; Federico & Capelleras, 2015; Lee, 2014). We particularly suggest that external crises might be an important market circumstance that impacts whether growth is profitable.

External crises vary in nature along dimensions such as domain (e.g., natural disaster, pandemic, or financial crisis), dynamism (e.g., predictable versus not predictable development), degree of uncertainty and magnitude (Miklian & Hoelscher, 2022; Rauch & Hulsink, 2021). For young firms with less resource slack (George, 2005; Sharfman et al., 1988) and liabilities of newness (Schlichter et al., 2021; Singh et al., 1986; Stinchcombe, 1965) external crisis can seriously jeopardise future profits and consequently also survival (Antonioli & Montresor, 2021; Peric & Vitezic, 2016; Rahman et al., 2022). In this sense crisis represents danger for many firms that may voluntarily or involuntary reduce operating cost and R&D investments as crisis strategy for survival (Klyver & Nielsen, 2021). In a study in Belgium, Evans and Borders (2014) for instance found that 239 % more firms filed for bankruptcy in the aftermath of the 2008 financial crisis.

An external economic crisis is characterized by a sharp downturn in economic activity, often accompanied by financial stress or financial crisis, and with a wide range of negative impacts on individuals, businesses, and governments, including rising unemployment, declining asset prices, and reduced trade. Although an external economic crisis challenges survival and profitability for many firms, we argue that the growth—profitability relationship among young firms might be further strengthen in periods of economic crisis for at least three reasons.

First, external crises hit firms heterogeneously with both winner and losers (Alekseev et al., 2020; Klyver & Nielsen, 2021). For instance, Strangler (2009) found that over half of American Fortune 500 firms were founded and developed in periods of recession or bear markets, indicating that opportunities may rise from external crises. In fact, it is generally acknowledged that new opportunities arise from environmental changes associated with economic crises (Davidsson et al., 2020). An economic crisis creates a period of instability that challenges prior collective sensemaking and cognitive frames of the market (Epure et al., 2024; Lounsbury & Hirsch, 2010; Ocasio et al., 2015), leaving new opportunities available (Sine & David, 2003) to young firms that are flexible organized and with tendencies seek to exploit new opportunities (Kelly & Amburgey, 1991; Lee, 2014; Steffens et al., 2009). When growth is based on new emerging opportunities associated with first or second mover advantages (Gal-Or, 1985), it strengthens the potential profitability of growth.

Second, competition in general is intensified during an economic crisis with declining markets (Kotelnikova et al., 2017), making firms fighting to keep their market share and profitability. However, such market disruptions often also create a sense of urgency that increases creativity (Borowiecki, 2014) and innovations (Brem et al., 2021). With the flexibility and opportunity seeking nature characterizing young firms (Kelly & Amburgey, 1991; Lee, 2014; Steffens et al., 2009), they are in a position to quickly take advantages of the new market conditions. When growth in young firms is based on creative and innovation behaviour, it likely strengthens the potential profitability of growth.

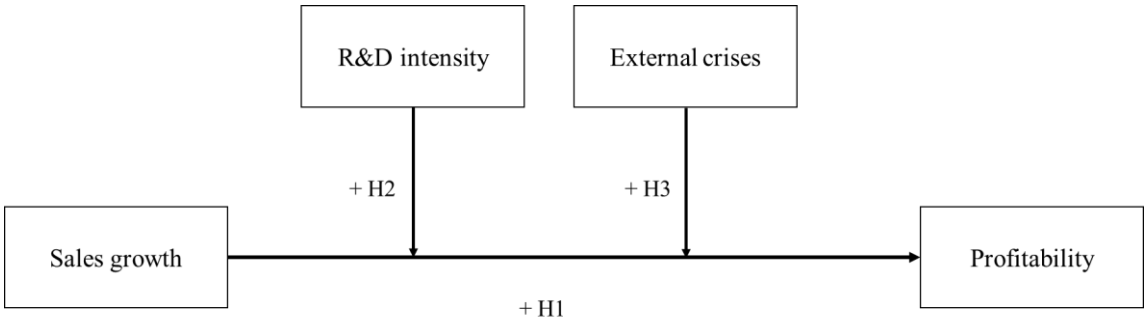
Finally, with competition intensified overall there will be an increasing number of bankruptcies (Evans and Borders, 2014). These bankruptcies are both consequence of unsustainable business models but also sometimes a consequence of lack of necessary financial resources to keep cashflow sustainable; that is, “cash is king” (Cowling et al., 2020; C. Kim & Bettis, 2014). During periods of economic crisis even healthy and profitable firms are challenged by more adverse access to credit which is crucial for firms temporarily running out of cash (Piette & Zachary, 2015). Accordingly, this leaves during the crisis temporary windows of opportunities in the market to exploit competitors’ bankruptcies. It is generally “cheap” growth when young firms are taking over market shares from competitors that went bankrupt, and therefore such growth is profitable.

Summing up, we argue that young firm growth has a stronger effect on profitability during periods of economic crisis because of new emerging opportunities, more creative and innovation and cheaper growth caused by higher numbers of bankruptcies.

Hypothesis 3: *External crises positively moderate the growth-profitability relationship among young firms.*

To sum up the three hypotheses, the conceptual model is shown in Figure 4.1.

Figure 4.1. Conceptual model



4.3. Method

4.3.1. Data

To test our hypotheses, we examine the relationship between growth and profitability among young firms with data from the Encuesta Sobre Estrategias empresariales (ESEE). This database is compiled by the SEPI Foundation with support from the Spanish Ministry of Science and Technology. The database is a firm-level panel covering a broad sample of Spanish manufacturing firms operating in different industry sectors. The sample is representative of firms with more than 10 employees. The SEPI Foundation applies varied criteria to ensure the accuracy of information collected in the ESEE, including the requirement for companies to submit documented justifications if they fail to meet consistency controls.

Our study uses data from 1991 to 2016, covering 25 years. Firms that disappear, change their main activity or close are replaced by firms with similar characteristics for this panel. Because we are interested in young firms, the cut-off firm age is <11. This consideration of young firms is common and follows the approach applied by other authors considering "young" as those companies between 1 and 10 years of age (Coad et al., 2016; Coad, Holm, et al., 2018). Due to some missing values and lagging independent variables, our final sample consists of 1,375 firms in an unbalanced panel with 5,848 observations.

Previous research has already used the ESEE database as a representative sample Spanish manufacturing firms (Rochina-Barrachina et al., 2010; Vieites et al., 2013) as well as to analyse the relationship between growth and profitability (Fuertes-Callén & Cuellar-Fernández, 2019), the effects of R&D intensity on firms performance (Díaz-Díaz et al., 2008;

Fossas-Olalla et al., 2015; Martínez-Sánchez et al., 2020) and the effect of economic crisis (García-Vega, 2022).

4.3.2. Variables

The dependent variable is *profitability*. In this study we use return on sales (ROS) as the average profitability rate, following measurement strategies used by previous research (Jang & Park, 2011; Nason et al., 2019; Zahra et al., 2000). While other measures of profitability can be used, such as return on equity (ROE) or return on assets (ROA) (Delmar et al., 2013; Fonseca et al., 2021), Return on Sales is a standardised measure that allows apples-to-apples comparisons; it focuses directly on a firm core operations and explains how efficiently it converts sales into profits and is correlated with other accounting performance measures (e.g., ROA, ROE and ROS) (Hoskisson et al., 1993).

As independent variables we introduce *Sales growth*, where growth is the logarithmic change in sales over time, following prior research in this area (Coad, 2007; Federico & Capelleras, 2015; Zahra & Hayton, 2008):

$$SALES_{it} = \ln(sales_{it}) - \ln(sales_{it-1}) \quad (1)$$

Sales growth is a widely used measure in the analyses of young firm growth (Delmar et al., 2013; McKelvie & Wiklund, 2010), with concurrent validity with employee growth (Delmar et al., 2003; Shepherd & Wiklund, 2009). Using the difference between the current year and the previous year allows us to test the learning-by-doing effect, which implies a change in profitability as the firm grows (Federico & Capelleras, 2015).

We introduce two moderator variables. First, we measure *R&D intensity* as the internal expenditure on R&D divided by sales expressed in logarithm and lagged 1 year, following previous research (Coad & Vezzani, 2019; Falk, 2012; Lee, 2018). Second, for the purpose of measuring economic *crisis*, we consider a crisis to be an extreme, unpredictable and unexpected event that threaten the viability of the organisation (Doern et al., 2019; Pearson & Clair, 1998; Portuguez Castro & Gómez Zermeño, 2020). Following Kovoor-Misra's (1995) crisis classification, we consider only economic crises, i.e., those that generates takeovers, significant loses and bankruptcies, and are triggered by significant financial losses or economic threats. For this purpose, we measure crisis by calculating the deviation from the 3-year GDP average, i.e. the difference between the GDP value of the current year and the average GDP of the three previous years:

$$Dev\ GDP_t = GDP_t - \frac{1}{3}\sum_{i=1}^{3} GDP_{t-i} \quad (2)$$

Since we are more interested in the existence of a crisis situation rather than in the direction and magnitude of the change in GDP to assess whether it is a crisis period or not, we calculate the change in Dev GDP in period t with respect to the value of Dev GDP in t-1. A negative value of this change is considered as crisis period and is classified as 1, and a positive value of this change is considered as non-crisis period and is classified as 0[8]:

$$Crisis = \begin{cases} 1 \quad if\ variation\ of\ Dev\ GDP_t < Dev\ GDP_{t-1} \\ \\ 0 \quad if\ variation\ of\ Dev\ GDP_t > Dev\ GDP_{t-1} \end{cases} \tag{3}$$

If the variable takes negative values, it is given a value of 1, indicating a crisis period, while positive values take a value of 0, indicating a non-crisis period. In order to test the validity of the binary variable, both the binary variable and the deviation from the 3-year GDP average were analysed, with similar results. The binary variable identifying the existence of crises was chosen for its greater simplicity in the interpretation of the results[9].

We also introduce control variables. Investment in R&D is essential for generating knowledge in the firm and transforming knowledge into a competitive advantage. However, young firm's top management teams and employees also play an important role (Cohen & Levinthal, 1990). As high skills in young firms can lead firms to higher levels of innovation ensuring profitable growth (Chandler & Lyon, 2009; Nielsen, 2015), we therefore control for *skills* measured as the percentage of scientists and engineers relative to the total number of employees (Estrada et al., 2010; Kafouros et al., 2020; Ramadani et al., 2019).

Several studies highlight the influence of external effects on young firms (Cohen & Levinthal, 1990; Fernhaber et al., 2012; Friesl, 2012). Accordingly, we included a control variable measuring *sectorial employment instability.* It measures the standard error of the regression slope coefficients of total employment by sector and year normalised by a three-year moving average of total employment, from 1990 to 2016, following the Dess and Beard (1984) measure of employment. We also included variables to control firms age and firms size, both in the form of a natural logarithm. Finally, we used years to control for the economic macro-effects and used a dummy variable for each activity sector to control for the differences according the activity sector. The description of each of the variables is detailed in table 4.2.

[8] This classification also coincides with the periods of economic crisis in the Spanish economy (Comín & Hernández, 2013), i.e., the economic crisis from 1993 to 1994 and the great financial crisis. In the Spanish case, the Great Financial Crisis ended in 2013 and lasted for six years, so the years between 2008 and 2013 take a value of 1 in our sample, consistent with the approach of previous analyses (Fuertes-Callén & Cuellar-Fernández, 2019; García-Vega, 2022).

[9] Additional analysis using the deviation from the 3-year GDP average are available under demand

Table 4.2. Definition of the variables

Variable	Description
Profit	Return on Sales (ROS), measured as the average profit rate.
Growth(ln)	Rate of growth expressed as the difference between total sales in time t and total sales in time t-1 expressed in natural logarithm (ln): $Sales\ growth = \ln Sales_t - \ln Sales_{t-1}$
R&D intensity	Internal expenditure on R&D divided by sales.
Crisis	Dummy variable (crisis). Crisis takes value 1 in the years where the differences between Deviation from the 3-year GDP average take negative values, and zero otherwise.
Skills	Percentage of scientists and engineers relative to the total number of employees, following previous empirical analyses (Estrada et al., 2010; Kafouros et al., 2020; Ramadani et al., 2019)
Employment Instability	Total employees (per activity sector): standard error of the regression slope coefficients of total employees per activity sector divided by the mean value of employees. Following measure of employment instability of Dess and Beard (1984)
Firm age(ln)	Calculated with foundation year minus the present year, expressed in natural logarithm (ln), lagged 1 year.
Firm size (ln)	Total number of employees per year (i) of a firm expressed in natural logarithm (ln), lagged 1 year.
Activity sector	Dummy variable indicating the industry sector.

4.3.3. Empirical approach

For the analysis, we use a two-step system Generalised Method of Moments (GMM) model, as recommended by seminal works (Arellano & Bover, 1995; Blundell & Bond, 1998; Roodman, 2009) to address endogeneity in variables of sales growth, profitability and GDP fluctuations. This method utilizes lags of independent variables as instrumental variables, integrating difference and level regressions to enhance estimation efficiency. Lagged exogenous and potentially endogenous variables served as instruments for the difference equations, while their differences were used for the level equations. The model's efficacy was further evaluated through the Arellano and Bond (1991) test for autocorrelation, affirming the

robustness of our approach. To illustrate the distinct impacts of R&D intensity and economic crises on return on sales (ROS), we plotted the average partial effects (APE).

The consistency of the results was confirmed by multiple validation tests and alternative analytical methods, including a fixed effects model, which yielded similar results. In addition, to refine our understanding of the impact of R&D investment and crises on profitability and growth, alternative variables such as the number of firm employees engaged in R&D were used to capture the human capital aspect of R&D efforts (Coad, Segarra-Blasco, et al., 2021; Falk, 2012), which also captures the human capital dimension of R&D efforts. The impact of crises was examined using annual GDP growth to assess economic shocks and the adaptability of firms.

4.4. Results

4.4.1. Descriptive statistics

The descriptive statistics and bivariate relationship among our variables are shown in Table 4.3. The table shows how the average ROS has a significant positive correlation with the independent variable sales growth (r=0.14).

The data suggest no sign of multicollinearity, given the largest correlation is 0.33, which is between the control variables of firm size and employment instability. However, for additional precaution, we computed variation inflation factor (VIF) for all the models to establish the VIF factors. The highest VIF value is 4.86, below the value of 5, the rule of thumb by which multicollinearity is considered to exist (Kleinbaum et al., 2013).

Table 4.3. Descriptive Statistics and Correlation Matrix.

	Mean	Std Dev	ROS	Sales Growth (ln)	RD Intensity	Sectorial Employment instability	Skills	Firm Size (ln)	Firm age (ln)
ROS	0.08087	0.2918	1						
Sales Growth(ln)	0.03560	0.4561	0.1429***	1					
RD Intensity	0.00422	0.0183	–0.0998***	–0.0156	1				
Sectorial Employment instability	0.25067	0.3304	–0.0065	0.0769***	0.016	1			
Skills	4.33224	7.6761	–0.0276**	0.0496***	0.2096***	–0.0187*	1		
Firm Size (ln)	3.71139	1.3935	–0.0183*	0.0808***	0.1043***	–0.0777***	0.2572***	1	
Firm age (ln)	1.57710	0.6505	0.0305**	–0.0315***	0.0041	–0.3338***	–0.0009	0.0360***	1

* Significant at 10 %, ** significant at 5 %, *** significant at 1 %

4.4.2. Main analysis

The econometric analysis is performed using a two-step system GMM model. The results are presented in Table 4.4. Model 1 introduces the control variables. In the second model, we test the effect of the independent variable growth on profitability. In the third model we introduce the moderating variables of R&D intensity and crisis to observe the direct effect they have on profitability, and finally in models 4 and 5 we separately test the moderating effects of R&D intensity and crisis on the growth-profitability relationship.

Model 1 of Table 4.4. including exclusively the control variables. Model 2 in Table 4.4. adds sales growth as the independent variable, showing a weak but significant positive effect on ROS ($\beta = 0.0220$, $p<0.001$), supporting Hypothesis 1. Model 3 in Table 4.4. adds the direct effects of the two moderators, showing a significant negative direct effect of both R&D intensity ($\beta = -1.025$, $p<0.01$) and crisis ($\beta = -0.0202$, $p<0.01$) on profitability. Models 4 and 5 respectively adds the interaction terms of growth with R&D intensity and crisis, respectively, in order to test Hypothesis 2 and 3. As can be seen in model 4, the interaction of growth and R&D intensity has a significant positive relationship with the ROS ($\beta = 1.008$, $p<0.1$), in support of hypothesis 2. Finally, model 5 shows that the interaction term of growth and crisis might have a positive effect on profitability ($\beta=0.0151$, $p<0.05$). While the coefficient is relatively modest in size, it provides support for Hypothesis 3.

To provide a more practical understanding, based on the mean value of sales growth in the previous year (3.6%), we can assume that young firms that have grown in the previous year will increase profitability in the current year by 0.08%. In terms of R&D intensity, young firms that have experienced sales growth and increased their investment in R&D in the previous year have seen a rise in profitability of 3.62%. Furthermore, young firms that have grown in a period of economic crisis have seen an increase in profitability of 0.05% for the following year.

Table 4.4. Regression results: dynamic model of sales growth relationship with young firm profitability

	ROS_t				
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Employment Instability $_{t-1}$	–0.00554	0.0141	0.0112	–0.00850	–0.0437
	(0.0578)	(0.0558)	(0.0557)	(0.0348)	(0.0313)
Skills $_{t-1}$	–0.00590	–0.00538*	–0.00368	–0.00378***	–0.00379***
	(0.00434)	(0.00307)	(0.00238)	(0.00137)	(0.000488)
Firm Age $_{t-1}$	0.000586*	0.000272	0.000329	0.000477**	0.000198
	(0.000347)	(0.000303)	(0.000280)	(0.000210)	(0.000154)
Firm Size $_{t-1}$	0.0672*	0.0334*	0.0455***	–0.00731**	–0.0118***
	(0.0387)	(0.0190)	(0.00619)	(0.00366)	(0.00224)
Activity Sector	*Included*	*Included*	*Included*	*Included*	*Included*
H1: Sales Growth(ln) $_{t-1}$		0.0220***	0.0184**	0.0207***	0.0135***
		(0.00840)	(0.00871)	(0.00722)	(0.00377)
RD Intensity $_{t-1}$			–1.025***	–0.942***	–0.881***
			(0.256)	(0.184)	(0.188)
Crisis $_{t-1}$			–0.0202**	–0.0262***	–0.0199***
			(0.00798)	(0.00554)	(0.00319)
H2: Growth(ln) $_{t-1}$***RD Intensity** $_{t-1}$				1.008***	
				(0.169)	
H3: Growth(ln) $_{t-1}$***Crisis**$_{t-1}$					0.0151**
					(0.00656)
Constant	–0.118	–0.0110	–0.0519**	0.127***	0.135***
	(0.125)	(0.0619)	(0.0244)	(0.0172)	(0.0145)
Number of instruments	31	60	60	105	125
Hansen test (p-value)	0.112	0.142	0.154	0.166	0.136
AR(2) (p-value)	0.208	0.213	0.380	0.338	0.379
Observations	5,884	5,884	5,884	5,884	5,884
Number of firms	1,375	1,375	1,375	1,375	1,375

The table shows the output for the two-stage system GMM estimation. All the definitions of the variables are summarized in Appendix B. AR(2) shows the p-value of the test of serial correlation in the error terms, under the null hypothesis of no serial correlation. Values presented for the Hansen test are p-values of the test of overidentifying restrictions of the instruments, under the null hypothesis of instrument validity. Standard errors in parentheses below the parameter estimates. *, ** and *** indicate significance levels at 10%, 5% and 1% respectively.

