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Impact of initial business model on the growth trajectory of new technology-based firms: a path dependency perspective

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Abstract
Our study explores links between the initial business model design and the post-founding development of new technology-based firms (NTBFs) through a selection of recently established NTBFs across Sweden, Finland, and France (481 firms). The trajectory of these firms' performance has been observed and analyzed over the span of five years. The study examines the long-term effects of NTBFs' initial business model design on their development and the path dependency of these designs on future firm performance. Our results indicate that high-growth and stable NTBFs have distinct initial designs, implying that new firms' founders and their business design decisions have important consequences for subsequent NTBF development. Specifically, our study examines how business model characteristics impact the growth trajectory of NTBFs by empirically differentiating between the foundational characteristics of high-growth and stable NTBFs. We find that maintaining stable activity is linked to a low level of uniqueness, less demanding business objectives, and a lack of risk while high-growth is related to a larger early access to resources. We propose an explanation using path dependency literature, arguing how early business model choices predetermine long-term growth paths. Our research also provides valuable insights for stakeholders in designing targeted strategies for sustainable development.

Keywords High-growth firms · Stable firms · Founding business model · Path dependency · Imprinting mechanism · Post-founding success

JEL Classification L26 · M13 · M21 · O25 · O32 · O44

1 Introduction

The startup ecosystem traditionally prioritizes high-growth, disruptive companies with the potential to become the next "unicorn" startup (Atzmon et al., 2022; Kuratko & Audretsch, 2022). However, this narrow focus overlooks the significance of "stable" new firms in driving economic growth and job creation (Kuckertz et al., 2023). Entrepreneurship researchers have predominantly concentrated on high-impact "black swan" events in

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the entrepreneurial realm (Mahroum, 2016), despite initial public offerings and venture capital-backed high-growth firms comprising only a small percentage of new firms and job creation. This oversight disregards the crucial role that stable and sustainable small and medium-sized enterprises play in propelling economic growth (Aldrich & Ruef, 2018). Our study aims to redirect this focus by investigating factors supporting the stability and long-term success of new technology-based firms (NTBFs) as they navigate their post-founding phase.

From a conceptual point of view, path dependency theory, as proposed by Arthur (1994) and David (1985), posits that initial choices have lasting effects, influencing future outcomes (Bergek & Onufrey, 2014). Previous studies have explored how path dependency affects the founding process (e.g., Boxstael & Denoo, 2020; Snihur & Zott, 2020; Tornikoski & Renko, 2014) and post-founding growth (e.g., Bamford et al., 2000), but have not been very specific in specifying what impacts founding process and subsequent development. In this study, we introduce the notion of business model as one possible conduit through which path dependency works in NTBFs.

Indeed, while NTBFs' post-founding development is marked by diverse trajectories, including high growth, stable path, or failure, this variation can be attributed to the business models adopted by these firms. Business models play a critical role in extracting value from innovation, enhancing firm performance, and building organizational capabilities (Aversa et al., 2015; Chesbrough & Rosenbloom, 2002; Jacobides, 2006). However, these business models often lack clarity and undergo multiple iterations before firm establishment (Loch et al., 2008; Kessler et al., 2012). Recent studies have explored scalable and non-scalable business models (Nair & Blomquist, 2019; Nielsen & Lund, 2018) and their link to resilience (Buliga et al., 2016) and financial risk (Patzelt et al., 2008). Analyzing NTBFs' founding business models sheds light on their growth potential and long-term viability. The success of NTBFs hinges on their initial business models, which delineate how a startup intends to generate revenue from its products or services. A robust initial business model articulates the value proposition to customers, addresses market needs, and identifies avenues for scalability. Investors often scrutinize the initial business model to evaluate its viability and potential return on investment.

Applying path dependency theory in our context, we anticipate discovering differences in founding business models between stable and high-growth NTBFs. This investigation is crucial for technology transfer, as the stability and adaptability of NTBFs are central to the effective dissemination and application of new technologies. To this end, our study builds on previous research by investigating the influence of founding business model design on NTBFs' sustained development. We consider NTBFs to be founded when they have initiated business activities and generate revenue, thus identifying their founding business models. Specifically, we aim to understand NTBFs' post-founding trajectories by examining the developmental impact of founding business models. Guided by path dependency theory, our primary research question is: *To what extent do founding business models and their different elements explain why some NTBFs witness stable post-founding development while others witness high growth?*

To investigate our research question, we conduct a quantitative, exploratory study using a sample of 481 NTBFs established across Finland, France, and Sweden in 2013. Tracking their progress until 2018, corresponding to their first five years of operation, our findings suggest that certain elements of founding business models significantly influence subsequent NTBF development. Additionally, we observe distinct differences in founding business models between stable and high-growth NTBFs. Overall, our study provides some evidence supporting the utility of path dependency theory

in comprehending the lasting effects of founders' decisions on NTBFs' post-founding development. By identifying the characteristics and strategies enabling NTBFs to maintain positive activity over time and contribute to economic growth, this study provides valuable insights for policymakers, entrepreneurs, and researchers in their efforts to support the development of stable, job-creating startups. As such, our findings have practical implications for entities interested in investing in NTBFs, such as venture capitalists, as they underscore the importance of understanding the conditions under which NTBFs are founded.

The paper is organized as follows. Section 2 outlines the theoretical framework. Section 3 details the dataset, data collection methods, and analyzed variables. Section 4 presents the findings, and Sect. 5 discusses their implications. Finally, Sect. 6 presents the conclusions.

2 Theoretical framework

2.1 Growth and survival

Policymakers and researchers recognize NTBFs' significant impact on long-term economic growth (Spencer & Kirchhoff, 2006; Storey & Tether, 1998). High-growth NTBFs can spur job creation (Coad et al., 2014; Henrekson & Johansson, 2010), leading to policies favoring resource allocation for their support (Mason & Brown, 2013; Shane, 2009). However, critics highlight the potential unsustainability of high growth (Daunfeldt & Halvarsson, 2015) and difficulty in identifying high-growth firms early (Hölzl, 2009; Rannikko et al., 2019; Storey, 1994). Evolving firm growth theories include neoclassical, transaction cost, and Penrose's theories. Modern economic theory, emphasizing competition and rapid technological change, aligns with contemporary growth and industrial understanding. This concurs with Schumpeter's concept of capitalism as "creative destruction." Alchian (1950) argues for the economic progress-driving mechanism of successful firm survival and growth, contrasting with the exit of less viable firms. However, new firms face challenges, with average survival rates around 50–55% (Dunne et al., 1989; Löfsten, 2016; van Praag, 2003). In 2005, the five-year survival rate for EU-founded enterprises was 46.4% (Eurostat, 2014), making survival and growth critical for economic development.

Policymakers acknowledge high-growth NTBFs' role in driving economic growth through R&D investments and innovative products (Martínez-Ros & Labeaga, 2009; García-Manjón and Remero-Merino, 2012). Several studies focus on NTBFs and early processes and support (Davidsson & Klofsten, 2003) as well as on the human capital side of NTBFs (De Cleyn, et al., 2015). However, high-growth NTBFs remain uncommon (Autio & Rannikko, 2016). Typically, small firms exhibit tent-shaped growth rate distributions, implying limited high-growth instances (Coad & Hölzl, 2009). High-growth firms struggle to maintain growth over time (Coad, 2007; Coad & Hölzl, 2009), and are often labeled "temporarily unstable populations" (Delmar et al., 2003).

With this focus on high-growth firms, firms that maintain stability over time have received little attention, despite their economic importance. Although much is known regarding these firms' survival rates, how and why they achieve stability is less understood. To address this knowledge gap, this study applies path dependency theory to investigate the characteristics of founding business models that may influence NTBF development over

time. Specifically, we explore the relationship between NTBFs' founding business models and subsequent development, focusing on both high-growth and stable firms.

2.2 Path dependency and initial conditions

We adopt path dependency theory to explore how new firms' founding business models affect subsequent development, and whether these firms experience high growth or stability. The path dependency theory posits that past decisions and actions influence future ones, leading to a similar developmental pattern. This suggests that a system has a memory that shapes its future development. However, path dependency is not a clearly defined concept (Djelic & Quack, 2007; Morgan & Kubo, 2005; Pierson, 2000), and collecting acceptable empirical evidence for it can be challenging (Vergne & Durand, 2010).

