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Time and Complexity of Competitive Action Repertoires in New Ventures:

Early Evolutionary Patterns and Growth Implications

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A mi padre, a mi madre, a mi marido y a mis hijos

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RESUMEN

El emprendimiento y la creación de nuevas empresas son una fuente esencial de generación de empleo y riqueza económica (Gilbert, Mcdougall y Audretsch, 2006; Dencker, Gruber y Shah, 2009). Las nuevas empresas (empresas en sus primeros años de actividad) son importantes para introducir innovaciones que hacen avanzar la economía (Schumpeter, 1942; McKelvie, Wiklund y Brattström, 2018) y dar soluciones a problemas sociales y medioambientales (Shepherd, Souitaris and Gruber, 2020). Un ejemplo contemporáneo que apela al espíritu emprendedor y a la innovación es el "Green Deal" europeo, que propicia nuevas oportunidades de negocio relacionadas con soluciones más sostenibles para el planeta, la sociedad y la economía (COM, 2019). Pero para traer estos beneficios, las nuevas empresas tienen que sobrevivir y crecer (Shane, 2009). Sin embargo, menos de la mitad de las empresas que se crean sobreviven y pocas crecen substancialmente (Eurostat, 2018).

La explicación de las diferencias en el crecimiento de empresas de nueva creación es una cuestión clave en la investigación sobre dirección estratégica y emprendimiento. Más allá de la idea innovadora, las nuevas empresas deben actuar estratégicamente para desarrollar su base de recursos y competencias, incluida su base de empleados, y por tanto crecer para lograr el éxito (Penrose, 1959; Geroski, 2005; Stam *et al.*, 2008). Tanto es así, que la literatura sobre el crecimiento empresarial destaca la importancia de explorar el proceso de (secuencia de acciones que conducen al) crecimiento de la empresa para explicarlo más allá de medirlo (Garnsey, Stam y Heffernan, 2006; Davidsson, Achtenhagen y Naldi, 2010; McKelvie y Wiklund, 2010). En este sentido, una de las principales preguntas que se plantean en la literatura es el cómo las acciones competitivas conducen al crecimiento de las empresas en sus primeros años de funcionamiento. Hasta la fecha, la mayoría de las respuestas se centran en acciones competitivas específicas, como la introducción de nuevos productos, la entrada en nuevos mercados y el establecimiento de alianzas (McDougall and Robinson Jr, 1990; Smith, Grimm y Grannon, 1992; McDougall *et al.*, 1994; Ireland *et al.*, 2001). Sin embargo, se ha prestado muy poca atención al conjunto de

movimientos competitivos de una nueva empresa, es decir, su repertorio competitivo (Larrañeta, Zahra y Galán González, 2014) y su dinámica evolutiva en el tiempo (Rindova, Ferrier y Wiltbank, 2010).

Esta escasa atención al conjunto de acciones competitivas interconectadas a la hora de explicar el crecimiento de las nuevas empresas llama la atención, ya que los repertorios competitivos son uno de los temas centrales en la literatura sobre dinámicas competitivas (Chen y Miller, 2012, 2015). Una amplia investigación en este campo demuestra que las características del repertorio de acciones competitivas, especialmente la simplicidad o complejidad en los tipos de decisiones estratégicas y acciones competitivas iniciadas por las empresas, explican diferencias en el rendimiento, la cuota de mercado y las valoraciones del mercado (Miller y Chen, 1996b; Ferrier y Lyon, 2004; Rindova, Ferrier and Wiltbank, 2010). Estos investigadores postulan que la complejidad del repertorio competitivo afecta a la variedad del conocimiento y competencias acumuladas por la empresa que constituyen un elemento clave a reconocer y desarrollar por los directores para generar ventajas competitivas sostenibles (Ferrier, Smith and Grimm, 1999; Carnes *et al.*, 2019). No obstante, varios autores destacan que la generación de competencias es un proceso dependiente del tiempo (Dierickx y Cool, 1989; Teece, Pisano y Shuen, 1997) y de ahí la importancia de crear capacidades dinámicas (Teece, Pisano and Shuen, 1997; Teece, 2007). De hecho, a propósito del tiempo, recientemente se ha demostrado que la complejidad de las acciones competitivas afecta de distinta manera al desempeño de la empresa en el corto (negativamente) y en el largo (positivamente) plazo (Connelly *et al.*, 2017).

Así pues, en el contexto de nuevas empresas y sus limitaciones en recursos, competencias y legitimidad (Stinchcombe, 1965), el emprendedor se halla ante el dilema entre explotar un repertorio 'simple' y eficiente (compitiendo con unos pocos tipos de acciones que conocen) o uno más 'complejo' (explorando una variedad más amplia de tipos de acciones) que otorga una mayor flexibilidad y adaptabilidad (Eisenhardt, Furr and Bingham, 2010; Eisenhardt

y Piezunka, 2011). Este último dará lugar a un aprendizaje más amplio, pero acarrea también un mayor riesgo de fallo. Ahora bien, no se trata de una elección puntual. La complejidad de los tipos de acciones implementadas por una empresa está estrechamente relacionada de manera recursiva con la variedad de competencias y habilidades creadas anteriormente y por tanto con las decisiones anteriores (Ndofor, Sirmon y He, 2011), lo que en el tiempo limita la plasticidad o flexibilidad de comportamientos competitivos posteriores. Las competencias y capacidades se crean a través de la implantación y rutinización de prácticas (Nelson, 1991). Una vez creadas, las competencias y capacidades no pueden cambiarse tan fácilmente (se necesita tiempo y posiblemente disrupción), estableciéndose así una dependencia entre las decisiones posteriores y las anteriores, con posibles implicaciones para el crecimiento posterior (Hastie, 2001; Davidsson, 2006; McMullen, 2015). Por otro lado, la evolución del repertorio competitivo y su complejidad no se puede entender sin considerar las expectativas y aspiraciones de la empresa para el futuro y sus interpretaciones que también dan forma al repertorio (incluyendo posiblemente variación y búsqueda de nuevas opciones) más allá del efecto del aprendizaje del pasado, importante a su vez para seleccionar y retener aquello que funciona (Aldrich, 1999; Aldrich y Yang, 2014). Sin duda los directivos pueden utilizar el pasado para repetir o evitar lo ocurrido (trayectoria dependiente) y también generar nuevas opciones (trayectoria creativa) (Garud, Kumaraswamy y Karnøe, 2010). No obstante, la generación de nuevas opciones también estará de alguna manera sesgada por el pasado (experiencias y conocimiento previo) (Levitt y March, 1988) y la búsqueda de lo "nuevo" y desconocido no es tan evidente, ya que requiere de una gran cantidad de trabajo de exploración e intuición (Wiklund, Davidsson y Delmar, 2003; Teece, 2007, 2019; Schumacher, 2020). Para los directivos es fundamental entender cómo funciona este proceso de aprendizaje y la trayectoria temporal en la que se sitúa la empresa, ya que ésta afecta a la construcción de su espectro de competencias en el tiempo y por tanto a su ventaja competitiva sostenible y a su crecimiento en el largo plazo.

Los efectos de la complejidad del repertorio de acciones competitivas en el desempeño de las empresas y los factores que la impulsan han sido tratados ampliamente en la literatura. Sin embargo, los entresijos de cómo evoluciona la complejidad de la estrategia en el tiempo y el vínculo con el crecimiento en el empleo en empresas de nueva creación necesitan ser clarificados. De hecho, la mayor parte de la investigación sobre la complejidad del repertorio de acciones competitivas se refiere a empresas establecidas y a la trampa de la competencia o del éxito (Miller, 1992b). Esta es el resultado del mecanismo de refuerzo del proceso de aprendizaje que favorece la selección y retención de acciones con éxito, conduciendo a un patrón de simplificación (Miller y Chen, 1996; Connelly et al., 2017) que puede dificultar la exploración y la adaptación futura. Sin embargo, en esta perspectiva falta la consideración de empresas de nueva creación, que carecen de historia operativa e inercia asociada, donde pueden ser posibles patrones alternativos impulsados por las aspiraciones y la naturaleza exploratoria de emprendedores y equipos fundadores (Aldrich, 1999; Ben-Oz y Greve, 2015).

En este contexto, este estudio explora el impacto de la evolución del nivel de complejidad de las acciones estratégicas en empresas de nueva creación (básicamente si compiten con un número limitado de tipos de acción o bien con uno más amplio y si cambian) sobre su crecimiento del empleo a lo largo del tiempo. En primer lugar, tratamos de identificar en nuevas empresas la existencia de distintos patrones estratégicos durante sus primeros años de funcionamiento. Para ello consideramos el cambio inter-temporal del nivel de complejidad de sus repertorios de acciones competitivas, que creemos evolucionará en base al aprendizaje del pasado (competencias acumuladas) y las expectativas y aspiraciones para el futuro. A continuación, tratamos de determinar los efectos de esos patrones alternativos en las tasas de crecimiento a corto y largo plazo del empleo en las nuevas empresas. Nos basamos en el marco teórico de la Conciencia-Motivación-Capacidad y en los enfoques del aprendizaje organizativo y las capacidades dinámicas para justificar nuestras predicciones. Además, nos basamos en la literatura sobre el crecimiento empresarial que destaca la importancia de explorar los procesos

que llevan al crecimiento. Empíricamente seleccionamos una muestra de nuevas empresas que salen al mercado alternativo bursátil poco después de su creación (por tanto, con ambiciones de crecimiento) y que operan en varios sectores de servicios. Los resultados muestran evidencia de cuatro patrones, dos patrones estables en el nivel de complejidad y dos patrones que cambian su nivel, así como que las nuevas empresas con patrones estables en el corto plazo crecen a tasas inferiores que las empresas con patrones cambiantes, pero manteniendo sin embargo un crecimiento más estable en el largo plazo. Nuestras conclusiones tienen importantes implicaciones para la investigación en dinámicas competitivas y emprendimiento empresarial, así como para la práctica empresarial.

SUMMARY ABSTRACT

Entrepreneurship and new venture (NV) creation are an essential source of job creation and economic wealth (Gilbert, Mcdougall and Audretsch, 2006; Dencker, Gruber and Shah, 2009). NVs (firms in their early years of activities) are important for introducing innovations that move the economy forward (Schumpeter, 1942; McKelvie, Wiklund and Brattström, 2018) and giving solutions to social and environmental problems (Shepherd, Souitaris and Gruber, 2020). A contemporary example calling for entrepreneurship and innovation is the European Green Deal, which opens up new market opportunities related to more sustainable solutions for the planet, society and the economy (COM, 2019). To reap these benefits, NVs have to survive and grow (Shane, 2009). In so doing, NVs must implement competitive actions seeking to learn and move from an *early start-up stage*—having a small size, limited resources, and faced with the liability of newness (Stinchcombe, 1965)—to a *growth stage* in profits and customers, which will be accompanied by the hiring of new employees and thus job creation.

In this dissertation, **we put the focus on the overall set of competitive actions NVs going public soon after creation deploy to explain variations in their growth in the number of employees, accounting for the role of time.** When entering a market, NVs can deploy different competitive actions such as introducing a new product, a marketing campaign, developing new technology, enhancing their productive capacity, or setting a strategic alliance.

Altogether, these actions constitute the competitive repertoire of the NV. This repertoire can be *complex* (or varied) if it includes a wide and balanced range of different action types such as R&D, marketing, operations, product, internationalization, or networking related actions, among others, or *simple* if it includes only a few types of competitive actions. For instance, it uses only marketing moves and new product launches (Miller and Chen, 1996b;

Connelly *et al.*, 2017). Because resources are scarce in NVs, conflicts between complexity and simplicity arise due to the competing demand for resources. Despite these limited resources and the liability of newness (i.e. lack of established capabilities and legitimacy) affecting NVs (Stinchcombe, 1965), some of them start competing comprehensively, using a wide variety of competitive action types, while others concentrate on one or two types of action (Miller *et al.*, 1996). Importantly, the complexity in the orchestration of the repertoire of competitive actions (use of resources) reflects the breadth of the underlying competences and capabilities being developed and accumulated by the firm that constitutes a key element to be recognised and developed by managers to generate sustained competitive advantages (Ferrier, Smith and Grimm, 1999; Carnes *et al.*, 2019). However, several authors stress that the generation of competences and capabilities is a time-dependent process (Dierickx and Cool, 1989; Teece, Pisano and Shuen, 1997) and hence the importance of creating dynamic capabilities (Teece, Pisano and Shuen, 1997; Teece, 2007). Moreover, recent empirical findings suggest different performance implications of the complexity of the competitive repertoire in the short- (negative) versus the long-term (positive) (Connelly *et al.*, 2017).

In the context of NVs, this trade-off may imply the significant dilemma for the entrepreneur of choosing between exploiting the available capabilities to survive (short-term/efficient) or develop (explore) capabilities for future growth (dynamic/flexible) (Sinha, 2015; Dai *et al.*, 2017). This is, however, not a one-time dilemma, as not all strategy choices are planned and deliberate, but some emerge (Mintzberg, 1987). Especially, as NVs learn from previous results and the competitive landscape, they can fine-tune the complexity of the repertoire. **Yet, as the competition unfolds, the level of the variety of the implemented actions will be closely related in a recursive way to the extent of the capabilities and skills that are being developed and made available to the NV (Ndofor, Sirmon and He, 2011), which limits the plasticity or flexibility of subsequent competitive behaviours.** Once created, capabilities cannot be changed so easily (it takes time and possibly disruption), thus establishing a

dependency between subsequent and previous competitive actions that parallels the path-dependent development of the NV capabilities with possible implications for subsequent growth (Hastie, 2001; Davidsson, 2006; McMullen, 2015). It appears that over time as NVs learn, feedback effects and path dependence play an important role in the evolution of the repertoire complexity and related capabilities, and the sequence with which (action-based) information is acquired matters as it affects not only the ease or difficulty of making use of it but also what can be created from it. NVs choices differentiate them and may translate into different trajectories in terms of the variety of their actions and associated capabilities. And yet, time and sequence are often absent from empirical research on entrepreneurship (McMullen and Dimov, 2013). Most research on the evolution of the complexity of the repertoire of competitive actions refers to established firms and the competence trap (Miller, 1992b). It results from the reinforcing mechanism of the learning process that subsequently favours the selection and retention of previously successful actions leading to a pattern of simplification (Miller and Chen, 1996b; Connelly *et al.*, 2017) that may hinder exploration and future adaptation. However, what is missing in this perspective, is the case of NVs, which lack operating history and associated inertia, where alternative patterns driven by the aspirations and exploratory nature of entrepreneurs and founding teams may be possible (Aldrich, 1999; Ben-Oz and Greve, 2015).

Focusing on such complexity of NVs competitive repertoires and time (entrepreneurship as a journey, taking place over time), this dissertation particularly seeks to explore two things. First, it explores the inter-temporal change of the complexity of the competitive repertoires of NVs during their early years of operations after entering the Alternative Investment Market of the London Stock Exchange (AIM). Our interest thereby is not the repertoire of NV's competitive moves at points in time but the sequence of competitive moves over a period of time, capturing how the current scope or variety of choices affect the following decisions (Ferrier, 2001; Rindova, Ferrier and Wiltbank, 2010). In particular, we seek to explore the existence of typical early patterns in the complexity of the competitive repertoires of NVs. Second, it explores how

NV growth is affected by the patterns of the complexity of their competitive repertoires during their early years of operations. When assessing these effects, we look at short-term growth rates versus long-term growth trends in employees over the course of several years as a measure of NV performance and an important indication of the rate of job creation by NVs.

When developing our theoretical arguments, we build on organizational learning and dynamic capabilities approaches from strategic management research in general and the Awareness-Motivation-Capability framework from competitive dynamics research in particular. Furthermore, we build on insights from the literature of NV growth that highlights the importance of exploring the process of (sequence of actions leading to) NV growth to explain the amount or quantity of different growth indicators (Davidsson, Delmar and Wiklund, 2006; Davidsson, Achtenhagen and Naldi, 2010; McKelvie and Wiklund, 2010). We test our predictions drawing on a unique purposely created database on a sample of NVs that operate in various service industries tracked during their early years of operations and go public soon after creation. The research relies on data collected using a content analysis research design applied to the letter of the Chairman or CEO to the NV stakeholders included in their annual reports, combined with time-series clustering and econometric analysis. We find evidence of the existence of four different patterns in the complexity of the competitive repertoires of NVs, two stable at either low or high levels of complexity and two changing to either lower or higher levels of complexity. We find as well that the stable versus changing patterns vary in their short-term growth rates and long-term growth trend, indicating the existence of a trade-off in terms of growth between stable and changing patterns. Our findings have important implications for research on competitive dynamics and entrepreneurship and for practice.

CHAPTER 1. INTRODUCTION

1.1 Background

Entrepreneurship and new venture (NV) creation are an essential source of job creation and economic wealth (Gilbert, Mcdougall and Audretsch, 2006; Dencker, Gruber and Shah, 2009). NVs are important for creating new industries, introducing disruptive innovations that drive the economy forward (Schumpeter, 1942; McKelvie, Wiklund and Brattström, 2018) and giving solutions to social and environmental problems (Shepherd, Souitaris and Gruber, 2020). Also, by challenging the position of established firms, NVs stimulate competition and foster overall productivity growth (Kritikos, 2014). A contemporary example calling for entrepreneurship and innovation is the European Green Deal, which fosters new market opportunities related to more sustainable solutions for the planet, society and the economy (COM, 2019).

To reap these benefits, NVs have to grow and survive (Shane, 2009), which are closely related phenomena (Coad, Frankish and Storey, 2020). In so doing, NVs must implement competitive actions seeking to move from an early start-up stage—having a small size, limited resources, and faced with the liability of newness (Stinchcombe, 1965)—to a growth stage in profits and customers (size scale), which will be accompanied by the hiring of new employees and thus job creation. In the struggle for growth and survival, NVs must initiate actions directed towards building the organizational structure (including staff and capabilities) to achieve a competitive advantage and actions directed towards growing by gaining a part of an existing market or creating a new one (Penrose, 1959; Brush, Greene and Hart, 2001; Gilbert, Mcdougall and Audretsch, 2006; Lockett *et al.*, 2011). These are competitive actions, such as launching a new product, investing in R&D projects, and acquiring or alliancing another company. Competitive actions initiated during the start-up years allow NVs, by applying entrepreneurial judgement (McMullen, 2015), to learn by doing (and build the breadth of capabilities) and adapt (Aldrich and Yang, 2014).

For these reasons, one of the major questions at the intersection of strategy and entrepreneurship research is to what extent competitive actions lead to the growth of companies in their early years of operations. Most attempts to answer this question have focused on individual competitive actions, such as new product introductions, entry to new markets and setting alliances (McDougall and Robinson Jr, 1990; Smith, Grimm and Grannon, 1992; McDougall *et al.*, 1994; Ireland *et al.*, 2001). However, very limited has been the attention towards the entire range of a NV's competitive moves—i.e. its competitive repertoire—(Rindova, Ferrier and Wiltbank, 2010; Larrañeta, Zahra and Galán González, 2014), especially considering that NV's actions are not self-standing, but closely related and often interdependent.

This limited attention concerning the complete sets of interconnected competitive actions when explaining the growth of NVs is surprising as competitive repertoires are one of the core themes in the literature on competitive dynamics (Chen and Miller, 2012, 2015). Extensive research on this field demonstrates that the characteristics of the competitive repertoire, notably the simplicity or complexity (i.e. variety or breadth) in the types of competitive actions undertaken, accounts for differences in firm profitability, market share and market valuations (Miller and Chen, 1996b; Ferrier and Lyon, 2004; Hughes-Morgan, Ferrier and Labianca, 2011).

Notably, previous research suggests an important trade-off between the *efficiency* (and inertia) of carrying out a simple and narrow repertoire of competitive actions and the *flexibility* (and increased adaptability) of having a more complex array of actions (Gersick, 1994; Eisenhardt, Furr and Bingham, 2010). Furthermore, recent findings suggest different performance implications of the complexity of the competitive repertoire in the short- (negative) versus the long-term (positive) (Connelly *et al.*, 2017). In the context of NVs, this trade-off might create the significant dilemma of choosing between exploiting the available

capabilities to survive (short-term/efficient) or develop (explore) capabilities for future growth (dynamic/flexible) (Winter, 2003; Eisenhardt and Piezunka, 2011; Rahmandad, 2012; Johnson and Van de Ven, 2017). Achieving a balance between exploitation and exploration is essential for survival and long-term performance, yet limited resource availability in NVs may force them to prefer one or the other (March, 1991). A simple competitive repertoire may help the firm to develop specific distinctive competences, but such specialisation can also lead to a competence trap by narrowing the range of knowledge and skills amassed (Levinthal and March, 1993; Miller and Chen, 1996b). On the contrary, a complex repertoire may help the firm to build dynamic capabilities such as ambidexterity or the ability to exploit and explore at the same time helping the firm to adapt and sustain long-term competitive advantage (Teece, 2007; O'Reilly III and Tushman, 2008), one that may be less imitable (Hughes-Morgan, Ferrier and Labianca, 2011). Still, complexity could also lead to failure traps if too much diversity in exploration activities is not accompanied by exploitation (short-term efficiency), under the idea that who focuses upon everything has, in fact, no focus (Levinthal and March, 1993; Levinthal and Marino, 2015) and the related lack of efficiency may hamper profitability and subsequent growth (Delmar, McKelvie and Wennberg, 2013).

Importantly, **having a simple or complex competitive repertoire is not a one-time choice,** and over time, NVs can adapt the level of complexity of their competitive repertoires. **This pushes the dilemma between being competitively simple versus complex over an extended period of time. As such, the question for NVs would be whether to start simple or complex and subsequently to remain stable or change from one approach to the other? Our study aims to address this important issue, considering how previous choices about repertoire complexity affect subsequent decisions.** In so doing, we first strive to identify the existence of alternative temporal patterns in the complexity of competitive repertoires of NVs during their early years of operations, considering the (more or less path-dependent) inter-temporal change of the complexity of their repertoires. We then seek to determine trade-offs between those

alternative patterns in terms of their effects on NVs' short-term growth rates versus long-term growth trends in the number of employees.

Despite the contributions of previous research on the study of the complexity of the firm competitive repertoire, its antecedents, consequences and temporal considerations, several issues require further analysis. For instance, missing in these studies is the role that time plays in establishing the sequential and temporal patterns of complexity resulting from the organizational learning and adaptation process preceding and following the execution of a competitive repertoire. Moreover, alternative sequential patterns of complexity and their performance implications are not well documented in the literature, as this mainly refers to patterns of simplification (i.e. reduction of the variety of action types) fostered by prior good performance and the associated risks of falling in competency traps (Miller and Chen, 1996b; Connelly *et al.*, 2017). This may be because the study of the simplicity or complexity of the repertoire has primarily focused on established firms, characterized by inertial pressures (Miller and Chen, 1994; Johnson and Van de Ven, 2017). Finally, we do not know the effect of alternative temporal patterns on performance. This is surprising given the importance of taxonomic approaches to temporal patterns to generate insight or to advance a predictive task (Miller and Friesen, 1980; Miller, 1996; Shi and Prescott, 2011). We aim to make use of new temporal pattern discovery techniques to address this important shortcoming. We build on organizational learning and dynamic capabilities approaches from strategic management research, in general, and the Awareness-Motivation-Capability (AMC) framework from competitive dynamics research, in particular, and insights from the literature on NV growth to justify our predictions. Furthermore, we draw on a sample of ambitious growth NVs that go public[1] undertaking an

[1] Going public refers to having the shares in a company on a stock exchange, and companies usually go public by an initial public offering (IPO) of their shares to investors to raise capital in expectation of expanding (Jenkinson, Ljungqvist and Ljungqvist, 2001). Specialised platforms for small and medium-sized enterprises (SME) public listing can provide financial resources for growth-oriented and innovative SMEs (OECD, 2015).

Initial Public Offering (IPO) at the early stage and operate in various service industries to test them.

In the rest of the chapter, we present first in subsection 1.2 the research questions, followed by the breakdown of the objectives of the dissertation in subsection 1.3 and the clarification of key concepts in subsection 1.4. Finally, in subsection 1.5, we outline the aims and goals of this dissertation, and we present the research approach and scope.