In Figure 4.2 and Figure 4.3 we plot the interaction effects. Figure 4.2 illustrates the relationship between sales growth and profitability at low, medium, and high levels of internal R&D, respectively. It indicates that higher sales growth contributes positively to profitability when R&D intensity is elevated. Conversely, the figure also reveals that when R&D investment is low, increased sales growth can negatively impact profitability. Figure 4.3

presents the dynamics between sales growth and profitability during crisis and non-crisis periods. The data demonstrate that sales growth enhances profitability in both scenarios, with a more pronounced effect observed during periods of crisis.

In order to graphically illustrate the positive effect of growth on profitability in periods of economic crises, corresponding to hypothesis 3, Figure 4.4 shows the deviation from the 3-year average GDP and the standardised coefficients (β) of growth on profitability. To measure the deviation from the 3-year average of GDP, we use the values obtained from formula (2).

In general terms, profitable growth, as defined by coefficients above 0, is diametrically opposite to the deviation from the 3-year GDP average. More specifically, we can observe that the effect of growth on profitability is driven mainly by crisis periods. There is generally positive profitability in crisis periods, especially early during a crisis while the profitability slowly vanish as the crisis reaches an end.

Figure 4.2. Sales growth by R&D intensity and its association with firm profitability (ROS).

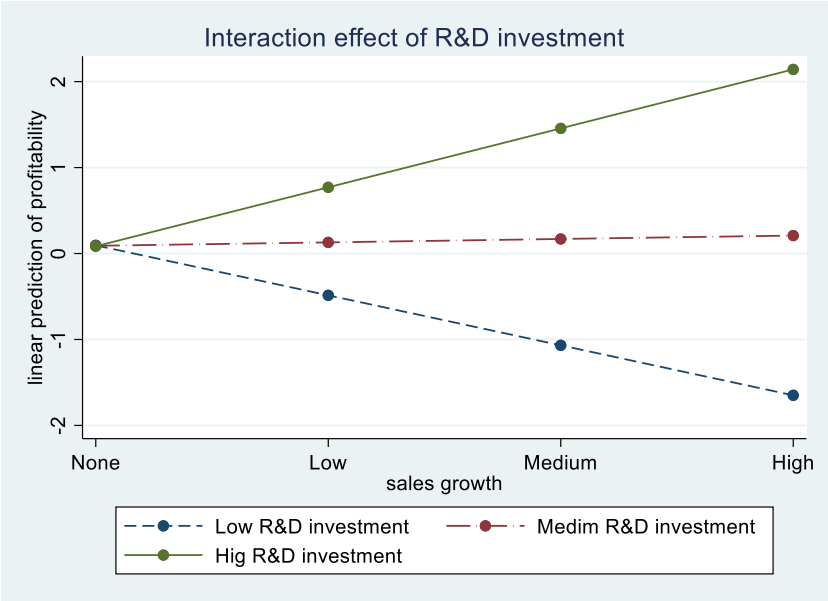


Figure 4.3. Sales growth according crisis period and its association with firms' profitability (ROS)

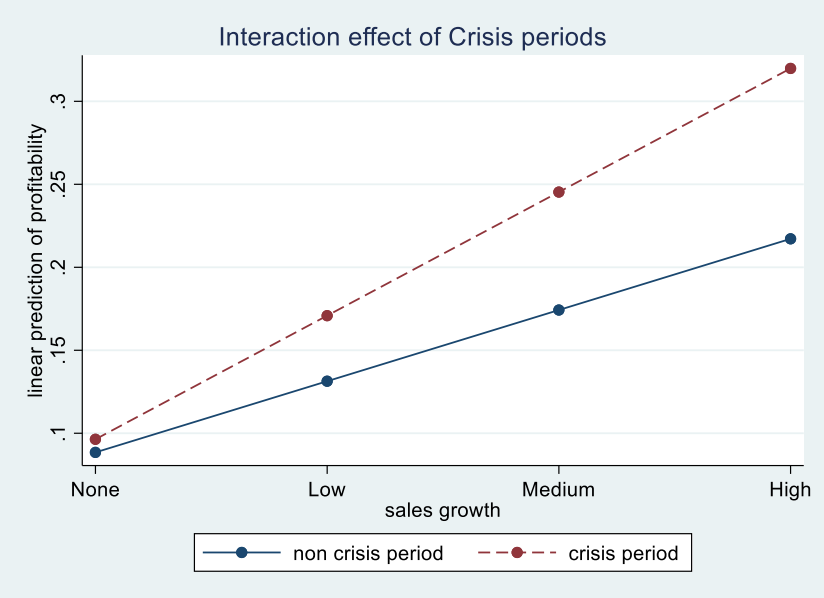
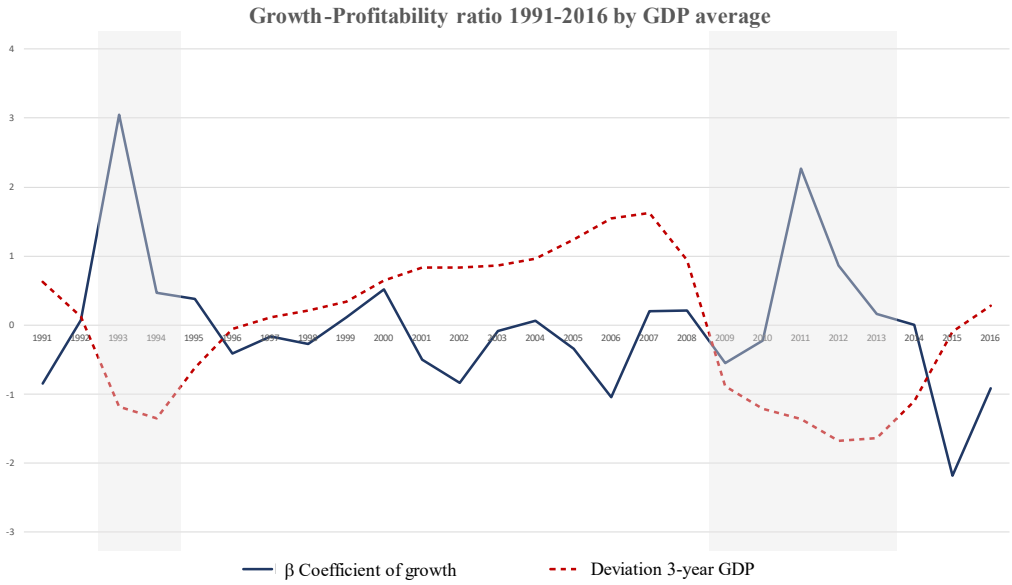


Figure 4.4: Deviation from the 3-year GDP average and standardised coefficients (β) of growth on profitability per year.



The periods of crisis are shaded in grey (1993-1994 and 2009-2013)

4.4.3. Robustness tests

To test the robustness of the results, we applied a system GMM estimation using alternative variables to validate the moderator effects of R&D investment and crises on the growth-profitability relationship, using the number of firm employees engaged in R&D activities and annual GDP growth, respectively. Table 4.5 shows the results of the robustness

test. Model 2 indicates a positive direct effect between growth and profitability in young firms (β=0.0220, p < 0.01), thereby reinforcing the results of the main analysis and confirming Hypothesis 1. The results of the crisis variable must be interpreted inversely, as it measures the effect of GDP growth. Thus, a decrease (increase) in GDP implies a decrease (increase) in the profitability of the firm. The results of Model 4 in Table 4.5, indicate a positive moderating effect on the relationship between growth and profitability as larger is the number of R&D employees (β=0.00104, p < 0.05). In same direction as lower (higher) is the GDP rate, higher (lower) the profitable growth of the young firm (β= –0.00633, p < 0.01), confirming both results the findings of the main analysis for hypotheses 2 and 3.

Table 4.5. Robustness test: dynamic model with interactions of employees in R&D and annual GDP growth rate

Variables	**Model1**	**Model2**	**Model3**	**Model4**	**Model5**
Employment Instability $_{t-1}$	–0.00554	0.0141	–0.0107	–0.0118	0.00605
	(0.0578)	(0.0558)	(0.0367)	(0.0366)	(0.0352)
Skills $_{t-1}$	–0.00590	–0.00538*	–0.00311***	–0.00275***	–0.00410***
	(0.00434)	(0.00307)	(0.000602)	(0.000623)	(0.000778)
Firm Age $_{t-1}$	0.000586*	0.000272	–0.000008	–0.000006	–0.000224**
	(0.000347)	(0.000303)	0.000008	0.000008	(0.00009)
Firm Size $_{t-1}$	0.0672*	0.0334*	–0.00408*	–0.00430**	0.00826***
	(0.0387)	(0.0190)	(0.00210)	(0.00215)	(0.00216)
Activity Sector	*Included*	*Included*	*Included*	*Included*	*Included*
H1: Sales Growth(ln) $_{t-1}$		0.0220***	0.0114***	0.00813*	0.0248***
		(0.00840)	(0.00440)	(0.00447)	(0.00506)
Employees in R&D $_{t-1}$			–0.00156***	–0.00195***	–0.00196***
			(0.000445)	(0.000469)	(0.000491)
Annual GDP growth rate			0.00272***	0.00260***	0.00486***
			(0.000726)	(0.000752)	(0.000512)
H2: Growth(ln) $_{t-1}$***Employees in R&D** $_{t-1}$				0.00104**	
				(0.000435)	
H3: Growth(ln) $_{t-1}$ *** annual GDP growth rate**					–0.00633***
					(0.000931)
Constant	-0.118	-0.0110	0.108***	0.110***	0.0690***
	(0.125)	(0.0619)	(0.0148)	(0.0149)	(0.0145)
Number of instruments	31	60	129	129	136
Hansen test (p-value)	0.112	0.142	0.117	0.120	0.169

AR(2) (p-value)	0.208	0.213	0.194	0.192	0.086
Observations	5,884	5,884	5,884	5,884	5,884
Number of firms	1,375	1,375	1,375	1,375	1,375

The table shows the output for the two-stage system GMM estimation. AR(2) shows the p-value of the test of serial correlation in the error terms, under the null hypothesis of no serial correlation. Values presented for the Hansen test are p-values of the test of overidentifying restrictions of the instruments, under the null hypothesis of instrument validity. Standard errors in parentheses below the parameter estimates. *, ** and *** indicate significance levels at 10%, 5% and 1% respectively.

4.5. Discussion

In this study we have investigated the growth-profitability nexus among young firms. While we have argued that growth can be a driver of increased profitability, our focus has been on how R&D investment and economic crises are boundary conditions for achieving higher profitability in growing young firms. In doing so, we respond to calls to provide a more nuanced view of their nonclear-cut relationship (Mansikkamäki, 2023).

Three main findings emerge. First, we have found that growth has a positive effect on profitability for young firms, which is in line with several prior studies (Federico & Capelleras, 2015; Senderovitz et al., 2016). Our interpretation is that this is because of the faster growth rates experienced by young firms compared to established ones, their flexibility in adapting to changing circumstances (Garnsey et al., 2006) and their opportunistic nature in seeking advantages beyond their current markets (Steffens et al., 2009). One takeaway from this finding is that young firms should consider growth as a potential pathway to enhanced profitability (Delmar et al., 2013). This goes against the notion that growth might jeopardize profitability, which has been a concern in some earlier research (Ben-Hafaïedh & Hamelin, 2022; Davidsson et al., 2009; Nason et al., 2019). Instead, our results suggest that young firms can leverage their flexibility, proactiveness, and learning-by-doing approach to achieve profitability while expanding their operations.

However, while the overall trend is positive, our study suggests that the relationship can vary depending on specific internal and external circumstances (Bamiatzi, 2016; Roper, 1999). In this vein, our second main finding is that R&D investment increases the profitability of young firms that are growing in sales. One reason could be that investment in R&D when young firms are growing facilitates a better adaptation to market demands (Audretsch et al., 2014; Delmar et al., 2013; Federico & Capelleras, 2015; King & Slotegraaf, 2011) by increasing the profitability of their growth results. Also, when R&D is developed internally – as opposed to an external R&D acquisition (McKelvie et al., 2018) – it allows the young firm to generate internal knowledge to address its weaknesses and/or provide greater market value (McKelvie et al., 2018), reporting positive performance outcomes. These reasons can

be further substantiated by the negative correlation between R&D intensity and profitability, as evidenced by the empirical analysis. Although this negative result may appear counterintuitive, when growth is taken into account, the negative direct effect of R&D on profitability becomes positive. These findings align with previous research that has identified the potential risks associated with the reduction in profitability that non-growing, small, young firms may encounter when investing in R&D (Coad, Mathew, et al., 2021; Moncada-Paternò-Castello, 2022; Nunes et al., 2012). Moreover, as Amore et al (2021) have demonstrated, the learning stage is fundamental as just optimism without learning when developing innovation can be detrimental for young firms. This suggests that when young firms invest in R&D, growth is an important prerequisite to explain profitability as it can provide structure. Thus, sales growth in young firms is a prerequisite for providing the impetus to complete R&D projects with higher returns.

The third key finding concerns the phenomenon of crises, which has attached growing interest in them in recent years (Klyver & Nielsen, 2021; Miklian & Hoelscher, 2022; Rauch & Hulsink, 2021). Young firms can identify and take advantage of new opportunities due to the crisis. For example, in response to the COVID-19 pandemic, some young firms have been able to pivot their business models to offering online collaboration or healthcare services (Davidsson et al., 2021). In this study, we focus on the ability of young firms to adapt to a difficult environment and to grow profitably. It suggests that in challenging external conditions, young firms identify and exploit opportunities for profitable growth, becoming more creative (Borowiecki, 2014), accelerating innovation outcomes and leading to more radical innovations (Giones et al., 2020). The proliferation of innovation reduces costs (Lichtenthaler, 2021) and the bankruptcy of competitors allows cheaper growth (Evans & Borders, 2014), contributing to higher young firms' profitable growth in times of crisis.

4.5.1. Theoretical implications

This study adds to the theoretical understanding by demonstrating that profitable growth is not a random event for young firms; rather, but a potentially achievable outcome. This suggests that growth could serve as a discernible pathway to profitability for young firms. We argue that that the growth of young firms increases organisational flexibility, and proactive opportunity-seeking behaviour, which in turn leads to increased profitability. Herhausen et al. (2018) found that slack resources reduce organizational flexibility in young firms, suggesting that a more disciplined or efficient allocation of resources may enhance flexibility. Similarly, Pilar et al. (2018) corroborated that firms that grow are able to leverage economies of scale, thereby increasing opportunities to access information and technological resources.

Consequently, rather than viewing profitability as an unpredictable outcome of external factors, this study proposes that young firms' profitability is linked to their growth patterns.

A second theoretical contribution is an expansion of the existing knowledge base regarding the influence of specific uncertainty sources on the profitable growth of young firms. The analysis of one internal source of uncertainty (i.e. R&D investment) and one external source (i.e. economic crises) assesses their impact on the growth and profitability of young firms. The findings of this chapter indicate that a growth trajectory provides young firms with the opportunity to overcome various types of uncertainty and to transform this growth into profitability with the confidence to do so effectively. In this regard, Coad et al. (2016) demonstrate that young firms with lower growth rates that invested in R&D were adversely affected by this investment, whereas young firms with higher growth rates that invested in R&D experienced greater benefits in the long term. Furthermore, young firms investing in R&D are better able to cope with uncertainty (Audretsch & Belitski, 2021; Koudstaal et al., 2016), being more proactive and innovative in exploiting market niches (Jayaram et al., 2014; McKelvie et al., 2018) and generating new opportunities (Cai et al., 2020; Pellegrino & Piva, 2020).

Moreover, economic crisis contexts make young firms more resilient and prone to learn, and more capable of adapting their business models to new realities (Kuckertz et al., 2020). To illustrate, Fuertes-Callén and Cuellar-Fernández (2019) identified that in economic crises, firms with strategies such as innovation and export, which are closely associated with knowledge achievement, demonstrate a positive growth relationship with profitability. Similarly, Cefis and Marsili (2019) found that only young firms with the capacity to adapt during crises are able to overcome the challenges posed by such contexts. Overall, the two moderating factors, have inherent uncertainty, and it is precisely this uncertainty that young growing firms can benefit from in terms of profitability.

Thirdly, this chapter employs a multifaceted approach, analysing both an internal factor (i.e. R&D intensity) and an external factor (i.e. economic crises) in order to elucidate the relationship between the growth and profitability of young firms. While prior research has established a linkage between internal and external determinants and the growth (Innocenti & Zampi, 2019) or overall performance of young enterprises (Saeed et al., 2015), our study uniquely extends this discourse by analysing how these factors specifically influence the profitable growth of young firms. This chapter considers both inside-out and outside-in perspectives, suggesting the potential of considering different variables (Roper, 1999; Covin & Slevin, 1991; Eisenhardt et al., 2000). This equilibrium between organisational and market

factors in elucidating profitable growth is consistent with theoretical frameworks such as the Schumpeterian perspective (Schumpeter, 1934, 1942). It also extends the understanding of how uncertainty impacts profitability in young firms (Knight, 1921) by incorporating the role of growth in the growth-profitability relationship.

4.5.2. Managerial and policy implications

There are some practical implications that can be derived from the findings. The challenges young firms face in growing profitably may incline them to view R&D as an expense that takes them away from profitability. The positive moderating impact of R&D investment shows entrepreneurs the need to support this investment. Although it could reduce the financial resources available to the young firm to dedicate to other activities, entrepreneurs should view this investment as a key factor in the growth process that significantly enhances profitability. The extra mile that is gained by investing in R&D more than compensates for the required effort.

A second consideration with practical implications is the role that crises play in the profitable growth of young firms. While economic crises may appear to be periods of contention, for young firms that are already experiencing growth, economic crises can be viewed as opportunities for proactive identification and capitalisation of new opportunities that arise from the changing market landscape. The study indicates that crises can act as catalysts for innovation and profitable growth, as firms become more creative and agile.

4.6. Limitations and future research

However, the study has some limitations that should be considered in future research. One limitation is the coverage of the ESEE database. Our longitudinal data covers 26 years but does not include the most recent years. Yet, the length of data collected over a quarter of a century has allowed us to consider a long-term period to study the growth-profitability nexus. Our results are robust to various specifications and controls, but caution is advised due to some limitations that may warrant attention. In particular, while the use of exclusive dummy variables to describe a crisis has the property of not imposing any specific path in the regression of "economic growth", more detailed data on the intensity of crises or the duration of crises could also be used effectively. Finally, the next logical step for future research would be to explore the joint effect of R&D investment and resource constraints during economic crisis periods on the relationship between growth and profitability in young firms.