Scholars such as David (1985), Arthur (1989), North (1990), Witt (1997), Rusko et al. (2019), Sydow et al. (2020), Cloutier and Messeghem (2021), Samuelsson et al. (2021), Ben-Hafaïedh and Hamelin (2022), and Hepp (2022) have been widely discussing this theory in the context of technological change. NTBFs are considered successful when they begin operations and generate sales revenue, at which point, past decisions regarding market access result in a founding business model. This model, validated by market success, continues to influence future decisions and determines a firm's development path**.**

Stinchcombe (1965) presents supporting ideas when arguing that a new organization's performance is significantly affected by the conditions and events surrounding its founding. Empirical evidence shows that founding conditions affect organizations over time (e.g., Boeker, 1988, 1989; Kimberly, 1975; Pennings, 1980; Tucker et al., 1990). Consequently, founding conditions are important sources of path dependency and imprinting effects for new firms at their inception (Romanelli, 1989). Moreover, imprinting can be understood as a founder-driven process for new firms (Johnson, 2007; Simsek et al., 2015). Founders' decisions when establishing a firm have long-term effects on firm development (Bamford et al., 2004). Thus, previous studies have proposed or discovered firm founders' imprint routines (Phillips, 2002), structures (Phillips, 2005), strategies (Boeker, 1989), capabilities (Klepper, 2002), values (Leung et al., 2013), and networks (Marquis, 2003; McEvily et al., 2012; Milanov & Fernhaber, 2009).

Why a firm's initial founding conditions and events shape its developmental trajectory is rooted in path dependency (Boeker, 1989). Once a firm establishes its initial strategies and configurations, the tendency to preserve these initial choices makes deviating from them difficult (Miller & Friesen, 1984; Quinn, 1980). This can be problematic for new firms if founders become overly optimistic and commit to decisions that ultimately hinder a firm's ability to adapt and adjust during its development (Cooper et al., 1988). Once an NTBF initiates operations and generates sales revenue, choices made during its founding will shape its development path (Sydow et al., 2009).

Research on new firms commonly assumes that high-growth firms are successful and low-growth firms are failures. However, this ignores the importance of firms that maintain stability over time, which do not qualify as high-growth firms. Accordingly, policymakers and researchers have paid little attention to these stable firms' economic importance and survival rates. Previous research has primarily focused on identifying high-growth firms' characteristics or determinants (e.g., Siegel et al., 1993; Barringer et al., 2005; Moreno & Casillas, 2008; Audretsch, 2012; Bianchini et al., 2017; Moschella et al., 2019; Rydehell

et al., 2019a), which can be related to growth opportunities, ability, and motivation (Löfsten & Lindelöf, 2001, 2002). However, growth orientation cannot sufficiently explain new firm growth, particularly in uncertain and unstable environments (Autio et al., 2000; Christensen & Raynor, 2013; Yli-Renko et al., 2002).

Some entrepreneurs refrain from pursuing certain growth strategies for non-economic reasons, such as employee well-being or the risk of losing control (Wiklund et al., 2003). Isaksson et al. (2021) analyze how initial business models in NTBFs influence their growth intentions and strategies. They underscore the significance of key partners, activities, resources, and value propositions in shaping the firm's strategic orientation towards growth. Notably, while Isaksson et al. (2021) identify critical differences in the business model components between high-tech manufacturing and knowledge-intensive firms, they report minimal direct correlations between the specific design of the business model and actual early growth outcomes. This suggests that, although the choice of business model elements is strategic, it does not necessarily translate into a willingness or capability for growth. Thus, it aligns with the notion that not all founders aim to expand their new businesses rapidly or extensively (Napier et al., 2012; Storey, 1994), pointing to a nuanced understanding of growth strategies where the willingness to grow is as pivotal as the strategic choices made in the business model design. We push this study further by exploring longer term growth outcomes.

According to Kirchhoff (1994), a lack of motivation and resources can impede innovative small firms' development. Research shows that founders' attitudes toward growth play a significant role in entrepreneurial firms' performance (Autio et al., 2000; Isaksson et al., 2013; Wiklund & Shepherd, 2003). Rydehell et al. (2019b) highlights the relationship between founders' growth orientation and actual growth. However, whether this relationship also applies to perceived performance (i.e., compared to the founders' goals) remains unclear. A firm's perceived performance can be influenced by unrealistic expectations at its inception (Rydehell et al., 2019b); however, not all entrepreneurs aspire for high growth (Gartner & Liao, 2012; Wiklund et al., 2003). Research also shows that founders may differ in their attitudes toward growth (Gartner & Liao, 2012; Kirchhoff, 1994; Wiklund et al., 2003), which should be considered when examining high-growth firms' characteristics and determinants (e.g., Siegel et al., 1993; Barringer et al., 2005; Moreno & Casillas, 2008; Audretsch, 2012; Bianchini et al., 2017; Moschella et al., 2019).

The discussion above highlights the crucial role that founders' aspirations and motivations play in shaping a new firms' developmental trajectory (Löfsten & Lindelöf, 2002; Yli-Renko et al., 2002). The decisions founders make at a new firm's inception, such as the type of business model adopted, likely have lasting effects on firm development. This aligns with path dependency and imprinting mechanism theories, which suggest that the choices made during a firm's early stages shape its future trajectory. However, while these theories provide insight into the potential impact of founders' decisions, they offer little guidance on what specific elements of a founding business model may have the most significant effects on new firm development. To address this gap, our study explores what elements of founding business models, if any, have an imprinting effect on subsequent new firm development. Through an explorative examination of the types of decisions entrepreneurs can make regarding new firms' founding business models, our study aims to provide a more nuanced understanding of the relationship between founding business models and new firm development.

Based on imprinting effects Snihur and Zott (2020) identify how founders achieve novelty imprinting, which they conceive as imprinting processes that result in and explain how cognitive imprints reinforce structural imprints in the context of business model

innovation. Other researchers studying the connection between organizational models and high-tech firms found that the employment relations models firm founders adopt shape how human resource management evolves, with a strong path dependency in the development of employment systems. Baron et al. (2001) find that changes in organizational leaders' accepted employment models increase turnover, thereby affecting subsequent organizational performance.

Our study demonstrates the utility of path dependency theory in understanding how founders' decisions regarding founding business models have imprinting effects on NTFBs' post-founding development. A business model delineates the manner in which a company generates, delivers, and enhances value (Amit & Zott, 2001; Osterwalder et al., 2005). In our study's context, the founding business model pertains to the framework of a nascent firm concerning its surroundings (Chesbrough & Rosenbloom, 2002). We hypothesize that low-growth, stable activity is not on the same continuum as high firm growth, which is inherently prone to instability. Stable, low-growth firms could benefit from being embedded in an entrepreneurial ecosystem to face difficulties despite their weaknesses. This same ecosystem might hinder high-growth companies, giving them less control and flexibility over their activities; however, if they assume their risk, they might have more freedom to differentiate themselves from competitors.

3 Sample and method

To investigate the relationship between a new firm's founding business model and its development, we mixed survey data (to collect information in the business model elements) with registry data (to gather annual financial records). We used logistic regression to analyze the connection between founding business models and subsequent development.

3.1 Definition of new technology-based firms

We used the NACE Rev. 2 classification to identify NTBFs, categorizing firms by R&D expenditure to value-added ratio. Our focus was on technology intensity, encompassing high-tech manufacturing, mid-tech manufacturing, and knowledge-intensive service industries. Notably, for knowledge-intensive services, we recognize that R&D expenditures are not the sole indicator of their intensity. Consistent with the Eurostat's high-tech classification, knowledge-intensive services can also be characterized by the proportion of employees with higher education degrees, reflecting their reliance on intellectual capabilities and expertise (Eurostat, n.d.). This broader definition allows for a more inclusive identification of NTBFs across various sectors, aligning our approach with prior research (Butchart, 1987; Daunfeldt et al., 2015; Ejermo & Xiao, 2014).

We conducted telephone surveys with 589 NTBFs founded in 2013 across Finland, France, and Sweden to gather business model information. We obtained annual financial records from founding to 2018 via official registries. Employing logistic regression, we explored the connection between founding business models and long-term success factors. Further details are available in Appendix Table 6.

3.2 Data collection

3.2.1 Initial data collection about the founding business model

Initially, we identified firms registered in 2013 within our target industries through business registries. Our second step involved conducting a telephone survey in early 2016. This timing was strategically chosen to ensure the firms had been operational long enough for their foundational business models to be established, typically a span of two to three years, which we considered an adequate period for meaningful data collection. In addition, surveying the firms in 2016 allowed targeting them in a phase where their business models were neither too nascent to reflect mere aspirations nor too matured to have significantly deviated from their original concepts. Business model configuration is often established through trial-and-error learning (Andries et al., 2013; Berends et al., 2016). Surveying firms after months of existence ensures that the founders provide insights about a business model on which they engaged enough time and energy to become path dependent while being, at the same time, very close to its initial implemented configuration. The survey yielded 589 responses, with 481 meeting our criteria for inclusion in the analysis.