1.2 Research questions

In this dissertation, we seek to advance knowledge about the complexity of the competitive repertoire of NVs from an evolutionary perspective. First, we strive to improve empirical evidence about how NVs evolve in the scope of their competitive practices to build and sustain competitive advantage by identifying a taxonomy of typical alternative temporal patterns (or trajectories) in the complexity of competitive repertoires (and related capabilities) of NVs going public soon after creation during their early years of operations. Second, we aim to evaluate the implications of these alternative temporal patterns for NVs immediate and later growth in the number of employees. Previous studies have tried to find and explain typical trajectories in NV growth as opposed to idiosyncratic growth—i.e. related to the individual characteristics of each company—(Delmar, Davidsson and Gartner, 2003; Garnsey, Stam and Heffernan, 2006; Diambeidou *et al.*, 2008; Coad *et al.*, 2013). However, the literature on NV growth highlights the importance of looking into the process of (or how the sequence of actions lead to) growth beyond looking into how much NVs grow (Davidsson, Achtenhagen and Naldi, 2010; McKelvie and Wiklund, 2010). Therefore, in this dissertation, we want to take a step back and look for typical trajectories in the evolution of the applied strategy, specifically in its breadth or complexity, to explain different paces of growth in NVs. In doing so, we rely on the idea that strategy making is a process of discovery. In NVs, it ranges from the identification and

development of a business idea or opportunity to the implementation of tangible actions to realise the business opportunity, knowing that current choices imply a sequence of choices that depend on each other and will affect the future (Hastie, 2001; Davidsson, 2006; McMullen, 2015). It seems that a higher complexity in the type of actions taken may help in the future by providing higher flexibility of action for ensuring long-term rents (Johnson and Van de Ven, 2017), but simplicity and focus may help in the short term to efficiently achieve current targets and profits (Connelly *et al.*, 2017).

In doing so, we assume that NVs make competitive choices to develop the range of capabilities they need to penetrate or create a market (the entrepreneurial opportunity) based on the breadth of resources, knowledge and skills and motivations they initially have (Shane, 2009; Douglas, 2013) and subsequently develop through the (path-dependent) process of learning and adaptation (Levinthal and Marino, 2015). We also assume that not all NVs are likely to have the same base of initial resources, skills and competencies and therefore expect different initial levels of complexity of their competitive repertoires. These variations in initial resources and capabilities sustain particular competitive actions that further leverage resources recursively (Ndofor, Sirmon and He, 2011). Moreover, we assume that not all NVs and their top management teams (TMTs) learn from (or interpret) the performance feedback of their choices equally, have the same aspirations, and adapt in the same way.

Considering the existence of path dependencies in the strategic decision-making process, Teece, Pisano, and Shuen (1997) state that *"Where a firm can go is a function of its current position and the paths ahead. Its current position is often shaped by the path it has traveled."* Moreover, in any entrepreneurial process, the sequence matters. The sequence with which (action-based) information is acquired influences not only the ease or difficulty of making use of it but also what can be created from it. However, time is often absent from empirical research on entrepreneurship (McMullen and Dimov, 2013).

Therefore, acknowledging that managers and entrepreneurs make choices that affect the sequential patterns of complexity of their competitive repertoires through subsequent decision-making on the broadness of action types deployed and the related path-dependently developed capabilities created to sustain such competitive repertoires, we are interested in empirically identifying which are the typical sequential patterns of the complexity of NVs' competitive repertoires. Specifically, are the competitive repertoires simple and remain simple, do they oscillate, or do they move towards complexity? Alternatively, are they complex and remain complex, oscillate or move towards simplicity? It is important to note that we consider that simplicity and complexity are two extremes of the same concept, and firms move along different degrees of complexity.

We specifically focus our study on NVs that are firms starting their journey and usually are limited in resources and lack the previous experience and established routines (capabilities) that need to be developed (Yang and Aldrich, 2011) but are unlikely to have the inertia to keep doing what has already been established (O'Reilly III and Tushman, 2008). They are exposed to uncertainty and greater risk and, therefore, learning soon and succeeding in the type of competitive choices initiated is essential (Aldrich and Yang, 2014). For these reasons, we believe that NVs deserve separate attention when looking into early temporal patterns of competitive repertoires when the learning process is at preliminary stages (no history or inertia).

Besides, we are interested in the effects of the temporal patterns of competitive complexity on NV's employment growth for several reasons. For NVs, usually being born small (Geroski, 1995), the growth in size appears to be essential for building an organizational structure (including capabilities) to develop a competitive advantage (Penrose, 1959; Garnsey, 1998; Lockett *et al.*, 2011). Extant literature considers growth in employment as the measure that best reflects the development of resources and capabilities (Penrose, 1959; Lockett *et al.*, 2011), associated with the degree of complexity of the competitive repertoire of actions. Once

the initial capabilities are in place, it is expected that customer and profit growth strategies and actions will require additional increases in employees and their related capabilities (Gilbert, Mcdougall and Audretsch, 2006). Last, employment growth provides an important indication of the rate of job creation by NVs, which is politically relevant.

Overall, our set of research questions are:

1. **Considering the inter-temporal change of the complexity of NVs' competitive repertoires during their early years of operations, can we identify alternative temporal patterns in its evolution?**

This question is important because prior research indicating that firms tend to simplify their repertoires, particularly around the strategies that have proven successful, may suggest that the simplification pattern is the norm and that other patterns are more unlikely to happen. However, most existing research has studied the complexity or simplicity of the repertoire from the established or mature firms' perspective. In NVs, with no long history and related inertia, we expect that in the process of search for a successful strategic approach, there is a lot of trial and error (experimentation) where the temporal interpretations and aspirations of managers shape competitive behaviours (Chen and Nadkarni, 2017). In such a situation, during the early stages of NVs evolutionary processes, priority is likely to be given to variation and exploration in the type of competitive actions undertaken as opposed to the selection (exploitation) of particular competitive actions (Aldrich, 1999). However, some exploitation may also be needed to ensure profits to sustain further exploration and growth (Frigotto, Coller and Collini, 2014). It appears that a more complex repertoire may help to get the balance between entrepreneurial exploration and exploitation for long-term success (Connelly *et al.*, 2017). Yet, as the competition unfolds, the level of the variety of the implemented actions will be closely related in a recursive way to the extent of the capabilities and skills that are being developed and made available to the NV (Ndofor, Sirmon and He, 2011). Once created, capabilities cannot be changed

so easily (it takes time), thus establishing a dependency between subsequent and previous competitive actions that parallels the path-dependent development of organizational capabilities with possible implications for subsequent growth. Thus, understanding the sequence (i.e. the pattern) of complexity in competitive action types can help in the predictive task.

The literature in competitive dynamics also suggests that the degree of complexity of the repertoire of actions affects firm growth differently in the short-term and in the long-term (Connelly *et al.*, 2017; Carnes *et al.*, 2019); therefore, our second question is as follows:

2. **What are the trade-offs between those potential alternative temporal patterns in the complexity of competitive repertoires in terms of their effects on NVs' short-term growth rates versus long-term growth trends in the number of employees?**

This question is important because NVs need to understand how alternative patterns of complexity help them grow as needed in the short-term as well as help them support long-term sustainable growth. Youndt, Subramaniam and Snell (2004) suggest that firms must utilize and leverage available knowledge and capabilities to initiate effective actions to gain competitive advantage and grow. Over time NV's knowledge and capabilities evolve in their breadth depending on the learning from the actions taken, with consequences for subsequent growth (Jovanovic, 1982; Clarysse, Bruneel and Wright, 2011). The literature suggests that, over time, NVs with strong initial annual growth rates translate into comparatively lower annual growth rates later on than those NVs that grow from the beginning at a slower rate. Coad et al. (2020) establish important implications of the growth pace on survival, finding higher survival rates in NVs with more moderated growth rates than high-growth rates. Thus, we aim to shed light on the trade-off NVs face between short-term growth rates and long-term growth trends by exploring its relationship with alternative patterns of the complexity of competitive repertoires. Interestingly, Venkatraman, Lee, and Iyer (2007) empirically proved the importance of looking

at sequential patterns of competitive (exploitative and explorative) behaviours together with other contingency effects to predict firm growth, yet on a sample of established firms.

1.3 Objectives breakdown

To answer these questions, the main objectives of this dissertation are the following:

- To disentangle the concept of inter-temporal change of the complexity of the firm competitive repertoire by using a set of well-established indicators or refinements of them that measure competitive complexity and measuring their (time-sequenced) change from one period to the next (Miller, 1993a).
- To identify a taxonomy of alternative temporal patterns in the complexity of competitive repertoires of NVs during their early years of operations.
- Theorize on the potential drivers of alternative temporal patterns of complexity firm and the behavioural mechanisms of pattern formation based on existing research.
- Determine the trade-offs between those alternative temporal patterns (considering the inter-temporal change of the complexity of the repertoire of competitive actions) regarding their effects on NV's short-term vs long-term growth trends in employees while controlling by a variety of factors that affect growth.

By including the temporal dimension in the form of temporal patterns, we acknowledge that we are not interested in studying the subsequent repertoires as screenshots of the complexity at given moments in time. In contrast, we are interested in the sequence that links them, reflecting a feedback loop between the set of competitive actions deployed, the perceived results of those implemented actions and the subsequent organizational capabilities developed to sustain the set of selected competitive actions through a path-dependent process. Our exploration comprises the early years of operations of a NV.

1.4 Clarification of key concepts

A new venture is a newly created (legally registered) firm (Gartner, 1985; Davidsson, Delmar and Wiklund, 2006) by independent entrepreneurs or an established corporation (Larrañeta, Zahra and Galán González, 2014). Competitors consider NVs as new market entrants and customers as a new source of supply (Gartner, 1985). In this dissertation, we are interested in a specific group of NVs—what we refer to as ambitious NVs—, those new firms that have high growth aspirations and soon after inception manage to go public in an effort to scale. Specifically, we focus on NVs that go through an IPO in a maximum of 2 years after their formal register.

For these entrepreneurial ventures, going through an IPO soon after inception (which is a springboard for their early development and growth), their strategic decisions are particularly critical for their operations and performance. NVs being in their early start-up phase, are typically limited in resources and faced with the liability of newness (Stinchcombe, 1965) since founders must acquire expertise (learn) in products, processes, market and technology (Gartner, 1985) to develop the organizational structure, including the resources, routines and capabilities they lack and achieve legitimacy (Freeman and Engel, 2007). Though NVs have the advantage of being more agile and flexible than mature firms (Weiblen and Chesbrough, 2015), they must first face their limitations to compete. Therefore, they must make choices and undertake actions to assemble the resources (e.g. financial, technological and human capital) and develop the capabilities they need (Penrose, 1959; Gilbert, Mcdougall and Audretsch, 2006; Lockett *et al.*, 2011). Then they must move to the growth phase in the pursuit of sales and profits, which will be accompanied by the further building of human resources (i.e. hiring of new employees) to support such growth strategy (Whetten, 1987; Gilbert, Mcdougall and Audretsch, 2006). Throughout the organizational process of NV emergence, strategic choices and actions taken are

critical. Competitive actions are driven by the *adaptive tension* between a perceived opportunity and a given aspiration (awareness and motivation) to develop a business, the performance feedback of previous actions (learning) and the current state of the (more or less path-dependent) internal (i.e. capabilities) and external (business environment) systems (Shepherd, Souitaris and Gruber, 2020). Through the learning process, firms, in general, improve actions by applying better knowledge and understanding (Fiol and Lyles, 1985), yet learning is influenced and to some extent limited by competitive moves made in the past (Levitt and March, 1988; Levinthal and March, 1993).

Time becomes essential in the process of NV creation to maturity as learning and profits take time. When moving from the early start-up phase, first mobilizing and then generating resources to the growth and profitability phase, NVs need to deal with different time horizons of decisions and combine actions for today's results with actions for expected future results. NVs must also combine the pressure from different types of stakeholders (e.g. shareholders looking for short-term results and venture capitalists with exploitative orientation vs entrepreneurs with long-term expectations) (Bird, 1992; Chen, Miller and Chen, 2019). This dissertation explores NVs strategies during the first five years of operations and their growth impacts up to the 6th year. Five years provides an adequate period for measuring long-term aspects of the strategy, coinciding with the period often taken into account to assess NV growth and survival (Delmar, 2006; Clarysse, Bruneel and Wright, 2011; Eurostat, 2018).

NV growth is essential to overcome the liability of newness and achieve viability (Gilbert, Mcdougall and Audretsch, 2006) by developing distinct organizational competences and capabilities. NV growth is a central question of entrepreneurship research next to innovation and NV creation (Delmar, 2006). There are several measures of NV growth, namely growth in

sales, employment, market share and market valuations. Among these measures, prior research on NV growth acknowledges that employment growth is the best indicator of the expansion of firm resources and capabilities (Penrose, 1959; Lockett *et al.*, 2011). In addition, employment growth provides a comparable measure of NV growth across NVs in the early years that is more stable than other fast-changing measures such as sales or market valuation (Garnsey, Stam and Heffernan, 2006). Profitability may not be a good measure to assess the early years of a NV since it takes time, and it could be ignored that NVs may sacrifice short-term performance to create long-term competitive advantage (Johnson and Van de Ven, 2017). Notably, employment growth at the firm level is primarily studied in terms of firms' net job creation, considering total employment gains and total employment losses in the studied firms (Henrekson and Johansson, 2010). Growth can be calculated as the change from one period to the next, and if expressed as a percentage, we call it the period growth rate, which provides a short-term view of the results of the actions initiated during that period t (the focal period) (Shepherd and Wiklund, 2009). Short-term growth can fluctuate considerably in NVs (Gilbert, Mcdougall and Audretsch, 2006), and some actions are expected to produce results in longer terms. For this reason, it is also essential to look at growth trends over several periods (t+1 and beyond) to understand where the NV is heading (Garnsey, Stam and Heffernan, 2006; Davidsson, Achtenhagen and Naldi, 2010; Carnes *et al.*, 2019). This dissertation focuses on growth in employment, distinguishing short- from long-term rates.

Competitive action is any strategic or tactical move externally or internally oriented, carried out by firms in their engagements or interaction with others in search of competitive advantage (Nokelainen, 2008; Chen and Miller, 2012, 2015). These moves include, among others, actions in R&D, marketing, product and service, operations, internationalization, acquisition and alliances.

The competitive action is the lowest unit of analysis of research in competitive dynamics. This dissertation focuses on the aggregation of these competitive actions into competitive repertoires at the firm level.

Competitive repertoire complexity refers to the extent to which the overall set of the NV competitive actions — i.e. the competitive repertoire — consists of actions of few types (simple) or actions of various types (complex) (Miller and Chen, 1996b; Ferrier and Lyon, 2004; Connelly *et al.*, 2017). The competitive repertoire complexity reflects at the same time the variety of action types and the breadth of capabilities being developed to sustain those competitive actions. Repertoires that are more complex are expected to be sustained by a greater range of organizational capabilities, allowing in NVs the dual attention to the exploitation of actions to perform and survive in the short term and the exploration of a varied set of actions that could nurture sustainable growth in the future. This idea is expressed in the literature as ambidexterity, which is considered a dynamic capability (O'Reilly III and Tushman, 2008) and has been related by recent research to the temporal orientations of managers (Lumpkin and Brigham, 2011; Chen, Miller and Chen, 2019).

Inter-temporal pattern in the complexity of the competitive repertoire refers to the temporal patterns or trajectory (path, progression, or line of development) that emerge from the inter-temporal change in the complexity of the successive repertoires of competitive actions deployed by a firm that results from the firm evolution in the (path-depending) learning and adaptation process over several periods. In our context, we conceptualize an inter-temporal pattern as the sequence or trajectory of the set of indicators measuring the complexity of the competitive repertoire over the early years of the NV.

1.5 Aims, scope and approach

1.5.1 Aims

The overall goal of this dissertation is to study how the degree of complexity of the overall set of competitive actions NVs deploy explain variations in their growth in employees, accounting for the role of time. More specifically, we first explore the inter-temporal change of the complexity of the competitive repertoires of NVs during their early years of operations). This is whether NVs choose to deploy a broad and balanced range of different competitive action types or concentrate on few action types and what happens as the competition unfolds in their search to build and sustain a competitive advantage over their rivals. Our interest thereby is not the repertoire of NV's competitive moves at particular points in time but the sequence of competitive moves over a period of time (Ferrier and Lee, 2002; Rindova, Ferrier and Wiltbank, 2010). We seek, therefore, to explore the existence of early patterns in the complexity of the competitive repertoires of NVs. Second, we explore how NV growth is affected by the patterns of the complexity of their competitive repertoires during their early years of operations. When assessing these effects, we look at short-term growth rates versus long-term growth trends in the number of employees over the course of several years.

Therefore, this dissertation seeks to contribute to the intersection of strategy and entrepreneurship research. In particular, we contribute to the literature on NVs growth and competitive dynamics. First, we seek to contribute to the literature on competitive dynamics and its repertoire approach by offering a taxonomy of temporal patterns in the complexity of the repertoires of competitive actions. Previous research provides a theorization that links competitive repertoire complexity and performance by mostly referring to one type of pattern (i.e. simplification) of the evolving degree of complexity in the competitive repertoire of actions. This simplification pattern appears to be driven by the selection and retention of competitive practices during the learning process, favouring practices and capabilities with early positive

results. This dissertation extends existing research by empirically identifying other types of patterns where NVs make choices outside the historical (path-dependent) learning cycle between actions, performance feedback and the developed range of capabilities. This dissertation theorizes around the temporal pattern formation, and its growth implications from the lens of organizational learning and dynamic capabilities approaches from strategic management research in general and the Awareness-Motivation-Capability (AMC) framework from competitive dynamics research in particular.

In practice, there is no one best way of doing for all NVs, but this depends on both internal and external factors. Yet, for managers and entrepreneurs, this research shall help to understand the importance of looking at how they make strategic decisions about the complexity (how many and how many different types to deploy simultaneously?) in the action types they initiate and how they are sequentially dependent (how many types they subsequently can deploy?). Managers and entrepreneurs can ask themselves if they are in the right trajectory (of development of actions and related capabilities) for long-term competitive advantage and, if not, plan the change and so move away from undesirable trajectories. The latter may result from the potential imbalance between the efficiency of a simple repertoire (exploitative) for short-term strategic alignment and the flexibility of a complex (and more explorative) repertoire later for long-term strategic adaptation (Venkatraman, Lee and Iyer, 2007; Dai *et al.*, 2017) and the temporal dependencies (McMullen and Dimov, 2013). Moreover, the contribution of NVs to the creation of new jobs in the economy depends on the start-up rate, the average size of firms at the start, the survival rate, and the average growth rate of survivors in the early years (Calvino, Criscuolo and Menon, 2015). Therefore, for policy-makers, this research can help understand how the alternative pathways in the variety of actions and capabilities may affect not just growth but also the pace of growth (fast or slow). Importantly, recent research associates survival with more moderated growth rather than with high growth (Coad, Frankish and Storey, 2020).

1.5.2 Theoretical scope

This dissertation falls within two large fields of research: strategic management and entrepreneurship. As we said at the beginning of the chapter, one of the major questions at the intersection of strategy and entrepreneurship research is to what extent competitive actions lead to the growth of companies in their early years of operations. Within the strategic management research, we rely on a major research stream in strategic management—i.e. competitive dynamics—, which centres its research on the competitive moves that firms carry out to outperform rivals. We draw on organizational learning (Levinthal and Marino, 2015) and dynamic capabilities (Eisenhardt and Martin, 2000; Teece, 2019) approaches from strategic management research in general and the Awareness-Motivation-Capability framework that underlies research in competitive dynamics (Chen and Miller, 2015) to explain competitive behaviours. Notably, we investigate the evolution of the complexity of the competitive repertoire of NVs and the implications for growth.

The field of entrepreneurship research involves studying the process by which NVs are created and become viable. Since NVs growth is essential to reach viability, our research relates to one of the central questions of entrepreneurship research which concerns firm growth (Eisenhardt and Schoonhoven, 1990; Gilbert, Mcdougall and Audretsch, 2006). Shane and Venkataraman (2000) set opportunity recognition at the centre of the entrepreneurship process (McMullen, 2015). In contrast, Hitt *et al.* (2001) stress that entrepreneurship involves both identifying and exploiting entrepreneurial opportunities. This occurs by committing the necessary resources, taking action and developing the capabilities and systems needed to full-scale operations to put a new product or service in the market in a competitive manner and learn during this process (March, 1991; Choi and Shepherd, 2004). In the same line, McMullen and Shepherd (2006) argue that opportunity awareness is a belief, not a fact, and, therefore, the subsequent action is needed to seize the believed opportunity. Bringing the action to the centre

of entrepreneurship research provides the link to research in competitive dynamics and to the question of how the series of competitive actions contribute to NVs growth.

1.5.3 Empirical scope

The study focuses on growth-oriented NVs (newly created firms during their early years of operation) going public shortly after creation and builds on the analysis at the firm level.

For the empirical study, we selected a population of young ventures fulfilling three requirements: first, they entered the Alternative Investment Market of the London Stock Exchange (AIM) in their first two years of their existence; second, they entered during the 2004-2010 period; third, they competed in one of several service industries. These conditions ensured that they were young, were competing in the same time period, and were comparable in their growth aspirations and potential. We tracked these ventures for five years following their formal incorporation into AIM up to 2014 (up to six years for employment data and other performance variables). AIM is a successful growth market, which belongs to the main Stock Market of London. In our context, AIM implies a rich database of fast-growing ventures that need capital for their expansion. Companies listed in AIM provide admission documents and annual reports, which are available on the AIM Website. These ventures offer an interesting setting for several reasons. First, they have left behind the inception and firm creation phase, including assembling the initial financial resources, to make way for the phase of learning and growth through experimentation and actions. Second, as the sampled NVs have undertaken IPO by entering AIM, we expect them to have high growth intentions.

We choose NVs from services industries (both business-to-business and business-to-customer services) because growth is likely to be faster and more knowledge and personnel intensive than in manufacturing industries. Consequently, the employment creation patterns that emerge may differ between services and manufacturing industries (Carter *et al.*, 1994).

Finally, including several services industries allows cross-industry comparisons and broader generalizability of results to services industries (Carter *et al.*, 1994).

Departing from those selection criteria, we developed a unique longitudinal database comprising seven cohorts of NVs, registered between 2004 and 2010, which we tracked up to the end of 2014. The final sample includes 1304 observations from 126 different NVs. The implemented strategy of NVs in the sample is tracked in the five subsequent years following their floating. For each year, we extracted information from the annual reports (i.e. from the Chairman and CEO letters to stakeholders) regularly published by the NVs by applying structured content analysis to identify and code competitive moves. As a result, 11071 actions were codified. Additionally, we compiled from Amadeus for each year (to the 6th year) data on each venture and its performance.

1.5.4 Research methods

The conceptual framework, hypotheses and research model of this dissertation are developed based on an extensive literature review. The variables are then operationalized by adopting or refining measures used in previous studies.

The empirical data to test the hypothesis are collected using content analysis of the CEO and Chairman letters published in the Annual Reports over the period of analysis. The study is longitudinal in nature; the data are collected over several years. Our approach to conceptualizing the temporal patterns of the complexity of the early competitive repertoires of NVs is in part deductive, inspired by theory, and in part inductive, inspired by the data through inductive techniques as clustering methods (Miozzo and DiVito, 2016). The use of pattern discovery techniques makes it possible to identify a taxonomy of temporal patterns empirically and test the hypothesis of the existence of alternative patterns in the complexity of the competitive repertoire of NVs.

Particularly, time-series cluster analysis using Dynamic Time Warping, the Distatis procedure (a multidimensional scaling approach) and a Partitioning Around Medoids (PAM) clustering algorithm is employed to find the temporal patterns. In turn, the econometric approach applied later makes it possible to empirically test the hypotheses derived from the theory on the growth implications of the identified alternative patterns. Specifically, we use the Arellano–Bond linear dynamic panel-data estimation is used to test whether the hypothesized relationships between the alternative patterns and growth hold in the data. The reliability, validity and limitations of the different steps of the study are considered and evaluated. With both quantitative approaches, this dissertation aims at building on and expanding the existing knowledge.

In the rest, the dissertation is structured as follows. In Chapter 2, we present the theoretical background. Then, in Chapter 3, we present our research model, the theoretical framework and the hypothesis, followed by the methodology and results in Chapter 4. In Chapter 5, we present the discussion and conclusions.

CHAPTER 2. THEORETICAL BACKGROUND

2.1 Strategic management, competitive dynamics and strategic action repertoire

2.1.1 Strategic management – Key theories and frameworks

Strategic management is a key differentiator aspect between firms and their achievements. It is commonly defined as the process by which top managers (on behalf of owners) decide and initiate actions on the strategic use and development of resources and capabilities of an organization to reach its long-term goals, such as enhanced performance, growth and sustained competitive advantage, within the internal and external environments in which the organization operates (Nag, Hambrick and Chen, 2007).