Despite the considerable body of research examining R&D intensity in young firms and the extensive research on its effects on profitability, the findings of this chapter

underscore the necessity for further analysis. Young firms often face a lack of resources (Audretsch et al., 2014) which can lead them to rely on external resources, implying higher acquisition costs (Furlan et al., 2014; Nason et al., 2019; Newbert & Tornikoski, 2011) and, even if growth is positive, lower profits and negative profitability results. Therefore, future research should consider a joint analysis of specific sources of R&D investment and different innovation outcomes in order to gain further insight into the effects on profitability outcomes, as well as to further unravel the effects of R&D on growth-profitability for young firms. Another common shortcoming facing young firms is the lack of managerial capacity and capabilities to identify and seize opportunities. These factors can limit the success of R&D activities (Coad, Mathew, et al., 2021), as well as increase the costs of knowledge absorption and transformation (Debrulle et al., 2020; Nunes et al., 2012) when facing recession contexts, and consequently hindering a positive relationship between growth and profitability. Further research could investigate how the development of managerial capabilities, particularly in the context of resource constraints and economic downturns, can enhance the effectiveness of R&D activities and improve the growth-profitability relationship in young firms. Moreover, external R&D acquisition represents a significant factor in explaining growth and profitability, particularly for younger firms (Bolívar-Ramos, 2017; McKelvie et al., 2018). Future research could further investigate the role of external R&D acquisition and its relationship with growth and profitability in young firms.

4.7. Conclusion

In order to ensure the profitable growth of young firms, it is crucial not only that young firms are able to grow, but also that they are able to convert this growth into higher profitability. This study examines the relationship between growth and profitability in young firms, paying particular attention to two factors: one internal, investment in R&D, and one external, economic crisis. Analysing young Spanish firms over a period of 26 years, the results of this study show that these firms tend to transform growth into profitability, which is more pronounced for those young firms that invest in R&D and when young firms are operating under conditions of economic crisis. From these results we can infer that greater investment in R&D promotes the acquisition of knowledge, which facilitates better adaptation to market demands. At the same time, economic crises can be beneficial for emerging firms, as they promote the creation of new opportunities and access to resources that would be more difficult to obtain under normal conditions. These results lead us to conclude that uncertainty, both that resulting from investment in R&D and that caused by instability during crises,

serves as a common link explaining why young firms in these contexts tend to increase their profitability through sales growth.

5. CHAPTER V: CONTRIBUTIONS, IMPLICATIONS AND FUTURE RESEARCH

5.1. Key findings

The dissertation contributes to the literature on the growth of young firms by examining the factors that influence this growth and its consequences, including the persistence of future growth and its impact on profitability. The findings of each chapter contribute to an understanding of the role of different dimensions of innovation, both in terms of inputs and outputs, and their impact on the growth of young firms. Furthermore, the scope of the analysis has been broadened by including external factors such as environmental dynamism, competitive intensity and economic crises, in order to provide a more complete and nuanced view of how external challenges modulate firm growth and profitable growth.

The initial chapter examined process innovation as a determinant of young firm growth, with particular consideration of the moderating effect of environmental dynamism – as measured by competitive intensity and demand dynamism – on this relationship. One of the most significant findings is the initially inverse relationship between process innovation and the growth of young firms, with a trend towards positive growth in the second year, suggesting a delayed benefit. This observation challenges the widely accepted notion that innovation is an unconditional driver of young firm growth. Nevertheless, this finding is consistent with previous research indicating that the initial benefits of process innovation often manifest themselves in operational efficiencies or increased survival chances in the early years, but not necessarily in terms of growth (Colombelli et al., 2016; Hervas-Oliver et al., 2014; Piening & Salge, 2015). When this process innovation takes place in contexts of high uncertainty, either due to intense competition or high demand dynamics, these environmental dynamisms serve as catalysts that enhance the positive impact of innovation on growth. This observation is consistent with recent research indicating that young firms possess a distinctive capacity to adapt and flourish in uncertain environments (Klyver et al., 2023).

The second objective of the paper was to investigate the persistence of growth in young firms, differentiating between positive and negative initial growth and examining the role of product innovation in this context. The results demonstrate the intrinsic capacity of young firms to reverse negative growth trends and sustain positive growth trajectories, underscoring their dynamic nature and remarkable adaptability (Coad et al., 2018). Although the introduction of new products can be associated with higher sales growth in young firms

(McKelvie et al., 2017), the relationship between product innovation and growth persistence is shown to be more complex than it might initially seem. In particular, the introduction of a large number of new products may jeopardise the persistence of positive growth. Moreover, persisting on product innovation during periods of negative growth can prolong this unfavourable trend. Conversely, a strategic approach to product innovation, which encompasses not only the launch of new products but also the commitment to product innovation, has been demonstrated to exert a positive moderating effect on the growth persistence of young firms when they have already experienced a period of positive growth.

The last objective of this thesis was to examine the relationship between growth and profitability in young firms, confirming a positive relationship as observed in previous studies (Davidsson et al., 2009; Schlichter et al., 2021; Senderovitz et al., 2016). The findings of this study contribute to the existing body of knowledge on the growth-profitability relationship in young firms by analysing the moderator effect of internal R&D investment and external shocks of economic crises. The results indicate a positive relationship between growth and profitability and a positive moderator effect of both R&D investment and crisis contexts in this relationship. This indicates that young firms that are already experiencing growth have the capacity to generate profits in specific internal and external circumstances as they grow. In particular, young firms that are already growing and invest in internal R&D can reduce their costs in launching new products, increase knowledge assimilation and become better aligned with market needs (McKelvie et al., 2018; Nason et al., 2019; Senyard et al., 2014). Hence, young firms that are already experiencing growth demonstrate a greater capacity to transform the knowledge gained through R&D investment into superior profitability. In contrast to the general economic trend, the results also indicate that young growing firms experience an increase in profitability during periods of GDP contraction. This serves to illustrate the resilience and adaptability of young firms, particularly in the context of challenges such as the development of R&D or economic downturns. Furthermore, the results demonstrate how young, growing firms are able to transform uncertain contexts generated by R&D investment and economic crises into opportunities to enhance their market position.

In aggregate, the principal findings of the three papers offer insights into three principal areas of research on the growth of young firms: (1) growth patterns, (2) the impact of innovation on growth and (3) the role of uncertainty in young firms. First, with regard to growth patterns, the thesis posits that not all growth strategies are equally valid for achieving growth. For instance, although process innovation is not a guaranteed route to growth, or at least to an immediate growth, it is evident that young firms are growth-seekers and growth-keepers. Once growth has been achieved, it tends to persist and transform into profitable

growth. The dynamic nature of young firms (Coad et al., 2018) enables them to seek out and exploit opportunities for flexibility, thereby avoiding negative growth and enabling a sustained growth trajectory and profitable growth when already in the process of growth (Garnsey et al., 2006; Steffens et al., 2009).

Second, the dissertation analyses the role of innovation in the growth of young firms. The analysis reveals that the inputs and outputs of innovation have distinct relationships with growth. Furthermore, the growth of young firms is moderated according to whether innovation is adopted as a strategic decision considering its long-term effects or not. On the one hand, investment in R&D is typically associated with the generation of new knowledge in young firms (Nason et al., 2019; Pellegrino & Piva, 2020). Conversely, outputs such as product and process innovation are more likely to impact the operations and demand of young firms (Battaggion & Tedeschi, 2021; Santi & Santoleri, 2017). The positive impact of R&D investment on profitable growth, in contrast to the conditional relationship between process innovation and growth, as well as between product innovation and growth persistence, indicates that innovation inputs exert a more significant influence on the growth analysis of young firms. Furthermore, the findings of the dissertation indicate that the relationship between innovation and growth is contingent upon whether the innovation is considered a strategic instrument applied over the long term. From this perspective, although process innovation does not have an immediate effect on sales growth, it does have a positive impact on growth in the second year following implementation. Similarly, product innovation can also facilitate persistent growth when applied over an extended period. Investment in research and development (R&D) is inherently long-term in nature and has the potential to act as a catalyst for profitable growth. In order to achieve, sustain or make profitable growth through innovation, it is necessary to mitigate the potential shortcomings associated with innovation investments, align innovations with firm strategy and warrant the adaptation of innovations to market demands (Audretsch et al., 2014; Nuscheler et al., 2019).

Third, this thesis examines how external uncertainty modulates the growth and profitability of young firms by including the moderator effect of environmental dynamism, competitive intensity and economic crisis (Jaworski & Kohli, 1993; McKelvie et al., 2011; Miklian & Hoelscher, 2022). In accordance with Knight's (1921) definition of uncertainty, uncertainty arises in situations where the probabilities of the outcome are unknown. The findings indicate that this uncertainty, which arises from environmental dynamism, competitive intensity, or economic crises, influences the growth of young firms. This suggests that young firms not only survive in uncertain environments (Davidsson et al., 2023), but also benefit from higher growth rates and profitable growth. Uncertainty can also be understood

as a phenomenon inherent to innovation in young firms as it also implies unknown outcomes (Audretsch & Belitski, 2021; McKelvie et al., 2011). In Chapters II and III, this thesis examines the internal uncertainty that arises from process innovation and product innovation, respectively. In Chapter IV, we examine the moderating effect of R&D investment on growth uncertainty in young firms (McKelvie et al., 2011). Consequently, this thesis identifies differences in growth outcomes when uncertainty is considered as a consequence of external factors, or of internally generated factors.

5.2. Implications

5.2.1. Theoretical implications

This thesis contributes to the body of knowledge on the growth of young firms, by analysing how young firms generate growth, sustain growth and translate growth into profitability. This approach provides an integrated view of the growth of young firms and offers new insights into the less researched stage of the consequences of growth and profitable growth in young firms (Alvarez & Barney, 2004; Combs et al., 2023). In line with the discussion section, the contributions of this thesis are articulated through three key avenues: (1) the dynamics of firm growth, (2) the role of innovation in driving and sustaining growth, and (3) the effects of uncertainty on growth trajectories.

First, scholars have historically encountered challenges in identifying clear factors that explain the growth of young firms, as well as sustained and profitable growth. This has led to the suggestion that the growth process is inherently random (see, e.g., Anyadike-Danes & Hart, 2018; Coad et al., 2013, 2015). However, the findings of this thesis demonstrate that the interplay of different kinds of factors, including the firm's age, its resource assimilation capability through innovation, and its environmental challenges, provides a deeper understanding of entrepreneurial growth. These findings highlight the importance of adopting a more multifaceted approach (Steffens et al., 2009), when analysing growth. This aligns with theoretical perspectives such as the resource-based view (Penrose, 1959) and the Schumpeterian view (1934; 1942). In accordance with these perspectives, the capacity of young firms to adapt and be flexible in the utilisation of resources, as well as in their adaptation to environmental and market conditions, is a key factor in their ability to grow, sustain growth, and achieve profitable growth.

Second, this thesis contributes to the theoretical understanding of the relationship between growth and innovation in young firms by emphasizing two key dimensions: innovation flexibility and strategic vision. The findings highlight that young firms' ability to

adapt their resource utilization plays a pivotal role in driving growth, in line with the Schumpeterian perspective (Schumpeter, 1934). Furthermore, the combined influence of strategic decision-making and innovation is essential for sustained growth. Specifically, process innovation tends to have a delayed effect on growth, while consistent product innovation is necessary for maintaining growth over time. This distinction between the innovation and diffusion phases underscores the critical role of strategic R&D in achieving profitable growth. Together, innovation flexibility and strategic vision allow young firms to navigate uncertainty, seize opportunities, and foster long-term growth and profitability.

A third implication of this thesis is a multiple-faceted analysis of the impact of challenging environments - such as dynamic markets, highly competitive environments or economic crises - on the growth of young firms. Challenging environments have been recognised as favourable environments for the creation of new ventures (Davidsson et al., 2023; Kimjeon & Davidsson, 2022; Motley et al., 2023). This dissertation extends the analysis of their effect in the field of young firm growth, by revealing that challenging environments are not only fertile ground for the creation of new firms, but also can act as a catalyst for young firm growth when innovating in processes, as well as enabling higher profitability when growing in crises environments. These results are consistent with previous research suggesting that young firms have an inherent ability to adapt and respond to market adversity (Klyver et al., 2023; Munoz et al., 2022; Taleb, 2012).

Finally, when considering the intersection of innovation and environmental challenges, a fundamental theme emerges: the pervasive uncertainty of both internal and external environments (Audretsch & Belitski, 2021; Freel, 2005; Magnani & Zucchella, 2018). This research underscores the central role of uncertainty in explaining growth in young firms, and adds knowledge in front of the call of further research in this avenue (Magnani & Zucchella, 2018). In particular, young firms show remarkable resilience in coping with external uncertainty, often using it as a catalyst for growth or improved profitability. Conversely, internal uncertainty arising from innovation manifests itself as a double-edged sword for young firms. From a Schumpeterian view (1934, 1942), the innovation is precisely the source of solving uncertainty and achieving growth, from a Knightian view (1921), it is the utilisation of knowledge in an imperfect market that transforms uncertainty into opportunities, thereby enhancing the performance of young firms. In this sense, usually has been linked innovation in young firms with knowledge overcoming uncertainty and deriving to growth patterns. We stop in the middle of these two perspectives, by adding that the innovation by itself can be a source of uncertainty and unknowledge reinforcing the difficulty to meet opportunities, but when adopting a long-term perspective, innovation can emerge as a means

of navigating uncertainty. On the contrary, external uncertainty adopts a short-term perspective by conferring opportunities to young firms in order to growth. Overall, a distinction needs to be made between both types of uncertainty and their impact on growth.

5.2.2 Policy implications

The findings of this thesis also provide a number of recommendations that can be applied to policies on the growth of young firms and to facilitate the continued growth and profitable growth of young firms.

First, a significant proportion of existing policies for young firms focus on financing and supporting growth in their early stages, which is consistent with the findings of this thesis. However, this research also shows that young firms are not only growth-seekers but also growth-keepers. They are persistent in their growth and have the potential to turn that growth into profitability. Therefore, policy should go beyond the early stages and focus on supporting young firms to sustain and transform growth into profitable outcomes, which is essential for broader economic growth.

Second, the findings of this thesis indicate that the promotion of innovation to facilitate the growth of young firms is an important consideration that should be included in policies aimed at early-stage firms. However, the provision of resources for the development of R&D, product or process innovation should be accompanied by the provision of resources to ensure the continuity of these innovation strategies.

Third, the results of this study challenge the traditional view that innovation is beneficial and environmental challenges detrimental to the growth of young firms. The findings demonstrate that in a dynamic and uncertain environment, young firms not only cope with emerging opportunities, but also capitalise on them and turn them into significant sales growth. This suggests that in times of economic turbulence, young firms can act as key drivers of the economy. Consequently, in periods of economic instability, governments and policy makers are presented with the opportunity to implement policies that recognise and support the distinctive potential of young enterprises. In essence, the findings of the thesis indicate that it may be advantageous to enhance the resilience of young firms through targeted support programmes during periods of crisis. This may entail training in crisis management, access to influential networks and other resources designed to enhance their long-term stability.

5.2.3 Practical implications

The findings of the thesis indicate that young firms are actively engaged in growth-seeking activities. Although growth is not always feasible, it is desirable, not only because of the need for growth in young firms, but also because of the ability to make it sustainable and transform it into profitable-growth. Consequently, it is of paramount importance that those responsible for decision-making in these young firms prioritise growth as a key strategic objective. Even when growth has been achieved, it is essential to maintain a focus on growth in order to facilitate further growth and greater profitability.

In order to achieve, sustain and warrant profitable growth, the findings of the dissertation indicate that the adoption of innovation strategies is of paramount importance. Furthermore, it is essential to maintain consistency and persistence in these strategies over time, particularly in product and process innovation. Consequently, a non-strategy as strategy is not a viable approach when pursuing growth through innovation. In this context, there are at least three main recommendations for decision-makers in young firms, as well as for investors and mentors. In order for innovation to have an impact on the growth of the young firm, it is not only a question of having the will to innovate; above all, it is essential to have absolute commitment to innovate, which is essential both in periods of growth and in the search for greater profitability. In addition, it is imperative to reassess the framework of criteria that directs the actions of young firms with regard to innovation. In particular, when assessing or evaluating the performance of young firm, it is of the utmost importance to consider long-term indicators, such as perseverance and the ability to sustain innovation, beyond the immediate benefits. Hence, it may be of interest to consider these indicators when assessing the potential for a return on investment and positive growth, particularly in instances where the ability of the firm to innovate is a determining factor in its success.

Finally, with regard to the pursuit and maintenance of growth in uncertain environments, it is commonly assumed that a stable environment is conducive to growth. However, the findings of this thesis indicate that it is precisely in dynamic and challenging economic contexts that young firms can pursue growth or enhance their profitability. Consequently, in periods of stability, it may be advisable to adopt a cautious approach and make prudent decisions. Conversely, in periods of uncertainty, it is advisable to adopt a more courageous stance and pursue more ambitious decisions, to commit to innovation and to pursue R&D policies.

5.3. Limitations and future research

It should be noted that this thesis is not without its limitations. The dissertation is based on the ESEE database, given the richness of strategic data and the extension of years covered, which span a period of 26 years. The utilisation of the ESEE database enables a comprehensive examination of the growth patterns of young firms over time. However, the data is confined to manufacturing firms, which may restrict the generalisability of the findings to other sectors. Further studies could investigate whether the identified patterns are applicable to sectors such as services, technology, or social entrepreneurship, among others. This could facilitate a more comprehensive understanding of the growth dynamics of young firms in diverse economic settings.

Additionally, the growth measures presented in this thesis concentrate on the sales of young firms. While sales-based growth measures are widely accepted and compared, this thesis may not fully reflect other dimensions, such as organisational growth, employment growth, or the socio-economic impact of young firms, as it does not consider employee growth. Further research could be conducted to expand the scope of the study by incorporating an analysis of growth in terms of employment, as well as an investigation of the differing impacts between sales growth and employment growth. An additional factor to consider in the analysis of growth is the rate of growth and the acceleration of this growth over time (Belitski et al., 2023). Subsequent analyses may examine different growth rates and levels of growth according to the speed of growth

A significant aspect of this thesis has been the adoption of a holistic perspective, by considering both internal and external factors in order to explain the growth of young firms. The literature in the entrepreneurship field has recently begun to demonstrate an increasing interest in a configurational approach in order to explaining the growth of young firms (Audretsch et al., 2023; Debrulle et al., 2020; Pugliese et al., 2022). Exploring how different factors interact to influence growth outcomes offers the potential for a more detailed examination of the intricate mechanisms that drive the success and sustainability of young firms' growth. This approach could enable researchers to identify specific configurations of factors that lead to varying growth trajectories across diverse contexts, thereby enriching our understanding of entrepreneurial dynamics. Consequently, future research should therefore integrate the identification of distinctive configurations or sets of variables in order to achieve a more precise explanation of the growth of young firms.

In order to elucidate the growth dynamics of young firms this thesis has focused on strategic decisions related to innovation within young firms. However, in order to enhance

the examination of innovation's impact, it is necessary to investigate other strategic domains, such as digitisation or diversification strategies. For instance, preliminary findings suggest that digitisation plays a pivotal role in the growth of young firms (Matalamäki & Joensuu-Salo, 2022). Furthermore, the relationship between diversification and firm growth has been demonstrated to be significant (Dosi et al., 2022). Consequently, further investigation is required not only analysing the impact of digitalisation and diversification, not only as antecedents of the growth of young firms, but also as consequences in their persistence and profitability of growth. Moreover, further research could investigate the complementarity of innovation strategies with digitalisation or diversification strategies in enabling young firms to achieve and sustain sales growth, as well as in enhancing the profitability of this growth. Another area of research is to analyse how digitalisation and diversification can promote the growth of young firms. It is also important to examine how digitalisation facilitates growth during periods of uncertainty, and how diversification enables the flexibility to persistently grow or become more profitable in the face of uncertain environments.