Overall, selecting Sweden, Finland, and France allowed us to gather a diverse and representative sample of NTBFs, providing a strong foundation for our research and making our findings more generalizable to the broader European industrial sector. We selected firms from Sweden, Finland, and France to ensure the relevance of our results to the European industrial sector. These countries were chosen for several reasons. First, they have a strong history of innovation and entrepreneurship, with Sweden and Finland known for their high-tech industries (Autio et al., 2014; Balawi & Ayoub, 2022), and France having a thriving startup ecosystem (Davies, 2022), making them ideal for studying NTBF development. Second, they offer a diverse range of cultural and economic environments, providing a comprehensive understanding of the factors that influence NTBFs. Third, they have developed infrastructures for innovation and entrepreneurship, including access to funding, training, and mentoring programs, supporting NTBF growth and development. Finally, the availability and quality of data in these countries is excellent, allowing us to track the development of NTBFs over time. Selecting these countries enhances the validity and reliability of our findings. To study French NTBFs, we focused on the Rhône-Alpes region, known for its high business activity and concentration of cities and industrial centers, such as Lyon and Grenoble. Its business register provided a comprehensive sample, improving the robustness of our findings.

We chose our sample selection criteria carefully to ensure the data accurately represents the population of interest. We only included firms organized as limited companies, as this legal structure clearly separates the firm from the individual and eliminates hobby firms from our sample. Additionally, detailed annual report data is typically only available for limited companies, making this structure more suitable for our study. By limiting our sample in this way, ensured a more robust and representative dataset, ultimately strengthening the validity of our findings. To ensure the homogeneity of our sample, we took several measures to control for heterogeneity among new firms. As Wennberg (2005) and Davidsson (2007) note, the characteristics and origins of new firms can vary greatly. Thus, we focused on independent firms that started as “de novo” entities, rather than spin-offs from existing businesses or other types of startups. Furthermore, to ensure that the sample firms were operationally active, we only included those that were registered in a specific year (2013), active (i.e., not deregistered or liquidated), and liable for value added tax and tax

prepayment. These measures allowed us to create a sample of firms that were truly independent, operationally active, and representative of the studied population.

This sample represented 18.8% of all NTBFs established in 2013 in the geographical areas of study. This response rate is consistent with previous mail surveys of small and medium-sized firms (Chandler & Hanks, 1994; McDougall et al., 1994; Yli-Renko et al., 2001). The non-respondents included firms that were inactive, could not be located, or chose not to participate without providing a specific reason. We found that the performance of non-respondents did not differ significantly from that of the firms in our sample, indicating that our results are generalizable to the population of NTBFs in the studied geographical areas. In the Appendix, Tables 7 and 8 respectively provide the response rates for each country and an analysis of the non-responses. Table 8 shows that firms decided not to report on their performance for reasons other than the characteristics of their founding business model.

3.2.2 Performance data and screening criteria

In 2020, we conducted a follow-up study to assess the growth and performance of our sample firms. Data were collected from reliable sources including the Retriever Business database (Sweden), Voitto + database (Finland), and Rhône-Alpes business register (France). These trusted sources maintained by organizations such as Asiakastieto Oy and French commercial courts ensured accurate, up-to-date, and comprehensive performance data.

We employed rigorous screening to ensure our sample represented genuine "de novo" firms. Firms reporting their business as "a purchase or takeover of an existing business" were excluded (44 firms). Additionally, 64 firms without established founding business models or initial sales were excluded. Data availability issues led to 75 firms being excluded, resulting in a final sample of 406 observations with performance and business model information. This meticulous screening process ensured that true independent start-ups were represented in our sample.

3.3 Questionnaire design and administration

To ensure reliable and valid data collection, we collaborated with TNS-Sifo, a leading research agency, to conduct telephone interviews in March 2016 across all three study countries. This approach enhanced data quality and control. Experienced professional callers, chosen randomly, were employed to further bolster data reliability. Telephone interviews yielded high response rates and minimized question misinterpretation risks. Interviewers were trained to guide respondents through the survey, reducing confusion.

Our survey development followed a two-step process. We initiated discussions with entrepreneurs to identify key resource dimensions for quantitative measurement. Thorough pre-testing and questionnaire modifications occurred through telephone discussions with firms to eliminate uncertainties. TNS-Sifo reviewed the questionnaire for language and clarity, enhancing result validity.

Interviews were monitored and recorded to ensure response consistency and quality. The master questionnaire was initially developed in English and later translated by proficient researchers into Swedish, Finnish, and French. Six NTBFs participated in a telephone pre-test to identify uncertainties and refine the survey. A pilot study with 26 NTBFs assessed questionnaire effectiveness. A pre-test in each country enhanced question clarity. Our research design prioritized reliability and validity in the data collection process.

3.4 Variables

3.4.1 Dependent variables

In the conceptual section of this paper, we suggest that firms witnessing stable and high-growth development are, by nature, different from inception. For this reason, we analyze the correlations between the business model characteristics and the firm trajectories in a different set of analyses, with two different dependent variables: a dichotomous measure for stable firms and one for high-growth firms.

(1) *Stable firms*: We identified stable firms as those consistently reporting positive sales over at least three consecutive years: 2014–2016, 2015–2017, or 2016–2018 (294 firms in the sample). Stability was determined by consistent reporting, excluding firms with irregular activity reporting, failed firms, or those missing activity reports.

(2) *High-growth firms*: Eurostat and OECD (2007) suggest defining high-growth firms as those with a minimum of ten employees in the founding year and an annualized employment growth surpassing 20% over three years (Hölzl, 2014). However, Coad et al. (2014) and Halabinsky et al. (2006) propose defining high-growth as those achieving at least 50% sales growth across three financial years. In our study, high-growth status was assigned to firms reporting sales for three consecutive years (meeting stability criteria) with an average annual growth rate exceeding 50% (103 firms in the sample). We calculated year-to-year growth (2014–2015, 2015–2016, 2016–2017, and 2017–2018), and the high-growth dummy was assigned if the four-period average exceeded 50%. Figure 1a presents the average annual sales growth distribution, showing sparse values above 50%. Our sample comprised three groups: (1) Non-stable firms, (2) Stable firms, and (3) High-growth firms. Figure 1b displays total sales distribution, accounting for new firms' inherent small initial values. To avoid disproportionate effects of extreme values, we dichotomized high growth (above/below 50%). Median annual growth for NTBFs in the sample was 18%.

3.4.2 Independent variables

We focused on founders' decisions regarding the design of their business, specifically the founding business model. This area of interest is particularly relevant, as new firms often encounter a high uncertainty in terms of markets and technologies (Andries et al., 2013), which poses challenges when deciding on a business model (Trimi & Berbegal-Mirabent, 2012). Furthermore, the technological uncertainties inherent in new firms' products, services, and processes exacerbate these difficulties (Bollinger et al., 1983; Storey & Tether, 1998).

A business model is a description of how a firm creates, delivers, and adds value (Amit & Zott, 2001; Osterwalder et al., 2005). In the context of our study, the founding business model refers to the architecture of a new firm in relation to its environment (Chesbrough & Rosenbloom, 2002). Founding business models also reflect the market knowledge and resources that a firm can acquire and utilize (Andries & Debackere, 2007, 2013).

A new firm's architecture is commonly described in relation to its environment by dividing its business model into nine interconnected elements: value proposition, target customer segments, customer relationships, distribution channels, revenue streams, vital resources, key activities, strategic partners, and cost structure (Osterwalder et al., 2005).

When designed effectively, these elements determine how a firm interacts with current and potential customers and organizes its internal operations and supply chain to meet customer needs (Sohl et al., 2020). The nine business model elements are represented by independent variables grouped into nine categories (Osterwalder & Pigneur, 2010):

(1) *Value proposition* was measured using three five-point scales: differentiation from competitors, pricing relative to industry peers, and product quality.
(2) *Customer segment* was assessed through three dummy variables: customer size, payers, and exporting.
(3) *Customer relationship* was measured using a five-point scale reflecting the proximity of a firm's relationship with primary customers.
(4) *Channel* was represented as a dummy variable indicating direct customer interaction.
(5) *Revenue streams* were denoted by a dummy variable for multiple revenue sources.
(6) *Key activities* were a measure comprising three five-point scales evaluating the extent of internalization for expertise, technology, production, and sales-related functions.
(7) *Cost structure* was a measure comprising two five-point scales reflecting the dominance of fixed costs and economies of scale in production.
(8) *Key partners* were quantified by averaging the number of different partner types, such as suppliers, subcontractors, distributors, local authorities, and universities.
(9) *Key resources* were assessed through two five-point scales gauging a firm's advanced expertise and recognition, along with counting external funding sources, such as banks, venture capital, crowdfunding, or public sources.