The modern process of formal strategic planning and controlling was first introduced in firms in the mid-1950s (Steiner, 1979). Around that time and in the following years, acknowledging the limitations of mainstream economics[2] to explain firms' differential performances, such as different growth in profits and jobs (Teece, 2019), the field of research in strategic management emerges drawing upon multiple disciplines—i.e. economics, sociology, psychology, political science and others—to provide insight into practical problems of managers. The field aims to understand "how firms are created, organized, and grow; how they innovate and compete; and how managers manage" (Teece, 2019), and ultimately how firms gain and retain competitive advantage and success (Guerras-Martín, Madhok and Montoro-Sánchez, 2014; Leiblein and Reuer, 2019). In other words, how managers, as agents of their firms and resource allocators, often responding to various stakeholders (e.g. owners, employees and society), deploy and develop resources and capabilities to achieve the firm's goals and what are the drivers and constraints and consequences of their managerial choices. The field delves so into the determinants and consequences of firm behaviour, trying to answer the fundamental

[2] Mainstream economics considers firms as homogeneous black boxes and cannot explain how different management teams have diverse motivations, make different interpretations and strategic choices, and learn from them, leading to differences in firm-level resource allocation, developed difficult-to-imitate capabilities and performance (Mintzberg, Ahlstrand and Lampel, 1998; Teece, 2019)

question in strategic management of why do some firms perform better than others do (Hitt, Boyd and Li, 2004; Guerras-Martín, Madhok and Montoro-Sánchez, 2014). Importantly, the purpose of the strategic management research field is two-fold: (i) advancing theory and (ii) providing advice to practising managers (Mintzberg, Ahlstrand and Lampel, 1998; Hitt, Boyd and Li, 2004; Guerras-Martín, Madhok and Montoro-Sánchez, 2014).

Research in the field emerges from the late 1950s[3] with Penrose (1959), Chandler (1962), Child (1972), Miles et al. (1978), Mintzberg (1979), Porter (1980), to name a few, and has developed theoretically and empirically into a more mature field since then (Mintzberg, Ahlstrand and Lampel, 1998; Hitt, Boyd and Li, 2004; Guerras-Martín, Madhok and Montoro-Sánchez, 2014). Without the intention to provide a fully comprehensive literature review, we conduct an illustrative review to give sense to the research we present in this study.

Top managers undertake strategic management. First, they must set strategic goals. Then, top managers must direct attention to resources and capabilities—i.e. financial and intellectual (e.g. human, technological, social and structural/organizational) capital (Martín-de-Castro *et al.*, 2006; Carmona-Lavado, Cuevas-Rodríguez and Cabello-Medina, 2010) needed to execute the strategy. They must assess internal strengths and weaknesses and external factors (e.g. customer, competitors and regulations) and the opportunities and threats to plan and pursue the right choices (Barney, 1991).

Strategic management is an ongoing process that requires continuous evaluation and control of the internal and external conditions and assessment of whether the implemented choices were successful, allowing for organizational learning and strategic adaptation that are key to strategic management and performance (Fiol and Lyles, 1985). However, organizational learning does not always lead to adaptation, and adaptation is not always the result of rational

[3] Alternatively, some authors situate Chandler's (1962) book on strategy and structure as the start of modern strategic management research (Hitt, Boyd and Li, 2004; Guerras-Martín, Madhok and Montoro-Sánchez, 2014; Leiblein and Reuer, 2019).

learning or of learning at all (Fiol and Lyles, 1985; Mintzberg, Ahlstrand and Lampel, 1998). Indeed, in contrast to thinking of strategic management as a (step-by-step) rational process, the research literature increasingly acknowledges that both rationality and intuition are essential in strategy-making (Steiner, 1979; Elbanna and Child, 2007; Calabretta, Gemser and Wijnberg, 2017). Rational decision is logical, bases on facts and can be explained later. In contrast, intuition is faster, non-conscious, and related decisions are charged by subjective perceptions, expectations and judgements. Managers interpretations and expectations (also temporal) have important performance implications (Wiklund and Shepherd, 2003; Schumacher, 2020). This subjectivity has been long stressed by a number of authors of the cognitive school that see strategy as an interpretation of the world (Mintzberg, Ahlstrand and Lampel, 1998). This is more notable even in entrepreneurial (as opposed to operational) activity where the inherent uncertainty in the absence of past facts brings about the need for start-ups to combine rationality with a good dose of intuitive capability (Allinson, Chell and Hayes, 2000). The literature acknowledges that entrepreneurial action is a response to judgement conducted under the uncertainty of whether investing or starting a new course of action towards a believed opportunity with the available means will provide the expected results (Shepherd, McMullen and Jennings, 2007; McMullen, 2015). However, McMullen, (2015) also emphasises the idea put forward by Hastie (2001) that most decision theories are designed to account for the choice of an action at one point of time, yet *"Sometimes choice in the current situation involves a sequence of decisions that are dependent on each other and on changing the future."* Controlling the anticipative sequence is relevant to strategic management research, but there are not enough empirical findings or a theoretical framework to account for such empirical findings (McMullen, 2015).

When accounting for the role of time, subjectivity and intuition are important concerning the temporal orientation of managers, i.e. their tendencies to evaluate and interpret time. This is the case when managing the tension between the pressure of expectations about

short-term results (exploitation), for example, to meet shareholders' demands, and the uncertainty of expectations about investments made now to have an impact on the future (exploration) (Johnson and Van de Ven, 2017). Different temporal orientations have been found to shape managers' competitive behaviour (Nadkarni, Chen and Chen, 2016).

Strategic management gives overall direction and long-term focus to the firm, supporting the achievement of goals within the stated period, yet long-term goals must be breakdown into short-term objectives and actions (tactical or operative). Strategic management encompasses competitive decisions and actions that will be strategic or tactical depending on the time horizon of execution and expected results, among others. Thus, managers must be able ("agile") to switch between short- and long-term horizons in the strategic decision-making process. The temporal agility has been recently linked by Chen, Miller, and Chen (2019) to the managerial dilemma introduced by March (1991) of exploiting current capabilities (focus short-term/efficiency) versus exploring or anticipating future capabilities (focus long-term flexibility/adaptation) (Eisenhardt and Piezunka, 2011) and the ambidexterity as a dynamic capability. In addition, exploitation and exploration activities trigger different types of organizational learning, with the former emphasizing the known and the latter the new (March, 1991). This trade-off is also at the core of the dynamic capabilities framework (DCF), an extension of the Resource-Based View (RBV) (Teece, Pisano and Shuen, 1997; Teece, 2007, 2019).

Linking firm-level strategy and organizational structure (resources and capabilities)

Penrose's (1959) theory of the growth of the firm laid the foundations of the *Resource-Based View (RBV)* developed later by Wernerfelt (1984) and Barney (1991) with important emphasis on firm internal aspects, notably firm resources. Barney (1991) defined firm resources as *"all assets, capabilities, organizational processes, firm attributes, information, knowledge,*

etc." that a firm has under control to plan and implement strategies to improve performance. A firm has a competitive advantage when it creates value through the available resources not simultaneously created by a competitor, and this firm has sustained competitive advantage if the created value is difficult to duplicate. Barney (1991) remarks that the characteristic of "sustained" does not refer to time but to inimitability. However, over time he acknowledges the competitive advantage may disappear with structural changes in the market or industry, the so-called Schumpeterian shocks, external shocks, which will require internal organizational changes. Time eventually renders all competitive advantages obsolete (Williams, 1992; Rindova and Fombrun, 1999)

The work of Chandler (1962) articulated the two-way link between strategy and structure. With resources and capabilities embedded in the structure, these are determined by strategy and at the same time influence strategy, conferring the firm strategic inflexibility and path dependence as once the structure is settled, changes are not easy, and peripheral vision to foresee challenges and new opportunities may be constrained. The works of Miller (1990, 1993) further developed this idea by using the Icarus Paradox to explain how a firm's success determines later its own failure. The strongly developed flying capabilities of Icarus did not work in a transformed environment and burned when coming close to the sun. Child (1972) introduced the idea that strategic choices as the result of the decision-making process can affect both the structural aspects of a firm as well as elements of the external competitive environment and, ultimately, different types of performance. The strategy-making process brings out the breadth of choice as well as the number of ways in which the environment and the firm structure can be reconciled to achieve a certain fit (Child, 1972; Miller and Friesen, 1980). From an evolutionary perspective of strategic management, Aldrich (1999) highlights that adaptation choices are not just the result of selection and retention of successful actions but also of variation, this is the purposely change in current routines and competences or change in the

organizational form either driven by searching to solve problems or occurring independently from environmental or selection pressures.

Linking firm-level strategy and dynamic capabilities

In 1997, Teece, Pisano, and Shuen (1997), drawing on Prahalad and Hamel's (1990) ideas, proposed the *dynamic capabilities framework (DCF)* that extends the *RBV* by explaining how "valuable, rare, difficult to imitate and imperfectly substitutable resources" can be created and its stock refreshed so as to sustain the firm competitive advantage over time with changing business environments. The *DCF* distinguishes clearly between resources and capabilities. A resource is what a firm owns or has at its disposal (e.g. financial, human, tangible, intangible and structural/organizational) and depreciates over time. Contrastingly, a capability (e.g. routines, processes, people's know-how) is created and developed inside the firm, is path-dependent (once created cannot be so easily changed) as it had been suggested already by Chandler (1962), and determines what a firm can do with its resources (Eisenhardt and Martin, 2000). In his work toward a *Knowledge-Based theory*, Grant (1996) emphasizes that the main resource of a firm for change and adaptation (competitive action) is the knowledge owned by the employees and their role as the primary actors in knowledge creation, being the main repository of knowledge. All this seems to point out the value of a greater base of action types to generate a greater base of capabilities and knowledge (Carnes *et al.*, 2019). However, there remains the difficult challenge, already stated above, of how to find in the evolution over time the right balance between the (costly and uncertain) flexibility and the efficiency of a more focused and narrower repertoire of actions and what are the implications.

DCF's main argument is that a firm cannot retain long-term competitive advantage by relying only on emphasizing current capabilities ("technical fit"), i.e. becoming more efficient, keeping competitors at bay and excluding new entrants, but it has to also shape the future. A

firm must embrace and develop new business opportunities and anticipate capabilities through building dynamic capabilities ("evolutionary adjustment") (Teece, Pisano and Shuen, 1997; Teece, 2007). In brief, after some time, competitors will overcome the inimitability of a resource or a capability, or these will lose their value in a changing business environment (recall Icarus paradox), and dynamic capabilities are those built in a moment for their deployment in the future to tap into and create new business opportunities while shaping the future. Dynamic capabilities fight inflexibility, inertia and prevent falling into the competence trap (Levinthal and March, 1993) that is caused by specialization, i.e. the excessive focus on what currently gives the competitive advantage and success.

The *DCF* incorporates, thus, the relevance for the decision-making process of including time and different temporal horizons (today's vs tomorrow's capabilities), providing the link to the *organizational learning school* that takes off with Quinn's (1980) work on strategies for change.

Linking sequential strategy to organizational learning and adaptation

Departing from the idea that *organizational learning* involves the process of enhancing actions by improving knowledge and understanding, Fiol and Lyles (1985) distinguished between *cognition development* if learning refers to developing understanding and conceptual schemes and *behaviour development* if it refers to new responses and actions based on interpretations. Levitt and March (1988) argued that organizations learn by drawing inferences from history in routines that guide behaviour. Researchers now recognize the dualism that learning can refer to changes in beliefs/cognitions or actions/behaviour (Argote, 2011). However, learning (improved knowledge) does not always translate into action (adaptation), and action is not always the result of learning (Fiol and Lyles, 1985).The process of *organizational learning* happens through the two mechanisms of trial and error (experiencing) and search for new options (Levitt and

March, 1988). More in detail, Bingham and Davis (2012) refer to four distinct *organizational learning* processes classified in direct learning (i.e. *trial-and-error learning*, *experimental learning* and *improvisational learning*) and indirect learning (i.e. vicarious learning). In *trial-and-error learning*, learning occurs after a firm experiences the consequences of the previous action and changes its behaviour or knowledge accordingly. In contrast, *improvisational learning* is the real-time learning process in which firms take action to solve issues or capture opportunities on the spot (Miner, Bassof and Moorman, 2001). *Experimental learning* occurs in controlled situations that firms use to test ideas and assumptions, creating knowledge in a cost-effective manner that can be incorporated into firm activities (Pisano, 1994). Recent research on entrepreneurship has focused on *experimental learning* methods in real-life settings. It refers to the "lean start-up" (LS) methodology that puts experimentation ahead of elaborate planning, customer feedback ahead of intuition and iterative design ahead of big up-front developments (Blank, 2013; Harms, 2015). LS is about making explicit assumptions and testing them empirically in the real world. It includes tools such as variations of the business model canvas, (qualitative and quantitative) market research and prototyping to support the exploration of opportunities towards an economically viable venture (Harms and Schwery, 2020). Another stream of recent research suggests that learning and adaptive actions (to environmental fluctuations) to ensure sustainable growth can be motivated by the use of nudges ("pushing someone gently with the elbow"), which integrate into the managers', employees' or customers' choice architecture aiming to influence their behaviour, leaving freedom of action (Dianoux *et al.*, 2019). Finally, *vicarious learning* is defined as the process of learning from the experience of others (Huber, 1991). Moreover, March (1991) gave another nuance distinguishing between *organizational learning* from the exploration of new possibilities and the exploitation of old certainties, with the latter considered effective in the short term but destructive in the long term. Both types of learning depend on the evaluation and interpretation of outcomes as success or failure, with the difficulty that sometimes the connections between actions and outcomes are incorrectly

specified (Levitt and March, 1988) and not contemporaneous, thus, based on projected and expected rather than actual outcomes (Celuch, Murphy and Callaway, 2007). Several authors highlight that organizational learning is somehow biased by the past, i.e. previous experiences and knowledge (Levitt and March, 1988), and therefore searching for the "new" and unknown out of the box is not so evident, requires an amount of exploratory work and intuition. The important implication for managers is that they must adopt a flexible mindset and disrupt themselves, for which they need a wide range of experiences and the appropriate competences to deal with them to create novel and robust strategies (Weick, 1979). This is so because the firm's strategic posture determines to some extent its learning capacity, as it fixes the goals and objectives and the breadth or complexity of actions and related capabilities to achieve them. In this sense, Fiol and Lyles (1985) state that *"strategy influences learning by providing a boundary to decision making and a context for the perception and interpretation of the environment."* Moreover, McMullen and Dimov (2013) emphasize the relevance of the temporal sequence in learning. The sequence with which the information related to the deployed strategy is acquired matters as it affects not only the ease or difficulty of making use of, but also what can be made. As organizations learn from experience, the created knowledge is retained through its integration in actions and routines and transferred within and between units affecting subsequent choices (Argote, 2011). In the same line, Bingham and Davis (2012) empirically demonstrate that different learning sequences affect both short- and long-term performance differently. Also, new knowledge can be acquired externally by hiring new people or firm acquisition (Grant, 1996). Similarly, Powell, Koput, and Smith-Doerr (1996) highlight the importance of inter-firm alliancing to bring new resources and capabilities into the firm. In this regard, Cohen and Levinthal (1990) stress the importance of the absorptive capacity—i.e. the firm's ability based on the accumulated knowledge that makes it easier *"to recognize the value of new, external knowledge, assimilate it, and apply it to commercial ends"*— to integrate external knowledge. Firms can enrich the variety of their actions by accessing external

knowledge (Larrañeta, Zahra and González, 2012), which also increases their expertise in a broader range of activities and improves firm's ability to recognize the value in new knowledge, enhancing their absorptive capacity (Lengnick-Hall, Beck and Lengnick-Hall, 2011).

Linking firm-level strategy and the business environment

Yet, keeping flexibility of action is at the risk of developing capabilities that the firm is not fully exploiting but use and returns may come in the future or not (Celuch, Murphy and Callaway, 2007). The *evolutionary school* with origins in *contingency theory* suggests that it is not enough for firms to keep moving, but they must avoid the red queen trap. As competitors also move, it is not just about moving, but they must get it right. Only the best-adapted companies are selected for survival (Barnett and Burgelman, 1996). Along with rational thinking, good interpretation and judgement will be needed for appropriate strategic adaptation or even full change. Contingency theorists stress that there is no one best way of doing it, but it depends on a variety of internal and external factors (Mintzberg, Ahlstrand and Lampel, 1998).

More strictly, however, the *Population Ecology View* argues that firms cannot really adapt, the basic structure of an organization is fixed shortly after birth, and only superficial changes can take place then due to strong inertial pressures (Hannan and Freeman, 1977). Among others, the appearance of sunk costs reduces their capability for real adaptation.

Evolutionary theories, as an alternative to the determinism of *Contingency Theory* and the *Population ecology view*, highlight that it is not just the entry conditions and external factors that are important, but also the actions progressively carried out by firms in order to grow and reach scale and to acquire and develop the range of knowledge and skills. According to E*volutionary theories*, firms are always competing against each other for growth opportunities, with the only limitation of firm abilities to pursue and finance that growth (Coad, 2010). Contrastingly, *Neoclassical theory* assumes that firms stop growing after they are satisfied by

reaching the 'optimal size'. However, *Evolutionary theories* also acknowledge the limited rationality and plasticity (or flexibility) in firm competitive behaviours as current decisions are related to past choices that are reflected in current production routines. This also stays in clear contrast to *Neoclassical theory* that assumes that agents can accurately anticipate the future and maximize their profits on an infinite time horizon independently of past choices (Coad, 2010).

Again, it appears that the key is to balance the inflexibility and inertia today with a broad base of strategic experiences and competences to shape and deal with tomorrow. In the evolutionary model, the success of strategies depends on achieving improvement in current fitness to produce short-term profits and developing advantages in size, knowledge and adaptability that can produce long-term rents (Johnson and Van de Ven, 2017). Moreover, the key difference between firms is not just the immediate strategic options available but also their ability to acquire new capabilities over time. However, this has two major limitations, the firm's budgetary constraints and the uncertainty to get it right in the evolution for the future.

Taxonomic approaches linking firm-level strategy and organization

Several examples in the literature use taxonomic approaches to understand different types of competitive behaviours and their performance consequences. In 1978, the work of Miles et al. (1978) deepened in the link between market strategy and organization following a taxonomic approach by classifying firms according to their competitive behaviour into four broad categories. These are defenders, prospectors, analysers, and reactors, each with a unique strategy to face the market as well as unique structural configurations (i.e. technology and process). From a taxonomic approach also, Mintzberg's (1979) five types of structural configurations further develop the link between structure and strategy, which serves as the basis of Miller's (1986) investigation into linkages between strategic and structural configurations. He

enhanced that strategy is not only a function of structure but also of external elements such as economic, competitive and customer factors as well as international market conditions.

Hambrick (1984) highlighted the importance of taxonomic approaches in the field of strategy as they support theory building and help in the predictive task. Further, he highlighted the importance of developing longitudinal taxonomies, among others, recalling the idea put forward by other authors that decision-making is a sequential process (Hastie, 2001; McMullen, 2015).

Linking industry-level strategy and business environment

In 1980 Porter's book, Competitive Strategy, had turned the attention to the industry and competitor analysis and defined strategic groups as clusters of firms conducting similar competitive strategies and representing different strategic positions within a single industry. Porter's (1980) research provides an "outside-in" view that contrasts with the "inside-out" view of previous research. Porter's (1980) draws on *industrial organization*, a field of *economics* focusing on how industries, rather than individual firms, compete. Some criticism of Porter's approach is that it over-formalizes and over-rationalises the strategy-making process removing to some extent the intuition as well as it provides a static view of strategy as a posture not considering the continuous interaction between competitors and the consequently temporarily of the relative competitive advantages.

Throughout history, management research has oscillated on various pendulums (Guerras-Martín, Madhok and Montoro-Sánchez, 2014). These are, first, the tension between the focus on factors internal (e.g. organization/structure, resources, knowledge and capabilities) or external (e.g. market and industry) to the firm, and, second, the tension between the micro (e.g. the firm, the individual and the action) and macro (e.g. the industry) level of analysis. A third pendulum reflects the tension between the static vs dynamic aspects of strategy, including

both the inter-firm rivalry (actions and reactions) and the inter-temporal dimension. It is specifically in the latter that we set the focus in this research study.

Competitive dynamics is a research stream within strategic management that emerges in the mid-1980s to study firms and their competition in the market under the consideration of the temporarily competitive advantage and placing the actual action at the centre of the research.

In this dissertation, consistent with recent research, we focus, particularly on the time-related dynamics. That is specifically on the evolution over time of the strategy (actions) implemented by firms that can change their competitive positioning in the market, considering how managers' consideration of time horizons plays a fundamental role in the strategic intentions and actions and the related capabilities with different implications for the short- and long-term performance of the firm. Although the literature on strategic management tackles this issue, this study provides new empirical evidence and sophisticated analysis uncovering patterns of the complexity (variety) of the strategy, combining deductive (theory-driven) and inductive methods. Furthermore, this dissertation links the different identified temporal patterns to growth and the pace of growth.

2.1.2 Competitive dynamics

Competitive dynamics emerge from the interplay of the series of actions and reactions among firms in an industry in search of competitive advantage and profits (Smith, Grimm and Grannon, 1992). Competitive dynamics is an important research stream within strategic management research that emerges in the mid-1980s with roots in Schumpeter's school and its concept of creative destruction (1942) and the Austrian view (Kirzner, 1997) of the market as a system of disequilibrium. The competitive dynamics research stream relies on the premise that changing conditions make a firm's positioning in a competitive market temporary, whether in

the short- or long-term (Chen and Miller, 1994; Ferrier, Smith and Grimm, 1999; Ferrier, 2001; Nadkarni, Chen and Chen, 2016).

The competitive dynamics research stream focuses on the study of how firm strategic action and reaction affect competitors, partners and other possible stakeholders, its competitive advantage and its performance, taking into account the evolution of firm organizational and market contexts and the organizational characteristics that drive firm strategic action (Smith, Ferrier and Ndofor, 2001; Chen and Miller, 2012, 2015). Moreover, Lamberg et al. (2009), in line with other research in strategic management, stress that each strategic action moves the firm to a new point, thus changes the firm and the competitive landscape. This way, consequences and antecedents of strategic action are not directional; instead, they are recursive, highlighting so the process nature of competition.

Competitive dynamics research has the focus on the firm level (not the industry) and on the dynamic inter-active (action dyads) and inter-temporal (evolutionary) perspective of the competitive actions. The competitive action is the implemented move that follows managers' decisions and is closely linked to the strategic choice (Child, 1972) that results from the strategic management process. Actions can be deliberate, resulting from a deliberated plan, or emergent, not formally planned from the beginning but decided during the process as part of the process of learning and adaptation (Mintzberg, Ahlstrand and Lampel, 1998). Competitive actions may be strategic or tactical (operative) depending on the resources, level of management and timeframes involved (Chen, Smith and Grimm, 1992).

Managers and entrepreneurs face major challenges in their pursuit of profitability and survival, as well as in the choice of alternative competitive actions. When entering or competing in a market, firms can deploy different competitive or strategic moves, such as introducing a new product, developing new technology, enhancing their productive capacity or closing a strategic alliance. The lowest unit of observation in competitive dynamics research is the

competitive action. It can be defined as any deliberate or emergent market-oriented (Smith, Grimm and Grannon, 1992; Miller and Chen, 1994, 1996b; Ferrier, Smith and Grimm, 1999; Ferrier, 2001) and non-market or internal-oriented (Baron, 1995) move carried out by a firm to improve its competitive advantage (Nokelainen, 2008). Ireland et al. (2001) make a distinction between entrepreneurial and strategic actions. While entrepreneurial actions are oriented to novelty (e.g. launch of a new product, conducting R&D activities, alliancing with other firms, and introducing products to foreign markets) and are associated with dynamic capabilities (Eisenhardt and Martin, 2000), strategic actions provide the context within which innovations are developed and commercialized. Chen and Miller (2012) and Rindova, Ferrier, and Wiltbank (2010) propose a comprehensive definition, which we assume in this work, referring to competitive action as any move a firm may take in its engagements and interaction with others (e.g. competitors, customers, owners, regulators and other stakeholders) in search of competitive advantage. According to this definition, as firms engage with others, actions maybe not strictly of rivalrous nature but also cooperative. Indeed networks are essential for firms and, in particular, for entrepreneurial ventures since they give access to resources and knowledge they may need and cannot easily build (Powell, Koput and Smith-Doerr, 1996). Also, actions may not be driven strictly by economic factors but by political, social and environmental ones to sustain the competitive advantage (Chen and Miller, 2015). With the growing power of stakeholders, firms are pressured to adopt sustainable and fair business practices (Aguilera and Jackson, 2010).