Similarly, this thesis has maintained a resource-oriented focus in order to explain the effects of innovation on growth. In particular, it has focused on internal R&D and the launching of new products and processes. However, it has not considered the effect of external resources. Previous research has indicated the significance of alliances and external knowledge for the growth and performance of young firms (Combs et al., 2023; Nason et al., 2019). In this context, the consideration of external knowledge and alliances can facilitate a more comprehensive understanding of the growth dynamics of young firms. In order to elucidate the intricate relationship of young firms and growth, it would be beneficial to also consider other external factors, such as customers, and their role in elucidating the growth patterns and consequences of young firms. Indeed, customers are considered an external enabler (Love & Roper, 2015). However, the analysis of how business-to-business (B2B) or business-to-consumer (B2C) affect young firms' growth when innovating is already emerging (Gemser & Perks, 2015). Furthermore, the B2B or B2C nature of customers is a significant factor that can explain the patterns of growth observed in young firms, suggesting a need for further research in these areas.

Furthermore, this thesis presents evidence of the environmental impact on the growth of young firms, demonstrating their capacity to seize opportunities in dynamic, competitive and crisis contexts. These findings indicate at least three potential areas for future research. First, future research should examine the various ways in which young firms not only resist but also benefit from uncertainty. This could involve examining the characteristics of resilience and antifragility (Taleb, 2012) and their relationship with the growth patterns of young firms.

This would entail investigating the manner in which the implementation of diverse strategies enables young firms to capitalise on unfavourable circumstances in order to flourish. Second, this thesis provides information on how process innovation in dynamic and competitive environments enables the growth of young firms. Nevertheless, a combined analysis of the effects of innovation and uncertainty on growth could be beneficial for research on the growth of young firms, in order to observe how these two factors contribute to the persistence of growth and the profitable growth of young firms. Thirdly, this paper has analysed changing environments that are considered to be negative. However, it may be of interest to analyse whether favourable changing environments, such as the emergence of new technologies or economic booms (Davidsson et al., 2023), also create significant opportunities for young firms to grow, to persist in growth or to grow more profitably. This research could contribute to the current understanding of the external factors that influence entrepreneurial growth.

This thesis has also addressed some aspects mainly related to uncertainty, and although it is acknowledged that crises, market dynamics and competitiveness are common sources of uncertainty (Audretsch & Belitski, 2021; Davidsson et al., 2023; Dess & Beard, 1984; Knight, 1921), it is still not clear to what extent these factors can be considered interchangeable or whether they have different effects in the context of uncertainty (Magniani & Zucchella, 2018; McKelvie et al., 2011). The ambiguity in the definitions and understanding of sources of uncertainty represents a significant opportunity for future research. It is recommended that studies be developed that seek to standardise definitions and measure more precisely the specific effects of each uncertainty factor on the growth of young firms.

Despite the existing literature linking uncertainty to the growth of young enterprises (McKelvie et al., 2011), there remains a lack of consensus regarding the conceptual alignment of these two constructs within entrepreneurship research (Davidsson et al., 2023). Furthermore, the emergence of novel forms of uncertain environments, such as those precipitated by natural crises like COVID-19 or the proliferation of poly-crises—situations where multiple crises occur concurrently—challenges conventional notions and boundaries of uncertainty, turbulence, and market instability (Miklian & Hoelscher, 2022). The complexity and interdependence of these crises present unprecedented challenges for young firms, demanding a more thorough examination of their implications on growth trajectories. It is therefore of great importance to gain an understanding of how young firms navigate and respond to poly-crisis scenarios, in order to inform strategic decision-making and resilience-building efforts in an increasingly volatile global landscape. Furthermore, the impact of innovation on the growth of young firms in challenging contexts, as well as the factors that

contribute to their success or failure in maintaining growth, remain unclear. Further investigation is therefore warranted.

REFERENCES

Acs, Z. J., Audretsch, D. B., & Lehmann, E. E. (2013). The knowledge spillover theory of entrepreneurship. *Small Business Economics*, *41*(4), 757–774. https://doi.org/10.1007/s11187-013-9505-9

Acs, Z. J., & Sanders, M. W. J. L. (2013). Knowledge spillover entrepreneurship in an endogenous growth model. *Small Business Economics*, *41*(4), 775–795. https://doi.org/10.1007/s11187-013-9506-8

Agarwal, R., Audretsch, D., & Sarkar, M. B. (2007). The Process of Creative Construction: Knowledge Spillovers, Entrepreneurship, and Economic Growth. *Strategic Entrepreneurship Journal*, *306*(2007), 263–286. https://doi.org/10.1002/sej

Agarwal, R., & Shah, S. K. (2014). Knowledge sources of entrepreneurship: Firm formation by academic, user and employee innovators. *Research Policy*, *43*(7), 1109–1133. https://doi.org/10.1016/j.respol.2014.04.012

Aghion, P., & Howitt, P. (1990). Model of growth through creative desctruction. *NBER Working Paper Series*, *3223*, 1–50.

Alcalde, H., & Guerrero, M. (2016). Open business models in entrepreneurial stages: evidence from young Spanish firms during expansionary and recessionary periods. *International Entrepreneurship and Management Journal*, *12*(2), 393–413. https://doi.org/10.1007/s11365-014-0348-x

Aldrich, H. E., & Auster, E. (1986). Even dwarfs started small: Liabilities of age and size and their strategic implications. *Research in Organizational Behavior*, *8*(October 2017), 165–198. http://papers.ssrn.com/abstract=1497769

Alekseev, G., Amer, S., Gopal, M., Kuchler, T., Schneider, J. W., Stroebel, J., Wernerfelt, N. C., Facebook, S. A., Way, H., Park, M., Facebook, J. S., & Facebook, N. C. W. (2020). *The Effects of COVID-19 on U.S. Small Businesses: Evidence from Owners, Managers, and Employees*.

Aliasghar, O., Rose, E. L., & Asakawa, K. (2022). Sources of knowledge and process innovation: The moderating role of perceived competitive intensity. *International Business Review*, *31*(2). https://doi.org/10.1016/j.ibusrev.2021.101920

Aliasghar, O., Sadeghi, A., & Rose, E. L. (2023). Process innovation in small- and medium-sized enterprises: The critical roles of external knowledge sourcing and absorptive capacity. *Journal of Small Business Management*, 1–40. https://doi.org/10.1080/00472778.2020.1844491

Alvarez, & Barney, J. B. (2007). Discovery and Creation: Alternative theories of entrepreneurial Action. *Strategic Entrepreneurship Journal*, *1*(1–2), 11–26. https://doi.org/10.1002/sej

Alvarez, S. A., & Barney, J. B. (2000). Entrepreneurial capabilities: A resource-based view. In *Entrepreneurship as Strategy: Competing on the entrepreneurial edge.*

Alvarez, S. A., & Barney, J. B. (2004). Organizing rent generation and appropriation: Toward a theory of the entrepreneurial firm. *Journal of Business Venturing*, *19*(5), 621–635. https://doi.org/10.1016/j.jbusvent.2003.09.002

Alvarez, S. A., & Barney, J. B. (2005). How do entrepreneurs organize firms under conditions of uncertainty? *Journal of Management*, *31*(5), 776–793. https://doi.org/10.1177/0149206305279486

Alvarez, S. A., & Busenitz, L. W. (2001). The entrepreneurship of resource-based theory. *Journal of Management*, *27*(6), 755–775. https://doi.org/10.1016/S0149-2063(01)00122-2

Amore, M. D., Garofalo, O., & Martin-Sanchez, V. (2021). Failing to learn from failure: How optimism impedes entrepreneurial innovation. Organization Science, 32(4), 940-964.

Anning-Dorson, T. (2017). How much and when to innovate: The nexus of environmental pressures, innovation and service firm performance. *European Journal of Innovation Management*, *20*(4), 599–619. https://doi.org/10.1108/EJIM-05-2016-0050

Antonelli, C., Crespi, F., & Scellato, G. (2013). Internal and external factors in innovation persistence. *Economics of Innovation and New Technology*, *22*(3), 256–280. https://doi.org/10.1080/10438599.2012.708135

Antonioli, D., & Montresor, S. (2021). Innovation persistence in times of crisis: an analysis of Italian firms. *Small Business Economics*, *56*(4), 1739–1764. https://doi.org/10.1007/s11187-019-00231-z

Anyadike-Danes, M., & Hart, M. (2018). All grown up? The fate after 15 years of a quarter of a million UK firms born in 1998. *Journal of Evolutionary Economics*, *28*(1), 45–76. https://doi.org/10.1007/s00191-017-0549-x

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Arrow, K. J. (1962). The economic implications of learning by doing. *Review of Economic Studies*, *29*, 155–173. https://doi.org/10.1007/978-1-349-15430-2_11

Audretsch, & Belitski, M. (2021). Towards an entrepreneurial ecosystem typology for regional economic development: the role of creative class and entrepreneurship. *Regional Studies*, *55*(4), 735–756. https://doi.org/10.1080/00343404.2020.1854711

Audretsch, D. B., Belitski, M., Caiazza, R., Chowdhury, F., & Menter, M. (2023). *Entrepreneurial Growth, Value Creation and New Technologies*. 1–5.

Audretsch, D. B., Grilo, I., & Thurik, A. R. (Eds.). (2007). *Handbook of research on entrepreneurship policy.* . Edward Elgar Publishing.

Audretsch, D. B., Segarra, A., & Teruel, M. (2014). Why don't all young firms invest in R&D? *Small Business Economics*, *43*(4), 751–766. https://doi.org/10.1007/s11187-014-9561-9

Audretsch, D., & Belitski, M. (2021). Frank Knight, uncertainty and knowledge spillover entrepreneurship. *Journal of Institutional Economics*, 1–27. https://doi.org/10.1017/S1744137421000527

Audretsch, D., & Mahmood, T. (1995). New Firm Survival : New Results Using a Hazard Function Author (s): David B . Audretsch and Talat Mahmood Source : The Review of Economics and Statistics , Vol . 77 , No . 1 (Feb ., 1995), pp . 97-103 Published by : MIT Press Stable URL : http://www.j. *The Review of Economics and Statistics*, *77*(1), 97–103.

Bachmann, J. T., Ohlies, I., & Flatten, T. (2021). Effects of entrepreneurial marketing on new ventures' exploitative and exploratory innovation: The moderating role of competitive

intensity and firm size. *Industrial Marketing Management*, *92*(October 2018), 87–100. https://doi.org/10.1016/j.indmarman.2020.10.002

Bamiatzi, V. (2016). Revisiting the Firm, Industry and Country Effects on Profitability under Recessionary and Expansion Periods: A Multi-level Analysis. *Strategic Management Journal*, *37*(7), 1448–1471.

Baptista, R., Karaöz, M., & Leitão, J. C. (2020). Diversification by young, small firms: the role of pre-entry resources and entry mistakes. *Small Business Economics*, *55*(1), 103–122. https://doi.org/10.1007/s11187-019-00142-z

Barba Navaretti, G., Castellani, D., & Pieri, F. (2014). Age and firm growth: evidence from three European countries. *Small Business Economics*, *43*(4), 823–837. https://doi.org/10.1007/s11187-014-9564-6

Barney. (1997). *Gaining and Sustaining Competitive Advantage.* Addison Wesley, Menlo Park, CA.

Barney, & Clark, D. N. (2007). *Resource-Based Theory: Creating and Sustaining Competitive Advantage* (O. U. Press, Ed.).

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Baron, R. A., & Tang, J. (2011). The role of entrepreneurs in firm-level innovation: Joint effects of positive affect, creativity, and environmental dynamism. *Journal of Business Venturing*, *26*(1), 49–60. https://doi.org/10.1016/j.jbusvent.2009.06.002

Bartik, A. W., Bertrand, M., Cullen, Z., Glaeser, E. L., Luca, M., & Stanton, C. (2020). The impact of COVID-19 on small business outcomes and expectations. *Proceedings of the National Academy of Sciences*, *117*(30), 17656–17666. https://doi.org/10.1073/pnas.2006991117/-/DCSupplemental.y

Battaggion, M. R., & Tedeschi, P. (2021). How do demand and costs affect the nature of innovation? *Journal of Economics*, *133*(3), 199–238. https://doi.org/10.1007/s00712-021-00733-z

Bayus, B. L. (1997). Spped to Market and New Product performance trade-offs. *Journal of Product Innovation Management*, *14*, 487–497.

Belitski, M., Stettler, T., Wales, W., & Martin, J. (2023). Speed and Scaling: An Investigation of Accelerated Firm Growth. *Journal of Management Studies*, *60*(3), 639–687. https://doi.org/10.1111/joms.12869

Ben-Hafaïedh, C., & Hamelin, A. (2022). Questioning the Growth Dogma: A Replication Study. *Entrepreneurship: Theory and Practice*, *0*(0), 1–20. https://doi.org/10.1177/10422587211059991

Bettinelli, C., Bergamaschi, M., Kokash, R., & Biffignandi, S. (2016). Process Innovation, Alliances, and the Interplay of Firm Age: Early Evidence from Italian Small Firms. *International Business Research*, *9*(5), 86. https://doi.org/10.5539/ibr.v9n5p86

Bianchini, S., Bottazzi, G., & Tamagni, F. (2017). What does (not) characterize persistent corporate high-growth? *Small Business Economics*, *48*(3), 633–656. https://doi.org/10.1007/s11187-016-9790-1

Bianchini, S., & Pellegrino, G. (2019). Innovation persistence and employment dynamics. *Research Policy*, *48*(5), 1171–1186. https://doi.org/10.1016/j.respol.2018.12.008

Bianchini, S., Pellegrino, G., & Tamagni, F. (2018). Innovation complementarities and firm growth. *Industrial and Corporate Change*, *27*(4), 657–676. https://doi.org/10.1093/icc/dty008

Blundell, R., & Bond, S. (1998). Reprint of: Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*, 115–143. https://doi.org/10.1016/j.jeconom.2023.03.001

Bolívar-Ramos, M. T. (2017). The relation between R&D spending and patents: The moderating effect of collaboration networks. *Journal of Engineering and Technology Management*, 46, 26-38.

Bolívar-Ramos, M. T., Capelleras, J. L., Rialp-Criado, A., & Rialp-Criado, J. (2020). The interplay between exports and technological collaborations: Effects on SME growth. *International Journal of Technology Management*, *84*(1–2), 110–136. https://doi.org/10.1504/IJTM.2020.112156

Bonanno, G., & Haworth, B. (1998). Intensity of competition and the choice between product and process innovation. *International Journal of Industrial Organization*, *16*(4), 495–510. https://doi.org/10.1016/s0167-7187(97)00003-9

Bond, S. S., Hoeffler, A., & Temple, J. (2001). GMM Estimation of Empirical Growth Models. *Economics Papers*, *01*, 33.

Boone, J. (2000). Competitive Pressure: The Effects on Investments in Product and Process Innovation. *The RAND Journal of Economics*, *31*(3), 549. https://doi.org/10.2307/2601000

Borowiecki, K. J. (2014). Artistic creativity and extreme events: The heterogeneous impact of war on composers' production. *Poetics*, *47*, 83–105. https://doi.org/10.1016/j.poetic.2014.10.005

Bottazzi, G., Dosi, G., Jacoby, N., Secchi, A., & Tamagni, F. (2010). Corporate performances and market selection: Some comparative evidence. *Industrial and Corporate Change*, *19*(6), 1953–1996. https://doi.org/10.1093/icc/dtq063

Boyd, B. K. (1995). CEO duality and firm performance: A contingency model. *Strategic Management Journal*, *16*(4), 301–312.

Bradley, S. W., Kim, P. H., Klein, P. G., McMullen, J. S., & Wennberg, K. (2021). Policy for innovative entrepreneurship: Institutions, interventions, and societal challenges. *Strategic Entrepreneurship Journal*, *15*(2), 167–184. https://doi.org/10.1002/sej.1395

Bradley, S. W., Shepherd, D. A., & Wiklund, J. (2011). The importance of slack for new organizations facing "tough" environments. *Journal of Management Studies*, *48*(5), 1071–1097. https://doi.org/10.1111/j.1467-6486.2009.00906.x

Brännback, M., Carsrud, A., Renko, M., Östermark, R., Aaltonen, J., & Kiviluoto, N. (2009). Growth and profitability in small privately held biotech firms: preliminary findings. *New Biotechnology*, *25*(5), 369–376. https://doi.org/10.1016/j.nbt.2009.03.006

Brem, A., Viardot, E., & Nylund, P. A. (2021). Implications of the coronavirus (COVID-19) outbreak for innovation: Which technologies will improve our lives? *Technological Forecasting and Social Change*, *163*. https://doi.org/10.1016/j.techfore.2020.120451

Brouwer, M. (2000). Entrepreneurship and Uncertainty: Innovation and Competition among the Many. *Small Business Economics*, *15*(2), 149–160. https://doi.org/10.1023/A:1008147829791

Bruno, R. L., Korosteleva, J., Osaulenko, K., & Radosevic, S. (2023). Sectoral digital capabilities and complementarities in shaping young firms' growth: evidence from Europe. *Entrepreneurship and Regional Development*, *36*(1–2), 115–135. https://doi.org/10.1080/08985626.2023.2218314

Buchko, A. A. (1994). Conceptualization and Measurement of Environmental Uncertainty: An Assessment of the Miles and Snow Perceived Environmental Uncertainty Scale. *Academy of Management Journal*, *37*(2), 410–425. https://doi.org/10.5465/256836

Burns, T., & Stalker, G. (1961). *The management of innovation*. Tavistock.

Cai, W., Wu, J., & Gu, J. (2020). From CEO passion to exploratory and exploitative innovation: the moderating roles of market and technological turbulence. *Management Decision*, *59*(6), 1363–1385. https://doi.org/10.1108/MD-02-2020-0233

Capasso, M., Treibich, T., & Verspagen, B. (2015). The medium-term effect of R&D on firm growth. *Small Business Economics*, *45*(1), 39–62. https://doi.org/10.1007/s11187-015-9640-6

Capelleras, JL., Contin-Pilart, I., Larraza-Kintana, M. et al. Entrepreneurs' human capital and growth aspirations: the moderating role of regional entrepreneurial culture. Small Bus Econ 52, 3–25 (2019). https://doi.org/10.1007/s11187-017-9985-0

Capelleras, J., & Federico, J. S. (2024). Does young firm growth persist? The role of firm age. *Applied Economics Letters*, *00*(00), 1–4. https://doi.org/10.1080/13504851.2024.2302918

Cefis, E., Leoncini, R., & Marengo, L. (2024). Is innovation failure just a dead end?. *Structural Change and Economic Dynamics*, 70, 481-493.

Cefis, E., & Marsili, O. (2019). Good times, bad times: Innovation and survival over the business cycle. *Industrial and Corporate Change*, *28*(3), 565–587. https://doi.org/10.1093/icc/dty072

Chandler, G. N., & Lyon, D. W. (2009). Involvement in Knowledge-Acquisition Activities by Venture Team Members and Venture Performance. *Entrepreneurship Theory & Practice*, *316*, 571–593.