In operationalizing the components of founding business models, our methodology employed a nuanced approach by distinguishing between reflective, formative, and single-item measures to capture the multifaceted nature of new firm development. Reflective measures were strategically applied to constructs such as the value proposition and customer relationships, where the underlying concept is believed to cause the observed indicators, ensuring coherence and inter-correlation among these indicators, reflective of the firm's strategic emphasis (Jarvis et al., 2003). This approach underscores the reflective nature of these variables, where changes in the construct are expected to be mirrored by all indicators. Formative measures were utilized for constructs where indicators collectively contribute to the formation of the latent variable, as seen in key activities and cost structure. These components independently affect the business model, highlighting the formative nature of these variables where each aspect contributes uniquely to the construct, necessitating a composite measure to account for the diverse elements (Diamantopoulos & Winklhofer, 2001).

Lastly, single-item measures were applied to straightforward constructs, where a singular, well-defined indicator sufficiently captures the construct's nature, such as channel and revenue streams. This decision, guided by the need for parsimony and the aim to reduce respondent burden, did not compromise the depth of insights into the founding business models' influence on firm development (Edwards & Bagozzi, 2000).

Together, these methodological choices, reflective measures for strategic emphasis constructs, formative measures for composite business model elements, and single-item measures for straightforward constructs, ensure a robust and nuanced understanding of how foundational business model elements drive new firm growth and evolution.

3.4.3 Control variables

We included four control variables to isolate the effects of different settings (i.e., all chosen variables may be associated with NTBF sales growth, in addition to the chosen independent variables): *(1) Type of goods for sales* measured on a five-point scale whether firms were selling "only products" (1), "Mainly products" (2), "Products and services equally" (3), "Mainly services" (4) or "Only services" (5); *(2) Growth satisfaction* as a composite measure of how satisfied the founder was with the time required to commercialize the product or service, with an increase in sales, business profitability, and employment; (3) *Startup experience*; and (4) *Industry experience* of the founders (dummies). We used dummies to assess whether founders had experience in startups ("true" if they had founded a prior business) or in the industry ("true" if the number of years of experience was greater than (5) To address the highly skewed distribution in our sample. We did not choose one year as the threshold, because 94% of the respondents had at least some prior industry experience.

4 Results

4.1 Descriptive statistics

Table 1 presents the descriptive statistics for our initial sample of NTBFs (complete observations, minus respondents screened out; $N=481$), for the complete dataset after collecting performance measures in the follow-up study in 2020 ($n=406$), and for the group of stable firms ($n=294$). Overall, the values are very similar across groups, suggesting that a firm's founding business model and its different elements, as measured in 2016, had little to no effect on subsequent firm development (follow-up and stable firms).

Table 2 shows the correlations between variables in our model. No major multicollinearity issues were found overall, although some business model elements were somewhat correlated. The highest correlation was 0.36, between the number of external sources of funding and number of key partners. To avoid spurious effects due to some collinearity between variables, we ran our two models with each business model element separately and all elements together.

4.2 Regression analysis

The next step was the regression analysis. Table 3 presents the results of the logistic regression to assess the correlations between the business model measurements and three-year positive sales reporting (at least) to identify stable NTBFs. Blocks 1–9 present the different business model elements individually. Model 10 aggregates all business models elements. The results were consistent across models. Product quality was strongly significantly correlated was a lower likelihood of reporting stable sales ($\beta=-0.925$; p-value <0.001), as was customer size (many small clients, as opposed to a few big clients; $\beta=-0.661$; p-value <0.05). Key activities (higher value means that more firm's activities are done externally; $\beta=0.481$; p-value <0.05) and key resources (higher value means a firm's expertise is more advance and their reputation is better; $\beta=0.498$; p-value <0.001) were associated with a higher likelihood of reporting stable sales. Thus, the NTBFs in our sample were more likely to achieve stable sales (as opposed to non-stable sales) when characterized by

Table 1 Descriptive statistics

N	Initial sample (1)		Follow-up		Stable firms	
	481		406		294	
	Mean	SD	Mean	SD	Mean	SD
1. High-growers	0.24	0.43	0.23	0.42	0.32	0.47
2. Stable reporting	0.72	0.45	0.72	0.45	1	0
3. Product or service	3.95	1.26	3.93	1.26	3.96	1.28
4. Growth satisfaction	3.66	0.89	3.64	0.91	3.77	0.88
5. Startup experience	0.58	0.49	0.57	0.50	0.57	0.50
6. Industry exp. (> 5y)	0.87	0.33	0.86	0.35	0.87	0.34
7. Diff. with compet	3.05	1.27	3.03	1.25	3.04	1.22
8. Pricing	2.70	0.98	2.68	1.00	2.73	0.95
9. Product quality	4.03	0.98	4.02	0.98	3.90	0.98
10. Customer size	0.33	0.47	0.32	0.47	0.27	0.44
11. Payers	0.23	0.42	0.23	0.42	0.22	0.41
12. Exporting	0.42	0.49	0.42	0.49	0.44	0.50
13. Dist. to customers	4.30	0.94	4.31	0.92	4.35	0.87
14. Channels	0.85	0.35	0.86	0.35	0.86	0.35
15. Revenue sources	0.44	0.50	0.44	0.50	0.43	0.50
16. Key activities	1.78	0.73	1.77	0.72	1.81	0.74
17. Cost structure	3.14	1.20	3.14	1.21	3.07	1.22
18. N partner types	1.15	1.01	1.15	1.00	1.16	0.99
19. Key resources	3.42	0.96	3.40	0.95	3.51	0.92
20. External funding	0.51	0.88	0.50	0.87	0.47	0.85

The initial sample contains all the observations collected through the phone survey, minus the respondents that were note new independent startup and who hadn't had their first sales yet at the time of survey (screening questions); the follow-up sample contains the complete observations included in the model after collecting performance data in 2020; the stable firms contains the subsample of firms that are stable (i.e. who reported positive sales for at least three years in a row, during the study period)

lower product quality, having few big clients, higher externalization of key activities, and better resources (more advanced expertise and a better reputation).

Table 4 focuses on the stable firms (reported positive sales for at least three consecutive years) and predicts which business model elements are correlated with a high-growth development path. The results were consistent across models. Two business model elements were correlated with high-growth. External funding (higher value means more funding sources) was associated was a higher likelihood of reporting high growth ($\beta = 0.576$; p-value < 0.01), as were revenue streams (higher value means higher diversity in revenue streams; $\beta = 0.865$; p-value < 0.01). Overall, the NTBFs in our sample were more likely to achieve an average annual growth above 50% (as opposed to stable sales) when they were characterized by more diverse revenue streams and funding sources.

Table 2 Correlation table

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. High-growers	1																			
2. Stable reporting	0.34	1																		
3. Product or service	-0.11	0.04	1																	
4. Growth satisfaction	0	0.23	0.19	1																
5. Startup experience	0.08	0	-0.17	-0.17	1															
6. Industry exp. (>5y)	-0.1	0.04	0.14	0.04	0.03	1														
7. Diff. with compet.	0.16	0	-0.29	-0.21	0.13	-0.03	1													
8. Pricing	0.05	0.07	0.05	0.1	0.04	0.05	0.02	1												
9. Quality	-0.04	-0.19	-0.02	0.12	-0.04	0.05	0.07	0.26	1											
10. Customer size	0.05	-0.19	-0.11	-0.25	0.07	-0.14	0.05	-0.1	-0.03	1										
11. Payers	-0.01	-0.03	-0.03	-0.08	-0.02	-0.04	0.04	-0.05	-0.02	-0.05	1									
12. Exporting	0.14	0.05	-0.18	0.1	0.15	0.01	0.11	0.02	0.13	0.08	0.06	1								
13. Customer relationship	-0.05	0.08	0.04	0.24	-0.07	0.12	-0.1	0.1	0.11	-0.22	-0.05	-0.07	1							
14. Channels	-0.1	-0.01	0.14	0.04	-0.06	0.05	-0.03	0.02	-0.06	-0.04	-0.02	-0.06	0.16	1						
15. Revenue streams	0.17	-0.04	-0.14	-0.11	0.04	-0.08	0.15	-0.04	0.03	0.11	0.05	0.08	-0.06	-0.08	1					
16. Key activities	0.07	0.09	-0.16	-0.09	0.07	0.05	0.04	0.06	0	0.07	-0.01	0.11	-0.05	-0.14	0.06	1				
17. Cost structure	0.03	-0.09	-0.27	-0.11	0.09	-0.1	0.11	-0.12	0.02	0.15	0.11	0.12	-0.02	0.02	0.06	0	1			
18. N partner types	0.12	0.02	-0.27	-0.01	0.14	0	0.17	0.01	0.07	0.08	0.06	0.2	0.05	-0.18	0.17	0.28	0.17	1		
19. Key resources	0.07	0.19	-0.02	0.24	0.06	0.08	0.18	0.15	0.22	-0.1	-0.09	0.09	0.15	-0.04	-0.02	0.02	0.07	0.08	1	
20. External funding	0.22	-0.07	-0.24	-0.17	0.09	-0.11	0.32	0.06	0.04	0.21	0.03	0.21	-0.08	-0.06	0.08	0.19	0.3	0.36	0.05	1