In competitive dynamics, the strategy is a dynamic process that involves an intricate pattern of actions and reactions as firms compete or adapt to the environment (Mintzberg and Quinn, 1998), and one must analyse the interplay and consequences of actions and reactions to understand profits and competition (Smith, Ferrier and Ndofor, 2001). In the search for a definition of strategy, Mintzberg (1987) presents five definitions of strategy — as plan, ploy, pattern, position, and perspective — and considers how they are interrelated. Competitive

dynamics draws on Mintzberg's (1987) strategy's conceptualization as the pattern of actions evolving out of their past, closely linked to the conceptualization as a plan of actions for the future. Contrastingly, other streams refer to strategy as strategic postures and orientations (see, e.g. Porter's definition: "*Strategy is the creation of a unique and valuable position, involving a different set of activities*"). Also, in contrast to Porter's that focuses on the industry level, the level of analysis is the firm, since each firm has specific resource endowments, orchestrated in a particular manner and specific market profiles (Chen and Miller, 2012). Finally, the competitive action perspective acknowledges that competitive behaviours evolve (strategy as a sequence of actions) (Ferrier, 2001).

Research on competitive dynamics draws upon multiple strategic management theories, such as *Organizational Learning* and *Dynamic Capabilities* as explained before, or even *Upper-Echelon theory*. The *Upper-Echelon theory* states that the individual managers' or top management team's characteristics, such as age, education or career experiences of individuals and team's heterogeneity, determine competitive choices, organizational structure and performance (Hambrick and Mason, 1984; Hambrick, Cho and Chen, 1996).

The Awareness, Motivation, Capability Framework

One of the unique frameworks developed within the realms of the research stream of competitive dynamics is the Awareness-Motivation-Capability (AMC), a framework that draws on multiple management and economic theories and perspectives—such as the *RBV*, the *DCF*, *Upper-Echelon perspective*, *contingency theory*, *organizational learning*, *and behavioural sciences— to* explain firms' competitive behaviour. The AMC framework, which tries to unify insights from all of those key theories and perspectives, posits that there are three essential elements around which to organize our understanding of the drivers of a firm's competitive

behaviour and its consequences (Chen, 1996; Ferrier, 2001; Chen, Su and Tsai, 2007; Chen and Miller, 2012).

The first element is the *awareness* of existing and upcoming opportunities and challenges to initiate particular actions and anticipate their potential implications, which is associated with the scanning of the environment and interpreting its signals. Second, the *motivation* to act once there is a belief that there is an opportunity. The motivation depends on aspects such as the entrepreneur's or founding team members' personality (e.g. pro-activity vs passivity). It also depends on attitudes towards risk (e.g. risk aversion may discourage new and variate competitive moves), career or firm stage (early vs later stages that may call for greater caution when planning action), and potential payoffs (i.e. financial, reputational or other) that will result in a greater or lesser propensity to initiate competitive actions. And, finally, the *capability* of taking action, especially the skill of the entrepreneur or founding team to understand the competitive arena and be able to design and implement competitive choices and the ability to understand and assemble the resources and capabilities needed for the successful implementation of the strategy.

In brief, managers will choose from among a number of viable alternative strategies, adopting those that suit their environments and also reflect their personal motivations, preferences and capabilities (Miller, Dröge and Toulouse, 1988).

The literature identifies the works of MacMillan, McCaffery, and Van Wijk (1985) with the study of competitor response time in new products introduction and Bettis and Weeks (1987) with the study of the moves and countermoves between Polaroid and Kodak in instant photography as the start of competitive dynamics research in strategic management. A series of works focusing on the characteristics of action-reaction dyads of competitors followed (Chen and Miller, 1994; Ferrier, Smith and Grimm, 1999). Then the focus shifted to streams or

repertoires of actions among sets of players that richly characterize firms' competitive behaviour and allow researchers to identify patterns in the overall strategy over a given period.

2.1.3 Competitive action repertoire and competitive behaviour

The competitive actions of a firm can be aggregated into categories, patterns, routines and sequences (Smith, Ferrier and Ndofor, 2001), resulting in what is referred to as the competitive repertoire of a firm; this is the array of different competitive moves deployed by a firm in a given time period to achieve competitive advantage (Miller and Chen 1996). The competitive repertoire accounts for the entire configuration of competitive actions and provides a holistic picture of the firm's competitive behaviour and posture (Chen and Miller, 2012). The emphasis on (relative importance of) the various strategic categories and subcategories of action (linked to functional and strategic value-generating areas, see Porter, 1985) in which the competitive repertoire can be organized have been associated with various performance measures in previous research (Hitt, Ireland, and Stadter 1982; Lockett et al. 2011; Zahra, Ireland, and Hitt 2000). An important stream of research in competitive dynamics focuses on the study of the firm's competitive repertoire, its structural characteristics, antecedents and implications for firm performance.

Research on competitive content (what firms do), for instance, studies the performance implications of organic (e.g. product launch and R&D) versus external (e.g. alliances and acquisitions) oriented competitive moves, domestic versus international oriented moves (Gilbert, Mcdougall and Audretsch, 2006) and alternative entry modes in international markets (e.g. joint venture, acquisition or exporting) (Zahra, Ireland and Hitt, 2000). From an evolutionary perspective, several authors study the tension between carrying out entrepreneurial actions, such as the new product launches, R&D activities, alliances with other firms and exports to foreign markets that bring adaptability to the firm (and generate dynamic capabilities), and

strategic actions to operate the business efficiently (Hitt *et al.*, 2002; Johnson and Van de Ven, 2017).

In contrast, the repertoire approach focuses on behavioural and structural characteristics of the overall set of competitive actions (how firms do), the competitive repertoires, to explain differential firm performance.

Characteristics of the competitive repertoire

Research on competitive dynamics suggests that the structural characteristics of the competitive repertoire reflect important dimensions of the firm's competitive behaviour that have implications for performance.

In Chen and Miller (2012), these characteristics are summarized as firm's competitive: (i) *inertia* (also called *competitive aggressiveness* in Ferrier and Lee, 2002; Ferrier *et al.*, 2002; Nadkarni, Chen and Chen, 2016; Carnes *et al.*, 2019) or the overall number of actions (Miller and Chen, 1994), (ii) *simplicity or complexity (i.e. variety and diversity)* in the type of competitive moves it makes (Miller and Chen, 1996b; Ferrier and Lyon, 2004; Rindova, Ferrier and Wiltbank, 2010; Connelly *et al.*, 2017), and (iii) *nonconformity or level of departure from industry norms* (Miller and Chen, 1996a). Recent research incorporates to the concept of complexity the intertemporal consistency versus change and novelty in the types of moves of a firm's competitive repertoire (Lamberg *et al.*, 2009; Connelly *et al.*, 2017). Through their choices, managers and entrepreneurs regulate the extent to which they deploy an aggressive repertoire putting in place more or fewer actions (volume), a complex repertoire putting in place a wider or narrower range of action types and industry-conforming repertoire using similar or different types of competitive actions in relation to the industry norm.

The literature, in general, recognises the positive effects of a more aggressive and complex repertoire while at the same time conforming to the industry, but also recognises important trade-offs whose net results will depend on how the benefits and risks and costs offset each other.

It appears that a competitive action repertoire that conforms to industry norms may cope better with environmental uncertainty, enjoy greater legitimacy, cooperation from regulators and customers, and help raise capital for growth (Miller and Chen, 1996a). But it may also be more predictable and imitable, and it reduces creativity (doing things different to competitors), being key for the deployment of unique combinations of actions (Penrose, 1959). Existing research found that prior firm good performance leads to more industry-conforming repertoires. In contrast, customer and competitor diversity, size (larger), age (younger) and less previous experience in the industry drive repertoires that are less conforming to the industry norms, which are associated with subsequent declines in financial performance (Miller and Chen, 1996a; Norman, Artz and Martinez, 2007).

Existing research has examined the antecedents of more aggressive repertoires of competitive actions and found that organizational slack and prior good performance contributes to aggressiveness (or inertia), and it is positively related to short-term performance (Miller and Chen, 1994; Ferrier, 2001). Furthermore, Miller and Chen (1994) find that poor performance might induce tactical changes, but not strategic actions, the latter being more difficult to implement, both operationally and politically. In contrast, poor market growth fosters strategic actions but not tactical, implying that the expansion of markets leads to actions that require a greater commitment of resources (Chen and Miller, 2012). Aggressiveness contributes to two types of action-based learning, one reactive (learning by doing from success and failure) and another experimental (trying new actions) (Miller and Chen, 1994; Ferrier, 2001). Yet carrying out a large number of competitive actions is not a universally effective strategy (Andrevski and

Ferrier, 2019). For instance, if excessive, costs can escalate and reduce financial performance is key for organizational success, and the latter and can be especially harmful if the "Red Queen" effect occurs because competitors respond by engaging in the same practices (Derfus *et al.*, 2008; Hughes-Morgan, Kolev and Mcnamara, 2018).

Following Miller's (1990, 1993b) work on the simplicity versus the complexity of strategy, extensive research highlights the importance of being sufficiently complex or varied in the types of competitive actions to promote wider learning and development of varied capabilities (flexibility and adaptability). And, by doing so, escape the learning (success or competence) trap that may be involved in carrying out a limited number of successful types of actions and competences while crowding out exploration of new competences and hindering the development of dynamic capabilities (Miller and Chen, 1996b; Ferrier and Lyon, 2004; Lumpkin and Dess, 2006; Connelly *et al.*, 2017). Together with exploitation, exploration seeking new competitive strategies is key for organizational success and the latter cannot be based only on managers' intuition that relies on automated expertise acquired in the past, but firms must develop a culture supportive of risk-taking by initiating well-thought new actions and failing (Miller and Ireland, 2005). The trade-off is also the possible loss of efficiency in the short-term and the uncertainty for the future of getting it right as too much variation in action types can also mean losing focus (exploration drives out exploitation) and lead to the failure trap. The latter has received less attention in the literature than the success trap (Levinthal and March, 1993; Liu, 2006). Interestingly, Wiklund and Shepherd's (2011) empirical study on entrepreneurial orientation (i.e. innovativeness, pro-activeness, and risk-taking orientation within the firm's decision-making processes, actions and behaviours) that they associate with exploration (i.e. experimentation and related entrepreneurial actions) finds that exploration is associated with higher rates of firm failure. In contrast, when considering only firms surviving firms, exploration is associated with higher performance.

Antecedents of competitive repertoire complexity

Prior research has found that the heterogeneity of the TMTs affects the complexity of the competitive repertoire and further moderates the relationship between the degree of complexity and performance positively (Ferrier and Lyon, 2004). Prior good performance leads to subsequent simplicity through the learning process that favours the actions with previous success (pursuit of efficiency) (Miller and Chen, 1996b), in contrast, organizational slack boosts the complexity of subsequent repertoires with more resources available for strategy implementation (Ferrier, 2001; Chiu and Liaw, 2009; Hughes-Morgan, Kolev and Mcnamara, 2018; Carnes *et al.*, 2019). Higher Chief Executive Officer (CEO) compensation (Offstein and Gnyawali, 2005) motivates a higher degree of complexity of the repertoire. The membership in alliances and networks is also associated with a broader repertoire of competitive actions as through them firms access new resources and capabilities (Gnyawali, He and Madhavan, 2006). On the contrary, higher market concentration and market munificence are associated with the simplicity of established firms but not of new incumbents entering a market, who are expected to deploy more complex repertoires to challenge incumbents (Smith, Ferrier and Grimm, 2001). Industry dynamism is an important external factor that may also lead to increased repertoire complexity as firms may adjust to the changing market forces by trying an increased variety of competitive action types (Larrañeta, Zahra and Galán González, 2014). Finally, both firm age and firm size have been found to affect the complexity of the firm's competitive repertoire, with age being associated with simplicity and size with complexity (Miller and Chen, 1996b).

Consequences of competitive repertoire complexity

The competitive repertoire reflects at the same time the range of action types deployed by the firm and the breadth of organizational capabilities that sustain the repertoire. This

suggests the possibility of giving the repertoire of actions a capability-based view, where the breadth of existing organizational capabilities shapes the range of possible competitive action types and vice versa. Despite the literature, in general, acknowledges the positive effects of a more complex repertoire, prior research shows that the degree of complexity of the competitive set of actions is not inherently good or bad. Actually, it depends on how external contexts and internal factors influence the trade-off between efficiency to generate short-term profits and flexibility (adaptability) to generate long-term rents. The way in which this trade-off will be resolved is affected by the firm's ambidexterity (the ability to exploit and explore at the same time) (Chen, Chen and Tsai, 2017; Chen, Miller and Chen, 2019). Repertoires that are more complex may help to build dynamic capabilities such as the ambidexterity, supporting exploitation and adaptation to the current business environment ("technical fitness") but also helping to create the future by shaping the future environment and adapting to it ("evolutionary fitness"), with positive implications for long-term competitive success[4] (Teece, Pisano and Shuen, 1997; Teece, 2007). In contrast, complex repertoires can also be financially lasting in the short term through increased costs that will potentially bring benefits at a later moment.

Some authors have empirically found that strategic simplicity (as opposed to complexity) is negatively associated with firm financial performance as it diminishes the range of capabilities for later action (Miller and Chen, 1996b). On the contrary, others have found simplicity to be positively associated with financial performance (Ferrier and Lyon, 2004) and stock returns (Hughes-Morgan, Ferrier and Labianca, 2011) under heterogeneous TMTs as compared to less heterogeneous TMTs. This is so because the former chose simplicity out of a broader variety of knowledge and capabilities and not as the result of narrow-mindedness and knowledge,

[4] "Technical fitness" refers to the necessary management practices such as improving quality, controlling costs, lowering inventories, and adopting best practices, while "evolutionary fitness" refers to the creation of new products and processes, new organizational forms and business models (innovation) (Teece, 2007).

conforming to the "law of requisite variety" (Ashby, 1957) and particularly to the idea that variety can manage simplicity but not the other way around (Ferrier and Lyon, 2004).

In NVs, simplicity has been negatively associated with sales growth, particularly in high dynamic environments (Larrañeta, Zahra and Galán González, 2014), yet also positively associated with market valuations in nascent markets, suggesting that external stakeholders understand better simple repertoires (Rindova, Ferrier and Wiltbank, 2010).

Connelly *et al.* (2017) find that simplicity is positively associated with financial performance in the short term, yet negatively in the long term. In the context of NVs, this trade-off may imply the significant dilemma for the entrepreneur or founding team of choosing between exploiting the current capabilities to survive (short-term) through a more simple and efficient repertoire or develop (explore) capabilities for future growth (dynamic/flexible). This trade-off is, however, not a one-time dilemma. Over time, as NVs learn from previous results and the competitive landscape, they can fine-tune the complexity of the repertoire, knowing that current choices imply a sequence of choices that depend on each other and will affect the future actions and the breadth of capabilities (Hastie, 2001; Davidsson, 2006; McMullen, 2015). This is so because previous choices and their variety or complexity are embodied in current routines, and define the range of capabilities available to the firm, and these take time to be built and eventually change, but, in turn, determine what the firm can do next. Therefore, feedback effects between the breadth of the repertoire of competitive actions and the breadth of the more or less path-dependent capabilities play an essential role in how the complexity of the repertoire evolves.

Time and the sequence of complexity of competitive repertoires

When reflecting on the notion of time in the study of the complexity of competitive repertoires, two critical studies have set the stage on the issue. On the one hand, there is

Connelly et al.'s study (2017) which notably incorporates in the notion of competitive complexity the idea of change and newness over time which requires looking at temporal variations in the repertoire of actions deployed, hence introducing dynamism in the concept. On the other hand, Lamberg et al. (2009) put the focus on the process of adaptation of firm competitive repertories over time, introducing the notion of competitive consistency, which is reflected in a certain similarity of competitive actions overtime, with past actions determining subsequent actions to a great extent in the process of adaptation.

Aside from these two exceptions, the body of literature on competitive repertoires, for the most part, does not explicitly consider the organizational learning process that precedes the execution of the competitive repertoire nor that it takes time. Most decisional theories are designed to explain the choice of an action at one point in time, yet choices at one point of time trigger a sequence of decisions that depend on each other (Hastie, 2001; McMullen, 2015). For example, it can be assumed that development and research activities precede the launch of a product (developed in-house) by a NV (Hitt, Ireland and Stadter, 1982). However, once launched, the firm can either focus on exploiting the new product (and simplify the strategy) or additionally further explore through continued development and research activities in order to address the future. The capabilities and know-how involved, if not kept up to date, must be rebuilt when they become necessary, with the risk of being too costly and not fast enough. In line with this reasoning, Miller and Friesen (1980) stress organizational adaptation as a process that takes place over time and that contingency approaches using static snapshots may not reveal the interesting dynamics of the process. Also, Ferrier and Lee (2002) highlight the importance of looking at the sequential pattern of competitive activity. By doing so, the inter-temporal change of the repertoire complexity may lead to alternative patterns of complexity and related (more or less dependent) capability building.

Looking at the sequential pattern transcends exploring the complexity as a characteristic of the repertoire at one moment or at successive moments in time but conceptualize the patterns as alternative paths to develop firm capabilities in search of competitive advantage. The pattern is concerned with the order (or sequence) of events or the levels of complexity. Previous literature usually explains the pattern that leads firms to simplify their competitive repertoires by specializing in the activities that made the firm currently successful because of the learning process that favours activities with previous success and selects out unsuccessful activities. In this way, companies can fall into the trap of success by unconsciously limiting the exploration of new activities. However, we know that in the feedback loop between activity, performance and path-dependent capabilities also motivations and aspirations as well as different temporal interpretations for the short- and for the long-term play a role and managers may follow other patterns that imply variation in competitive activity, instead of selection and retention of successful activities (Aldrich, 1999; Aldrich and Yang, 2014). These alternative patterns are not empirically tested and we do not know what the implications for NV growth of alternative patterns are, and this is precisely what we aim to explore in this dissertation.

2.2 Entrepreneurship & new ventures' growth

Entrepreneurship is the pursuit of opportunities beyond the resources currently under control (Stevenson and Jarillo, 1990; Hart, Stevenson and Dial, 1995). In that definition, "pursuit" refers to the awareness of an opportunity and the entrepreneur's motivation to address it. In addition, "beyond resources currently under control" acknowledges resource constraints as entrepreneurs must commit and mobilise the limited resources they control to develop new competences and capabilities (e.g. development of new products or services, new customers, new distributions channels, working capital) to exploit the opportunity (Eisenmann, 2013). This way, entrepreneurship includes the processes of discovering, evaluating and exploiting new

opportunities while dealing with the uncertainty of the potential opportunity's success (Shane and Venkataraman, 2000; Choi and Shepherd, 2004). Importantly, without an opportunity, there is no entrepreneurial activity that can succeed, no matter how hard tried (Short *et al.*, 2010). An entrepreneurial opportunity refers to external conditions suggesting the viability of launching new products and services, introducing new raw materials and organising methods, creating a new business model, improving an existing product or service, or targeting new sets of customers, all at prices that exceed their production costs (Shane and Venkataraman, 2000; Hitt *et al.*, 2002). Therefore, there is no business opportunity without customer demand; this is customers willing or motivated to pay the price the entrepreneur asks for (McMullen and Dimov, 2013). The opportunity may emerge because of supply and demand gaps, price differentials, technology replacement or innovation (Short *et al.*, 2010), which once sensed (awareness) may be seized depending on the willingness (motivation) and capability of the potential entrepreneur to act, leading to subsequent (re-)configuration of resources, knowledge and skills (Teece, 2007). Therefore, entrepreneurship must be seen as an iterative and sequential process of learning that involves action, integration of feedback from action (information) and projection, and eventually interaction with multiple agents (McMullen and Dimov, 2013). Most significantly, the sequence in which entrepreneurs make choices and learn from them matters, affecting subsequent choices. For example, the decision of closing an alliance with a partner (be it a supplier, customer or technology firm) will clearly affect subsequent decisions and behaviours around that alliance. After a while, the alliance decision may be reversed with more or less time and effort, but the path walked cannot be undone.

One form of entrepreneurship is the creation of new firms or ventures (NVs), one that is particularly important for innovation, job creation, and economic wealth (Gilbert, Mcdougall and Audretsch, 2006; Shepherd, Souitaris and Gruber, 2020). Still, these potential benefits of NV creation can only be realised if NVs are able to grow and survive. As such, the explanation of growth is one of the key concerns of entrepreneurship research (Cope, 2005).

Actions and changes are critical throughout the organizational process of NV emergence. NVs actions to exploit an opportunity and grow are driven by the *adaptive tension* between a perceived opportunity and the personal aspiration to start and grow a business and the current state of the firm internal (i.e. capabilities and financial resources) and external (business environment) system (Shepherd, Souitaris and Gruber, 2020) and entrepreneurial judgement (Choi and Shepherd, 2004). In this regard, entrepreneurship literature has connected NV growth with the nexus between the opportunity and the entrepreneur, characterised by their *capabilities* and *motivation* (intentions and aspirations) to grow that lead them to implement growth-oriented actions. Also, this research suggests how to identify entrepreneurs predisposed to growth (Douglas, 2013). This literature distinguishes between growth-oriented NVs (associated with transformational entrepreneurs) and independence-oriented NVs (associated with subsistence entrepreneurs for which growth is not a goal) (Schoar, 2010; Douglas, 2013). Growth-oriented entrepreneurs are important for jobs creation (Criscuolo, Gal and Menon, 2014) but require funding. Since recent, policy-makers attention has been directed to equity finance and, in particular, specialised SME public listing platforms that can provide financial resources to growth-oriented NVs. Public policies are both supply-side measures, such as tax incentives, and demand-side measures that target entrepreneurs' skills and capabilities (OECD, 2015).

Moreover, March (1991) described the *adaptive tension* between exploitation behaviours (i.e. actions to refine and extend existing competences) for short-term results and exploration behaviours (i.e. actions to search, variate and experiment to develop new competences) for long-term competitive advantage. Afterwards, Hitt et al. (2002) provide a complementary view of both types of behaviour by explaining how strategic actions to efficiently operate the current business are important not only to ensure short-term profits (exploitation) but to support entrepreneurial actions (exploration) that help to sustain a competitive advantage over time and generate dynamic capabilities. Interestingly, Wiklund and Shepherd

2011) associate the exploration behaviours to the concept of *entrepreneurial orientation* (or the firm orientation toward entrepreneurial activity), which is assumed to exist in varying degrees in NVs. This is, they are expected to have the autonomy to act (to develop an idea to completion), to be innovative and prone to experiment, to be risk-taking (inclined to take audacious actions), and to be proactive (anticipate and act on future opportunities) (Lumpkin and Dess, 1996; Rauch *et al.*, 2009). Thus, the *entrepreneurial orientation* is related to the capacity and propensity (again related to awareness and motivational aspects) of the NV to take entrepreneurial actions. Curiously, though it is clear that NVs need *entrepreneurial orientation,* and the related dynamic capabilities have been positively associated with NV employment growth (Stam *et al.*, 2008), Wiklund and Shepherd (2011) found that NVs with a high degree of entrepreneurial orientation are prone to fail (exploration is not equal to success). However, they find that among surviving NVs, those with higher entrepreneurial orientation perform better. In a similar line, some researchers have established that *entrepreneurial orientation* (exploration) is more valued before the venture's IPO than at the IPO time when increased focus toward exploitation may be seen as necessary to achieve stable growth (Mousa, Wales and Harper, 2015).

Beyond carrying out actions, it is the action-based learning that is essential for the NV to evolve as the reflection and learning (increased knowledge) from the success or failure of previous actions informs further actions and their variety and how the range of related knowledge, skills and abilities is accumulated (Cope 2005). The literature argues that a more complex repertoire of competitive actions may allow a broader learning scope, but a simple and focused repertoire may be more efficient and effective, so paralleling the exploitation (efficiency)-exploration (flexibility) dilemma explained above while highlighting the dependencies in time and sequence associated with the path-dependent capability building (Beckman and Burton, 2008). Most interesting, Beckmann (2006) finds that NVs that both exploit and explore experience higher growth.

Unfortunately, most new businesses fall short of achieving growth, less than 50% of them survive beyond five years (Eurostat, 2020), and only a few of them (less than 15%) achieve high growth (growth by 10% or more in the number of employees), raising the central question in entrepreneurship of why different NVs grow and survive differently.