Chang, Y., Gomes, J., & Schorfheide, F. (2002). Learning-by- doing as a propagation mechanism. *American Economic Review*, 1498–1520. https://doi.org/10.2139/ssrn.277131

Chaparro, X. A. F., Kozesinski, R., & Júnior, A. S. C. (2021). Absorptive capacity in startups: A systematic literature review. *Journal of Entrepreneurship, Management and Innovation*, *17*(1), 57–95. https://doi.org/10.7341/20211712

Chen, Y., & Song, M. (2022). The persistence and dynamics of new venture growth. *Small Business Economics*, *58*(1), 303–322. https://doi.org/10.1007/s11187-020-00411-2

Chen, Y., Wang, Y., Nevo, S., Benitez-Amado, J., & Kou, G. (2015). IT capabilities and product innovation performance: The roles of corporate entrepreneurship and competitive intensity. *Information and Management*, *52*(6), 643–657. https://doi.org/10.1016/j.im.2015.05.003

Churchill, N. C., & Lewis, V. L. (1983). The Five Stages of Small Business Growth. *Harvard Business Review*, *61*(3), 30–50. https://doi.org/10.1016/0024-6301(87)90071-9

Ciriaci, D., Moncada-Paternò-Castello, P., & Voigt, P. (2012). *Does size or age of innovative firms affect their growth persistence?* (03/2012; IPTS Working Papers on Corporate R&D and Innovation., Issue September). http://iri.jrc.ec.europa.eu/papers/WP 3-2012.pdf

Clarysse, B., Wright, M., & Van de Velde, E. (2011). Entrepreneurial Origin, Technological Knowledge, and the Growth of Spin-Off Companies. *Journal of Management Studies*, *48*(6), 1420–1442. https://doi.org/10.1111/j.1467-6486.2010.00991.x

Coad, A. (2007). Testing the principle of "growth of the fitter": The relationship between profits and firm growth. *Structural Change and Economic Dynamics*, *18*(3), 370–386. https://doi.org/10.1016/j.strueco.2007.05.001

Coad, A. (2018). Firm age: a survey. *Journal of Evolutionary Economics*, *28*(1), 13–43. https://doi.org/10.1007/s00191-016-0486-0

Coad, A., Daunfeldt, S. O., & Halvarsson, D. (2018). Bursting into life: firm growth and growth persistence by age. *Small Business Economics*, *50*(1), 55–75. https://doi.org/10.1007/s11187-017-9872-8

Coad, A., Daunfeldt, S. O., & Halvarsson, D. (2022). Amundsen versus Scott: are growth paths related to firm performance? *Small Business Economics*, *59*(2), 593–610. https://doi.org/10.1007/s11187-021-00552-y

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

Coad, A., Frankish, J. S., & Link, A. N. (2020). The Economic Contribution of a Cohort of New Firms Over Time. *Review of Industrial Organization*, *57*(3), 519–536. https://doi.org/10.1007/s11151-020-09777-9

Coad, A., Frankish, J. S., Roberts, R. G., & Storey, D. J. (2015). Are firm growth paths random? A reply to "Firm growth and the illusion of randomness." *Journal of Business Venturing Insights*, *3*, 5–8. https://doi.org/10.1016/j.jbvi.2014.11.001

Coad, A., & Guenther, C. (2013). Diversification patterns and survival as firms mature. *Small Business Economics*, *41*(3), 633–649. https://doi.org/10.1007/s11187-012-9447-7

Coad, A., Harasztosi, P., Pal, R., & Teruel, M. (2022). Policy instruments for high-growth enterprises. In *Questioning the Entrepreneurial State* (p. 273).

Coad, A., Holm, J. R., Krafft, J., & Quatraro, F. (2018). Firm age and performance. *Journal of Evolutionary Economics*, *28*(1), 1–11. https://doi.org/10.1007/s00191-017-0532-6

Coad, A., & Hölzl, W. (2009). On the autocorrelation of growth rates: Evidence for micro, small and large firms from the Austrian Service Industries, 1975-2004. *Journal of Industry, Competition and Trade*, *9*(2), 139–166. https://doi.org/10.1007/s10842-009-0048-3

Coad, A., Mathew, N., & Pugliese, E. (2021). What's good for the goose ain't good for the gander: Heterogeneous innovation capabilities and the performance effects of R&D. *Industrial and Corporate Change*, *29*(3), 621–644. https://doi.org/10.1093/ICC/DTZ073

Coad, A., & Rao, R. (2008). Innovation and firm growth in high-tech sectors: A quantile regression approach. *Research Policy*, *37*(4), 633–648. https://doi.org/10.1016/j.respol.2008.01.003

Coad, A., Segarra, A., & Teruel, M. (2013). Like milk or wine: Does firm performance improve with age? *Structural Change and Economic Dynamics*, *24*(1), 173–189. https://doi.org/10.1016/j.strueco.2012.07.002

Coad, A., Segarra, A., & Teruel, M. (2016). Innovation and firm growth: Does firm age play a role? *Research Policy*, *45*(2), 387–400. https://doi.org/10.1016/j.respol.2015.10.015

Coad, A., Segarra-Blasco, A., & Teruel, M. (2021). A bit of basic, a bit of applied? R&D strategies and firm performance. *Journal of Technology Transfer*, *46*(6), 1758–1783. https://doi.org/10.1007/s10961-020-09826-1

Coad, A., & Vezzani, A. (2019). Three cheers for industry: Is manufacturing linked to R&D, exports, and productivity growth? *Structural Change and Economic Dynamics*, *50*, 14–25. https://doi.org/10.1016/j.strueco.2019.04.006

Cohen, & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, *35*(1), 128–152. https://doi.org/10.2106/00004623-195840030-00002

Cohen, M. A., Eliashberg, J., & Ho, T. H. (1996). New product development: The performance and time-to-market tradeoff. *Management Science*, *42*(2), 173–186. https://doi.org/10.1287/mnsc.42.2.173

Cohen, W. M., & Levin, R. C. (1989). Empirical Studies of Innovation and Market Structure. *Handbook of Industrial Organization*, *2*, 1059–1107.

Colombelli, A., Krafft, J., & Vivarelli, M. (2016). To be born is not enough: the key role of innovative start-ups. *Small Business Economics*, *47*(2), 277–291. https://doi.org/10.1007/s11187-016-9716-y

Combs, J. G., Ketchen, D. J., Terjesen, S. A., & Bergh, D. D. (2023). After the startup: A collection to spur research about entrepreneurial growth. *Strategic Entrepreneurship Journal*, *17*(3), 693–709. https://doi.org/10.1002/sej.1476

Covin, J. G., Slevin, D. P., & Covin, T. J. (1990). Content and performance of growth-seeking strategies: A comparison of small firms in high- and low technology industries. *Journal of Business Venturing*, *5*(6), 391–412. https://doi.org/10.1016/0883-9026(90)90013-J

Covin, J. G., & Slevin, D. P. (1991). A conceptual model of entrepreneurship as firm behavior. *Entrepreneurship theory and practice*, 16(1), 7-26.

Cowling, M. (2004). The growth - Profit nexus. *Small Business Economics*, *22*(1), 1–9. https://doi.org/10.1023/B:SBEJ.0000011568.42714.c9

Cowling, M., Brown, R., & Rocha, A. (2020). Did you save some cash for a rainy COVID-19 day? The crisis and SMEs. *International Small Business Journal: Researching Entrepreneurship*, *38*(7), 593–604. https://doi.org/10.1177/0266242620945102

Cui, A. S., Griffith, D. A., & Tamer, S. (2005). The Influence of Competitive Intensity and Market Dynamism on Knowledge Management Capabilities of. *Journal of International Marketing*, *13*(3), 32–53.

Cyert, R. M., & March, J. G. (1965). *A Behavioral Theory of the Firm* (J. G. M. M. Cyert, Ed.; 2nd ed.). Englewood Cliffs: Penrice-Hall.

Damanpour, F. (1991). Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators. *Academy of Management*, *34*(3), 555–590. http://www.jstor.org/stable/256406

Damanpour, F., & Gopalakrishnan, S. (2001). The dynamics of the adoption of product and process innovations in organizations. *Journal of Management Studies*, *38*(1), 45–65. https://doi.org/10.1111/1467-6486.00227

Daunfeldt, S. O., Elert, N., & Johansson, D. (2014). The Economic Contribution of High-Growth Firms: Do Policy Implications Depend on the Choice of Growth Indicator? *Journal of Industry, Competition and Trade*, *14*(3), 337–365. https://doi.org/10.1007/s10842-013-0168-7

Davidsson, P. (2015). Entrepreneurial opportunities and the entrepreneurship nexus: A re-conceptualization. *Journal of Business Venturing*, *30*(5), 674–695. https://doi.org/10.1016/j.jbusvent.2015.01.002

Davidsson, P., Delmar, F., & Wiklund, J. (2006). Entrepreneurship and the growth of firms. In *Entrepreneurship and the Growth of Firms*. https://doi.org/10.4337/9781781009949

Davidsson, P., Recker, J., Chalmers, D., & Carter, S. (2023). Environmental change, strategic entrepreneurial action, and success: Introduction to a special issue on an important, neglected topic. *Strategic Entrepreneurship Journal*, *17*(2), 322–334. https://doi.org/10.1002/sej.1464

Davidsson, P., Recker, J., & von Briel, F. (2020). External enablement of new venture creation: A framework. *Academy of Management Perspectives*, *34*(3), 311–332. https://doi.org/10.5465/amp.2017.0163

Davidsson, P., Recker, J., & von Briel, F. (2021). COVID-19 as External Enabler of entrepreneurship practice and research. In *BRQ Business Research Quarterly* (Vol. 24, Issue 3, pp. 214–223). SAGE Publications Inc. https://doi.org/10.1177/23409444211008902

Davidsson, P., Steffens, P., & Fitzsimmons, J. (2009). Growing profitable or growing from profits: Putting the horse in front of the cart? *Journal of Business Venturing*, *24*(4), 388–406. https://doi.org/10.1016/j.jbusvent.2008.04.003

Day, G. S. (1994). Capabilities of Market-Drive Organizations. *Journal of Marketing*, *58*, 37–52.

Day, G. S. (2011). Closing the marketing capabilities gap. *Journal of Marketing*, *75*(4), 183–195. https://doi.org/10.1509/jmkg.75.4.183

Debrulle, J., Steffens, P., De Bock, K. W., De Winne, S., & Maes, J. (2020). Configurations of business founder resources, strategy, and environment determining new venture performance. *Journal of Small Business Management*, 1–39. https://doi.org/10.1080/00472778.2020.1831807

Decker, R., Haltiwanger, J., Jarmin, R., & Miranda, J. (2014). The role of entrepreneurship in us job creation and economic dynamism. *Journal of Economic Perspectives*, *28*(3), 3–24. https://doi.org/10.1257/jep.28.3.3

Delmar, F., McKelvie, A., & Wennberg, K. (2013). Untangling the relationships among growth, profitability and survival in new firms. *Technovation*, *33*(8–9), 276–291. https://doi.org/10.1016/j.technovation.2013.02.003

Delmar, F., & Wiklund, J. (2008). The effect of small business managers' growth motivation on firm growth: A longitudinal study. *Entrepreneurship Theory and Practice*, *32*(3), 437–457. https://doi.org/10.4337/9780857933614.00011

Demir, R., Wennberg, K., & McKelvie, A. (2017). The Strategic Management of High-Growth Firms: A Review and Theoretical Conceptualization. *Long Range Planning*, *50*(4), 431–456. https://doi.org/10.1016/j.lrp.2016.09.004

Derbyshire, J., & Garnsey, E. (2014). Firm growth and the illusion of randomness. *Journal of Business Venturing Insights*, *1*(1–2), 8–11. https://doi.org/10.1016/j.jbvi.2014.09.003

Desai, V. M. (2008). Constrained growth: How experience, legitimacy, and age influence risk taking in organizations. *Organization Science*, *19*(4), 594–608. https://doi.org/10.1287/orsc.1070.0335

Deschryvere, M. (2014). R&D, firm growth and the role of innovation persistence: An analysis of Finnish SMEs and large firms. *Small Business Economics*, *43*(4), 767–785. https://doi.org/10.1007/s11187-014-9559-3

Dess, G. G., & Beard, D. W. (1984). Dimensions of Organizational Task Environments. *Administrative Science Quarterly*, *29*(1), 52–73. http://www.jstor.org/stable/2393080 Accessed

Diallo, A., & Tomek, G. (2015). The Interpretation of HH-Index Output Value When Used As Mobile Market Competitiveness Indicator. *International Journal of Business and Management*, *10*(12), 48. https://doi.org/10.5539/ijbm.v10n12p48

Díaz-Díaz, N. L., Aguiar-Díaz, I., & De Saá-Pérez, P. (2008). The effect of technological knowledge assets on performance: The innovative choice in Spanish firms. *Research Policy*, *37*(9), 1515–1529. https://doi.org/10.1016/j.respol.2008.06.002

Djolov, G. (2013). The herfindahl-hirschman index as a decision guide to business concentration: A statistical exploration. *Journal of Economic and Social Measurement*, *38*(3), 201–227. https://doi.org/10.3233/JEM-130379

Doern, R., Williams, N., & Vorley, T. (2019). Special issue on entrepreneurship and crises: business as usual? An introduction and review of the literature. *Entrepreneurship and Regional Development*, *31*(5–6), 400–412. https://doi.org/10.1080/08985626.2018.1541590

Dosi, G. (1982). Technological paradigms and technological trajectories. A suggested interpretation of the determinants and directions of technical change. *Research Policy*, *11*(3), 147–162. https://doi.org/10.1016/0048-7333(82)90016-6

Dosi, G. (1988). Sources, Procedures, and Microeconomic Effects of Innovation. *Journal of Economic Literature*, *26*(3), 1120–1171. https://doi.org/10.4337/9781782541851.00008

Dosi, G., Mathew, N., & Pugliese, E. (2022). What a firm produces matters: Processes of diversification, coherence and performances of Indian manufacturing firms. *Research Policy*, *51*(8), 104152. https://doi.org/10.1016/j.respol.2020.104152

Dosi, G., Nelson, R. R., & Winter, S. G. (2002). *The Nature and Dynamics of Organizational Capabilities*. Oxford University Press.

Duncan, R. B. (1972). Characteristics of Organizational Environments and Perceived Environmental Uncertainty. *Administrative Science Quarterly*, *17*(3), 313. https://doi.org/10.2307/2392145

Edelman, L., & Yli-Renko, H. (2010). The impact of environment and entrepreneurial perceptions on venture-creation efforts: Bridging the discovery and creation views of entrepreneurship. *Entrepreneurship: Theory and Practice*, *34*(5), 833–856. https://doi.org/10.1111/j.1540-6520.2010.00395.x

Eisenhardt, K. M., Brown, S. L., & Neck, H. M. (2000). Competing on the entrepreneurial edge. *Entrepreneurship as strategy*, 49-62.

Epure, M., Martin-Sanchez, V., Aparicio, S., & Urbano, D. (2024). Human capital, institutions, and ambitious entrepreneurship during good times and two crises. *Strategic Entrepreneurship Journal*, *December 2021*, 1–34. https://doi.org/10.1002/sej.1492

Erhardt, E. C. (2021). Measuring the persistence of high firm growth: choices and consequences. *Small Business Economics*, *56*(1), 451–478. https://doi.org/10.1007/s11187-019-00229-7

Esteve-Pérez, S., Pieri, F., & Rodriguez, D. (2022). One swallow does not make a summer: episodes and persistence in high growth. *Small Business Economics*, *58*(3), 1517–1544. https://doi.org/10.1007/s11187-020-00443-8

Esteve-Pérez, S., Pieri, F., & Rodriguez, D. (2023). Coping with high decline: firms' resilience to adversity. *Small Business Economics*. https://doi.org/10.1007/s11187-023-00809-8

Estrada, I., De La Fuente, G., & Martín-Cruz, N. (2010). Technological joint venture formation under the real options approach. *Research Policy*, *39*(9), 1185–1197. https://doi.org/10.1016/j.respol.2010.05.015

Estrada, I., & Dong, J. Q. (2020). Learning from experience? Technological investments and the impact of coopetition experience on firm profitability. *Long Range Planning*, *53*(1), 101866. https://doi.org/10.1016/j.lrp.2019.01.003

Estrin, S., Korosteleva, J., & Mickiewicz, T. (2022). Schumpeterian Entry: Innovation, Exporting, and Growth Aspirations of Entrepreneurs. *Entrepreneurship: Theory and Practice*, *46*(2), 269–296. https://doi.org/10.1177/1042258720909771

European Commission. (2022). *Comission Staff Working Document: A New European Innovation Agenda*.

Evans, J., & Borders, A. L. (2014). Strategically surviving bankruptcy during a global financial crisis: The importance of understanding chapter 15. *Journal of Business Research*, *67*(1), 2738–2742. https://doi.org/10.1016/j.jbusres.2013.03.024

Falk, M. (2012). Quantile estimates of the impact of R&D intensity on firm performance. *Small Business Economics*, *39*(1), 19–37. https://doi.org/10.1007/sl

Federico, J. S., & Capelleras, J. L. (2015). The heterogeneous dynamics between growth and profits: the case of young firms. *Small Business Economics*, *44*(2), 231–253. https://doi.org/10.1007/s11187-014-9598-9

Ferguson, C. H. (1988). You Voodoo Economics. *Harvard Business Review*, *66*(3), 55–62.

Fernhaber, S., Patel, P., Fernhaber, S. A., & Patel, P. C. (2012). How do young firms manage product portfolio complexity? The role of absorptive capacity and ambidexterity. *Strategic Management Journal*, *33*(13), 1516–1539. https://doi.org/10.1002/smj.1994

Fitzsimmons, J., Steffens, P., & Douglas, E. (2005). Growth and Profitability in Small and Medium Sized Australian Firms. *Proceedings of AGSE Entrepreneurship Exchange*, *February*. https://doi.org/10.2139/ssrn.1263734

Fonseca, S., Guedes, M. J., & da Conceição Gonçalves, V. (2021). Profitability and size of newly established firms. *International Entrepreneurship and Management Journal*, 1–18. https://doi.org/10.1007/s11365-020-00730-6

Fossas-Olalla, M., Minguela-Rata, B., López-Sánchez, J. I., & Fernández-Menéndez, J. (2015). Product innovation: When should suppliers begin to collaborate? *Journal of Business Research*, *68*(7), 1404–1406. https://doi.org/10.1016/j.jbusres.2015.01.022

Freel, M. S. (2005). Perceived environmental uncertainty and innovation in small firms. *Small Business Economics*, *25*(1), 49–64. https://doi.org/10.1007/s11187-005-4257-9

Freeman, C. (2019). History, co-evolution and economic growth. *Industrial and Corporate Change*, *28*(1), 3–44. https://doi.org/10.1093/icc/dty075

Freeman, J., Carroll, G. R., & Hannan, M. T. (1983). The Liability of Newness : Age Dependence in Organizational Death Rates. *American Sociological Review*, *48*(5), 692–710.