The correlation matrix is based on the sample of the follow up study (N = 406). Correlation underlines are significant at $p < .05$

Table 3 Predictors of stable firms between the business model elements and three-year positive sales reporting (at least)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Product or service	0.009	0.002	0.000	0.003	−0.005	0.036	−0.033	0.007	−0.004	0.022
	(0.101)	(0.096)	(0.094)	(0.095)	(0.095)	(0.096)	(0.097)	(0.097)	(0.097)	(0.111)
Growth satisfaction	0.769***	0.487***	0.566***	0.580***	0.577***	0.619***	0.574***	0.577***	0.481***	0.592***
	(0.148)	(0.136)	(0.133)	(0.130)	(0.130)	(0.132)	(0.130)	(0.130)	(0.134)	(0.161)
Startup experience	0.181	0.221	0.229	0.221	0.227	0.207	0.243	0.218	0.184	0.082
	(0.250)	(0.245)	(0.239)	(0.239)	(0.239)	(0.240)	(0.240)	(0.240)	(0.243)	(0.267)
Indus. exp. (> 5y)	0.288	0.070	0.180	0.199	0.191	0.132	0.168	0.192	0.104	−0.058
	(0.336)	(0.331)	(0.326)	(0.324)	(0.324)	(0.327)	(0.324)	(0.324)	(0.328)	(0.362)
Diff. with compet	0.171									0.149
	(0.101)									(0.113)
Pricing	0.272*									0.227
	(0.122)									(0.130)
Quality	−0.781***									−0.925***
	(0.155)									(0.165)
Customer size		−0.689**								−0.661*
		(0.246)								(0.272)
Payers		−0.148								0.009
		(0.275)								(0.302)
Exporting		0.169								0.304
		(0.248)								(0.274)
Customer relationsh			0.055							0.095
			(0.123)							(0.138)
Channels				−0.098						−0.148
				(0.336)						(0.375)
Revenue streams					−0.087					0.005
					(0.232)					(0.259)

Table 3 (continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Key activities						0.434*				0.481*
						(0.183)				(0.210)
Cost structure							−0.151			−0.106
							(0.100)			(0.117)
N partner types								0.034		0.027
								(0.120)		(0.144)
Key resources									0.355**	0.498***
									(0.126)	(0.145)
External funding									−0.139	−0.191
									(0.134)	(0.166)
Constant	−0.147	−0.741	−1.561*	−1.313	−1.316*	−2.348**	−0.739	−1.435*	−2.022**	−0.663
	(0.948)	(0.688)	(0.745)	(0.674)	(0.655)	(0.758)	(0.760)	(0.654)	(0.726)	(1.314)
Observations	406	406	406	406	406	406	406	406	406	406
Log Likelihood	−211.659	−224.059	−227.940	−227.995	−227.968	−225.021	−226.873	−227.997	−223.745	−196.666
AIC	439.319	464.117	467.880	467.989	467.937	462.042	465.746	467.993	461.490	431.332

$p < .05$; **: $p < .01$; ***: $p < .001$. Stable firms are firms who reported positive sales for at least three years in a row, during the study period (i.e. active and surviving firms)

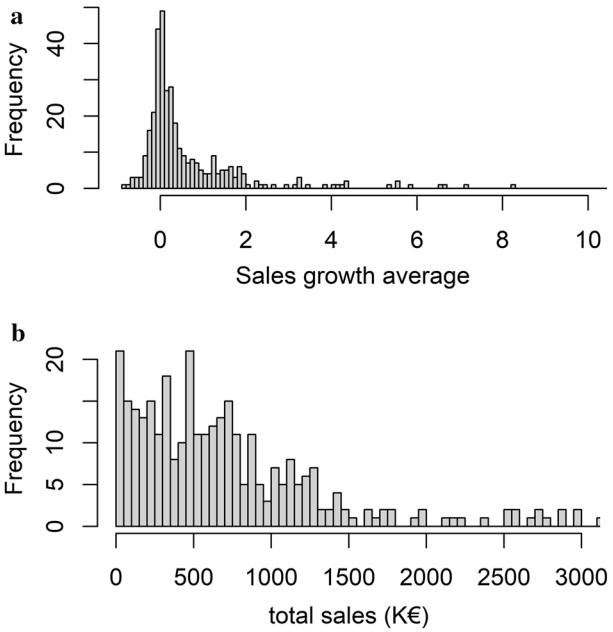

Fig. 1 **a** Distribution of sales growth – Frequency and average sales growth. N = 406; the graph includes all the stable firms; the average sales growth is the average annual growth of sales between 2014 and 2018. If the first value is below 1 (no sales), the growth of that year is ignored, to avoid infinite value. A value of 1 means 100% sales increase per year, on average, over the study period. A negative value means that on average, the revenue decreased between the first and the last record of positive sales. **b** Distribution of sales (sum) over the study period. N = 406; 30 firms (not displayed) have a total revenue beyond 3 million euros over the study period

4.3 Robustness checks

Most recently founded NTBFs are in the computer programming industry, which was also the case in our sample (60% of firms). To assess the extent to which our results are robust to industry differences, we computed multiple models with industry dummies and subsamples by industry (computer programming or others). The results are available in Table 9 in the Appendix. For the models that predicted sales stability, our results were robust to industry controls. Maintaining the same significance level is difficult when splitting a sample, likely because of a lack of power related to a much smaller sample size. For the models predicting high growth, although the direction remained the same and the model with industry controls was identical, the significance level varied by industry. Further studies could consider the industry-specific effects of business model characteristics with a larger sample of firms.

5 Discussion, limitations and future research directions

This study applied path dependency theory to investigate if variations in founding business models impact NTBFs' development paths, distinguishing between stable growth and high growth. We analyzed a 2013 NTBF cohort in Sweden, Finland, and France, tracking their

Table 4 Predictors of high-growth firms between the business model elements and to predict which business model elements are correlated with a high growth development path

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Product or service	−0.101	−0.138	−0.178	−0.150	−0.150	−0.163	−0.164	−0.122	−0.106	−0.062
	(0.106)	(0.103)	(0.101)	(0.103)	(0.103)	(0.103)	(0.102)	(0.105)	(0.107)	(0.118)
Growth satisfaction	−0.088	−0.132	−0.093	−0.117	−0.072	−0.121	−0.123	−0.141	−0.057	0.029
	(0.154)	(0.158)	(0.152)	(0.149)	(0.153)	(0.149)	(0.149)	(0.150)	(0.159)	(0.178)
Startup experience	0.308	0.227	0.341	0.343	0.351	0.347	0.340	0.303	0.199	0.127
	(0.273)	(0.277)	(0.270)	(0.271)	(0.275)	(0.270)	(0.271)	(0.272)	(0.281)	(0.295)
Indus. exp. (> 5y)	−0.887*	−0.813*	−0.744*	−0.785*	−0.723	−0.811*	−0.777*	−0.849*	−0.646	−0.585
	(0.375)	(0.373)	(0.367)	(0.366)	(0.370)	(0.366)	(0.364)	(0.368)	(0.387)	(0.421)
Diff. with compet	0.316**									0.216
	(0.117)									(0.130)
Pricing	0.086									0.125
	(0.145)									(0.158)
Quality	0.078									0.032
	(0.147)									(0.156)
Customer size		0.465								0.388
		(0.294)								(0.325)
Payers		−0.091								−0.134
		(0.318)								(0.336)
Exporting		0.614*								0.390
		(0.273)								(0.300)
Customer relationsh			−0.164							−0.022
			(0.146)							(0.168)
Channels				−0.537						−0.377
				(0.356)						(0.405)
Revenue streams					0.869***					0.865**
					(0.263)					(0.286)

Table 4 (continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Key activities						0.090				−0.144
						(0.178)				(0.218)
Cost structure							0.051			−0.074
							(0.109)			(0.122)
N partner types								0.249		−0.070
								(0.135)		(0.163)
Key resources									0.037	−0.032
									(0.149)	(0.162)
External funding									0.650***	0.576**
									(0.160)	(0.196)
Constant	−0.968	0.454	1.448	1.210	0.121	0.676	0.664	0.511	−0.140	−1.186
	(0.965)	(0.761)	(0.868)	(0.738)	(0.748)	(0.803)	(0.829)	(0.728)	(0.829)	(1.423)
Observations	294	294	294	294	294	294	294	294	294	294
Log Likelihood	−173.628	−173.696	−177.563	−177.067	−172.646	−178.057	−178.070	−176.466	−169.255	−159.296
Akaike Inf. Crit	363.257	363.392	367.125	366.133	357.293	368.113	368.140	364.933	352.510	356.593

$p < .05$; **: $p < .01$; ***: $p < .001$. High-growers, among the stable firms, are firms who had an average annual growth of more than 50% during the study period; only those firms that make a positive sales for 3 years in a row are included in the models above

Table 5 Stable and high-growers

	Preserving resources	Increasing resources
Stable firms	Higher product quality (−)	
	Smaller customer size (−)	
	Externalize activities (+)	
High-growers		Diversified revenue streams (+)
		More external funding (+)

development from 2014 to 2018. Our findings reveal two key insights. First, NTBFs achieve sales stability by displaying traits such as lower product quality, fewer major clients, increased externalization of key activities, and superior resources (enhanced expertise and reputation). Second, NTBFs attain high growth through diverse revenue streams and funding sources. However, few founding business model elements overall influence NTBF development. Elements driving stable growth and high growth diverge, with no single element aligning with both trajectories. We explore the theoretical and practical implications of these findings further below.