Growth and survival of new and young ventures is a topic that has been largely researched over the past decades. An important research stream has investigated firm growth and the probability of survival in relation to size and age. Empirical works in this research find that young firms tend to grow faster (Evans, 1987; Coad, 2009), contradicting Gibrat's Law or the *law of proportionate effects* (Gibrat, 1931), according to which the rate of growth of a firm is independent of its size, which may hold in established firms. Though firm size (Delmar, 2006) and age (Gilbert, Mcdougall and Audretsch, 2006) are important variables in the study of growth, they may lack sufficient economic explanation, and it is, therefore, important to look at the systematic determinants of performance and growth, such as strategy choices. Moreover, previous work has also highlighted that the growth rate of NVs (mostly positive) is very heterogeneous across cohorts of NVs, with a majority of NVs growing slowly and a very small share growing fast, calling for further exploration on the firm-level heterogeneity of growth in NVs (Criscuolo, Gal and Menon, 2014)

The research stream in entrepreneurship that tries to explain NV growth builds on Edith Penrose's seminal and important work on the theory of the growth of the firm (1959), which laid the foundations of the resource-based view (Barney, 1991). Penrose's work highlights that for understanding firm growth, the focus must be not only on the change in the quantity of a particular indicator but notably on the process (sequence of actions) by which this change in the quantity of the particular indicator happens (Davidsson, Achtenhagen and Naldi, 2010). Ironically, most of the literature on NV growth focuses on understanding how much NVs grow

instead of how NVs grow (the ways entrepreneurs manage and grow their businesses) (McKelvie and Wiklund, 2010).

Growth is important for NV survival as NV survival depends on the stock of resources at start-up and those accumulated from growth after the market entry (Coad *et al.*, 2013). Growing NVs face pressures to take strategic actions, especially concerning the expansion and adjustment of their resource base via organizational learning (Stam *et al.*, 2008). Post-entry, the actions and responses of NVs to the internal and external conditions are key to explain growth (Stam *et al.*, 2008). This growth is needed in NVs in order to develop their resources and capabilities (often sustained by their employee base) to overcome the liability of newness (Stinchcombe, 1965) and the liability of smallness (Bruderl and Schussler, 1990), allowing them to take over a part of the market while building their competitive advantage (Penrose, 1959; Garnsey, 1998; Lockett *et al.*, 2011).

There are two main strategic growth options for the firms: organic and acquisitive growth. The first one refers to the internal development of resources, and the latter one refers to externally acquiring resources by buying another firm, which is subsequently integrated within the operations of the acquiring firm or becomes its subsidiary (Lockett *et al.*, 2011; see also Capron, Dussauge and Mitchell, 1998). Notably, this division is closely related to the *make-or-buy* notion utilized in transaction cost economics (TCE) (Williamson, 2008). However, both types of growth encounter obstacles. In external growth, while the acquired firm implies a larger pool of people, resources and related capabilities, it is sometimes challenging to exploit synergies with the newly acquired company due to existing rigidities and path dependencies. In turn, organic growth may occur slowly due to, among others, bounded rationality (e.g. limited cognitive capability and time available to make the decision) and maybe not fast enough to meet market demands compared to the pool of resources and capabilities offered by acquisitions (Lockett *et al.*, 2011).

Drawing on McKelvie and Wiklund (2010) insight about the need to investigate how NVs grow beyond by how much they grow, the focus of this dissertation is the relationship between the evolving complexity of competitive actions (and related breadth of capabilities) and growth in employment as the measure that best captures the development of NV competences and capabilities.

McDougall et al. (1994) had found that broad strategies are more successful for NV performance. However, an important debate in the literature is how growth is associated with different performance measures such as profitability and survival (Delmar, McKelvie and Wennberg, 2013) and the growth pace effects. Concerning the latter, Coad et al. (2020) find that overall growth enhances survival, but firms with moderate positive growth show the highest survival rates, while firms growing fast do not have the highest survival rates.

There are interesting attempts in the literature to sort firms into taxonomies based on their growth paths and using one or more indicators of growth (e.g. sales and employment) at the same time (see Coad et al., 2013, for an overview). However, these taxonomies do not dig into understanding the managerial processes of growth, which is highly relevant for managers (Davidsson, Achtenhagen and Naldi, 2010). Departing from Gambler's Ruin argument that growth rates follow a random walk, Coad et al. (2013) acknowledge that it is not a pure random walk, but the chance is the dominant driver. They find that each growth path has equal chances to occur, but the resulting path has a significant and longer-term effect on NV survival. They argue that since growth rates are found to variate more over time within firms than between firms, resource-based theories are not so supportive of explaining firm growth differentials. We argue it differently since we adopt a dynamic view of the firm and the competition, where knowledge, skills and resources coevolve with competitive actions and may explain firm growth differentials (within and between firms). Specifically, we argue that inter-temporal changes in

the complexity of the action types and the related path-dependent (scope of) capabilities can affect the way NVs grow.

Some researchers highlight the role of the entrepreneur as that of a detector of business opportunities (Shane and Venkataraman, 2000), achiever of legitimacy and pursuer of fitness for a given environment (Johnson and Van de Ven, 2017). Not surprisingly, there have been numerous studies to investigate the traits of the entrepreneur. However, this research represents a static approach to the study of entrepreneurship that ignores the dynamic learning perspective of entrepreneurship; this is entrepreneurs' ability to learn, develop and change as they manage and grow their ventures (Cope, 2005). In contrast, the behavioural perspective to the study of entrepreneurship aims to discern the entrepreneurial process, setting the focus not on who the entrepreneurs are but rather on what they do and learn (Gartner, 1988; Cope, 2005). Initial NV funding may be secured through the trust generated in potential investors by certain characteristics of the entrepreneur or founding team and their proposal, but subsequent funding supporting NV growth will be based on the trust generated by what they do (Lefebvre, Certhoux and Radu-Lefebvre, 2020). Therefore, other authors put the emphasis on the subsequent actions that must follow the belief of an opportunity to exploit it in the expectation of uncertain results with the means available and made available through subsequent decisions and entrepreneurial judgement that allows for assessing, estimating, and inferring what events will happen (McMullen and Shepherd, 2006; McMullen, 2015). Aldrich and Yang (2014) stress the action-based learning process that accompanies the sequence of actions as the determinant of NVs' success. Therefore, the topic of the growth process as the sequence of actions is an area that still requires exploration (Davidsson, Achtenhagen and Naldi, 2010).

Life cycle approach and new venture growth

The creation, development and eventual maturity of a NV is a (dynamic) process composed of different phases (Garnsey, 1998). NVs evolve through stages of development called

the life cycle (Churchill and Lewis, 1983). The life cycle is an analytical tool that can be used to analyse growth at the different stages, considering that (1) the life cycle of the NV is defined as a function of its growth and (2) the determinants of NV growth vary depending on the stage in which they are. However, this approach is limited to explain firm differentials at each stage (Davidsson, Achtenhagen and Naldi, 2010).

New venture life cycle stages

The early start-up phase, typically the first and the second year, is concerned with first actions mobilizing and then generating resources (starting operations, also called 'traction' phase), which triggers learning through early market feedbacks and adaptation, allowing firms to build and develop their competences and skills, supported by the recruitment of the employees needed. The growth reinforcement or scaling-up phase typically takes from the second or third year on (or later for companies requiring long research and development periods such as the biotech and pharmaceutical companies) (Gilbert, Mcdougall and Audretsch, 2006). This phase involves growing the customer base and offerings and the firm self, accompanied by further hiring employees, to reach the requisite size (scale) and legitimacy (Penrose, 1959; Garnsey, 1998; Shepherd, Souitaris and Gruber, 2020). Legitimacy—the perception or assumption that the actions taken by an organization are desirable and adequate within socially constructed norms, values, beliefs and definitions (Suchman, 1995)—is not only essential to gain customers but to attract the most valuable human capital (Gilbert, Mcdougall and Audretsch, 2006; Shepherd, Souitaris and Gruber, 2020). In this phase NVs struggle to find the optimal distinctiveness; this is the balance between industry conformity for legitimation and differentiation for competitive advantage with the idea behind that NVs should be as different as legitimately possible (McKnight and Zietsma, 2018).

New venture growth determinants during the life cycle stages

NVs in the early start-up phase are typically more limited in resources and faced with the liability of newness (Stinchcombe, 1965) since founders must acquire expertise (learn) in products, processes, market and technology (Gartner, 1985). The NV's liability of newness stems from the lack of trust and reputation, limited operation history, lack of internal structure, processes and routines, lack of exchange relationships with suppliers and customers, which represent important barriers to market entry (Gruber, 2004). Also, the small size of NVs implies limitations in resources in terms of finances and personnel. Resource constraints limit the options and the variety of strategies NVs can pursue, demanding a high degree of effectiveness and efficiency. Against this background, they must assemble the resources (i.e. financial, technological, cultural, social and human capital) and develop the capabilities they need (Penrose, 1959; Gilbert, Mcdougall and Audretsch, 2006; Lockett *et al.*, 2011). Shepherd, Souitaris and Gruber (2020) refer to the emergent organizing of a NV as the configuration and connection of actions they initiate to develop the processes and routines (i.e. capabilities) in the start-up phase to enhance the functioning of operations and overcome the liability of newness. These configurations of actions are critical at the start-up phase resulting from both deliberated (planned) and emergent (improvised) actions during the NV development (Mintzberg, Ahlstrand and Lampel, 1998; Weick, 1998). NV's learn from the results of initial actions and can fine-tune them, and the success of the venture is related to how fast NVs learn (Aldrich and Yang, 2014). However, learning fast is not necessarily linked to moving or organizing fast. Miller's (1992) results are in this line, suggesting that managers may need to adapt sequentially, keeping internal alignment while progressively adjusting to changes in the environment. Also, Brush, Manolova and Edelman (2008) find that NVs that organize more slowly are more likely to continue to organize than terminate the pursuit of the NVs (Shepherd, Souitaris and Gruber, 2020). Similarly, Coad et al. (2020) find that firms growing at the highest rates do not show higher survival rates than firms growing at average growth rates.

During the start-up phase, management and entrepreneurial capabilities are crucial (Ireland *et al.*, 2001), and a considerable part of NVs' literature is dedicated to the study of the entrepreneurs and the founding teams (Beckman, 2006). Prior research establishes that NVs' success is linked to the founder or founding team's education and previous experience, though not in a unique form since previous knowledge on a particular product or market can also blind new opportunities (Shepherd, Souitaris and Gruber, 2020). Researchers call for founding team's diversity in educational background and previous experience (Beckman, 2006) and have found that narrowly experienced teams have problems adding new expertise (Beckman and Burton, 2008). Yet, among previous experience, entrepreneurial and management experience endowments play a major role in enhancing market opportunities compared to marketing or technological experience (Gruber, MacMillan and Thompson, 2012). Once a NV is in the growth phase and has developed the distinct capabilities that confer its competitive advantage, maintaining this advantage may involve replacing the founding team to escape the constraints of the experience and knowledge of the initial team (Beckman and Burton, 2008).

Other determinants of new venture growth

NV's success is also linked to founders' motivation and positive emotions (e.g. enthusiasm) and their social relationships and networks. Also, cognition capabilities are important to cumulate experience, learn from it, shape new opportunities, and initiate the actions to seize them. Yet interpretation and judgements (e.g. over-optimism) play a fundamental role in the learning process and can bias future decisions (Schumacher, 2020; Shepherd, Souitaris and Gruber, 2020).

Concerning the external business environment, the literature has found that market munificence, defined as the ability of the environment to support firm growth (Dess and Beard, 1984), influences firm competitive action. Also, governments can influence the external

environment through policies that facilitate or obstruct new venture creation and growth (Shepherd, Souitaris and Gruber, 2020).

Alternative ways to measure new venture growth

Growth can be measured through different indicators. The NV literature recognises four main indicators of growth, namely sales, market share, employment and market valuations (Gilbert, Mcdougall and Audretsch, 2006; Rindova, Ferrier and Wiltbank, 2010), though literature also acknowledges the need for growth to be profitable (Clarysse, Bruneel and Wright, 2011). In empirical studies, the correlations between measures of growth and profits range from very positive to insignificant to negative (Davidsson, Achtenhagen and Naldi, 2010). Actually, sales growth and employment growth are the two most used measures of growth in NVs, but it is important to note that they are not interchangeable (Chandler, McKelvie and Davidsson, 2009). Growth in employment is the measure that best captures the development of resources and capabilities (Penrose, 1959), providing a measure of firm assets as human resources is one of the most important assets of the NV (Stam *et al.*, 2008), and it has the best concurrent validity with the other measures (Shepherd and Wiklund, 2009). Coad, Cowling and Siepel (2017) investigate firms' growth along with several measures of growth from a dynamic perspective. Structural Vector Autoregressions (SVARs) show that the growth processes of firms start with employment growth, then sales growth, then operating profits growth and finally assets growth, while the growth processes of high-growth firms put more emphasis on operating profits growth driving the other dimensions and employment growth happening at the end. Growth can be measured in both relative and absolute terms. When measured as a percentage, it is the growth rate.

It is important to consider that relative growth rates comparatively overstate the growth of small firms, and absolute growth values comparatively overstate the growth of large firms

(Delmar, 2006). More importantly, when considering the effect of competitive actions on growth, since these consist of both tactical (short-term oriented) and strategic (long-term oriented), both period-to-period growth rates at the end of each period (short-term) and the growth trend (slope) over several periods (long-term) should be considered to better capture where the NV is heading (Garnsey, Stam and Heffernan, 2006; Davidsson, Achtenhagen and Naldi, 2010). The growth process is essentially non-linear and discontinuous; therefore, is important to look at several periods (Cope, 2005).

Beyond the way of measuring growth in employment which gives a comparable measure indicating the development of capabilities, our interest is in knowing how the complexity of the repertoire of actions, and, in particular, the pattern of complexity followed and associated capability building path leads to trade-offs between short- and long-term growth. We relate the complexity in the repertoire to growth in two ways. First, it can be the result of actions aimed at employment growth as a reinforcement of certain areas, or it can be the result of the variety of actions successfully implemented that lead to hire new employees and, therefore, to employment growth.

In this dissertation, we aim to add to this stream of research by understanding how the evolution of the complexity of the competitive repertoires of NVs contributes to their growth and the possible trade-offs between their immediate growth rates and the longer-term growth trends.

CHAPTER 3. RESEARCH MODEL

3.1 Theoretical framework

The competitive behaviour of NVs during their early years is critical to their survival and growth as during that period, NVs create and adapt their resource and capability base, including their employee base, to perform well (Penrose, 1959; Lumpkin, Wales and Ensley, 2006). Hardly the entrepreneur or founding team will have all the skills and capabilities needed to transform the initial idea or opportunity into an operational business but will have to build them over time resulting from competitive behaviours taken (including hiring) and learning processes (Hitt *et al.*, 2002). NVs must make the decisions, take actions, and learn from the results to turn their limited resources into competitive capabilities before they can successfully compete against competitors (Lumpkin, Wales and Ensley, 2006). No doubt, NVs that go public (through an IPO[5]) in the early years show growth-oriented intentions (Douglas, 2013) and can benefit from the funding raised, which represents not only an essential springboard for their early development and growth but can improve access to subsequent debt financing (OECD 2015). However, it is the different ways in which managers deploy resources and target competitive actions post IPO that can make the difference between NVs (Penrose, 1959; Aldrich and Yang, 2014; McMullen, 2015).

The Awareness Motivation Capability (AMC) framework posits three essential drivers of a firm's competitive behaviour and its consequences. First, the *awareness* of existing and upcoming opportunities and challenges associated with the initiation of particular actions. Second, the *motivation* to act aiming at an expected subjective reward (e.g. financial, reputational or other). And, third, the *capability* to take action, connected with the firm's ability to actually initiate competitive actions, based on the effective use of its skills and resources (Chen and Miller, 1994, 2012; Chen, 1996; Ferrier, 2001; Chen, Su and Tsai, 2007). These three

[5] Notably, at the core of the capital markets union (the plan to mobilise capital in Europe) is to make it easier for SMEs to access financing through public markets (European Parliament, 2019)

factors are interrelated, as a firm' capabilities affect its ability to realise the need to act, but awareness is not enough to move; the firm also needs incentives. Awareness and incentives are necessary conditions, but taking action requires sound capabilities, whose development also depends on previous choices made and actions taken embedded in routines and structures that affect current and future choices, hinting at time dependencies in the decision process (McMullen, 2015).

A key element of a firm's strategic behaviour receiving attention from the lens of the AMC framework within competitive dynamics is the full set of competitive actions of a given firm over a specified time interval (i.e. the action repertoire) (Miller and Chen, 1996b; Chen and Miller, 2015). As Porter (1991) argued, a firm is a set of individual but interrelated economic activities in the combination of which lies the source of competitive advantage. The entire configuration of competitive actions provides a holistic picture of the firm competitive posture that allows looking at specific vital characteristics. These include the firm overall level of competitive activity (Miller and Chen, 1994; Ferrier, Smith and Grimm, 1999), the simplicity or complexity of the competitive action repertoire (Miller and Chen, 1996b; Ferrier and Lyon, 2004; Rindova, Ferrier and Wiltbank, 2010; Connelly *et al.*, 2017) and its nonconformity (dissimilarity) or similarity with industry norms (Miller and Chen, 1996a) and with the firm past (consistency vs disruption) (Lamberg *et al.*, 2009; Connelly *et al.*, 2017). All these characteristics have important consequences for the success of the firm competitive posture, with complexity or variety of action types (of the key strategic categories of action or key competency areas of the firm) being it the characteristic that has received more research attention (Miller and Chen, 1996b; Ferrier and Lyon, 2004; Connelly *et al.*, 2017). Increased dynamic competition and market pressures prompt firms and their managers to start competitive moves for defending and improving a firm's short- and long-term competitive position in the market. (Ferrier, 2001; Nadkarni, Chen and Chen, 2016; Hughes-Morgan, Kolev and Mcnamara, 2018). In doing so, a firm must choose between a variety of competitive action types to set the direction in which its

human capital (education, experience and skills from both entrepreneurs, founding TMTs and employees) and other resources have to be applied to develop firm capabilities and achieve firm objectives (Rauch, Frese and Utsch, 2005). To achieve a competitive advantage, firms must generate specific knowledge and competencies that are unique and difficult to imitate (Barney, 1991) and, over time, sustain or replace them to adjust to new competitive situations (Teece, 2007).

Viewed from the resource-based and dynamic capabilities perspectives and the role the AMC factors play, limited by resource constraints and the liability of newness[6] (Stinchcombe, 1965), NVs must choose the complexity of the repertoire of competitive action types to develop the range of capabilities needed to place a product/service on the market efficiently and competitively on a sustained basis. They must pursue strategic actions around specific competency areas—such as marketing, operations, organization and finance—to start and run the new business successfully. However, more importantly, they also need entrepreneurial actions around other competency areas—such as R&D, new product development, enhancing efficiencies, inter-firm alliance and acquisition routines, and internationalization—that help build dynamic capabilities (Hitt *et al.*, 2002). These serve to exploit opportunities not noticed or fully exploited by rivals (Shane and Venkataraman, 2000; Hitt *et al.*, 2002) and to adjust the resource and capability base (through the integration of internal and external knowledge) without delay to changes in the competitive landscape (Teece, Pisano and Shuen, 1997; Eisenhardt and Martin, 2000; Teece, 2007; Stam *et al.*, 2008). There is consensus in the literature that building up organizational slack can support the development of dynamic capabilities and support a broader repertoire of actions to address the uncertainty generated by innovations and

[6] The lack of history and records, among others, implies legitimacy constraints, lack of routines and knowledge of what works and what does not work.

the associated dynamic competition, but not to forget is that it is also costly (Teece, Peteraf and Leih, 2016).

Overall, the competitive repertoire of actions should take the optimal configuration or orchestration of available resources and capabilities in a value-added manner to yield a competitive advantage that can generate current and future economic incomes and be sustained or re-invented. Notably, the firm's actions are not self-standing but closely related and often interdependent, which suggests that the strategy as a whole is more valuable than the sum of the parts and that all parts must fit together (Miller, 1996). However, while some firms compete in a comprehensive way, using a broader array of competitive types, others embrace much simpler competitive strategies and concentrate on just one or two types (Miller *et al.*, 1996).

Most significantly, the complexity of these configurations or repertoire of actions evolve in the interactive relationship between resources and capabilities, competitive behaviour (tactics and strategic actions), learning mechanisms and market conditions, and this evolution takes time (Miller, 1996). As NVs learn by judging the effectiveness of the actions taken, they may move to different levels of complexity. Successful actions are reinforced and routinized (leading to its exploitation), while unsuccessful actions lead to further experimentation (exploration of new actions and capabilities). Evolutionary economics, however, recognises that firms have limited plasticity or flexibility in firm behaviours and related capabilities and explains current choices as dependent on past decisions that are integrated into current productive routines and decision-making mechanisms that may affect subsequent choices (Coad, 2010). Penrose (2009, in the foreword to the third edition of 1995) stressed this path-dependent view of strategy making by stating that *'…"history matters"; growth is essentially an evolutionary process and based on the cumulative growth of collective knowledge, in the context of a purposive firm.'*

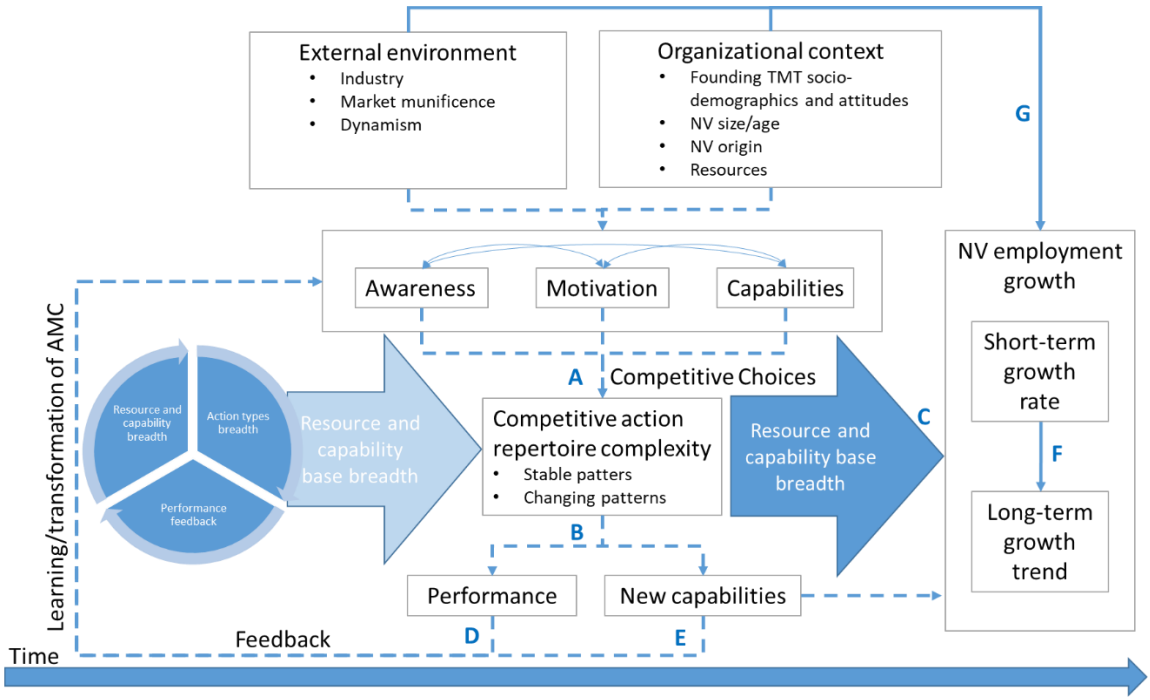
In contrast to industrial organization economics sustaining that firm's competitive advantage and subsequent performance are mainly driven by industry structure (Porter, 1980), competitive dynamics research provides the competitive repertoire as the perfect framework to evaluate the complexity of competitive interactions, behaviours and related breadth of capabilities which has been found to have implications for performance (Miller and Chen 1996). Over time, managers learn and adjust (depending on the available flexibility and their awareness and willingness to do so) the complexity of the repertoires. Accounting for the sequence of early competitive repertories over several periods makes it possible to assess how the complexity evolves in a temporal pattern and the effect of alternative patterns on NV short- and long-term performance in NV growth. Therefore, beyond the understanding of inter-temporal change in the complexity of the repertoires, understanding the sequence is important because developing the complexity of the competitive repertoire and the related breadth of capabilities over time is path-dependent through the development of more or less path-dependent capabilities that sustain particular competitive repertoires. These capabilities take time to develop and are difficult to change once established and internalised in decisional-mechanisms (leading to organizational and structural inertia). Capabilities (i.e. tacit, knowledge-based resources) are routinized in patterns of actions, which allows a firm to specialize to efficiently exploit its capabilities, giving continuity, organization's memory and defining employees' area of competence and action. On the downside, routinization limits the flexibility and inclination to explore new actions and innovate (Den Hond, 1996). Over time, flexibility (e.g. through a more complex repertoire that creates dynamic capabilities) is needed to face change and the awareness and motivation to go for it. As competitors also learn and evolve, firms need not only maintain capabilities but also renew them, for which they need this flexibility. This core paradox is described as the 'efficiency versus flexibility' trade-off, the right balance of which is key to superior performance. (Eisenhardt, Furr and Bingham, 2010). However, this trade-off is resolved sequentially over time, taking into account that current decisions are affected by previous

decisions and will affect future decisions. Consequently, the effects of the complexity of the competitive repertoires on NV growth should occur not only in the short but also in the long term, and, in particular, the pattern of complexity followed might play an important role.