Frésard, L., Mancini, L., Schroth, E. J., & Sinno, D. (2023). How Do Firms Choose Between Growth and Efficiency? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4383725

Friesl, M. (2012). Knowledge Acquisition Strategies and Company Performance in Young High Technology Companies. *British Journal of Management*, *23*(3), 325–343. https://doi.org/10.1111/j.1467-8551.2011.00742.x

Fritsch, M., & Storey, D. J. (2014). Entrepreneurship in a Regional Context: Historical Roots, Recent Developments and Future Challenges. In *Regional Studies* (Vol. 48, Issue 6, pp. 939–954). https://doi.org/10.1080/00343404.2014.892574

Fuertes-Callén, Y., & Cuellar-Fernández, B. (2019). Inter-relationship between firm growth and profitability in a context of economic crisis. *Journal of Business Economics and Management*, *20*(1), 86–106. https://doi.org/10.3846/jbem.2019.6928

Furlan, A., Grandinetti, R., & Paggiaro, A. (2014). Unveiling the growth process: Entrepreneurial growth and the use of external resources. *International Journal of Entrepreneurial Behaviour and Research*, *20*(1), 20–41. https://doi.org/10.1108/IJEBR-12-2012-0142

Gabay-Mariani, L., Paillé, P., & Valéau, P. (2023). The long-term persistence among nascent entrepreneurs: An fsQCA analysis. *Journal of Business Research*, *156*(July 2022). https://doi.org/10.1016/j.jbusres.2022.113477

Gali, N., Hughes, M., Morgan, R. E., & Wang, C. L. (2024). Entrepreneurial entropy: a resource exhaustion theory of firm failure from entrepreneurial orientation. *Entrepreneurship Theory & Practice*, *48*(1), 141–170.

Gal-Or, E. (1985). First Mover and Second Mover Advantages. *International Economic Review*, *26*(3). https://about.jstor.org/terms

García-Vega, M. (2022). R&D restructuring during the Great Recession and young firms. *International Journal of Industrial Organization*, *81*. https://doi.org/10.1016/j.ijindorg.2021.102819

García-Sánchez, E., García-Morales, V. J., & Bolívar-Ramos, M. T. (2017). The influence of top management support for ICTs on organisational performance through knowledge acquisition, transfer, and utilisation. *Review of Managerial Science*, 11, 19-51.

Garnsey, E., Stam, E., Heffernan, P., & Hugo, O. (2006). The new firm growth: exploring processes and paths. *Industry and Innovation*, *13*(1), 1–20.

Gartner, W., & Liao, J. (2012). The effects of perceptions of risk, environmental uncertainty, and growth aspirations on new venture creation success. *Small Business Economics*, *39*(3), 703–712. https://doi.org/10.1007/s11187-011-9356-1

Gemser, G., & Perks, H. (2015). Co-creation with customers: an evolving innovation research field. *Journal of Product Innovation Management*, *32*(5), 660–665.

George, G. (2005). Slack Resources and the Performance of Privately Held Firms. In *Academy of Management Journal* (Vol. 48, Issue 4). https://ink.library.smu.edu.sg/lkcsb_research

Giachetti, C., & Torrisi, S. (2018). Following or Running Away from the Market Leader? The Influences of Environmental Uncertainty and Market Leadership. *European Management Review*, *15*(3), 445–463. https://doi.org/10.1111/emre.12130

Gibrat, R. (1931). *Les inégalités économiques.* Librairies de Recueil Sirey.

Gilbert, B. A., McDougall, P. P., & Audretsch, D. B. (2006). New venture growth: A review and extension. *Journal of Management*, *32*(6), 926–950. https://doi.org/10.1177/0149206306293860

Giones, F., Brem, A., Pollack, J. M., Michaelis, T. L., Klyver, K., & Brinckmann, J. (2020). Revising entrepreneurial action in response to exogenous shocks: Considering the COVID-19 pandemic. *Journal of Business Venturing Insights*, *14*(May), e00186. https://doi.org/10.1016/j.jbvi.2020.e00186

Golovko, E., & Valentini, G. (2011). Exploring the complementarity between innovation and export for SMEs growth. *Journal of International Business Studies*, *42*(3), 362–380. https://doi.org/10.1057/jibs.2011.2

Goni, J. (2022). Process Innovation Capabilities in Less-structured Business Processes: Business Process Management Journal. *Business Process Management Journal*.

Gopalakrishnan, S., Bierly, P., & Kessler, E. H. (1999). A reexamination of product and process innovations using a knowledge-based view. *Journal of High Technology Management Research*, *10*(1), 147–166. https://doi.org/10.1016/S1047-8310(99)80007-8

Grant, R. M. (2019). *Contemporary Strategy Analysis* (10th ed.). Wiley & Sons.

Grazzi, M., & Moschella, D. (2018). Small, young, and exporters: New evidence on the determinants of firm growth. *Journal of Evolutionary Economics*, *28*(1), 125–152. https://doi.org/10.1007/s00191-017-0523-7

Greiner, L. E. (1972). Evolution and revolution as organizations grow. *Harvard Business Review*, *50*(4), 37–46. https://doi.org/10.1111/j.1741-6248.1997.00397.x

Greve, H. (1998). Performance , Aspirations , and Risky Organizational Change. *Administrative Science Quarterly*, *43*(1), 58–86.

Greve, H. R. (2003). *Organizational learning from performance feedback: A behavioral perspective on innovation and change.* Cambridge University Press.

Greve, H. R. (2008). A Behavioral Theory of Firm Growth: Sequential Attention to Size and Performance Goals. *Acadamy of Management Journal*, *51*(3), 476–494.

Grillitsch, M., Schubert, T., & Srholec, M. (2019). Knowledge base combinations and firm growth. *Research Policy*, *48*(1), 234–247. https://doi.org/10.1016/j.respol.2018.08.009

Guarascio, D., & Tamagni, F. (2019). Persistence of innovation and patterns of firm growth. *Research Policy*, *48*(6), 1493–1512. https://doi.org/10.1016/j.respol.2019.03.004

Guerras-Martín, L. Á., Madhok, A., & Montoro-Sánchez, Á. (2014). The evolution of strategic management research: Recent trends and current directions. *BRQ Business Research Quarterly*, *17*(2), 69–76. https://doi.org/10.1016/j.brq.2014.03.001

Gupta, A. K., & Govinarajan, V. (1984). Business Unit Strategy, Managerial Characteristics, and Business Unit Effectiveness at Strategy Implementation^. *Academy of Management Journal*, *27*(1), 25–41.

Gupta, V. K. (1981). Minimum Efficient Scale as a Determinant of Concentration: A Reappraisal. *The Manchester School*, *49*(2), 153–164.

Haltiwanger, J. C., Jarmin, R. S., & Miranda, J. (2010). Young, Who Creates Jobs? Small vs Large vs Young. *NBER Working Paper Series*, *16300*, 53.

Haltiwanger, J., Jarmin, R. S., & Kulick, R. B. (2016). High Growth Young Firms: Contribution to Job, Output and Productivity Growth. *SSRN Electronic Journal*, 11–62. https://doi.org/10.2139/ssrn.2866566

Hammer, M., & Champy, J. (1993). *Reengineering the Corporation: A Manifesto for Business Revolution*. Collins.

Hart, M., Prashar, N., & Ri, A. (2021). From the Cabinet of Curiosities: The misdirection of research and policy debates on small firm growth. *International Small Business Journal: Researching Entrepreneurship*, *39*(1), 3–17. https://doi.org/10.1177/0266242620951718

Headd, B., & Kirchhoff, B. (2009). Businesses : An Exploratory Study of Life Cycles *. *Journal of Small Business Management*, *47*(4), 531–550.

Henrekson, M., Johansson, D., & Karlsson, J. (2024). To Be or Not to Be: The Entrepreneur in Neo-Schumpeterian Growth Theory. *Entrepreneurship: Theory and Practice*, *48*(1), 104–140. https://doi.org/10.1177/10422587221141679

Herhausen, D., Morgan, R. E., Brozović, D., & Volberda, H. W. (2021). Re-examining strategic flexibility: a meta-analysis of its antecedents, consequences and contingencies. *British Journal of Management*, 32(2), 435-455.

Hervas-Oliver, J. L., Sempere-Ripoll, F., & Boronat-Moll, C. (2014). Process innovation strategy in SMEs, organizational innovation and performance: A misleading debate? *Small Business Economics*, *43*(4), 873–886. https://doi.org/10.1007/s11187-014-9567-3

Hirschman, A. O. (1964). The Paternity of an Index. *The American Economic Review*, *54*(5), 761.

Hisrich, R. D. (1992). The need for marketing in entrepreneurship. *The Journal of Business & Industrial Marketing*, *7*(3), 53.

Hoskisson, R. E., & Hitt, M. A. (1999). Theory and research in strategic management: Swings of a pendulum. *Journal of Management*, *25*(3), 417–456.

Hsu, S. T., & Cohen, S. K. (2020). Revisiting the R&D Investment–Performance Relationship: The Moderating Effects of Factor Market Characteristics. *Journal of Engineering and Technology Management - JET-M*, *57*(July). https://doi.org/10.1016/j.jengtecman.2020.101570

Huergo, E., & Jaumandreu, J. (2004). Firms' age, process innovation and productivity growth. *International Journal of Industrial Organization*, *22*(4), 541–559. https://doi.org/10.1016/j.ijindorg.2003.12.002

Huergo, E., & Moreno, L. (2011). Does history matter for the relationship between R&D, innovation, and productivity? *Industrial and Corporate Change*, *20*(5), 1335–1368. https://doi.org/10.1093/icc/dtr019

Hymer, S., & Pashigian, P. (1962). Turnover of Firms As a Measure of Market Behavior. *The Review of Economics and Statistics*, *44*(1), 82–87.

Innocenti, N., & Zampi, V. (2019). What does a start-up need to grow? An empirical approach for Italian innovative start-ups. *International Journal of Entrepreneurial Behaviour and Research*, *25*(2), 376–393. https://doi.org/10.1108/IJEBR-04-2018-0194

Jang, S. C. (Shawn), & Park, K. (2011). Inter-relationship between firm growth and profitability. *International Journal of Hospitality Management*, *30*(4), 1027–1035. https://doi.org/10.1016/j.ijhm.2011.03.009

Jansen, Bosch, F. A. J. Van Den, & Volberda, H. W. (2005). Managing Potential and Realized Absorptive Capacity: How Do Organizational Antecedents Matter? *Acadamy of Management Journal*, *48*(6), 999–1015.

Jansen, J., Van der Bosch, F. A. J., & Volberda, H. W. (2006). Exploratory innovation, exploitative innovation, and performance: effects of organizational antecedents and environmental moderator. *Management Science*, *52*(11), 1661–1674. https://doi.org/10.5962/bhl.title.67734

Jaworski, B. J., & Kohli, A. K. (1993). Market Orientation: Antecedents and Consequences. *Journal of Marketing*, *57*(3), 53. https://doi.org/10.2307/1251854

Jayaram, J., Oke, A., & Prajogo, D. (2014). The antecedents and consequences of product and process innovation strategy implementation in Australian manufacturing firms. *International Journal of Production Research*, *52*(15), 4424–4439. https://doi.org/10.1080/00207543.2013.849363

Jin, B. E., Cedrola, E., & Kim, N. (2019). Process innovation: hidden secret to success and efficiency. In B. E. Jin & E. Cedrola (Eds.), *rocess Innovation in the Global Fashion Industry* (pp. 1–23). Palgrave Macmillan US.

Jo, G. S., & Jang, P. (2022). Innovation characteristics of high-growth startups: the Korean case startups. *Journal of Small Business and Entrepreneurship*, *34*(2), 222–239. https://doi.org/10.1080/08276331.2021.1887663

Kachlami, H., & Yazdanfar, D. (2016). Determinants of SME growth: The influence of financing pattern. An empirical study based on Swedish data. *Management Research Review*, *39*(9), 966–986. https://doi.org/10.1108/MRR-04-2015-0093

Kafouros, M., Love, J. H., Ganotakis, P., & Konara, P. (2020). Experience in R&D collaborations, innovative performance and the moderating effect of different dimensions

of absorptive capacity. *Technological Forecasting and Social Change*, *150*(September 2019), 119757. https://doi.org/10.1016/j.techfore.2019.119757

Kahneman, D. (2013). *Thinking, Fast and Slow*. Language.

Katila, R., & Shane, S. (2005). When does lack of resources make new firms innovative? *Academy of Management Journal*, *48*(5), 814–829. https://doi.org/10.5465/AMJ.2005.18803924

Kelly, D., & Amburgey, T. L. (1991). Organizational Inertia and Momentum: A Dynamic Model of Strategic Change. *Academy of Management Journal* , *34*.

Ketchen, D. J., Thomas, J. B., & Snow, C. C. (1993). Organizational Configurations and Performance : A Comparison of Theoretical Approaches. *Academy of Management*, *36*(6), 1278–1313.

Kim, C., & Bettis, R. A. (2014). Cash is surprisingly valuable as a strategic asset. *Strategic Management Journal*, *35*(13), 2053–2063. https://doi.org/10.1002/smj.2205

Kim, J. (2022). Innovation failure and firm growth: dependence on firm size and age. *Technology Analysis and Strategic Management*, *34*(2), 166–179. https://doi.org/10.1080/09537325.2021.1892622

Kimjeon, J., & Davidsson, P. (2022). External Enablers of Entrepreneurship: A Review and Agenda for Accumulation of Strategically Actionable Knowledge. *Entrepreneurship: Theory and Practice*, *46*(3), 643–687. https://doi.org/10.1177/10422587211010673

King, D. R., & Slotegraaf, R. J. (2011). Industry Implications of Value Creation and Appropriation Investment Decisions. *Decision Sciences*, *42*(2), 511–529. https://doi.org/10.1111/j.1540-5915.2011.00321.x

Kirner, E., Kinkel, S., & Jaeger, A. (2009). Innovation paths and the innovation performance of low-technology firms-An empirical analysis of German industry. *Research Policy*, *38*(3), 447–458. https://doi.org/10.1016/j.respol.2008.10.011

Kleinbaum, D. G., Kupper, L. L., Nizam, A., & Rosenberg, E. S. (2013). *Applied Regression Analysis and Other Multivariate Methods*. Cengage Learning. https://doi.org/10.2307/3150614

Klepper, S. (1996). Entry, Exit, Growth, and Innovation over the Product Life Cycle. *American Economic Review*, *86*(3), 562–583.

Klyver, K., & Nielsen, S. L. (2021). Which crisis strategies are (expectedly) effective among SMEs during COVID-19? *Journal of Business Venturing Insights*, *16*. https://doi.org/10.1016/j.jbvi.2021.e00273

Klyver, K., Steffens, P., & Nielsen, S. L. (2023). Crisis response efficacy: Perceived ability to respond entrepreneurially to crises. *Journal of Business Venturing Insights*, *20*(October). https://doi.org/10.1016/j.jbvi.2023.e00429

Knight, F. (1921). *Risk, Uncertainty and Profit*.

Kotiloglu, S., Chen, Y., & Lechler, T. (2021). Organizational responses to performance feedback: A meta-analytic review. *Strategic Organization*, *19*(2), 285–311. https://doi.org/10.1177/1476127019883361

Koudstaal, M., Sloof, R., & Praag, M. Van. (2016). Risk, Uncertainty, and Entrepreneurship: Evidence from a Lab-in-the-Field Experiment. *Management Science*, *62*(10), 2897–2915. https://doi.org/10.1287/mnsc.2015.2249.This

Kovoor-Misra, S. (1995). A multidimensional approach to crisis preparation for technical organizations: Some critical factors. *Technological Forecasting and Social Change*, *48*(2), 143–160. https://doi.org/10.1016/0040-1625(94)00041-T

Kuckertz, A., Brändle, L., Gaudig, A., Hinderer, S., Morales Reyes, C. A., Prochotta, A., Steinbrink, K. M., & Berger, E. S. C. (2020). Startups in times of crisis – A rapid response to the COVID-19 pandemic. *Journal of Business Venturing Insights*, *13*. https://doi.org/10.1016/j.jbvi.2020.e00169

Kurtmollaiev, S., Lervik-Olsen, L., & Andreassen, T. W. (2022). Competing through innovation: Let the customer judge! *Journal of Business Research*, *153*, 87–101. https://doi.org/10.1016/j.jbusres.2022.08.002

Kwieciński, D. (2017). Measures of competitive intensity - Analysis based on literature review. *Journal of Management and Business Administration. Central Europe*, *25*(1), 53–77. https://doi.org/10.7206/jmba.ce.2450-7814.189

Labeaga, J. M., Martínez-Ros, E., Sanchis, A., & Sanchis, J. A. (2021). Does persistence in using R&D tax credits help to achieve product innovations? *Technological Forecasting and Social Change*, *173*. https://doi.org/10.1016/j.techfore.2021.121065

Lawrence, P. R., & Lorsch, J. W. (1967). Differentiation and Integration in Complex Organizations. *Administrative Science Quarterly*, *12*(1), 1. https://doi.org/10.2307/2391211

Lee, S. (2014). The relationship between growth and profit: evidence from firm-level panel data. *Structural Change and Econcomic Dynamics*, *28*, 1–11. https://doi.org/10.1016/j.strueco.2013.08.002

Lee, S. (2018). Growth, profits and R&D investment. *Economic Research-Ekonomska Istrazivanja* , *31*(1), 607–625. https://doi.org/10.1080/1331677X.2018.1432380

Lévesque, M., Minniti, M., & Shepherd, D. (2009). Entrepreneurs Decisions on Timing of Entry : Learning From Participation and From the Experiences of Others. *Entrepreneurship Theory & Practice*, *33*(2), 547–570.

Levinthal, D. A., & March, J. G. (1993). The myopia of learning. *Strategic Management Journal*, *14*(Special Issue: Organizations, Decision Making and Strategy (Winter, 1993)), 95–112.

Lewin, A. Y., Massini, S., & Peeters, C. (2011). Microfoundations of internal and external absorptive capacity routines. *Organization Science*, *22*(1), 81–98. https://doi.org/10.1287/orsc.1100.0525

Lichtenthaler, U. (2021). Profiting from innovation in the aftermath of an economic crisis. *Journal of Research in Marketing and Entrepreneurship*, *23*(2), 282–294. https://doi.org/10.1108/JRME-06-2020-0085

LiPuma, J. A., Newbert, S. L., & Doh, J. P. (2013). The effect of institutional quality on firm export performance in emerging economies: a contingency model of firm age and size. *SMALL BUSINESS ECONOMICS*, *40*(4), 817–841. https://doi.org/10.1007/s11187-011-9395-7

Lounsbury, M., & Hirsch, P. M. (2010). *Markets on trial: toward a policy-oriented economic sociology* (pp. 5–26). https://doi.org/10.1108/s0733-558x(2010)000030b029

Love, J. H., & Roper, S. (2015). SME innovation, exporting and growth: A review of existing evidence. *International Small Business Journal: Researching Entrepreneurship*, *33*(1), 28–48. https://doi.org/10.1177/0266242614550190

Magnani, G., & Zucchella, A. (2018). Uncertainty in Entrepreneurship and Management Studies: A Systematic Literature Review. *International Journal of Business and Management*, *13*(3), 98. https://doi.org/10.5539/ijbm.v13n3p98

Makkonen, H., Pohjola, M., Olkkonen, R., & Koponen, A. (2014). Dynamic capabilities and firm performance in a financial crisis. *Journal of Business Research*, *67*(1), 2707–2719. https://doi.org/10.1016/j.jbusres.2013.03.020

Mansikkamäki, S. (2023). Firm growth and profitability : The role of age and size in shifts between growth – profitability configurations. *Journal of Business Venturing Insights*, *19*(June 2022). https://doi.org/10.1016/j.jbvi.2023.e00372

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, *2*(1), 71–87.