5.1 Theoretical implications

While classical approaches to path dependency theory focus on external conditions surrounding new organizations, our study focuses on imprinting factors under founders' volitional control: newly founded firms' business models. Founders face several possibilities when considering whether to start a new firm; however, once they begin to make decisions and take action, these initial choices trigger further developments that determine a firm's organizational path (Sydow et al., 2009). Our findings appear to support this, as they show differences in founding business models that apparently result in different development paths between stable and high-growth NTBFs. These observations provide support for path dependency theory in that choices made at a new firm's inception have significant effects well beyond the founding phase (Aspelund et al., 2005; Geroski et al., 2010). Thus, our findings complement existing studies demonstrating the benefits of adopting path dependency theory to explain performance and success when founding new firms (e.g., Boxstael & Denoo, 2020; Snihur & Zott, 2020). Boxstael and Denoo (2020) analyzed business model design during new venture creation and provided a dynamic view on founder identity imprinting on business models, finding that novelty-centered business models are derived from cognitive work developed by founder identity construction and verification processes.

The founding business model elements explored in our study did not all exert significant path dependency effects on subsequent NTBF development. Specifically, the nine business model elements were not shown to be equally important for imprinting NTBFs' development paths. Notably, some business model elements are related to stable development while others are associated with high-growth; however, the rationale behind these differences in path dependency effects deserves further exploration.

First, we observed that high-growth NTBFs' founding business models are characterized by highly diverse funding sources and revenue streams. External funding has been consistently associated with high growth, as a requirement or enabler (Assenova & Sorenson, 2017; Delmar and Shane, 2003; Cavallo et al., 2019; Huergo et al., 2020). Thus, external financing can be used to acquire other resources (Katila et al., 2008) and enhance the development of

the new offer to accelerate market development (Festel et al., 2013; Homburg et al., 2014; Katila et al., 2008). Firms with access to more resources can diversify their revenue sources early. Resource slack enables parallel development (as opposed to sequential) of different revenue logics. Although these observations are not particularly surprising, the underlying path dependency remains in question. We refer to this business model path dependency as "increasing resources" and posit that, when external funding brings in new powerful external stakeholders, this creates a moral and legal obligations for NTBFs to deliver on promises they made to secure financing (Table 5). Thus, the entry of external stakeholders in the form of new funding imprints NTBF development toward the sole goal of high growth. Acquiring other required resources through external funding can also cement an NTBF's path toward high growth.

Second, stable NTBFs have a distinct path dependency. We observed that stable NTBFs' founding business models are characterized by lower *product quality*, few big *customers*, externalizing *key activities*, and better *resources* (higher expertise and reputation). Adopting these elements in their founding business model will help NTBFs experience stable development. These elements provide an intriguing picture about stable NTBFs. To design firms that will experience stable development, founders should focus on lower-quality products, offer their products to few big clients, and maintain a lean organization (i.e., externalize key activities), while honing their expertise and reputation. We refer to this business model path dependency as "preserving resources," (Table 5) and posit that, when founders aim to maintain sales, overextending their resources may not be sensible.

The assumption that founders focus on lower-quality products might be explained by their lack of funding to develop high-quality products. Stable growth might be result from an inability to incorporate venture capital or other investments, not a deliberate design choice, and externalizing key activities may not lead to lower quality, but rather a basic lack of funding to internalize activities. This could be a critical design issue related to a trade-off between product-related choices and financial arrangements. The selection of economies of scope versus scale and product quality may be evident design choices enabled by financial resources and risk.

Thus, NTBFs may face drawbacks in developing perfect products (which takes time), while missing potential revenue from offering less-finished products on the market (DeKinder & Kohli, 2008). Externalizing the maximum number of key activities might also make it harder for NTBFs to pursue high-quality products. Instead, keeping an organization lean, and focusing on honing its own internal expertise and reputation, might be the right decision if internal resources are used to target a few large clients and keep them satisfied with lower-quality products. Externalizing key activities might also allow NTBFs to remain flexible when facing potential market disturbances (Kim & Pennings, 2009) and adjust needed operations to maintain sales. When adopting path dependency theory to explain stable NTBF development, several initial decisions of founders should be considered: the organization of key activities (maximum number externalized), quality of firm resources, and less-than-perfect products initially offered to a few big clients. Compared with the other five, these four business model elements appear to result in more imprinting effects on NTBFs' subsequent stable development.

Our study indicates that new firms' founders and their business design decisions have important consequences for subsequent NTBF development. However, designing business models is complex, can require multiple iterations, and may be characterized

by regression, which conflicts with path dependency theory. After a business model is implemented and exploited, path dependency might hinder changes, particularly in exploration phases where new high-tech startups have more freedom and entrepreneurs appear completely free to choose their path. Several trade-offs between technology, financial, product/service and financial dimensions in a business model are intently related and interdependent, and the most important issues can be related to customers, resources, and expertise or an entrepreneurial ecosystem. A founder's decision itself might not imprint a certain business model, but rather the degree to which the founder succeeds in attracting external funding. Certain partners being included in an entrepreneurial ecosystem leads to access to capital. Including a venture capitalist's relevant knowledge and partners including intellectual capital is often why startups grow quickly. However, receiving external funding may not be an intentional choice founders make, but dependent on selection mechanisms that venture capital funding agencies commonly use.

5.2 Practical implications

Our study has practical relevance for not only NTBFs but also individuals interested in investing in such firms, such as venture capitalists. To make informed investment decisions, potential investors should understand the conditions under which an NTBF is founded. The job-creation ability of high-growth firms implies that policymakers should allocate more resources to support these firms, rather than investing in startups that generally have no growth ambition. However, this suggestion has been criticized because high-growth does not appear to have long-term stability, and potential high-growth firms are difficult to identify early. However, stable firms can also benefit from being embedded in an entrepreneurial ecosystem, which can provide them with the support and resources necessary to face difficulties despite their weaknesses. Therefore, policymakers should consider allocating resources to support both high-growth and stable NTBFs to promote the overall development of technology-based industry.

While it's true that stable firms can benefit from being embedded in an entrepreneurial ecosystem by gaining access to new ideas, talent, and potential collaboration opportunities, the practical implementation of this recommendation may encounter several challenges. Firstly, stable firms may have different organizational cultures and risk appetites compared to start-ups and other entrepreneurial ventures within the ecosystem, which could lead to difficulties in integrating and collaborating effectively. Secondly, the priorities and objectives of stable firms may not always align with those of the entrepreneurial ecosystem. These firms may prioritize efficiency, predictability, and risk mitigation over innovation and experimentation, making it challenging to navigate within the dynamic and uncertain environment of an entrepreneurial ecosystem.

The approach to allocate more resources to support high-growth NTBFs over start-ups with no growth ambition is a topic that warrants careful consideration and discussion. High-growth NTBFs have the potential to significantly impact economic growth, job creation, and innovation. By allocating resources to support these firms, policymakers can catalyze economic development and drive technological advancements that benefit society as a whole. NTBFs often pioneer disruptive technologies and business models that

enhance competitiveness and drive industry innovation. By prioritizing support for high-growth NTBFs, policymakers can foster a culture of innovation and entrepreneurship that propels industries forward. High-growth NTBFs have the potential to scale rapidly and expand into international markets, bringing revenue and investment back to the home country. Allocating resources to support these firms can position the country as a leader in emerging industries and create opportunities for global market penetration. However, supporting start-ups with no growth ambition can contribute to job stability, community resilience, and the diversification of the business landscape. Policymakers must strike a balance between supporting high-growth NTBFs and start-ups with no growth ambition. Both types of firms play valuable roles in the economy, and a holistic approach that considers the diverse needs of entrepreneurs and businesses is essential. A balanced approach that considers the unique contributions and challenges of different types of firms is essential for fostering a dynamic and resilient entrepreneurial ecosystem.