Figure 1 below uses the AMC as a baseline framework to explain different temporal patterns of the complexity of the competitive repertoire of NVs and connect them with their growth implications. First, the AMC rationale has previously helped to explain the drivers of greater competitive complexity (Figure 1, A), which among others, appear to be the broader heterogeneity and range of experiences of TMTs (Hambrick, Cho and Chen, 1996; Miller and Chen, 1996b; Ferrier, 2001) and higher CEO pay (Offstein and Gnyawali, 2005). Greater repertoire complexity may also be driven by membership in alliances and networks by which firms learn new capabilities and access resources (Gnyawali, He and Madhavan, 2006), and higher organizational slack (i.e., more resources available for strategy foster complexity, whereas fewer resources foster the efficiency and simplicity of competitive moves) (Ferrier, 2001; Chiu and Liaw, 2009; Hughes-Morgan, Kolev and Mcnamara, 2018). Industry dynamism may also lead to increased repertoire complexity as firms may adjust to the changing market forces by trying an increased variety of competitive action types, thus increasing complexity (Larrañeta, Zahra and Galán González, 2014). On the contrary, prior good performance and specific industry characteristics such as higher market concentration and market munificence (i.e. industry growth) have been associated with greater strategic repertoire simplicity (as opposed to complexity) (Miller and Chen, 1996b). Or perhaps they are driven by inertia and the positive reinforcement of actions with good results (Miller and Chen, 1994; Ferrier, 2001; Hughes-Morgan, Kolev and Mcnamara, 2018). Failure may increase the number of competitive actions but generally does not increase the variety of action types (Miller and Chen, 1994). Finally, both firm age and firm size are also important determinants of the complexity of the firm's competitive repertoire, with age being associated with simplicity and size with complexity

(Miller and Chen, 1996b). These findings refer mainly to established firms and, therefore, to a specific time interval of their development.

Figure 1. Diagram representing the research model linking the Awareness-Motivation-Capability framework with the temporal patterns of the complexity of a NV competitive repertoire and its growth implications



Source: Author's elaboration, adjusted from Nagel (2016)

When it comes to the consequences of the complexity of the repertoire of competitive actions, the AMC rationale suggests that it influences both the development of distinctive firm capabilities and various dimensions of firm performance (Levitt and March, 1988; Miller and Chen, 1996b) (Figure 1, B). For instance, Miller and Chen (1996b) find that simple repertoires (as opposed to complex ones) are negatively associated with performance in terms of sales growth, arguing that this indicates that simplicity brings out inertia and lack of responsiveness to changing competitive landscapes. They suggest that prior good performance may foster firms' strategic simplicity and specialization by bringing firms to focus on the actions that have led most to their success. However, this can be detrimental in later periods as simplicity restricts knowledge of competitive alternatives and managerial search, reducing thus the breadth of firm

capabilities (Levinthal and March, 1993) and negatively affecting subsequent growth in sales (Miller and Chen, 1996b) and profits (Connelly *et al.*, 2017). Given that empirical evidence shows a positive association between sales growth and subsequent employment growth (Coad, 2007b; Coad and Rao, 2010), we can expect that simplicity may also eventually reduce employment growth more deeply.

In several studies, Ferrier presents a more nuanced view of the consequences of strategic simplicity versus complexity. Looking at market share gains, Ferrier (2001b) encounters a U-shape relationship with competitive complexity, implying high gains at higher levels of either simplicity or complexity. Ferrier and Lyon (2004) establish that the level of heterogeneity in top management teams (TMTs) moderates the relationship between strategic repertoire simplicity and sales growth, being positive under heterogeneous TMTs and negative under less heterogeneous TMTs. These findings in established firms point out that it is not clear whether it is better to be simple or complex in the competitive repertoire and that the relationship to different performance measures may be conditioned by factors such as characteristics of the TMT and the specific point in time in the life cycle of the firm.

In the entrepreneurial context, we know that NVs, constrained by the liability of newness (Stinchcombe, 1965), achieve higher growth when deploying *complex* (or varied) competitive repertoires, particularly in highly dynamic contexts (Lumpkin and Dess, 1995; Larrañeta, Zahra and Galán González, 2014). Complexity helps them to learn about their suppliers', customers' and competitors' landscapes, influencing the development of distinctive capabilities and fostering organizational growth (Levitt and March, 1988; Lumpkin and Dess, 2006). In particular, repertoire complexity may increase entrepreneurial ventures' absorptive capacity, helping them to transform new knowledge into effective competitive actions (Cohen and Levinthal, 1990; Zahra and George, 2002), enabling through experience the transition from novice entrepreneurs to experts. The latter, more able to hold in mind multiple actions and temporal frames at the same time and to think in terms of priorities and sequences, integrating

so past and future actions (Bingham and Eisenhardt, 2011; Chen and Nadkarni, 2017; Chen, Miller and Chen, 2019). Also, more complex repertoires may help to build dynamic capabilities, those that not only support adaptation to the business environment ("technical fitness") but also help to create the future by shaping that environment and adjusting to it ("evolutionary fitness"), with positive implications for long-term competitive success (Teece, 2007). On the contrary, a simpler competitive repertoire may bring the needed specialization and efficiency, often with the focus on the short-term. Simplicity has been positively associated in nascent markets with market valuations as shareholders seem to reward simplicity in the sequence of actions (Rindova, Ferrier and Wiltbank, 2010). But simplicity may ignore upcoming developments in the competitive environment unless simplicity has been meticulously chosen by an entrepreneur or founding team with a sufficient variety of knowledge and skills, i.e. it is not the result of a narrow range of knowledge (Ferrier and Lyon, 2004). Here, we recall the idea of Ashby's Law of Requisite Variety (Ashby, 1957) applied to organizations suggesting that 'only variety can manage variety,' extended by Ferrier and Lyon (2004) to 'only variety can effectively manage simplicity.' Hart et al. (1995) found that entrepreneurs aim at building flexibility in resources and capabilities, enhancing their capacity to adapt by choosing partners by the breadth and depth of their capabilities rather than on willingness to respond to the immediate needs of the NV. Founding TMT size and heterogeneity encourages discussion among team members, which is essential to effective TMT performance, as it avoids complacency and mistakes that might exhaust resources (Eisenhardt and Schoonhoven, 1990).

So far, we have explained how the AMC framework helps to explain the complexity of the competitive repertoire and the relationship between the complexity of the repertoire and firm performance. From here, we want to explain how the organizational learning feedback loop between repertoire complexity, results and capabilities explains the evolution of the complexity of the competitive repertoire or what we refer to as its temporal evolutionary pattern (Figure 1, D-E).

Over time, companies learn from the results of previous actions (past) (Figure 1, D) and create (path-dependent) routines and capabilities (Figure 1, E) (David, 2001). Through learning, companies change their subsequent behaviour in response to prior performance outcomes (Bingham and Davis, 2012). When prior NV actions are considered successful, usually more resources are devoted to them, being good performance a reinforcing mechanism of certain actions (selection and retention) to the detriment of others and related knowledge (Miller and Chen, 1996b; Connelly *et al.*, 2017). Indeed, when the NV actions are judged as unsuccessful new courses of actions may be prescribed (variation). Importantly, whether an action is considered successful or not depends on the managers' perceptions and interpretations of the performance feedback (Schumacher, 2020) and on the consideration of different time horizons or not in the tension between the short- and long-term performance focus (Chen and Nadkarni, 2017).

Consequently, the current repertoire complexity depends on the breadth of knowledge and competencies they have selected to retain in the learning process (positive reinforcement of considered successful action types), which, in turn, depends on their previous choices about actions to carry out, their complexity (or variety) and the related breadth of capabilities (Figure 1, A-B-D-E). The learning feedback loop is path-dependent as current choices are influenced by previous decisions and affect subsequent decisions through the path-dependent structures and capabilities created along the way, which take time to build up and, once routinized, cannot be changed suddenly but tend to be maintained by the inertia of the previous way of doing. Not surprisingly, once the strategy is in place, the founding TMT may need to keep changing to escape the constraints of the founding team knowledge and avoid biases in subsequent decision-making. Certainly, the process from NV creation to the growth to maturity implies expanding the knowledge of the entrepreneur/founding team from the initial idea and expertise to a broader and more general understanding of markets and customers (Wennberg, 2013).

Despite Ferrier (2001b) and Rindova, Ferrier, and Wiltbank (2010) use the idea of patterns by measuring complexity in the sequence of competitive moves, we do not know in entrepreneurial contexts what happens next. This is, whether NVs sustain the complexity or simplicity of their competitive repertoires, or they shift towards other levels, and what are the consequences. Recent research on competitive dynamics suggests that the main dilemma for managers rests in that the complexity of the competitive repertoire appears to have different performance consequences in the short term (negative) versus the long term (positive) (Connelly *et al.*, 2017), recalling the 'Icarus Paradox' used by Miller (1992b, 1993) to explain firm decline after a period of success. In NVs, this trade-off might create the significant dilemma of choosing between exploiting the available capabilities to survive (short-term/efficient) or developing capabilities for future growth (dynamic/flexible) (Winter, 2003; Eisenhardt, Furr and Bingham, 2010; Rahmandad, 2012; Connelly *et al.*, 2017).

Importantly the simplicity vs complexity decision is not a one-time choice. As firms learn from the results of previous choices (Figure 1, D), they can tune the complexity of the repertoire of actions (Levitt and March, 1988), moving the firm to a new situation of capabilities (Figure 1, E), which will, in turn, determine the complexity of the following repertoire (Figure 1, A). (Teece, Pisano and Shuen, 1997). This is so because the exploitation of a firm's capabilities can only take place through routinization in actions (Teece, Pisano and Shuen, 1997), the results of which will determine the breadth of capabilities to select and retain and these the subsequent set of actions, or will suggest the need for variation and search, taking into account that search and exploration of new actions are to some extent limited by the knowledge developed in the past (Levitt and March, 1988). This way, the antecedents and consequences of the complexity of competitive repertoires are not directional but recursive, highlighting the process nature of competition (Lamberg *et al.*, 2009).

The literature suggests that in this process, 'lock-in' may operate in the longer-term conditioning future complexity choices (Miller, 1992b) depending on how current and future

capabilities are envisaged by previous complexity choices (Garnsey, 1998). Importantly, routinization of capabilities into patterns of action provides a stable internal environment to exploit the capabilities more efficiently. However, routinising can limit the firm's flexibility and its willingness to explore new actions and innovations. As capabilities develop over time, they bring routines (patterns of actions) and structures that cannot be easily changed later, thus endowing the strategic decision process with rigidity and inertia (Miller and Chen, 1994). The simplification and specialization enable the exploitation of current efficiencies and advantages but contributes to the myopia of learning as firm engage successively in what currently works forgetting the exploration of other areas that may become essential in the future but will be challenging to address without having developed previous knowledge and experience (Levinthal and March, 1993). The self-reinforcing nature of the learning process can take organizations to keep a short-term (current) focus creating the competence trap associated with the repetition of a certain behaviour (Levinthal and March, 1993; Liu, 2006). However, firms can also be trapped into excessive exploration (the failure trap), by which firms enter a circle of experimentation, search and innovation, driven by a dynamic of failure that may crowd out exploitation (Levinthal and March, 1993; Liu, 2006).

Another critical point to remember is that the subjective consideration by managers and entrepreneurs of temporal horizons play an important role in interpreting the results that when positive will act as reinforcing mechanisms of certain behaviours. Previous research emphasizes the need for entrepreneurs to have the competence of 'time agility' (Bird, 1992); this is being able to reframe expectations when looking at problems with different horizons (similar to using a strategic zoom lens). While long-run or forward-thinking will be important for some decisions, they also need the ability to act in the short-run effective and efficiently. This competency is especially relevant in NVs, where managers may deal with both time frames, whereas in established firms, different managers usually deal with different temporal horizons. In the same line, Nadkarni, Chen, and Chen (2016) highlight the importance of paying attention to the time

horizons that the managers look at (i.e., the subjective perspective of time) when observing past and future events, which affects the loop between firm's competitive behaviour, performance and capability building.

Given the time-dependent nature of firm action breadth and the capabilities that provide the competitive advantage, it appears that the role of time in the evolution of the repertoire complexity (variety) must be examined in greater depth (Nadkarni, Chen and Chen, 2016), extending so the entrepreneurial dilemma to the sequence of repertoires that form the early complexity patterns. Thus, it highlights the need to look at the sequence or temporal patterns and not only at each year's repertoire, considering the short- and long-term consequences. Bingham and Davis (2012) empirically found that different learning sequences differentially affect shorter and longer-term performance.

NV employment growth

When it comes to understanding performance in NVs, growth in employment is a critical measure in our study for a number of reasons. First, it indicates the expansion of firm resources and capabilities (Penrose, 1959; Lockett *et al.*, 2011), which is related to the complexity of the repertoire of actions, and provides a comparable measure of the venture growth in the early years that is more stable than other fast-changing measures such as sales or market valuation (Garnsey, Stam and Heffernan, 2006). Moreover, many NVs have no sales in their first year or second of life, and none have sales at founding (Eisenhardt and Schoonhoven, 1990). Second, usually being born small (Geroski, 1995) and confronted with the liability of newness (Stinchcombe, 1965), organizational growth is essential to create organizational structure and develop unique current and future competencies and capabilities that enable the venture to achieve and maintain competitive advantage (Penrose, 1959; Garnsey, 1998; Lockett *et al.*, 2011). Therefore, employment growth is usually considered a measure of success (Rauch, Frese and Utsch, 2005) and important for studying long-term success (Coad, Frankish and Storey,

2020). To our knowledge, there are no studies about the relationship between the pattern of the complexity of the competitive action repertoire over a NV's early years and its growth. From a policy-making perspective, explaining NV growth is crucial because it provides a measure of the new jobs created by the NV.

This growth is driven by managers' and entrepreneurs' aspirations for size and performance and their interpretations of results and markets (Figure 1, G). Depending on them, they initiate competitive moves to expand or contract the organization size and initiate market-oriented competitive moves that may result in the expansion or contraction of the size of the organization (Figure 1, C) (Whetten, 1987; Wiklund and Shepherd, 2003; Wiklund, Davidsson and Delmar, 2003; Greve, 2008). Wright, McMahan, & McWilliams (1994) had stressed the value of developing the human resources pool (employees and managers) as an important source of competitive advantage over which managers have control. We know that most firms are not able to sustain stable growth over time (McKelvie and Wiklund, 2010). However, we expect that to some extent, the firm strategy (as the sequence of competitive actions) (Mintzberg, 1979), with different evolving degrees of complexity and consistency, explains the different patterns of growth over several periods (Figure 1, F) (Lamberg *et al.*, 2009).

Notably, in the analysis of growth, the annual growth rates show us the result of the set of competitive moves in a given period (short-term), thus giving us snapshots of what is currently happening (Shepherd and Wiklund, 2009). However, high growth in period one does not imply high growth in period two, and the effects of some actions may be lagged in time, so fluctuations occur frequently. Therefore, it is equally important to analyse the growth trend, slope, and slope changes to understand where the firm is moving to in the longer-term (Figure 1, F) (Garnsey, Stam and Heffernan, 2006; Davidsson, Achtenhagen and Naldi, 2010) and associate it with the temporal pattern of complexity.

In a NV's early years, when there is a lack of accumulated experience and established routines or inertia, we expect that all paths of competitive repertoires are possible. Below, we hypothesise how alternative patterns of competitive complexity are formed in the first years of a venture and its implications for its short and long-term growth.

3.2 Hypotheses

3.2.1 On the existence of alternative early patterns of the complexity of the competitive repertoires of new ventures

In NVs, limited resources and the liability of newness (Stinchcombe, 1965) lead to conflicts between complexity and simplicity due to the competing demands for resources and capabilities. The choice is how simple and efficient to be in order to survive in the short-term or how complex to be to ensure flexibility later and long-term survival. Despite these constraints, some NVs start competing comprehensively, using a wide variety of competitive action types (complex repertoire), while others concentrate on one or two types of action (simple repertoire) (Miller et al. 1996). This decision is not a one-time choice, but the unfolding complexity of action types deployed is path-dependent as a reinforcing feedback loop connects previous and subsequent choices of strategic action types through the path-dependent capabilities. The range of NV capabilities is deployed in a variety of different action types (Teece, Pisano and Shuen, 1997) according to the awareness of opportunities and the motivation to pursue them. Therefore, the founding TMT's initial AMCs set the venture's early course of action. Undertaking first competitive actions, they learn from the performance feedback of initial choices. The AMC rationale explains how prior performance becomes a critical driver (motivation) of subsequent strategic decision-making and its degree of complexity. Positive performance feedback acts as self-reinforcement mechanisms of certain choices and their associated capabilities (David, 2001), fostering competitive activity around the past strategies and competitive strengths and

capabilities that have proven to be successful (Miller and Chen, 1994). These capabilities, in turn, will determine the subsequent course of action. Importantly, strategic choices also rely on strong considerations and interpretations of results based on intentionality and aspirations (motivation/will), the subjective perception of time (short- vs long-term decisional horizons), market conditions and alternatives (awareness), and the available capabilities to perceiving, interpreting and subsequently acting (Penrose, 1959; Wiklund and Shepherd, 2003; McKelvie and Wiklund, 2010; Ben-Oz and Greve, 2015; Schumacher, 2020), that may favour long-term capability development for future performance (flexibility) over short-term success (efficiency) or the other way around (Teece, 2007). As some authors state, future expectations and knowledge from past actions merge to shape specific actions in the present (Garud, Kumaraswamy and Karnøe, 2010), pointing to the managerial ability to deal with different time horizons when deciding between exploitation and exploration activities, i.e. ambidexterity (Bird, 1992; Chen, Miller and Chen, 2019). Moreover, when there are time-lags between an action and its actual consequences, even more interpretation and expectations about results play a fundamental role in determining the sequence of strategy-making (Wright and Snell, 1998; Greve, 2008). The latter is especially important in the NV context, where there is no long accumulated experience.

Following previous work on the interpretation of performance feedback, we hypothesise that interpreted positive feedback of certain actions types will act as self-reinforcement mechanisms. Perceived success/satisfied aspirations would, therefore, lead to the sequential simplification of the competitive repertoire over time (Greve, 2008): either leading to a sustained stable pattern of simplicity or a dynamically changing pattern towards simplicity, depending on the initial level of complexity of the venture's competitive repertoire. Managers of NVs above their aspiration levels will not seek to shrink them; however, they may be less willing to take the risk of new competitive moves and a more complex repertoire of actions.

Alternatively, NVs that perceive failure or have aspirations beyond the current situation will strive to explore a broader range of competitive actions (Singh, 1986; Greve, 2008): either leading to a sustained a stable pattern of complexity or a dynamically changing pattern towards complexity, depending on the level of complexity of their current competitive repertoire. The perception of underperformance moves NVs to assume higher risks and explore new competitive actions with the hope that positive returns may come in the future (Celuch, Murphy and Callaway, 2007). We believe that in the early years of operations of NVs, all four described paths in the evolution of their competitive repertoires (particularly their complexity) are possible: stable patterns (either simple or complex) and dynamically changing patterns (either towards simplicity or towards complexity). Therefore, we propose:

> *Hypothesis 1: Alternative patterns in the complexity of competitive repertoires can be observed across NVs over their early years of operations. Specifically, there can be observed two stable patterns and two dynamically changing patterns in terms of complexity.*

3.2.2 On the implications of alternative complexity patterns of the competitive repertoires for the growth of new ventures

Strategy is a cumulative process by which firms build competences and capabilities to support the deployment of their strategies over time. This idea suggests a linkage between the evolution in the complexity of the competitive repertoires of NVs and their growth in the number of employees. This is so because a competitive repertoire needs to be aligned with the firm's capabilities in order to be successfully implemented (Miller, 1992a), with the knowledge, skills and abilities of the employees joining the new firm underpinning the base of capabilities made available to the new firm (Lopez-Cabrales, Valle and Herrero, 2006). One of the earliest tasks of the entrepreneur or founding team is to hire others to get the NV going. It is undoubtedly a fundamental step as hiring decisions determine the creation of enduring firm

capabilities that, over time, sustain growth (Dahl and Klepper, 2015). A competitive strategy must be built around an adequate human resource base, which can confer the firm a competitive advantage (Bartlett and Ghoshal, 2002). Wright and Snell (1998) highlighted the link between the array of skills of the human capital pool with the ability to implement the adequate variety of types (or complexity) of competitive moves both to face complementarily the (short-term) goals and needs of the current competitive landscape and to anticipate and respond to the varying competitive demands in the future. Human resources are understood to have these dual roles of fitting the firm's short-term more operational needs and long-term strategic needs by enabling a flexible response to a variety of strategic needs over time (Wright and Snell, 1998). For this reason, it makes sense to look at the NV employment growth from the short- and long-term perspectives.

Generally, NVs show declining growth rates over time (Jovanovic, 1982; Evans, 1987) after experiencing a sudden burst of growth shortly after entry (Coad, Daunfeldt and Halvarsson, 2018), but their downward slope may differ (Davidsson, Achtenhagen and Naldi, 2010). The slope and its change are essential elements in understanding the growth path of a NV, serving to indicate whether growth is continuous, stable, or declining as compared to the analysis of snapshots of growth at given moments (Garnsey, Stam and Heffernan, 2006). Previous empirical evidence shows that most firms are unable to sustain high growth beyond a short period, and the probability of repeating high growth is low (Daunfeldt and Halvarsson, 2015).

When linking growth and strategy, we observe that over time the competitive repertoire produces subsequent changes in the firm's structure and its resources and capabilities, including its employee base (Lamberg et al. 2009; Greve 2008; Whetten 1987). Given the link between employees' knowledge, skills and abilities, and organizational capabilities (Lopez-Cabrales, Valle and Herrero, 2006), NV growth in the number of employees is important to understand the change in capabilities as input for subsequent growth in capabilities and markets (i.e. sales).

Moreover, the rate at which employees are hired (the employment growth path) is important to understand the growth at a given moment (short-term) and, more importantly, the cumulative development of firm capabilities to sustain long-term competitive advantage. We argue that short-term growth in the early years of the NV will be mainly driven by changes (increases or decreases) in the complexity of the repertoires requiring expansion of human resources to new areas of action or reinforcement existing ones. In contrast, stable longer-term growth trends will be driven by stable patterns in the complexity of the repertoires as capabilities, and the related human resources are progressively added.

On the implications of alternative complexity patterns for the short-term growth of new ventures

Based on this logic, we expect that alternative patterns in the complexity of the competitive repertoires deployed by NVs may result comparatively in different short-term growth rates in employees. Specifically, we expect NVs with competitive repertoires dynamically changing towards simpler or more complex competitive repertoires to be associated with higher employment growth rates in the short term than those NVs with more stable repertoires. This is so because adjustments (broadening or narrowing) of the set of the venture competitive actions will be accompanied by a need for either new skills and capabilities (when broadening the competitive repertoire) or reinforcing existing ones (when simplifying the competitive repertoire by focusing and strengthening particular aspects of the strategy), for instance, increasing sales force (Shepherd and Wiklund, 2009) or research and development capabilities (Coad & Rao, 2010), which will involve hiring new employees. Hiring new employees with the required capabilities instead of training the existing workforce (Schuler and Jackson, 1987) is an effective short-term form to pursue strategic adaptation in two ways. New talent may add complementary capabilities, and at the same time, new hirings may change organizational

capabilities through the interaction of newly hired employees with the existing routines and employees (Lacetera, Cockburn and Henderson, 2004). This approach is particularly valid in NVs where there tends to be a limited human resource base.