Markman, G. D., Baron, R. A., & Balkin, D. B. (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

Markman, G. D., & Gartner, W. B. (2002). Is Extraordinary Growth Profitable? A Study of Inc. 500 High–Growth Companies. *Entrepreneurship Theory & Practice*, *27*(1), 65–75.

Martínez-Sánchez, Á., Vela-Jimenez, M. J., Abella-Garces, S., & Gorgemans, S. (2019). Flexibility and innovation: moderator effects of cooperation and dynamism. *Personnel Review*, *48*(6), 1548–1564. https://doi.org/10.1108/PR-12-2017-0397

Martínez-Sánchez, A., Vicente-Oliva, S., & Pérez-Pérez, M. (2020). The relationship between R&D, the absorptive capacity of knowledge, human resource flexibility and innovation: Mediator effects on industrial firms. *Journal of Business Research*, *118*(December 2019), 431–440. https://doi.org/10.1016/j.jbusres.2020.07.014

Marzi, G. (2022). Uncertainty-driven Innovation: Managing the New Product Development Processes in an Unpredictable Environment. In *Uncertainty-driven Innovation: Managing the New Product Development Processes in an Unpredictable Environment*. https://doi.org/10.1007/978-3-030-99534-8

Matalamäki, M. J., & Joensuu-Salo, S. (2022). Digitalization and strategic flexibility – a recipe for business growth. *Journal of Small Business and Enterprise Development*, *29*(3), 380–401. https://doi.org/10.1108/JSBED-10-2020-0384

McKelvie, A., Brattström, A., & Wennberg, K. (2017). How young firms achieve growth: reconciling the roles of growth motivation and innovative activities. *Small Business Economics*, *49*(2), 273–293. https://doi.org/10.1007/s11187-017-9847-9

McKelvie, A., Haynie, J. M., & Gustavsson, V. (2011). Unpacking the uncertainty construct: Implications for entrepreneurial action. *Journal of Business Venturing*, *26*(3), 273–292. https://doi.org/10.1016/j.jbusvent.2009.10.004

McKelvie, A., & Wiklund, J. (2010). Advancing Firm Growth Research: A Focus on of Growth Mode instead of growth Rate. *Entrepreneurship Theory and Practice*, *34*(2), 261–288.

McKelvie, A., Wiklund, J., & Brattström, A. (2018). Externally Acquired or Internally Generated? Knowledge Development and Perceived Environmental Dynamism in New Venture Innovation. *Entrepreneurship Theory and Practice*, *42*(1), 24–46. https://doi.org/10.1177/1042258717747056

Mcmullen Baylor, J. S., & Shepherd, D. A. (2006). Entrepreneurial Action and the Role of Uncertainty in the Theory of the Enrepreneur. *Academy of Management Review*, *31*(1), 132–152.

Miklian, J., & Hoelscher, K. (2022). SMEs and exogenous shocks: A conceptual literature review and forward research agenda. In *International Small Business Journal: Researching Entrepreneurship* (Vol. 40, Issue 2, pp. 178–204). SAGE Publications Ltd. https://doi.org/10.1177/02662426211050796

Miller, D. (1990). Organizational configurations: Cohesion, Change , and Prediction. *Human Relations*, *43*(8), 771–789.

Miller, D., & Shamsie, J. (1999). Strategic responses to three kinds of uncertainty: Product line simplicity at the Hollywood film studios. *Journal of Management*, *25*(1), 97–116. https://doi.org/10.1177/014920639902500105

Miller, D., & Toulouse, J.-M. (1986). Strategy, structure, CEO personality and performance in small firms. *American Journal of Small Business*, *10*(3), 47–62.

Milliken, F. J. (1987). Three Types of Perceived Uncertainty About the Environment: State, Effect, and Response Uncertainty. *Academy of Management Review*, *12*(1), 133–143. https://doi.org/10.5465/amr.1987.4306502

Mishina, Y., Pollock, T. G., & Porac, J. F. (2004). Are more resources always better for growth? Resource stickiness in market and product expansion. *Strategic Management Journal*, *25*(12), 1179–1197. https://doi.org/10.1002/smj.424

Moncada-Paternò-Castello, P. (2022). Top R&D investors, structural change and the R&D growth performance of young and old firms. In *Eurasian Business Review* (Vol. 12, Issue 1). Springer International Publishing. https://doi.org/10.1007/s40821-022-00206-3

Motley, D. C., Eesley, C. E., & Koo, W. (2023). Born into chaos: How founding conditions shape whether ventures survive or thrive when experiencing environmental change. *Strategic Entrepreneurship Journal*, *17*(2), 408–444. https://doi.org/10.1002/sej.1461

Mueller, D. C. (1977). The Persistence of Profits above the Norm. *Economica*, *44*(176), 369–380.

Munoz, A., Billsberry, J., & Ambrosini, V. (2022). Resilience, robustness, and antifragility: Towards an appreciation of distinct organizational responses to adversity. *International Journal of Management Reviews*, *24*(2), 181–187. https://doi.org/10.1111/ijmr.12289

Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research Policy*, *48*(8), 103773. https://doi.org/10.1016/j.respol.2019.03.018

Nason, R. S., Wiklund, J., McKelvie, A., Hitt, M., & Yu, W. (2019). Orchestrating boundaries: The effect of R&D boundary permeability on new venture growth. *Journal of Business Venturing*, *34*(1), 63–79. https://doi.org/10.1016/j.jbusvent.2018.05.003

Nelson, R. R. (1985). *An evolutionary theory of economic change*. harvard university press.

Nelson, R., & Winter, S. G. (1982). The Schumpeterian Tradeoff Revisited. *The American Economic Review*, *72*(1), 114–132. https://doi.org/10.1057/9780230226203.1976

Newbert, S. L., & Tornikoski, E. T. (2011). Resource acquisition in the emergence phase: Considering the effects of embeddedness and resource dependence. *Entrepreneurship: Theory and Practice*, *37*(2), 249–280. https://doi.org/10.1111/j.1540-6520.2011.00461.x

Nicolas, T. (2022). Short-term financial constraints and SMEs' investment decision: evidence from the working capital channel. *Small Business Economics*, *58*(4), 1885–1914. https://doi.org/10.1007/s11187-021-00488-3

Nielsen, K. (2015). Human capital and new venture performance: the industry choice and performance of academic entrepreneurs. *Journal of Technology Transfer*, *40*(3), 453–474. https://doi.org/10.1007/s10961-014-9345-z

Nunes, P. M., Viveiros, A., & Serrasqueiro, Z. (2012). Are the determinants of young SME profitability different? Empirical evidence using dynamic estimators. *Journal of Business Economics and Management*, *13*(3), 443–470. https://doi.org/10.3846/16111699.2011.620148

Nuscheler, D., Engelen, A., & Zahra, S. A. (2019). The role of top management teams in transforming technology-based new ventures' product introductions into growth. *Journal of Business Venturing*, *34*(1), 122–140. https://doi.org/10.1016/j.jbusvent.2018.05.009

Ocasio, W., Loewenstein, J., & Nigam, A. (2015). How streams of communication reproduce and change institutional logics: The role of categories. In *Academy of Management Review* (Vol. 40, Issue 1, pp. 28–48). Academy of Management. https://doi.org/10.5465/amr.2013.0274

OECD. (2005). Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data. In *Communities: Vol. Third edit* (5ed ed.).

OECD. (2018). Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation. In *The Measurement of Scientific; Technological and Innovation Activities*.

Park, K. M. (2007). Antecedents of convergence and divergence in strategic positioning: The effects of performance and aspiration on the direction of strategic change. *Organization Science*, *18*(3), 386–402. https://doi.org/10.1287/orsc.1060.0240

Parker, O. N., Krause, R., & Covin, J. G. (2017). Ready, Set, Slow: How Aspiration-Relative Product Quality Impacts the Rate of New Product Introduction. *Journal of Management*, *43*(7), 2333–2356. https://doi.org/10.1177/0149206315569314

Pearson, C., & Clair, J. A. (1998). Reframing Crisis Management. *Academy of Management Review*, *23*(1), 59–76. https://doi.org/10.5465/amr.1998.192960

Pellegrino, G., & Piva, M. (2020). Innovation, industry and firm age: are there new knowledge production functions? In *Eurasian Business Review* (Vol. 10, Issue 1). Springer International Publishing. https://doi.org/10.1007/s40821-019-00129-6

Penrose, E. (1959). *The theory of growth of the firm* (4rth editi). Oxford University Press Inc.

Pérez-Gómez, P., Arbelo-Pérez, M., & Arbelo, A. (2018). Profit efficiency and its determinants in small and medium-sized enterprises in Spain. *BRQ Business Research Quarterly*, 21(4), 238-250.

Peric, M., & Vitezic, V. (2016). Impact of global economic crisis on firm growth. *Small Business Economics*, *46*(1), 1–12.

Peterson, A., & Wu, A. (2021). Entrepreneurial learning and strategic foresight. *Strategic Management Journal*, *42*(13), 2357–2388. https://doi.org/10.1002/smj.3327

Phillips, B. D., & Kirchhoff, B. A. (1989). Formation, growth and survival; Small firm dynamics in the U.S. Economy. *Small Business Economics*, *1*(1), 65–74. https://doi.org/10.1007/BF00389917

Piening, E. P., & Salge, T. O. (2015). Understanding the antecedents, contingencies, and performance implications of process innovation: A dynamic capabilities perspective. *Journal of Product Innovation Management*, *32*(1), 80–97. https://doi.org/10.1111/jpim.12225

Piette, C., & Zachary, M.-D. (2015). *Sensitivity to the crisis of Sme financing in Belgium*. https://www.nbb.be/doc/oc/repec/ecrart/ecoreviii2015_h2.pdf

Porter, M. E. (1980). *Competitive Strategy* (N. Y. T. F. Press, Ed.).

Portuguez Castro, M., & Gómez Zermeño, M. G. (2020). Being an entrepreneur post-COVID-19 – resilience in times of crisis: a systematic literature review. *Journal of Entrepreneurship in Emerging Economies*, *13*(4), 721–746. https://doi.org/10.1108/JEEE-07-2020-0246

Posen, H., Keil, T., Kim, S., & Meissner, F. (2018). Renewing Research on Problemistic Search—A Review and Research Agenda. *Academy of Management Annals*, *12*(1), 208–251.

Protogerou, A., Caloghirou, Y., & Vonortas, N. S. (2017). Determinants of young firms' innovative performance: Empirical evidence from Europe. *Research Policy*, *46*(7), 1312–1326. https://doi.org/10.1016/j.respol.2017.05.011

Pugliese, R., Bortoluzzi, G., & Balzano, M. (2022). What drives the growth of start-up firms? A tool for mapping the state-of-the-art of the empirical literature. *European Journal of Innovation Management*, *25*(6), 242–272. https://doi.org/10.1108/EJIM-03-2021-0163

Raalskov, J., Schlichter, J., Haug, A., & Klyver, K. (2024). Organizational ambidexterity in young SMEs? The incompatibility of entrepreneurial orientation and process improvement. Entrepreneurship & Regional Development, 1-22.

Rahman, M. S., AbdelFattah, F. A. M., Bag, S., & Gani, M. O. (2022). Survival strategies of SMEs amidst the COVID-19 pandemic: application of SEM and fsQCA. *Journal of Business and Industrial Marketing*, *37*(10), 1990–2009. https://doi.org/10.1108/JBIM-12-2020-0564

Ramadani, V., Hisrich, R. D., Abazi-Alili, H., Dana, L. P., Panthi, L., & Abazi-Bexheti, L. (2019). Product innovation and firm performance in transition economies: A multi-stage estimation approach. *Technological Forecasting and Social Change*, *140*(August 2018), 271–280. https://doi.org/10.1016/j.techfore.2018.12.010

Rauch, A., & Hulsink, W. (2021). Just one Damned Thing After Another: Towards an Event-based Perspective of Entrepreneurship. In *Entrepreneurship: Theory and Practice* (Vol. 0, Issue 0, pp. 1–20). SAGE Publications Ltd. https://doi.org/10.1177/10422587211061738

Raymond, W., Mohnen, P., Palm, F., & van der Loeff, S. S. (2010). Persistence of innovation in dutch manufacturing: Is it spurious? *Review of Economics and Statistics*, *92*(3), 495–504. https://doi.org/10.1162/REST_a_00004

Reed, J. H. (2020). Strategic agility and the effects of firm age and environmental turbulence. *Journal of Strategy and Management*, *14*(2), 129–149. https://doi.org/10.1108/JSMA-07-2020-0178

Reichstein, T., & Salter, A. (2006). Investigating the sources of process innovation among UK manufacturing firms. *Industrial and Corporate Change*, *15*(4), 653–682. https://doi.org/10.1093/icc/dtl014

Reid, G. C. (1995). Early-cycle behaviour of micro-firms in Scotland. *Small Business Economics*, *7*(2), 89–95.

Rochina-Barrachina, M. E., Mañez, J. A., & Sanchis-Llopis, J. A. (2010). Process innovations and firm productivity growth. *Small Business Economics*, *34*(2), 147–166. https://doi.org/10.1007/s11187-008-9110-5

Romer, P. (1986). Inceasing returns and long term growth. *Journal of Political Economy*, *94*(5), 1002–1037.

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *Stata Journal*, *9*(1), 86–136. https://doi.org/10.1177/1536867x0900900106

Roper, S. (1999). Modelling Small Business Growth and Profitability. *Small Business Economics*, *13*(3), 235–252. https://doi.org/10.1023/A:1008104624560

Rosenbusch, N., Brinckmann, J., & Bausch, A. (2011). Is innovation always beneficial? A meta-analysis of the relationship between innovation and performance in SMEs. *Journal of Business Venturing*, *26*(4), 441–457. https://doi.org/10.1016/j.jbusvent.2009.12.002

Saeed, S., Yousafzai, S., Paladino, A., & De Luca, L. M. (2015). Inside-out and outside-in orientations: A meta-analysis of orientation's effects on innovation and firm performance. *Industrial Marketing Management*, *47*, 121–133. https://doi.org/10.1016/j.indmarman.2015.02.037

Santarelli, E., Klomp, L., & Thurik, A. R. (2006). Chapter 3 Gibrat's Law: An Overview of the Empirical Literature. In *Entrepreneurship, Growth and Innovation* (pp. 41–73).

Santi, C., & Santoleri, P. (2017). Exploring the link between innovation and growth in Chilean firms. *Small Business Economics*, *49*(2), 445–467. https://doi.org/10.1007/s11187-016-9836-4

Saraf, N., Dasgupta, S., & Blettner, D. P. (2022). How do managerial perceptions of performance feedback affect innovation? *Strategic Organization*, *20*(3), 451–480. https://doi.org/10.1177/14761270211019484

Sarasvathy, S. D. (2001). Causation and Effectuation : Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency. *The Academy of Management Review*, *26*(2), 243–263.

Scherer, F. M., & Ross, D. (1990). *Industrial market structure and economic performance.* University of Illinois at Urbana-Champaign's Academy for entrepreneurial leadership historical research reference in entrepreneurship.

Schlichter, J., Klyver, K., & Haug, A. (2021). The moderating effect of ERP system complexity on the growth–profitability relationship in young SMEs. *Journal of Small Business Management*, *59*(4), 601–626. https://doi.org/10.1111/jsbm.12502

Schmalensee, R. (1987). *Inter-Industry Studies of Structure and Performance Inter-Industry Studies of Structure and Performance Handbook of Industrial Organization*. *April*.

Schneck, S., Werner, A., & Wolter, H. J. (2021). A replication study on growth paths of young firms: Evidence from German administrative data. *Journal of Business Venturing Insights*, *16*(October 2019), e00246. https://doi.org/10.1016/j.jbvi.2021.e00246

Schreyer, P. (2000). High-growth firms and employment. *OECD Science, Technology and Industry Working Papers 2000/03*, 139. http://ideas.repec.org/p/oec/stiaaa/2000-3-en.html

Schumpeter, J. A. (1934). The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle. In T. Publishers (Ed.), *The theory of economic development* (Vol. 42, Issue 2, pp. 249–259).

Schumpeter, J. A. (1942). *Capitalism, socialism and democracy* (Routeledge, Ed.). Routeledge.

Senderovitz, M., Klyver, K., & Steffens, P. (2016). Four years on: Are the gazelles still running? A longitudinal study of firm performance after a period of rapid growth. *International Small Business Journal: Researching Entrepreneurship*, *34*(4), 391–411. https://doi.org/10.1177/0266242614567483

Senyard, Davidsson, P., & Steffens, P. R. (2015). Environmental Dynamism as a Moderator of the Relationship Between Bricolage and Firm Performance. *Academy of Management Proceedings*, *2015*(1), 14893. https://doi.org/10.5465/ambpp.2015.14893abstract

Senyard, J., Baker, T., Steffens, P., & Davidsson, P. (2014). Bricolage as a path to innovativeness for resource-constrained new firms. *Journal of Product Innovation Management*, *31*(2), 211–230. https://doi.org/10.1111/jpim.12091

Sharfman, Wolf, M. P., Chase, G. ;, Tansik, R. B. ;, & David A. (1988). Antecedents Of Organizational Slack. *Academy of Management Review*, *13*(4), 601–614.

Sine, W. D., & David, R. J. (2003). Environmental jolts, institutional change, and the creation of entrepreneurial opportunity in the US electric power industry. In *Research Policy* (Vol. 32).

Singh, J. V, Tucker, D. J., & House, R. J. (1986). Organizational Legitimacy and the Liability of Newness. *Administrative Science Quarterly*, *31*(2), 171–193.

Sirén, C., Hakala, H., Wincent, J., & Grichnik, D. (2017). Breaking the routines: Entrepreneurial orientation, strategic learning, firm size, and age. *Long Range Planning*, *50*(2), 145–167. https://doi.org/10.1016/j.lrp.2016.09.005

Solano, G., Larrañeta, B., & Aguilar, R. (2020). Absorptive capacity balance and new venture performance: cultivating knowledge from regional clusters. *Technology Analysis and Strategic Management*, *32*(11), 1264–1276. https://doi.org/10.1080/09537325.2020.1760236

Sørensen, J. B. (2001). The Strength of Corporate Culture and the Reliability of Firm Performance. *Administrative Science Quarterly*, *47*(1), 70–91.

Soto-Simeone, A., Sirén, C., & Antretter, T. (2020). New Venture Survival: A Review and Extension. *International Journal of Management Reviews*, *22*(4), 378–407. https://doi.org/10.1111/ijmr.12229

Spanos, Y. E., & Lioukas, S. (2001). An examination into the causal logic of rent generation: contrasting Porter's competitive strategy framework and the resource-based perspective. *Strategic Management Journal*, *22*(10), 907–934. https://doi.org/10.1002/smj.174

Stam, E. (2010). Growth beyond Gibrat: Firm growth processes and strategies. *Small Business Economics*, *35*(2), 129–135. https://doi.org/10.1007/s11187-010-9294-3

Stam, E., & Wennberg, K. (2009). The roles of R&D in new firm growth. *Small Business Economics*, *33*(1), 77–89. https://doi.org/10.1007/s11187-009-9183-9

Steffens, P., Davidsson, P., & Fitzsimmons, J. (2009). Performance Configurations Over Time: Implications for Growth- and Profit-Oriented Strategies. *Entrepreneurship Theory and Practice*, *33*(1), 125–148.