In examining the influence of initial business models on the growth trajectories of NTBFs, it is pertinent to consider the broader context of governmental support mechanisms, such as the Small Business Innovation Research (SBIR) program in the United States. The SBIR program exemplifies a strategic government initiative aimed at fostering innovation and growth within small businesses, serving as a critical comparison point for our study. As highlighted by Link and Scott (2013), the SBIR program underscores the economic role of government in facilitating business innovation and development. This comparison elucidates the nuanced differences in governmental roles across different national contexts and their impact on NTBF growth. Furthermore, our analysis aligns with the concept of institutional path dependence, as discussed by Goel and Saunoris (2016), which emphasizes the enduring influence of initial conditions and institutional frameworks on firms' international research intensity and growth patterns.

5.3 Limitations and future research directions

This study has limitations that can provide a foundation for future research. First, our study has limitations in terms of measuring business models. Although we used a comprehensive framework of nine business model elements, alternative, more effective measures may exist for some elements, particularly those we found to have no significant impact on NTBF development, such as customer relationships, key partnerships, and customer-centric value proposition. Also, conceptually, the role of critical design in business model innovation has received some attention (Clauss, 2017; Sánchez & Ricart, 2010; Schneckenberg & Velamuri, 2019) because the design aspect and how these nine business model elements of Osterwalder and Pigneur (2010) does not make the interdependencies (trade-offs) between design choices explicit. Trade-offs with respect to market access include customer segmentation and channels used to access customers and may be part of a business model's design, but not the result of design choices. Additionally, we did not collect data on respondents' growth mindset, which might provide insights into how it aligns with various imprinting elements. Thus, future research should explore these issues in greater depth and develop new methods for measuring business model elements in the context of NTBF development.

Second, we also acknowledge that relying on founders' declarations about their business may lead to some biases in the answer, including desirability biases. This is a common risk of surveys. We tried to mitigate this risk by measuring the business model elements in a neutral way, giving no hint to the respondent on possible preference in answer. We also collected the performance measure independently of the survey, from registry. However, future studies may try to assess business characteristics using, for instance, archival data and observations rather than declaration, for increased objectivity of the measures.

Third, regarding the sampling frame, we chose NTBFs created (registered) in 2013 and surveyed them in 2016. This allowed us to analyze the founding business models of NTBFs that had generated sales revenue, which is an important indicator of a company's progress and growth potential. Additionally, this sampling method allowed us to track NTBF development over time, which is crucial for understanding factors that influence firm development. However, this might have excluded some NTBFs created in 2013 that had not reported sales revenue at the time of our survey but might have succeeded in doing so after 2016. Future research can expand and improve our sampling method by incorporating a wider range of NTBFs.

Reflecting further on our methodological choices, particularly the exclusion of firms without established founding business models or those that did not report performance data, we acknowledge the potential for selection bias. This exclusion was predicated on the focus of our study on the tangible impacts of specific business model configurations on firm performance. Including firms at too nascent or undefined a stage could have compromised the clarity and relevance of our findings. However, this approach may limit the generalizability of our results across a broader spectrum of NTBFs. Recognizing this, future research could endeavor to include a wider range of NTBFs, perhaps those in earlier stages of development or with incomplete data sets, employing innovative methodologies to infer missing data points. Such studies could provide valuable insights into the early dynamics of business model formation and performance outcomes, enriching our understanding of NTBF development trajectories. This expansion of the research scope would not only address potential biases but also enhance the robustness and applicability of findings across different contexts and stages of firm development.

Fourth, we used a survey to collect information on founding business models, resulting in cross-sectional data. Thus, while we can provide a snapshot of the situation of NTBFs in 2016, we have limited means to identify founders' intentions and development paths in firms' early stages. However, our design was able to capture the state of a founding business model in 2016, and the subsequent development data collected through business registries provides valuable insights into these firms' post-founding development. Although our design has its limitations, we have provided a detailed description of our methodological approach to allow future researchers to build upon and improve our measures and design. Due to the structure of our data and the type of analyses we conduct, correlational in nature, we make no causal claims, but we highlight significant differences in the initial business model characteristics of some NTBFs with stable development trajectories and with high-growth trajectories. We hope that further studies may overcome empirical limitations of ours, including an integrated measure and modeling of the new firm growth trajectories.

Fifth, the study's claim that specific business model elements dominate path dependency effects on subsequent high-growth NTBFs overlooks the dynamic nature of

entrepreneurial processes. While certain business model elements may indeed influence the trajectory of NTBFs, attributing dominance to specific factors oversimplifies the complex interplay of variables shaping entrepreneurial outcomes. Entrepreneurial ventures are inherently dynamic, influenced by various internal and external factors that evolve over time. Path dependency effects, while significant, are just one aspect of a multifaceted process that includes adaptation, learning, and response to changing market conditions, technological advancements, and competitive landscapes. Advocating for a more nuanced approach to understanding NTBF development involves recognizing the interactive nature of entrepreneurial processes. Rather than attributing outcomes solely to specific business model elements, it is crucial to consider how these elements interact with each other and with external factors to shape the growth trajectory of NTBFs.

Our investigation was guided by path dependency theory. We acknowledge that alternative perspectives exist to investigate the same phenomenon. In fact, we encourage future scholarly work to build on our insights and continue exploring the phenomenon of stable development among NTBFs by adopting alternative theoretical perspectives to complement and build on our results. However, rather than categorizing founding business model elements into distinct path dependency effects, another research approach is to study the complex interplay of factors that shape new firm development. This approach acknowledges that the process of founding and developing a new firm involves a dynamic interaction of various internal and external factors. These factors can include market conditions, technological advancements, regulatory environments, entrepreneurial skills and capabilities, industry dynamics, and socio-cultural influences, among others. By focusing on the interplay of these factors, researchers and practitioners can gain a deeper understanding of how new firms emerge and evolve over time. Hopefully, our findings will inspire further scholarly work and serve as a catalyst for further conceptual development in this field. Future research can also focus on different types of business models, industries, or countries to establish our findings' generalizability. In addition to investigating the imprinting effects of founding business models on subsequent NTBF development, it would be valuable for future research to explore the origins of founding business models and extent to which they are shaped by path dependency and imprinting mechanisms. A further challenge for future scholars is also to develop improved methods for measuring business model elements (for example customer relationships and key partnerships) in the context of NTBFs to better guide decision making of investors and policy makers.

6 Conclusions

This study provides valuable insights into the role of path dependency of founding business models on NTBFs' post-founding development. Given the crucial role NTBFs play in the economy, gaining a deeper understanding of their development paths is of great importance. This study's findings provide support for path dependency theory, indicating that the choices made at the inception of a new organization have profound effects on its future development. The study reveals that differences in founding business models result in distinct development paths for NTBFs with stable compared with high growth. NTBFs with stable growth

are typically characterized by lower-quality products, fewer big clients, higher externalization of key activities, and better resources, while high-growth NTBFs have more diverse revenue streams and funding sources. This study emphasizes the significance of considering theory-based logic to explain the post-founding development of NTBFs and has implications for both academia and practitioners. Furthermore, for policymakers the idea that founding conditions play a significant role in NTBF development should also be of importance. Understanding concerning this relationship would help to develop conditions under which desired types of NTBFs could be created. By enriching the ongoing discussion regarding the importance of founding business models and their imprinting role in NTBFs' post-founding development, we aim to contribute to the field and provide useful insights for future research.

Differences in founding business models indeed dictate distinct development paths for NTBFs. However, oversimplification of these paths may hinder practical relevance by overlooking the nuanced entrepreneurial trajectories that exist. Each NTBF, depending on its unique business model, faces a set of challenges and opportunities that shape its development journey. For instance, a knowledge-intensive service startup may have a different growth trajectory compared to a manufacturing startup due to differences in market dynamics, customer acquisition strategies, and revenue models. By recognizing and understanding these differences, policymakers, investors, and entrepreneurs can tailor their support, funding, and strategies to better suit the specific needs of NTBFs. Failure to acknowledge the complexity of entrepreneurial trajectories may result in generic solutions that do not effectively address the diverse challenges faced by NTBFs.

Furthermore, whether an NTBF targets many small customers or a few big customers does not appear to matter; once they accept external funding, they need to pursue high growth no matter what type of customers they target. Similarly, regardless of whether key activities are mostly external or internal, or their own expertise is high quality, an NTBF that accepts external funding needs to pursue high growth. Almost all other business model elements are irrelevant (except the revenue model) from a path dependency perspective if an NTBF accepts external funding. Thus, when adopting path dependency to explain the development of NTBFs toward a high-growth path, only at two of the founders' initial decisions need to be examined: whether they accepted external funding and if they decided to develop multiple revenue streams simultaneously with the firm's founding. These two business model elements appear to override any path dependency effects the other seven might have on the subsequent high growth of NTBFs. We aimed to provide conceptual arguments, highlighting why certain business model elements appear to have a greater impact on NTBF development. Our study has limited ability to examine the factors that influence founding business model formation, particularly during the nascent entrepreneurial stage when founders are trying to establish their business and generate their first sales. This could include exploring the constraints and forces that shape the development of an entrepreneurial project, and how they may affect the creation of the desired founding business model. Understanding these underlying mechanisms could provide insight into how founding business models emerge and evolve over time.