On the contrary, NVs deploying stable competitive repertoires over time in terms of their degree of complexity or simplicity will not require incurring in short-term fast growth in the number of employees. Under these circumstances, employment growth will occur at a more gradual pace as personnel needs will emerge sequentially (Miller, 1992a). When the level of competitive repertoire complexity (or simplicity) remains stable over time, existing employees likely have the bulk of skills and capabilities needed to implement those strategic actions (Wright and Snell, 1998) or the NV has time to adapt them gradually. Accordingly, we suggest:

> *Hypothesis 2: The patterns of the complexity of the competitive repertoire of NVs will be associated with their short-term growth rates in employees. Specifically, NVs deploying competitive repertoires dynamically changing in complexity will be associated with higher short-term growth rates than NVs deploying stable competitive repertoires.*

On the implications of alternative complexity patterns for the long-term growth trend of new ventures

We expect that alternative patterns in the complexity of the competitive repertoires deployed by NVs may also result comparatively in different long-term growth trends in the number of employees. Specifically, we expect NVs deploying stable patterns in their competitive repertoires (at any levels of complexity or simplicity) to be associated with more sustained long-term growth trends in employees than NVs deploying dynamically changing competitive repertoires. Our expectations are based on a number of prior findings but fundamentally on Lamberg et al. (2009) concept of strategic consistency. Strategic consistency, which refers to the existence of a certain level of homogeneity between the past and subsequent firm strategy (and

consequently the underlying repertoire of competitive actions), is sustained on a relatively stable or gradually updating of the range of the organization's skills and capabilities. Through strategic consistency, new organizational needs are approached progressively (Lamberg *et al.*, 2009). Interestingly, these authors find that firms that are consistent with their own firm history (previous competitive actions and capabilities) and gradually update to changes in the competitive landscape are able in the long run to sustain more stable growth. Miller (1992a) also empirically supported the idea that firms that conduct adaptive tasks sequentially, looking to maintain an internal alignment between organizational skills and capabilities and strategic actions, manage to function smoothly while seeking adaptation with a changing environment gradually. Overall, Miller advocates for the advantages of stable patterns of competitive repertoires (at any levels of complexity or simplicity), which would allow the firm to build the required new capabilities progressively once those capabilities that have been acquired settle down. Rindova et al. (2010) provide a different argument finding that stable patterns in (the complexity or simplicity) of competitive repertoires are better understood by external stakeholders (i.e. investors), which will infuse resources to the firm that can support its potential growth.

Based on the same logic, we expect that those ventures with dynamically changing patterns of complexity in their competitive repertoires face various challenges for sustaining growth in employees. However, these challenges may vary based on the pattern of change (increasing or declining complexity). NVs with patterns increasing in complexity will face the challenge of consolidating new types of competitive actions and new employees and the related capabilities to reduce the imbalance between capabilities and current competitive actions (Miller and Chen, 1996b). Also, they must integrate new employees into their organizational structure, which may put a limit to future growth due to the limited capabilities of existing management (Penrose 1959). Indeed, a major constraint on firm growth is that adding employees takes time and effort, as new employees must be trained and internalised (Coad *et*

al., 2014). Suppose a firm grows too fast, and managers must concentrate on integrating new employees with new capabilities that must eventually be trained and the development of management structures. In that case, this can lead to losses of productivity and profitability, hampering future growth. Another concern comes from the literature on time compression diseconomies, suggesting that fast-growing firms may be less selective when choosing employees pushed by the pressure of time, leading to declining quality of the hired employees or to increasing costs of identifying and attracting employees of a given quality, also hampering profitability and future growth (Coad *et al.*, 2014; Krausert, 2019).

Alternatively, NVs with patterns increasing in simplicity will eventually dismantle specific areas of strategic expertise that might still be essential in the future, hampering opportunities for future growth. By concentrating their strategic actions in narrow areas of previous success, NVs may be in a good position for deploying short-term efficient actions; however, they will be minimizing their future growth options by reducing the array of capabilities in which to sustain future strategic actions. The simplification of the firm strategy has been associated with lock-in effects, as firms find difficulties in subsequently moving to new types of competitive actions. Indeed, if the range of capabilities is reduced in a continuing simplification trend, this may slow down the growth in the number of employees. Overall, these arguments lead us to suggest:

Hypothesis 3: The patterns of the complexity of the early competitive repertoire of a NV will be associated with its long-term growth trend. Specifically, NVs deploying stable competitive repertoires will be associated with a more sustained long-term growth trend than NVs deploying dynamically changing competitive repertoires.

CHAPTER 4. METHODOLOGY AND RESULTS

4.1 Population, sample, and data

A longitudinal database was purposely constructed to test the research model developed in this dissertation. The database comprises a sample of 126 ambitious NVs, which fulfilled the following three requirements. First, they entered the Alternative Investment Market of the London Stock Exchange (AIM)[7] in their first two years of their existence. Second, they entered during the 2004-2010 period. Third, they competed in one of several service industries[8].

Limiting our selection to these criteria, we ensured that NVs in the sample were young, were competing in the same time period, and were comparable in their growth aspirations and potential. We tracked these ventures five years (up to six year for employment data and other performance variables) following their formal incorporation into AIM. This tracking ends in 2009 for the ventures floated in 2004 up to 2015 for the ventures floated in 2010. AIM is a successful growth market, which belongs to the main Stock Market of London. In our context, AIM implies a rich database of fast-growing ventures that need capital for their expansion. Companies listed in AIM provide admission documents and annual reports, which are available on the AIM Website.

These ventures offer an interesting setting for several reasons. First, they have left behind the inception and firm creation phase, including assembling the initial financial resources, to make way for the phase of learning and growth through experimentation and actions. Second, as the sampled NVs have undertaken an IPO by entering AIM, we expect them to have high growth intentions.

[7] https://www.londonstockexchange.com/companies-and-advisors/aim/for-companies/companies.htm

[8] The industry classification provided by AIM follows the Industry Classification Benchmark (ICB), which is an internationally recognised standard, operated and managed by FTSE Russell for categorising companies and securities (http://www.ftserussell.com/financial-data/industry-classification-benchmark-icb). ICB provides four levels of classification, from industry to super sector, sector and subsector. Each company is assigned to the subsector that better represents its business's nature, which is determined by its primary source of revenue and other publicly available information.

We choose NVs from services industries (both business-to-business and business-to-customer services) because growth is likely to be faster and more knowledge and personnel intensive as compared to manufacturing industries. Consequently, the employment creation patterns that emerge may be different between services and manufacturing industries (Carter *et al.*, 1994). Finally, including several services industries allows cross-industry comparisons and wider generalizability of results to services industries (Carter *et al.*, 1994).

Departing from those selection criteria, we developed a unique longitudinal database of ambitious NVs. The final sample includes 1304 observations from 126 different NVs. For each of the five subsequent years following the venture floating into AIM, we extracted information from the annual reports (i.e. from the Chairman and CEO letters to stakeholders) regularly published by the NVs by applying structured content analysis to identify and code competitive moves. As a result, 11071 actions were codified. Additionally, we compiled from Amadeus for each year data on each venture and its performance. Annual data on employment (full-time equivalents at the end of the year) was also gathered up to the sixth year since the floating. A paired control sample was extracted from Amadeus of UK unlisted companies as of the date of registration and industry of activity (NACE[9]). The control sample includes 256 unlisted ventures with similar frequencies of NACE codes, year of registration and size (measured by the number of employees) as our original sample. No significant differences were found in the main variables between the listed and unlisted NVs groups.

Building on competitive dynamics research (Miller and Chen, 1996b; Rindova, Ferrier and Wiltbank, 2010; Larrañeta, Zahra and Galán González, 2014), a comprehensive list of 76 non-industry specific action types or competitive methods (Dess and Davis, 1984) was set up. These

[9] The NACE (for the French term "nomenclature statistique des activités économiques dans la Communauté européenne"), is the industry standard classification system used in the European Union. The current version is revision 2 and was established by Regulation (EC) No 1893/2006 (European Parliament and Council, 2006). We use the NACE code to compare the industry affiliation of firms listed and not listed in AIM, since the ICB classification was only available for the AIM-listed companies.

were grouped into eight main categories along with the key strategic value-chain activities (e.g. marketing, product, operations, and strategic alliances) and 28 subcategories (e.g. communication & branding, technical or market-oriented strategic alliances) (see Table 27 in Annex 1). Offstein and Gnyawali (2005) developed a comparable approach but with a focus on a single industry. The main author of this work and another PhD student coded the annual reports independently, arriving at an inter-rater agreement ratio of 75%. Coding differences were analysed to understand whether the differences were systematic (implying differences in understanding) and not systematic. The two types of differences were discussed with two additional experts to reach an agreement on the final coding. As a result, an initial sample of 914 company per year observations was generated.

Table 1 shows the competitive action categories, content and examples of sentences used in the coding process. For our analysis, we are interested in the first five years since firm creation, which reduces our initial sample of 11071 actions to 7464 actions and 604 company per year observations.

Table 1. Strategic action categories, content and examples

Action category	Total number	Content	Examples
Research & development	2107	Development new products and services, technologies; prototypes and trials; internal developments; investment in R&D capacities and technologies; patents	With regard to OXPzero™ co-development work has begun with Hermes Pharma for a range of ibuprofen direct to mouth granules using the OXPzero™ technology. This will lead to clinical studies in early 2013 to demonstrate the bio equivalence of our OXPzero™ ibuprofen salt, a major step towards securing the first licensed medicine using the technology.
Operations	1397	Capacity increases, adjustments reductions;	Expansion of production facilities underway targeting capacity of 40 Acta Power units per month for H2 2014.

Action category	Total number	Content	Examples
		enhancement of operational efficiencies; human resources activities	
Marketing	900	Communication & branding, promotions; price actions; distribution channels; customer service	The launch ahead of the Company's presence at the IBC show in September was successfully and cost-effectively executed.
Product & services	922	New product and services launches; modifications; roll-outs	Release of updated low power GPRS/GPS combined products (GM862-GPS and GE863-GPS) with 35% less power consumption than the previous versions.
Organization and management	1506	Business sale, outsourcing, organizational restructuring, HR TMT, cost reduction programs; and others	Operational efficiency: From 01 December 2008 we have reorganized the business into three business units: devices, client software and enterprise solutions.
Acquisitions	960	Technology and market oriented acquisitions; investment in other companies	In October, we completed the acquisition of MGP Diagnostics AS, which owns the patent rights to a unique biomarker, Matrix GLA protein (mGLA).
Firm cooperation	2296	Alliances & inter-organizational relationships (technology and market oriented)	A key strategic partnership with Callcredit Information Group, a consumer data and marketing firm, has further enhanced the Group's mobile DNA offering.
Internationalization	983	Downstream, upstream activities	Strengthened position in Eastern Europe with an office opened in St Petersburg.
Total	11071		

Source: Own elaboration

Our unit of analysis is the NV in the sense of a new legal enterprise (Davidsson, Delmar and Wiklund, 2006), which may be independent or part of a company group. The analysis presented in this dissertation focuses on a particular set of NVs: those ambitious and growth-seeking ventures that manage to go through an IPO soon after their formal register. Specifically, we explore NVs that manage to do so in a maximum of 2 years after their formal register. We then track these ventures up to their sixth year after the floating. We capture their competitive actions for five subsequent years and their growth until six subsequent years to account for the impact of the repertoires of competitive actions on the NV subsequent growth. Our focus to assess the early years' NVs' competitive behaviour is on their first five years, coinciding with the 5-year's cut-off point for NV survival (Eurostat, 2018), which represents a reasonable time horizon suggesting certain sustainability in the development pattern (Wiklund and Shepherd, 2003). Therefore, in this study NVs' are tracked up to a maximum of their first six years after going public. While there is a strong debate in the literature about the age range in which a NV can be considered as such, in this dissertation, we use the 6-year point to consider a firm as a 'new' venture (Biggadike, 1979; McDougall and Robinson Jr, 1990).

To identify each NV over time, we track the International Securities Identification Number (ISIN) that uniquely identifies the NVs in our sample as far as they continue in AIM even if they change company name, industry affiliation or owner. The overview in Table 2 shows that the global financial recession starting in 2007-2008 appeared to influence the number of firms created and, therefore, it is important to consider this in the analysis of the taxonomy and control for it in the regression analysis.

Table 2. Overview of the number of NVs in the sample by cohort (year of registration and admission to AIM)

Year	Number of firms registered	Number of firms admitted to AIM
2004	42	22
2005	29	28
2006	28	35
2007	9	19
2008	4	6
2009	6	1
2010	8	11
2011		4
Total	126	126

Concerning the demographic characteristics, the NVs in the sample are well distributed across different industries, with the Health, Pharmaceuticals & Biotechnology sector showing the smallest share and most of NVs starting either as micro, small, medium-sized firms (Table 3). Furthermore, considering NVs origin, an important factor determining access to resources and capabilities at start-up, most of our NVs (57%) have a corporate backup, yet a not insignificant percentage of 43% of companies have an independent origin.

Table 3. The distribution of the population of NVs across industries, firm start size classes and venture origin

	Percentage of the entire population (n=126) %	**Percentage of the subpopulation with at least 5-year data (n=110) %**
Original industry classification (ICB)		
Consumer Goods and Services	23.02	21.82
Energy and Natural Resources	10.32	10.91
Financials	17.46	17.27
Health, Pharmaceuticals & Biotechnology	8.73	10.00
Industrials	23.02	22.73
Information Communication Technologies	17.45	17.27
Firm start-size class (number of employees)		
Micro (< 9 employees)	29.37	30.00
Small (10-49 employees)	34.13	36.36
Medium (50-249 employees)	26.98	25.45
Large (> 250 employees)	9.52	8.18
Origin		
Independent	42.86	40.91
Corporate backup	57.14	59.09

This study is about the evolution over the early years. Therefore, we are interested in seeing how these companies grow and eventually change size class over the first years of operations or even change the industry as, ultimately, industry affiliation is a strategic choice made by the NV beyond being an indicator about the business context (Porter, 1980; Davidsson, Achtenhagen and Naldi, 2010). A significant chi-square (chi-square = 432.46, p-value = .000) in contingency table analysis (Table 4), where the rows are the industry affiliation of NVs at the start, and the columns are the industry affiliation after five years (the null hypothesis H0 assumes that there is no association between rows and columns), indicates that NVs do not generally change the industry over the early years.

Table 4. Contingency (two-way) table showing the number of NVs by industry affiliation at start-up (rows) and five years after the floating (columns)

Industry classification	(1)	(2)	(3)	(4)	(5)	(6)	Total
Consumer Goods and Services (1)	22	1	0	0	1	0	24
Energy and Natural Resources (2)	0	10	0	0	2	0	12
Financials (3)	0	0	17	0	1	1	19
Health, Pharmaceuticals & Biotechnology (4)	0	0	1	10	0	0	11
Industrials (5)	1	1	1	0	22	0	25
Information Communication Technologies (6)	0	0	0	0	1	18	19
Total	23	12	19	10	27	19	110

Chi-square = 432.46, p-value = .000

Though the industry affiliation remains mainly unchanged, we expect that a number of NVs change their mission in the early years when confronted with reality, which may imply changes in the board members. In the following table, we can see the percentage of NVs that change mission and the board's composition by firm age.

Table 5. Development of changes in NV mission and the board's composition by NV age (2004 to 2015)

	Mission change (Firm count)		Board changes (Firm count)	
Age	**Percentage of the entire population (n=126) %**	**Percentage of the subpopulation with at least 5-year data (n=110) %**	**Percentage of the entire population (n=126) %**	**Percentage of the subpopulation with at least 5-year data (n=110) %**
1	5%	5%	40%	41%
2	6%	5%	40%	42%
3	6%	7%	47%	50%
4	6%	5%	33%	39%
5	7%	8%	33%	42%

Start-up size is a determinant of growth in NVs, which tend to grow faster in the early years (Coad, 2009). In our sample on NVs, the average start-up size is relatively low, with 70% of firms being small-(10-49 employees) or micro-sized (<9 employees). The contingency table

analysis (Table 6) for industry affiliation at start-up and NV size-class shows that we reject that industry affiliation and start-up size are not associated (chi-square = 36.01, p-value = .002)

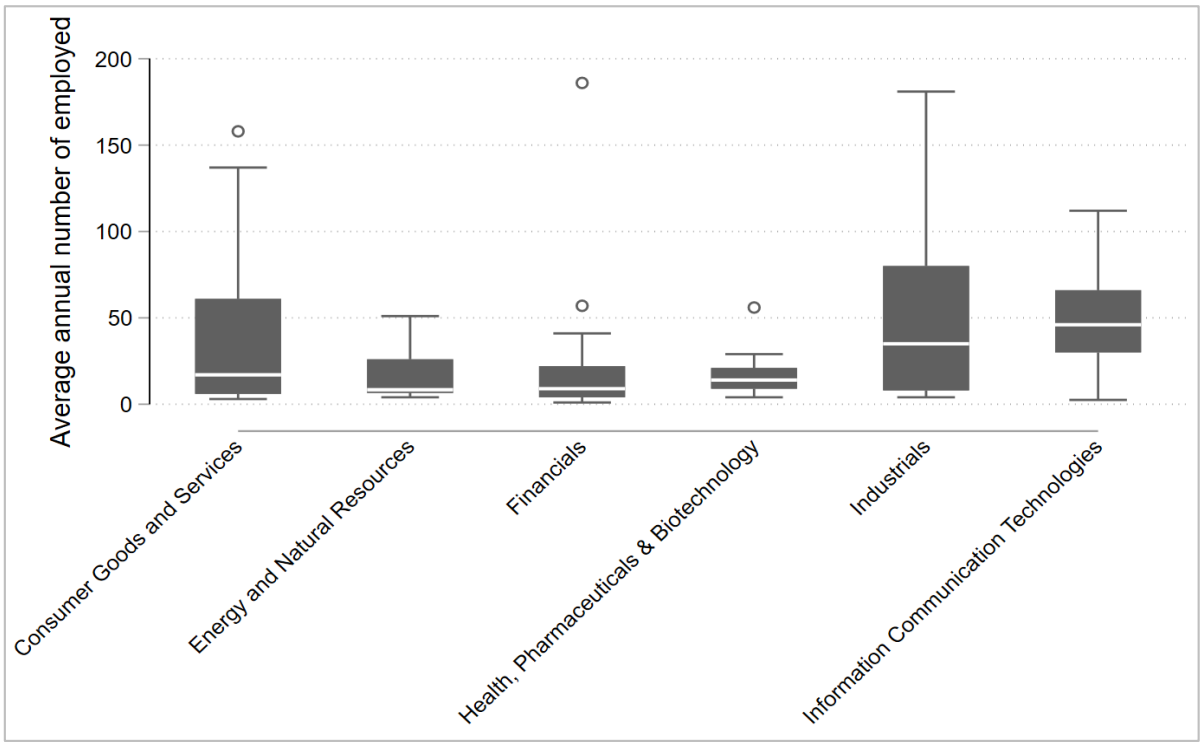
Table 6. Contingency (two-way) table showing the number of NVs by industry affiliation at start-up (rows) and size class (in number of employees) at start-up (columns)

Industry classification / start-up size	Micro (<9)	Small (10-49)	Medium (50-249)	Large (>249)	Total
Consumer Goods and Services	7	4	1	0	12
Energy and Natural Resources	5	5	12	3	25
Financials	5	8	6	5	24
Health, Pharmaceuticals & Biotechnology	3	7	1	0	11
Industrials	2	10	6	1	19
Information Communication Technologies	11	6	2	0	19
Total	33	40	28	9	110

Chi-square = 36.01, p-value = .002

Figure 2 illustrates the average size of the NVs in the sample at the start time over the industry affiliation, reflecting that NVs entering the industrials, consumer goods and services, and ICT sectors tend to be larger than those entering the rest of the sectors are.

Figure 2. Average start-up size by industry affiliation. Box plot graph showing the 25th, 50th and 75th percentiles and outside values



Note: NVs of sizes over 200 employees, being above the 75th percentile of the overall sample, are excluded.

The contingency table analysis for NV size-class at start-up and five years after the floating reveals that NVs do not significantly (chi-square = 137.51, p-value = .000) move from one size-class to another over the early years though some shifts can be observed from micro to small, from small to medium and from medium to large.

Table 7. Contingency (two-way) table showing the number of NVs by size class at start-up (rows) and 5-years after the floating (columns)

Size-class	(1)	(2)	(3)	(4)	Total
Micro (<9 employees) (1)	22	8	2	1	33
Small (10-49 employees) (2)	1	27	11	1	40
Medium (50-249 employees) (3)	0	1	17	10	28
Large (>250 employees) (4)	0	0	0	9	9
Total	23	36	30	21	110

Chi-square = 137.51, p-value = .000

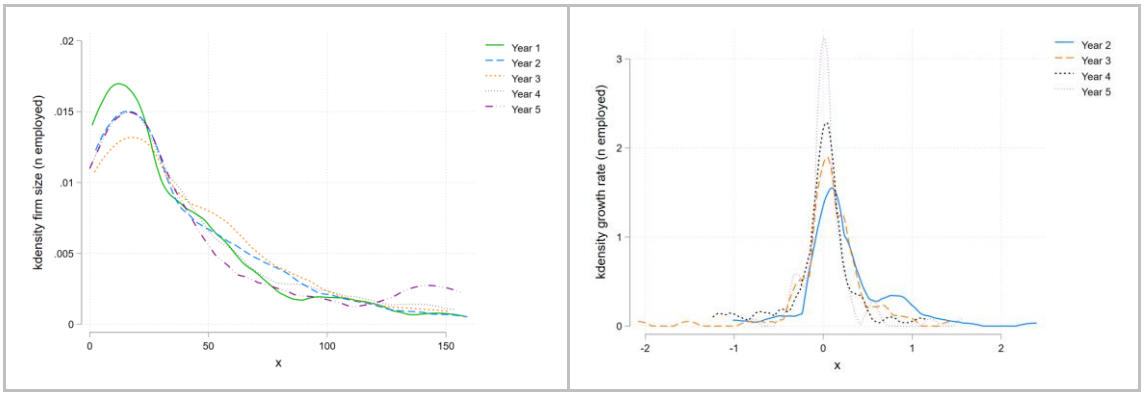
The success of the NV can be measured by different variables such as the number of employees, sales, profitability or market capitalization, the last one reflecting the shareholders' expectations. In the following table, we see the development of firm employment and market capitalization by NV age.

Table 8. Development of NV employment and market capitalization by NV age (2004 to 2015)

	Employees				Market capitalization (£m)				N
Age	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max	
1	122.73	302.24	1	2189	34.25	39.49	1.68	246.06	126
2	140.53	277.11	2.5	2156	30.98	42.42	0.56	294.21	126
3	178.77	343.69	2	2237	36.61	62.90	0.17	535.73	126
4	200.25	392.72	1	2589	40.77	77.86	0.12	575.97	126
5	214.99	424.81	0	2822	41.92	79.08	0	550.81	126
Total	171.46	353.02	0	2822	36.91	62.59	0	575.97	

Figure 3 presents the distribution of firm size in terms of the number of employed (left) and firm employment growth (right) across years. In line with the literature on company growth, suggesting that growth rates tend to decrease over the years, we observe that while some NVs show high growth rates in the first few years, as we advance in time, the rates mainly concentrate around values slightly above zero.

Figure 3. Distribution of the number of firm employees (left) and the employment growth rate (right) in years 1 to 5



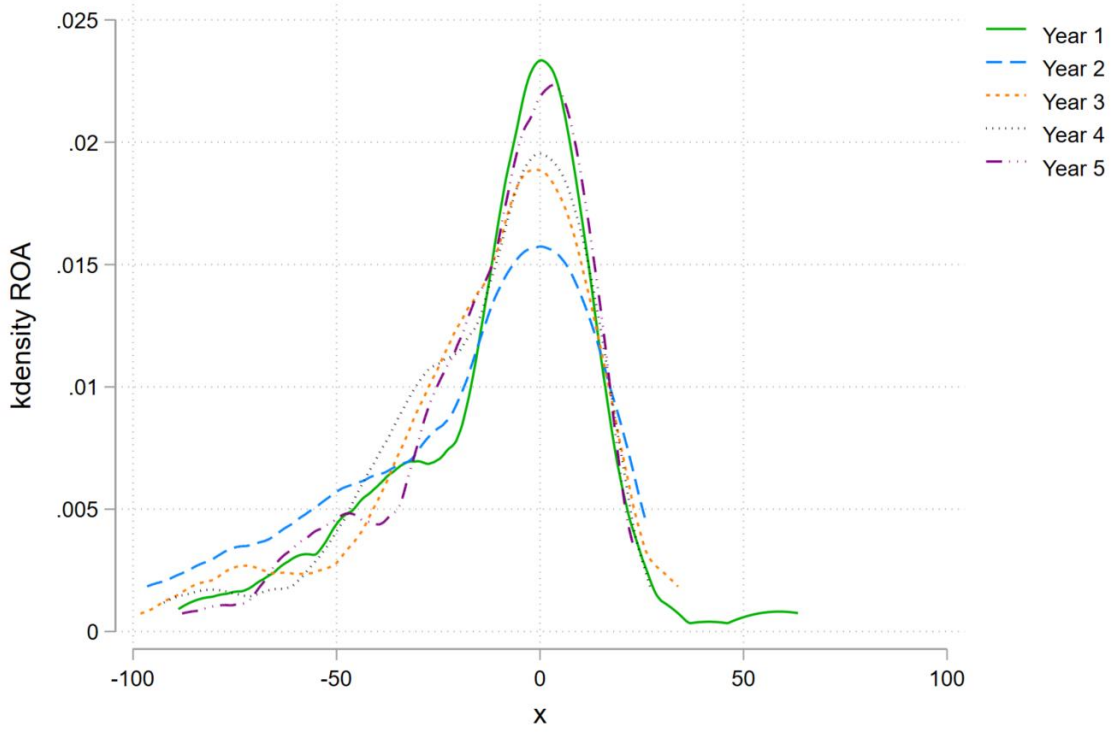
Notes: NVs of sizes over 200 employees, being above the 75th percentile of the sample, are excluded.