Stiglitz, J. E. (1987). Learning to learn localized learning and technological progress. In P. Dasgupta & P. Stoneman (Eds.), *Economic policy and technological performance* (pp. 125–153). Cambridge University Press.

Stinchcombe, A. (1965). Social structure and organizations. In J. M. (Ed.) (Ed.), *Handbook of organizations* (pp. 142–193). Rand McNally.

Sutton, J. (1991). *Sunk Costs and Market Structure: Price Competition, Advertising, and the: Vol. I.*

Taleb, N. (2012). *Antifragile: How to Live in a World we don't Understand*. Allen Lane.

Teece, D. J. (1993). The Dynamics of Industrial Capitalism: Perspectives on Alfred Chandler's Scale and Scope. In *Source: Journal of Economic Literature* (Vol. 31, Issue 1).

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533. https://doi.org/10.1093/oso/9780198781806.003.0019

Teece, D., & Pisano, G. (1998). *The Dynamic Capabilities of Firms: an Introduction* (pp. 193–212). oxford university press.

Temel, S., & Forsman, H. (2022). Growth and innovation during economic shocks: A case study for characterising growing small firms. *Scandinavian Journal of Management*, *38*(4), 101220. https://doi.org/10.1016/j.scaman.2022.101220

Townsend, D. M., Hunt, R. A., McMullen, J. S., & Sarasvathy, S. D. (2018). Uncertainty, knowledge problems, and entrepreneurial action. *Academy of Management Annals*, *12*(2), 659–687. https://doi.org/10.5465/annals.2016.0109

Triguero, A., Córcoles, D., & Cuerva, M. C. (2014). Persistence of innovation and firm's growth: Evidence from a panel of sme and large spanish manufacturing firms. *Small Business Economics*, *43*(4), 787–804. https://doi.org/10.1007/s11187-014-9562-8

Tsai, K. H., & Yang, S. Y. (2013). Firm innovativeness and business performance: The joint moderating effects of market turbulence and competition. *Industrial Marketing Management*, *42*(8), 1279–1294. https://doi.org/10.1016/j.indmarman.2013.06.001

Tsai, K. H., & Yang, S. Y. (2014). The contingent value of firm innovativeness for business performance under environmental turbulence. *International Entrepreneurship and Management Journal*, *10*(2), 343–366. https://doi.org/10.1007/s11365-012-0225-4

Uhlaner, L. M., van Stel, A., Duplat, V., & Zhou, H. (2013). Disentangling the effects of organizational capabilities, innovation and firm size on SME sales growth. *Small Business Economics*, *41*(3), 581–607. https://doi.org/10.1007/s11187-012-9455-7

Un, C. A., & Asakawa, K. (2015). Types of R&D collaborations and process innovation: The benefit of collaborating upstream in the knowledge chain. *Journal of Product Innovation Management*, *32*(1), 138–153. https://doi.org/10.1111/jpim.12229

Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing*, *26*(3), 341–358. https://doi.org/10.1016/j.jbusvent.2009.09.004

Utterback, J., & Abernathy, W. (1975). A Dynamic Model of Process and Product Innovation. *Omega*, *3*(5), 639–656.

Vieites, Á. G., del Río, F. N., del Río, J. N., & GonzÁlez, J. L. C. (2013). A study of innovation activities and the role played by ownership structure in Spanish industrial companies. *Handbook of Research on Family Business, Second Edition*, 694–718. https://doi.org/10.4337/9781781009383.00045

Wales, W. J., Covin, J. G., Schüler, J., & Baum, M. (2023). Entrepreneurial orientation as a theory of new value creation. *Journal of Technology Transfer*, *48*(5), 1752–1772. https://doi.org/10.1007/s10961-023-10021-1

Wales, W. J., Parida, V., & Patel, P. C. (2013). Too much of a good thing? Absorptive capacity, firm performance, and the moderating role of entrepreneurial orientation. *Strategic Management Journal*, *34*, 622–633. https://doi.org/10.1002/smj.2026

Wang, H., Su, Z., & Zhang, W. (2019). Synergizing independent and cooperative R&D activities: the effects of organisational slack and absorptive capacity. *Technology Analysis and Strategic Management*, *31*(6), 680–691. https://doi.org/10.1080/09537325.2018.1543867

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

Wenzel, M., Stanske, S., & Lieberman, M. (2021). Strategic responses to crisis. *Strategic Management Journal*, *42*(2), O16–O27. https://doi.org/10.1002/smj.3161

Wernerfelt, B. (1984). A Resource-based View of the Firm. *Strategic Management Journal*, *5*(June 1982), 171–180.

White, H. (1982). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*, *50*(1), 817–838.

Whittaker, D. H., Fath, B., & Fiedler, A. (2020). Open to competition? Competitive density and the growth of young New Zealand ventures. *Australian Journal of Management*, *45*(2), 343–358. https://doi.org/10.1177/0312896219883914

Wiggins, R. R., & Ruefli, T. W. (2005). Schumpeter's ghost: Is hypercompetition making the best of times shorter? *Strategic Management Journal*, *26*(10), 887–911. https://doi.org/10.1002/smj.492

Wiklund, J., Baker, T., & Shepherd, D. (2010). The age-effect of financial indicators as buffers against the liability of newness. *Journal of Business Venturing*, *25*(4), 423–437. https://doi.org/10.1016/j.jbusvent.2008.10.011

Wiklund, J., & Shepherd, D. (2003). Knowledge-based resources, entrepreneurial orientation, and the performance of small and medium-sized businesses. *Strategic Management Journal*, *24*(13), 1307–1314. https://doi.org/10.1002/smj.360

Wiklund, J., & Shepherd, D. (2005). Entrepreneurial orientation and small business performance: a configurational approach. *Journal of Business Venturing*, *20*, 71–91. https://doi.org/10.1016/j.jbusvent.2004.01.001

Wilcox, J. (1971). A gambler's ruin prediction of business failure using accounting data. *Sloan Management Review*, *12*(3), 1–10.

Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, *24*(10 SPEC ISS.), 991–995. https://doi.org/10.1002/smj.318

Wolff, J. A., & Pett, T. L. (2006). Small-firm performance: Modeling the role of product and process improvements. *Journal of Small Business Management*, *44*(2), 268–284. https://doi.org/10.1111/j.1540-627X.2006.00167.x

Wooldridge, J. (2010). *Econometric analysis of cross section and panel data*. The MIT press.

Yang, T., & Aldrich, H. E. (2017). "The liability of newness" revisited: Theoretical restatement and empirical testing in emergent organizations. *Social Science Research*, *63*, 36–53. https://doi.org/10.1016/j.ssresearch.2016.09.006

Zahra, S. A., & Bogner, W. C. (2000). Technology strategy and software new ventures' performance: Exploring the moderating effect of the competitive environment. *Journal of Business Venturing*, *15*(2), 135–173. https://doi.org/10.1016/S0883-9026(98)00009-3

Zahra, S. A., & George, G. (2002). Absorptive Capacity : A Review , Reconceptualization , and Extension. *Academy of Management Review*, *27*(2), 185–203. https://www.jstor.org/stable/4134351

Zahra, S. A., & Hayton, J. C. (2008). The effect of international venturing on firm performance: The moderating influence of absorptive capacity. *Journal of Business Venturing*, *23*(2), 195–220. https://doi.org/10.1016/j.jbusvent.2007.01.001

Zahra, S. A., Neubaum, D. O., & Huse, M. (2000). Entrepreneurship in Medium-Size Companies : Exploring the Effects of. *Journal of Management*, *26*(5), 947–976.

Appendix A: Additional analyses chapter II

Table A.1. Results of hierarchical regression analysis for stablished firms (10 years and older)

Variable		Model 1	Model 2	Model 3	Model 4
Firm size(ln) t-1	*Coef*	-0.07450***	-0.07504***	-0.07849***	-0.07878***
	S.E	0.0065	0.0065	0.0069	0.0069
Employee Instability t-1	*Coef*	0.02100**	0.02024**	0.00217	0.00234
	S.E	0.0098	0.0099	0.0203	0.0203
R&D intensity t-1	*Coef*	0.75007***	0.75043***	0.74623***	0.74655***
	S.E	0.0223	0.0223	0.022	0.022
Foreign equity investment t-1	*Coef*	0.00005	0.00004	0.0001	0.0001
	S.E	0.0001	0.0001	0.0001	0.0001
Product standardisation	*Coef*	-0.01645**	-0.01635**	-0.01758**	-0.01792**
	S.E	0.0073	0.0073	0.0075	0.0075
New products	*Coef*	0.00005	0.00003	0.00007	0.00008
	S.E	0.0001	0.0001	0.0001	0.0001
Firm age	*Coef*	-0.02046**	-0.02071**	-0.01889**	-0.01888**
	S.E	0.0084	0.0084	0.0091	0.0091
year		*Included*	*Included*	*Included*	*Included*
activity sector		*included*	*included*	*included*	*included*
Region		*Included*	*Included*	*Included*	*Included*
Process innovation t-1	*Coef*		0.01654***	0.01736***	0.19035*
	S.E		0.0053	0.0064	0.1048
Environmental dynamism t-1	*Coef*			0.03377	0.03414
	S.E			0.037	0.0361
Competitive intensity t-1	*Coef*			-0.11670*	-0.0931
	S.E			0.067	0.0685
Process innovation t-1* Environmental dynamism t-0	*Coef*			0.00309	
	S.E			0.0359	
Process innovation t-1* Competitive intensity t-1	*Coef*				-0.18264*
	S.E				0.1106
Constant	*Coef*	0.52787***	0.52639***	0.61771***	0.59330***
	S.E	0.1244	0.1244	0.145	0.1457
Observations		26302	26302	24346	24346
R2		0.12061	0.12098	0.12532	0.12521
Difference R2		-0.01296	-0.01257	-0.01231	-0.01244
VIF		2.02	2.02	2.23	2.23

Analysis of sub-samples

We conducted a comparative analysis of high-technology (HMT) versus low- and medium-technology (LMT) firms[10]. In our analysis of high-technology (N=1524) and low-medium technology (LMT) firms (N=3442), using separate interaction models, we observed significant sector-based differences (Table A.2). LMT firms, as per Model 2, showed no significant effect of process innovation on sales growth, while high-tech firms displayed a negative impact (β=-0.03309, $p<0.1$). Model 3 reveals that for high-tech young firms, competitive intensity does not significantly interact with process innovation. However, high environmental dynamism correlates with increased sales growth in these firms when new processes are developed (β=0.25417, $p<0.05$). In contrast, Model 4 shows that in LMT young firms, the process innovation and competitive intensity interaction is positively significant (β=1.00798, $p<0.01$), but the interaction with market dynamism is not. These findings imply that industry characteristics influence how environmental turbulence affects the process innovation-growth relationship in young firms.

[10] HMT encompasses industries with high technological content, such as pharmaceuticals, machinery and equipment, computers, and electronic and optical products, as well as medium-high technology sectors, including electrical machinery, chemicals, motor vehicles, and transport equipment. On the other hand, LMT covers industries with lower technological intensity, such as textiles, food, tobacco, wood, and paper, along with medium-low technology sectors like rubber and plastics, basic metals, and other non-metallic mineral products.

Table A.2. Results of hierarchical regression analysis for LMT young firms and high-tech young firms

	Low Tech Firms				Medium and High-tech firms			
Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Employee Instability t-1	0.00055	0.00124	-0.11731**	-0.11446**	-0.04351	-0.04182	-0.06092	-0.06636
	0.0216	0.0216	0.0457	0.0458	0.0366	0.0366	0.0767	0.0765
R&D intensity t-1	0.68333	0.75213	0.2711	0.35263	2.67873***	2.70617***	2.59800***	2.59955***
	0.7038	0.7052	0.7279	0.7283	0.3264	0.3266	0.3465	0.3456
Foreign equity investment t-1	0.00059	0.00059	0.00069*	0.00070*	0.00003	0.00004	0.00011	0.00012
	0.0004	0.0004	0.0004	0.0004	0.0006	0.0006	0.0006	0.0006
Product standardisation	-0.0016	-0.00134	0.00995	0.00811	-0.00052	0.00185	-0.03198	-0.02675
	0.0205	0.0205	0.0222	0.0222	0.0333	0.0333	0.0387	0.0386
New products	-0.00007	0	0.0002	0.00007	0.0002	0.00029	0.00026	0.00023
	0.0005	0.0005	0.0006	0.0006	0.0008	0.0008	0.0009	0.0009
Firm size(ln) t-1	-0.19389***	-0.19240***	-0.16933***	-0.16876***	-0.21690***	-0.21327***	-0.22903***	-0.22666***
	0.018	0.018	0.0193	0.0193	0.0332	0.0332	0.0355	0.0353
Firm age	-0.00797**	-0.00791**	-0.00254	-0.00332	0.01664***	0.01686***	0.01607**	0.01642**
	0.0039	0.0039	0.0043	0.0043	0.0061	0.0061	0.0068	0.0068
year	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
activity sector	*included*	*included*	*included*	*included*	*included*	*included*	*included*	*included*
Region	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Process innovation t-1		-0.01982	-0.96236***	-0.02123		-0.03309*	-0.21631	-0.05845**
		0.0136	0.3309	0.0184		0.0199	0.509	0.0274
Environmental dynamism t-1			0.36565	0.63499**			0.87287**	0.94798**
			0.3344	0.3225			0.4396	0.4228
Competitive intensity t-1			0.21529**	0.18481**			0.08116	0.00035
			0.0852	0.0877			0.1404	0.1444

Process innovation t-1* Environmental dynamism t-1			1.00798***				0.20537	
			0.3499				0.5341	
Process innovationt-1 *Competitive Intensityt-1				0.06739				0.25417**
				0.0678				0.1093
Constant	1.18137***	1.17802***	0.03457	-0.21625	0.84735***	0.82916***	0.14641	0.06885
	0.1856	0.1855	0.3539	0.3443	0.3047	0.3047	0.4765	0.4642
Observations	4095	4095	3442	3442	1854	1854	1524	1524
R2	10.62%	10.68%	8.96%	8.71%	14.36%	14.53%	14.69%	15.10%
Difference R2	10.62%	0.06%	-1.72%	-1.97%	14.36%	0.18%	0.16%	0.57%

*Significances are represented by *** $p < 0.01$. ** $p < 0.05$. * $p < 0.1$.*

Appendix B: Additional analyses chapter III

Table B.1. Hazard model estimation results: negative growth persistence

	NEGATIVE GROWTH PERSISTENCE					
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
H2a: Number of new products $_{t-1}$	0.000200	0.000064			0.000965	0.000650
	(0.00123)	(0.00120)			(0.00162)	(0.00148)
H3a: Persistence in product innovation $_{t-1}$			-0.0237	-0.126***	-0.0833*	-0.0873*
			(0.0432)	(0.0452)	(0.0464)	(0.0483)
Total employes (ln) $_{t-1}$	0.0503***	0.0310**	0.0513***	0.0425***	0.0539***	0.0361***
	(0.0110)	(0.0132)	(0.0110)	(0.0129)	(0.0112)	(0.0129)
Age (ln) $_{t}$	0.00926	-0.00427	0.0213	0.0158	0.00898	0.00983
	(0.0259)	(0.0265)	(0.0199)	(0.0257)	(0.0258)	(0.0258)
Year (ln)	-34.66***	-36.60***	-37.07***	-34.08***	-34.25***	8.729
	(5.378)	(4.454)	(4.394)	(5.438)	(5.373)	(8.677)
Technological effort (ln) $_{t-1}$		-0.00477		0.000732		-0.00176
		(0.00633)		(0.00631)		(0.00623)
ROS $_{t-1}$		0.000186		0.000249		0.000315
		(0.000418)		(0.000377)		(0.000386)
R&D investment $_{t-1}$		0.0598		0.0754*		0.0797**
		(0.0402)		(0.0395)		(0.0397)
Process innovation $_{t-1}$		0.0404		0.0197		0.0272
		(0.0343)		(0.0336)		(0.0335)
Export intensity $_{t-1}$		0.000813		0.000611		0.000566
		(0.000638)		(0.000627)		(0.000613)
Constant	263.5***	278.4***	281.9***	259.1***	260.4***	-65.90
	(40.85)	(33.84)	(33.38)	(41.31)	(40.82)	(65.93)
year	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Activity sector	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Variance of the firm	0.0313***	0.0166*	0.0256***	0.0278***	0.0305***	0.0139*
	(0.00894)	(0.00847)	(0.00895)	(0.00858)	(0.00897)	(0.00803)
Observations	3,298	3,232	3,341	3,280	3,298	3,232
Log Likelihood	-2,228.99	-2,224.52	-2,327.34	-2,205.86	-2,227.39	-2,166.09
LR test (ρ=0)	17.10***	4.69**	10.90***	14.44***	15.96***	3.59**

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B.2. Hazard model estimation results: Positive growth persistence

	HAZARD: POSITIVE GROWTH PERSISTENCE					
VARIABLES	Model1	Model2	Model3	Model4	Model5	Model6
H2b: Number of new products $_{t-1}$	0.00251*	0.00255*			0.00373**	0.00343*
	(0.00150)	(0.00153)			(0.00182)	(0.00180)
H3b: Persistence in product innovation $_{t-1}$			-0.199***	-0.232***	-0.199***	-0.239***
			(0.0448)	(0.0474)	(0.0491)	(0.0518)
Total employes (ln) $_{t-1}$	-0.0808***	-0.103***	-0.0811***	-0.106***	-0.0786***	-0.105***
	(0.0102)	(0.0127)	(0.0113)	(0.0136)	(0.0116)	(0.0140)
Age (ln) $_{t}$	0.00311	0.0122	0.0295	0.0226	0.0227	0.0140
	(0.00531)	(0.0207)	(0.0222)	(0.0226)	(0.0226)	(0.0230)
Technological effort (ln) $_{t-1}$		0.00335		0.00469		0.00600
		(0.00839)		(0.00892)		(0.00909)
ROS $_{t-1}$		0.000313		0.000354		0.000358
		(0.000359)		(0.000342)		(0.000345)
R&D investment $_{t-1}$		0.0369		0.00972		0.00897
		(0.0408)		(0.00757)		(0.00773)
Process innovation $_{t-1}$		-0.00585		-0.0251		-0.0277
		(0.0316)		(0.0342)		(0.0347)
Export intensity $_{t-1}$		0.00136**		0.000526		0.000570
		(0.000613)		(0.000670)		(0.000681)
Year (ln)	-55.13***	-54.77***	-36.76***	-36.70***	-36.83***	-36.55***
	(4.450)	(4.574)	(3.984)	(4.166)	(4.039)	(4.227)
Constant	419.4***	416.7***	279.6***	279.2***	280.2***	278.1***
	(33.81)	(34.75)	(30.26)	(31.65)	(30.68)	(32.11)
year	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Activity sector	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Variance of the firm	0.0127*	0.0108	0.0202**	0.0180*	0.0214**	0.0198*
	(0.00771)	(0.00782)	(0.0102)	(0.0100)	(0.0105)	(0.0104)
Observations	5,461	5,256	5,504	5,363	5,373	5,245
Log Likelihood	-1,920.65	-1,833.37	-2,098.02	2,021.28	-2,063.35	-1,991.49
LR test (ρ=0)	3.31**	2.27**	5.06**	4.10**	5.41**	4.59**

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1