Appendix

See Tables 6, 7, 8 and 9.

Table 6 NACE Rev.2-sectors (responding firms)

Sector	Frequencies (%)		
	Sweden	Finland	France
Manufacture of chemicals and chemical products	0.4	0.5	3.4
Manufacture of fabricated metal products, expt. machin. and equipmt	0.4	0.0	0.0
Manufacture of computer, electronic and optical products	2.5	7.5	2.7
Manufacture of electrical equipment	0.8	0.5	2.0
Manufacture of machinery and equipment n.e.c	3.7	4.5	2.0
Manufacture of motor vehicles, trailers and semi-trailers	0.8	0.5	2.0
Manufacture of other transport equipment	0.0	1.0	0.0
Manufacture of furniture	0.0	0.0	0.7
Other manufacturing	0.8	0.0	0.0
Repair and installation of machinery and equipment	0.0	0.0	4.1
Wholesale of mining, construction and civil engineering machinery	0.4	0.0	0.0
Motion picture, video television prog. production, sound record	11.6	10.0	10.8
Programming and broadcasting activities	0.0	1.0	1.4
Telecommunications	2.1	5.0	1.4
Computer programming, consultancy and related activities	58.1	56.5	59.5
Information service activities	7.1	5.0	4.7
Activities of head offices; management consultancy activities	0.4	0.0	0.0
Architectural and engineering activities; technical testing and analysis	2.9	0.0	0.0
Scientific research and development	7.1	8.0	5.4
Other professional, scientific and technical activities	0.8	0.0	0.0
Sum	100	100	100

Table 7 Sample and response rate (number of firms)

	Total	Sweden	Finland	France
N (population)	3,131	1,290	899	942
n (response, initial sample)	589 (18.8%)	241 (18.7%)	200 (22.2%)	148 (15.7%)
n (follow-up, complete obs.)	409 (69%)	194 (80%)	132 (66%)	83 (56%)

Table 8 Mean differences (t-tests) in performance between respondents and non-respondents

		Total	Sweden	Finland	France
Employees	Respondents	1.62 (6.01)	1.95 (8.18)	1.38 (2.42)	1.20 (3.59)
	Non-respondents	1.38 (3.78)	1.24 (2.39)	1.83 (5.47)	1.05 (3.78)
	p-value	0.391 (n.s.)	0.391 (n.s.)	0.125 (n.s.)	0.742 (n.s.)
Sales	Response	219.08 (961.28)	240.37 (1,256.47)	136.74 (277.90)	340.70 (913.26)
	Non-respondents	196.51 (650.29)	160.53 (387.23)	223.63 (963.62)	267.39 (583.46)
	p-value	0.620 (n.s.)	0.620 (n.s.)	0.051 (n.s.)	0.500 (n.s.)
Assets	Response	167.91 (705.43)	152.20 (799.84)	156.67 (649.76)	246.27 (502.19)
	Non-respondents	153.87 (574.59)	89.28 (149.87)	226.03 (918.47)	196.39 (470.88)
	p-value	0.674 (n.s.)	0.674 (n.s.)	0.229 (n.s.)	0.421 (n.s.)

Standard deviations in parentheses. Amounts for sales and for total assets in 1000 euros. Accounting data for sampling year of 2014

Table 9 Robustness checks. Industry specific models

	DV: Stable firms				DV: High-growth			
	Complete sample		Group 1	Group 2	Complete sample		Group 1	Group 2
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Product or service	0.022	0.029	0.201	−0.046	−0.062	−0.121	0.115	−0.449*
	(0.111)	(0.115)	(0.186)	(0.170)	(0.118)	(0.127)	(0.235)	(0.192)
Growth satisfaction	0.592***	0.592***	0.835***	0.043	0.029	0.028	−0.077	0.517
	(0.161)	(0.161)	(0.216)	(0.289)	(0.178)	(0.179)	(0.246)	(0.337)
Startup experience	0.082	0.080	0.033	0.177	0.127	0.164	0.002	0.377
	(0.267)	(0.267)	(0.334)	(0.523)	(0.295)	(0.297)	(0.396)	(0.643)
Indus. exp. (> 5y)	−0.058	−0.055	−0.499	−0.140	−0.585	−0.644	−0.669	−0.726
	(0.362)	(0.363)	(0.526)	(0.662)	(0.421)	(0.422)	(0.634)	(0.697)
Computer industry		−0.068				0.495		
		(0.281)				(0.327)		
Diff. with compet	0.149	0.147	0.286+	0.008	0.216+	0.231+	0.105	0.587*
	(0.113)	(0.113)	(0.159)	(0.193)	(0.130)	(0.131)	(0.187)	(0.260)
Pricing	0.227+	0.222+	0.180	0.341	0.125	0.149	0.395	0.168
	(0.130)	(0.132)	(0.181)	(0.211)	(0.158)	(0.160)	(0.240)	(0.259)
Quality	−.925***	−.924***	−.739***	−1.60***	0.032	0.012	0.240	−0.104
	(0.165)	(0.165)	(0.201)	(0.370)	(0.156)	(0.156)	(0.217)	(0.276)
Customer size	−0.661*	−0.664*	−0.859*	−0.693	0.388	0.410	0.650	0.790
	(0.272)	(0.273)	(0.382)	(0.488)	(0.325)	(0.328)	(0.483)	(0.599)
Payers	0.009	0.005	−0.212	0.422	−0.134	−0.093	−0.100	−0.354
	(0.302)	(0.302)	(0.396)	(0.564)	(0.336)	(0.338)	(0.483)	(0.583)
Exporting	0.304	0.301	0.038	0.867+	0.390	0.432	0.618	−0.435
	(0.274)	(0.274)	(0.353)	(0.520)	(0.300)	(0.303)	(0.423)	(0.605)
Customer relationsh	0.095	0.096	−0.118	0.608*	−0.022	−0.013	0.244	−0.456
	(0.138)	(0.138)	(0.186)	(0.277)	(0.168)	(0.170)	(0.228)	(0.341)
Channels	−0.148	−0.149	0.109	−0.544	−0.377	−0.360	−0.758	−0.330
	(0.375)	(0.375)	(0.511)	(0.667)	(0.405)	(0.406)	(0.580)	(0.714)
Revenue streams	0.005	0.003	0.148	−0.168	0.865**	0.896**	0.480	1.414*
	(0.259)	(0.259)	(0.342)	(0.505)	(0.286)	(0.287)	(0.391)	(0.555)
Key activities	0.481*	0.481*	0.684*	0.013	−0.144	−0.130	−0.354	0.235
	(0.210)	(0.210)	(0.283)	(0.427)	(0.218)	(0.217)	(0.301)	(0.459)
Cost structure	−0.106	−0.104	−0.159	−0.236	−0.074	−0.083	0.038	−0.161
	(0.117)	(0.117)	(0.158)	(0.223)	(0.122)	(0.123)	(0.176)	(0.220)
N partner types	0.027	0.025	−0.039	0.230	−0.070	−0.032	−0.000	−0.114
	(0.144)	(0.145)	(0.187)	(0.276)	(0.163)	(0.165)	(0.239)	(0.279)
Key resources	0.498***	0.497***	0.478*	0.554*	−0.032	−0.002	−0.207	0.277
	(0.145)	(0.145)	(0.191)	(0.272)	(0.162)	(0.165)	(0.225)	(0.320)
External funding	−0.191	−0.193	0.033	−0.231	0.576**	0.562**	0.980**	0.132
	(0.166)	(0.166)	(0.246)	(0.279)	(0.196)	(0.197)	(0.316)	(0.347)
Constant	−0.663	−0.630	−2.198	3.364	−1.186	−1.507	−2.915	−2.268
	(1.314)	(1.322)	(1.839)	(2.566)	(1.423)	(1.441)	(2.191)	(2.519)
Observations	406	406	251	155	294	294	180	114
Log Likelihood	−196.666	−196.636	−121.239	−65.206	−159.296	−158.118	−90.635	−55.270
Akaike Inf. Crit	431.332	433.273	280.478	168.412	356.593	356.236	219.270	148.539

Table 9 (continued)

$p < .05$; **: $p < .01$; ***: $p < .001$. Group 1: firms in the industry of *Computer programming, consultancy and related activities*; Group 2: firms *NOT* in the industry of *Computer programming, consultancy and related activities;* Model 1 and Model 5 are reminders of models 10 of Tables 2 and 3 (for easier comparison)

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