Table 9 presents the average ROA in the sample by NV age, while Figure 4 presents the detail of the distribution of ROA across years for the NVs in our sample.

Table 9. Development of NV ROA and share of NVs achieving a positive ROA by age (2004 to 2015)

	ROA					**N**
Age	Mean	S.D	Min	Max	Percentage of NVs with positive ROA	
1	-10.75	26.00	-88.85	63.39	40%	99
2	-18.74	30.67	-96.53	25.98	41%	109
3	-13.30	26.57	-98.16	33.91	38%	107
4	-13.94	24.59	-92.42	27.41	38%	107
5	-11.72	22.94	-87.93	22.98	42%	95
Total	-13.80	26.42	-98.16	63.39	40%	

Figure 4. Distribution of yearly ROA across the five years following the floating



Finally, to understand the survival of the NVs in the sample, we tracked the firms delisting from AIM (either voluntary or involuntary) over a longer period (up to 2017, year by which all companies tracked had at least an age of seven years) and the motive for delisting. Note that no firm was delisted from AIM during the first six years of operations, which constitutes our main period of analysis.

Table 10. The share of firms delisted from AIM by year up to the year 2017

		Percentage of the entire population (n=126) %	**Percentage of the subpopulation with at least 5-year data (n=110) %**
Delisted from AIM	*Age*		
2013	8	3.97	4.55
2014	9	7.14	7.27
2015	9	5.56	4.55
2016	9	3.17	1.82
2017	11	0.79	0.91
Total		20.63	19.09

The key drivers for delisting usually have to do with bankruptcies, failure to maintain the requirements established by the exchange, takeovers or mergers and stock performance. The following table shows that most NVs in our sample delisted from AIM were either acquired or merged.

Table 11. The share of firms delisted from AIM up to the year 2017 by motive of delisting

	Percentage of the entire population (n=26) %	**Percentage of the subpopulation with at least 5-year data (n=21) %**
Delisted from AIM		
Takeover or merges	46.15	42.86
Firm closure	26.92	28.57
Business continues outside AIM	26.92	28.57

4.2 Variables and measures

4.2.1 Clustering variables

Our H1 seeks to find certain temporal patterns of complexity in the repertoires of competitive actions of our NVs' sample. To this end, we have selected from the literature seven well-established or refined indicators that measure different nuances of competitive repertoire complexity, with criterion validity concerning management objectives such as performance and the development of the firm competences and capabilities to achieve it (Sarstedt and Mooi, 2014). Our selection of clustering indicators is based on solid theoretical and empirical research in competitive dynamics suggesting that the complexity of the competitive repertoire influences firm performance and the breadth of developed competitive capabilities (Miller and Chen, 1996b; Ferrier and Lyon, 2004; Rindova, Ferrier and Wiltbank, 2010; Connelly *et al.*, 2017; Carnes *et al.*, 2019). The latter being best captured by employment growth (Penrose, 1959). A

description of the seven variables (classified in three different types) that were calculated to investigate alternative temporal patterns of the complexity of the repertoire of competitive actions is provided in Table 12.

The first type of variables measure the complexity in terms of the variety and diversity in the type of moves started by a firm in each period (t); we use both a *range* indicator (i.e. the number of different action categories started in each year) and a *diversity* indicator (i.e. a Herfindahl type index) (Miller and Chen, 1996b). The *diversity* indicator provides more information about the composition of the repertoire than simply the *range* as it takes into account the relative presence of different competitive actions in each action category of action. For instance, a firm putting in place a balanced number of actions across all types would score similar in *range* and *diversity*, but if the firm deploys actions from all types, with 90% of them belonging to one single type, this firm would score high in *range* but low in *diversity*. Because the common level of complexity may differ across industries, we also consider an index measuring the diversity in competitive types in relation to the industry norm in a given period (t). This indicator captures the tension between the advantage of being different and the legitimacy of being similar to the industry. Specifically, we use an indicator of *relative diversity* as compared to the industry measuring the similarity/non-specialization (conformity) or dissimilarity/specialization (non-conformity) in the variety of types of competitive actions carried out by a firm in a period (t) in relation to the average variety in its industry in the same period (t). Interestingly, empirical studies have found better firm performances at higher levels of industry conformity (in the tension between being similar and legitimated and being different to the rest of competitors) (Miller and Chen, 1996a). We consider that complexity increases with conformity since it requires a sound knowledge of the competitive landscape.

The second type of variables concerns the inter-temporal variety and measures aspects of the novelty of the categories of actions implemented in a period (t) as compared to the

previous period (t-1)and regularity/continuity (or consistency) in the categories of action over several periods. We draw on Connelly *et al.* (2017) to incorporate an indicator of *change* (or novelty), capturing the degree to which firms engage in new types of competitive actions by counting the number of categories of actions in which a firm engages in a period (t) but in which it did not engage in the previous period (t-1). The literature associates novelty (change/adaptation) in competitive types with higher complexity and performance. Finally, we draw on Lamberg *et al.'s* (2009) idea that competitive repertoires must be both consistent with the environment (involving change and adaptation through new action types) and with the past firm actions and capabilities (continuation of started action types). For this, we incorporate a *continuity* indicator that measures the number of years that, on average, last the categories of action initiated in relation to the total number of years considered. Specifically, we calculate a normalized measure (between zero and 1) of the average permanence (duration) over time of the various categories of competitive actions initiated by a firm over the whole period of analysis (t + 1 and beyond). This indicator provides a new nuance to the notion of inter-temporal variety by capturing the duration over time of the introduced types of action. We argue that keeping the newly introduced types over a longer period is reflects a more complex, consistent long-term oriented competitive repertoire as opposed to introducing action types in one period that are replaced in the subsequent one, leading to certain inconsistency between accumulated capabilities and current actions.

Additionally, with our third type of variables, we control the total number of competitive actions (*competitive activity*) when searching for patterns of complexity, which measures the propensity to engage in competitive behaviour. By doing so, we account differently for those firms scoring the highest in the complexity (or variety) of competitive action types, which, in the extreme case, deploy only one action from each type and those firms scoring the same in the degree of complexity deploying many competitive moves from each type. As the number of actions may vary from industry to industry, we also consider the total number of competitive

actions carried out by a firm in a given period in relation to the industry mean (*relative competitive activity*).

The data collected through structured content analysis provided two important types of information: (1) the number of competitive actions conducted each year and (2) the type or category of each competitive action. The unit of calculation of the clustering indicators is the action type or category. Additionally, we compute the indicators at the subcategory level, which can help us better profile the trajectory clusters. Considering that $i\ (=1,\dots,126)$ are our NVs, $j\ (=1,\dots,8)$ are the distinct action categories and $l\ (=1,\dots,78)$ are the action subcategories, $k(=1,\dots,9)$ are the industries in which our NVs operate and $t\ (=1,\dots,5)$ are the observation periods where $t=1$ corresponds to the first period after AIM entry, we have operationalized the indicators as follows in Table 12.

Table 12. Description and operationalization of the clustering variables

Indicator	Description	Calculation	Reference
Type 1. Intra-firm variety and diversity in each period and in relation to the industry norm			
Range [1,8]	Number of different types or categories of actions put in place by a firm in a given year.	$R_{i,t} = count_j\,(a_{i,j,t})$	Miller and Chen, 1996b; Larrañeta, Zahra and Galán González, 2014
Diversity(1) (2) [0,1]	Firm's concentration on a few vs a variety of actions types during a given year, calculated by using a Herfindahl type index.	$D_{i,t} = 1-\sum_j\left(\frac{a_{i,j,t}}{A_{i,t}}\right)^2$	Ferrier and Lyon, 2004; Offstein and Gnyawali, 2005; Rindova, Ferrier and Wiltbank, 2010
Industry relative diversity(3) [0,~2]	Relative firm's concentration on a few vs a broader array of action types during a given year compared to the rest of firms in the industry.	$RD_{i,t} = 2 - \sum_j\left\|b_{i,j,t} - \overline{b_{j,t}}\right\|$, where $b_{i,j,t}$ is the share of the number of actions of category j implemented by firm i in a given year t ($a_{i,j,t}$) of the total number of actions implemented by firm i in year t ($A_{i,t}$) and $\overline{b_{j,t}}$ is the average share of actions of category j of total actions across the entire	Krugman, 1991; Miller and Chen, 1996a

Indicator	Description	Calculation	Reference
		sample of firms in the industry in year t.	
Type 2. Inter-temporal variety			
Change [1, 7]	Number of newly introduced categories of actions by a firm in a given year compared to the previous year.	$CH_{i,t} = count_j(a_{i,j,t})$ $\forall a_{i,j,t-1} = 0$	Connelly *et al.*, 2017
Continuity [0, 1]	Normalized indicator of the average number of years that actions are kept in place by a firm since the start.	$C_{i,t} = \frac{\sum_j (\sum_{j,t} count_j (a_{i,j,t}) / \mathrm{t})^2}{J}$	Lamberg *et al.*, 2009
Type 3. Volume of competitive activity			
Competitive activity	Total number of competitive actions a firm undertook during a given year.	$A_{i,t} = \sum_j a_{i,j,t}$, where $a_{i,j,t}$ are the number of actions taken by firm i of category j in period t.	Chen and Hambrick, 1995; Ferrier, 2001; Offstein and Gnyawali, 2005; Carnes *et al.*, 2019
Relative competitive activity	Total number of competitive actions a firm undertakes during a given year in relation to the industry average.	$RA_{i,t} = \frac{A_{i,t}}{\frac{\sum i_k A_{i,kt,}}{N_k}}$, where N_k are the number of firms in industry k and $i \epsilon k$	Young, Smith and Grimm, 1996

(1) Note that by subtracting from 1, the index is converted into a direct measure of diversity. The index varies from zero (maximal concentration) to 1 (maximal diversification).
(2) Other authors (e.g. Connelly *et al.*, 2017) use a Shannon index to measure diversity which provides similar results.
(3) This index takes values between 0 and 2(J-1)/J. Note that by subtracting from 2, the index is converted into an indirect measure of relative diversity. The index varies from zero (does not resemble the structure of the reference level) to ~2 (resembles the structure of the reference level).

In addition to the level indicators measured for each year, we include their cumulated changes each year in the cluster analysis. The cumulative rather than the annual changes are measured to smooth out short-term fluctuations.

4.2.2 Dependent variables

Hypotheses 2 and 3 predict short- and long-term NV growth in employment, respectively. There are two dependent variables relevant to the analysis: the annual (year-to-year) employment growth rate and the five-year growth trend.

Short-term firm growth

The annual growth rate is operationalized as the logarithmic difference between the number of employees in two consecutive time periods and is referred to as firm i and time t (Del Monte and Papagni, 2003; Donati, 2017) as follows.

$$g_{i,t} = \ln S_{i,t} - \ln S_{i,t-1}$$

g refers to the growth rate in period t, $S_{i,t-1}$ refers to the size in number of employees at the start of the period t (or end of period $t-1$) and $S_{i,t}$ refers to the size at the end of period t. Growth in the number of employees is a commonly used indicator of firm growth (Beckman, 2006; Lööf and Nabavi, 2014). We calculate annual (year-to-year) growth rates at the end of each year over the first five years following the floating, which means that we used growth data for the first six years after floating for building those measures.

Long-term firm growth

In the medium/long-term, we operationalized the growth trend as the slope of the regression of the annual number of employees over five subsequent years, beginning the year of the venture floating and considering the following five years after the entry at AIM (Davidsson, Achtenhagen and Naldi, 2010; Connelly *et al.*, 2017). The firm growth trend allows us to observe the heterogeneity in the change of the growth over time, thus providing more detail about long-term firm-level changes in growth than that which simple averages or

snapshots of growth at one point in time would provide (Singer and Willett, 2003). The literature on NV growth suggests that looking at longer-term growth trends *"…narrows the gap between the size change and process perspectives on growth, even though it still assumes growth to be linear and uni-directional"* (Davidsson, Achtenhagen and Naldi, 2010).

4.2.3 Independent variables

Temporal patterns of the complexity of the competitive repertoire

The main explanatory variable in the proposed econometric model is the one that collects the alternative early temporal patterns of the complexity of the competitive repertoires, that is, the cluster affiliation or membership that results from the dynamic cluster analysis run over the first five-year time-series of the clustering variables.

4.2.4 Profiling and control variables

The study also controls for several variables at different levels of analysis to ensure valid results and to profile the obtained dynamic clusters or temporal patterns (typical trajectories); these control variables relate to the business environment, industry, strategic orientation, and firm as described next.

Size: We define size firm by the number of employees, and we include it since growth may depend on size (Evans, 1987). Its squared term (size firm squared) is included to test the non-linear effect of size (Barge-Gil and López, 2014). **Start size-class:** firms can be classified into different size categories (defined in terms of the number of persons employed). Small and medium-sized enterprises (SMEs) employ fewer than 250 people. SMEs can be further subdivided into micro-enterprises (fewer than 10 employees), small enterprises (10 to 49 employees) and medium-sized enterprises (50 to 249 employees). Large enterprises employ 250 or more people (Eurostat, 2020). We consider the number of employees in the first period to

define the start-size class of the new venture. Previous literature associates the NV size at the start of operations with performance (Coad *et al.*, 2013). **Munificence**: Munificence refers to the availability of resources to support growth within an industry (Dess and Beard, 1984). We use the five-year average growth of operating income in each industry to compile the measure of industrial munificence (Keats and Hitt, 1988; Chen *et al.*, 2017). We gathered operating income for each two-digit industry (by NACE code) by year from Eikon Database. We follow the methodology used by Keats and Hitt (1988) applied to a panel data structure. For each year and industry, we regressed the natural logarithm of total industry operating income and an index variable of years, with time serving as the independent variable. Then, the antilog of the regression coefficient capturing the growth rate of operating income was used as the measurement of industrial munificence (Chen *et al.*, 2017). **Dynamism**: Dynamism refers to the volatility and unpredictability of the changes within a dominant industry, which will always heighten the uncertainty for organizational members (Dess and Beard, 1984; Keats and Hitt, 1988; Chen *et al.*, 2017). Following Keats and Hitt (1988), we use the same methodology in measuring the munificence to quantify dynamism, taking into account our panel data structure. Thus, the antilog of the standard error of the slope regression coefficient was used as the measure of industry dynamism that captures the volatility of industry growth of operating income rates. **Industry:** NVs may tend to adopt a simpler or a more complex repertoire in some industries than in other ones. AIM classifies our NVs into nine sectors following the Industry Classification Benchmark (ICB), an internationally recognised standard. We further aggregate the categories into Consumer Goods and Services (n=24, N=230), Energy and Natural Resources (n=12, N=143), Financials (n=19, N=207), Health, Pharmaceutical (n=11, N=121), Industrials (n=25, N=291), Information Communication Technology (ICT) (n=19, N=209). Panel regressions confirm several statistically significant differences in the complexity indicators across industries. Range and diversity of action types, for example, scored significantly lower in companies of the Financials sector, while scored significantly higher in the ICT sector than in other industries.

Origin: even though all our sample firms are NVs operating in service industries, their origins are diverse, possibly leading to performance differentials (Larrañeta, Zahra and Galán González, 2014). We capture venture origin using a dummy variable where we code an independent NV (i.e., created by an individual) as 1 and 0 if the company is sponsored by a corporation (i.e., corporate venture). **Market capitalization**: It is defined as the number of shares issued multiplied by the closing mid-price. For publicly traded firms, market capitalization is an external measure of firm performance as it measures shareholders' wealth (Robinson and Phillips McDougall, 2001) while summarizes all strategic decisions that affect the firm's ability to efficiently allocate and manage scarce resources over time (Hillman and Keim, 2001). Access to capital is expected to influence firm growth positively. **Total assets**: Previous literature has found a relationship between size measured in terms of net assets and firm growth and survival (Dunne and Hughes, 1994). **Return on assets**: we use annual return on assets (ROA) as a control variable because it is a stable indicator of the efficient use of an organization's facilities (Keck, 1997; Krishnan and Park, 2005). **TMT Size**: The size of the Top Management Team (TMT) (in our case, the founding team) is included as a control variable because the TMT's strategic choices are often linked to the number of managers serving on the TMT (Kor, 2003) and the size of the founding team has been positively associated to firm growth (Davidsson, Achtenhagen and Naldi, 2010). **International growth emphasis:** It measures the degree of internationalization as the emphasis on internationalization oriented actions (Gilbert, Mcdougall and Audretsch, 2006), and we operationalize it as the standardized value of the sum of internationalization actions (e.g. entry to foreign markets through exports or establishing a subsidiary). **Development growth emphasis:** It measures the degree of development activity as the emphasis on research and development (R&D)-oriented actions in order to develop new products and/or processes for their venture as there may be a relation between R&D and employment growth (Stam *et al.*, 2008; Coad and Rao, 2010). We operationalize it as the standardized value of the sum of R&D actions. **Internal vs external growth emphasis:** The way firms grow, specifically organically or

through acquisition (Gilbert, Mcdougall and Audretsch, 2006; Lockett *et al.*, 2011) affects by how much firms grow. We measure this as the ratio between the standardized value of the sum of organic growth-oriented actions (R&D, marketing, product, operations, organizational) deployed by the firm and the standardized value of the sum of firm acquisitions and cooperative actions. **Age:** In growth studies, it is important to control for age since prior literature has proved the effect of time on growth. In general, younger firms tend to show higher growth rates than older ones (Lockett *et al.*, 2011).

4.3 Analysis and results

The empirical analysis of this dissertation is divided into two phases. In the first phase, a multivariate dynamic or time-series cluster analysis is conducted to identify distinct temporal patterns of the complexity of the repertoire of competitive actions in the five years following the NV entry to AIM. Five years provides a reasonable time for measuring long-term aspects of the strategy, coinciding with the period often taken into account to assess NV growth and survival (Delmar, 2006; Clarysse, Bruneel and Wright, 2011; Eurostat, 2018). Longitudinal studies play a prominent role in strategy and competitive behaviour analysis. By following firms over time, temporal changes in one or multiple variables of interest can be analysed. An important question concerns the existence of different trajectories or sequential patterns in terms of the variable or variables of interest, which can be discovered through longitudinal or dynamic cluster analysis (unsupervised learning) to separate firms into homogenous groups based on the level and trend of one or more variables. Previous research acknowledges that analysing multidimensional sequences is an important advancement in behaviour research (Diamantopoulos, Fritz and Hildebrandt, 2013). In the second phase, a regression analysis is run to evaluate how annual firm growth (calculated at the end of each period) and its underlying trend (calculated over five years) varies as a function of the temporal pattern (or cluster) of the

complexity of the competitive repertoire, considering other important variables of the environment, industry, firm and strategy that may affect firm growth. It has been demonstrated that including the cluster or (temporal pattern) membership, in addition to other time-varying and time-unvarying variables, helps to predict or explain better the dependent variable in regression analysis (Prinzie and Van den Poel, 2006).

4.3.1 Phase 1: Dynamic cluster analysis – Taxonomy development

Clustering variables. In cluster analysis, it is essential to avoid collinearity (high level of correlation between two variables) to avoid duplication of certain aspects. Factor analysis is helpful to identify redundancies, as correlated variables tend to load highly on the same factor. Results from factor analysis show that our clustering variables group around three dimensions that we can describe as (1) the variety in competitive action types in each year within the firm and relative to the industry, (2) the level of competitive activity and (3) the inter-temporal variety (Table 13).

Table 13. Rotated (orthogonal varimax) factor loadings and unique variances of the clustering variables

Variable	Factor1	Factor2	Factor3	Uniqueness
Range	0.8347*	0.3127	0.1668	0.1776
Diversity	0.8628*	0.0864	0.1036	0.2373
Industry relative diversity (indirect measure)	0.7899*	0.0636	0.1079	0.3604
Change	0.3244	0.0638	0.6621*	0.4523
Continuity	0.1006	0.0396	0.6391*	0.5798
Competitive activity	0.1703	0.8931*	0.0451	0.1713
Relative competitive activity	0.1142	0.8837*	0.0219	0.2056
Descriptive title of factor	Variety	Activity Volume	Inter-temporal variety	

*Highest scores

Because pairwise correlations are below 0.9 (Table 14), we keep all variables in the analysis to capture the different nuances of complexity (Sarstedt and Mooi, 2014). For instance,

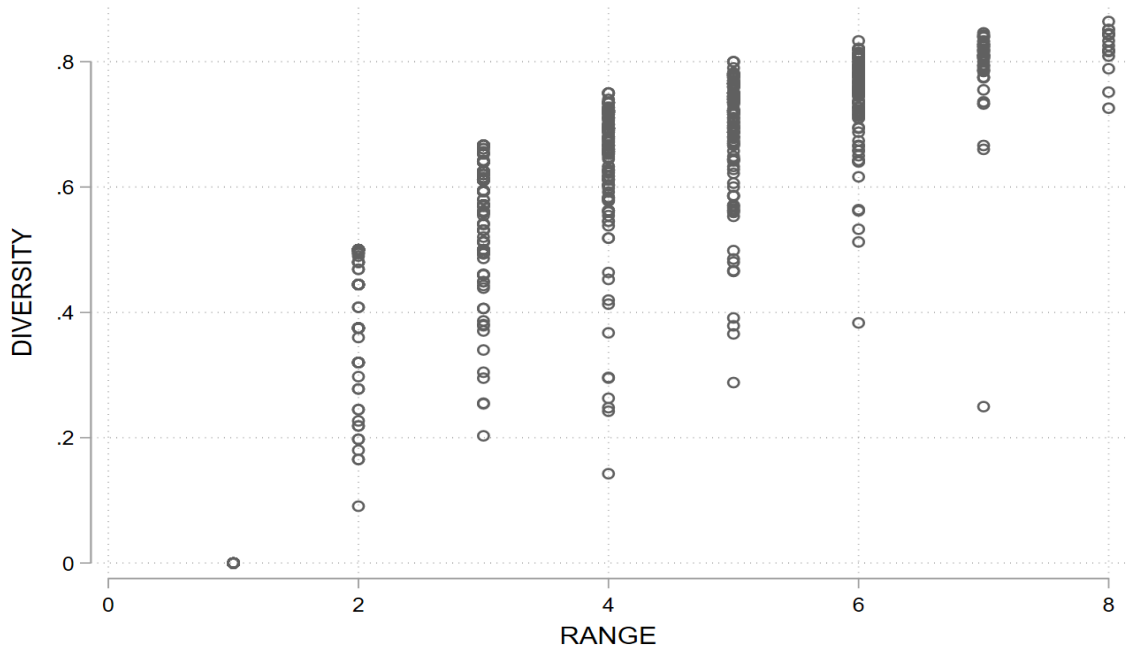
Figure 5 illustrates that despite the relatively high correlation (0.79***) between range and diversity (two indicators of within-firm yearly variety), for the same score of the range index, the diversity index vary widely, except for the high levels of the range index where the diversity index seems to be more concentrated also around high levels.

Table 14. Descriptive statistics and pairwise correlations of the clustering variables (indicators of complexity)

Variables	Means[(1)]	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Range	3.92	1.72	1.00						
(2) Diversity	.58	.22	0.79***	0.79***					
(3) Industry relative diversity	1.04	.34	0.71***	0.71***	0.71***				
(4) Change	1.57	1.58	0.45**	0.45***	0.45***	0.45***			
(5) Continuity	.39	.25	0.164***	0.16***	0.16***	0.16***	0.16***		
(6) Competitive activity	12.13	13.11	0.45***	0.45***	0.45***	0.45***	0.45***	0.45***	
(7) Relative competitive activity	1	.84	0.37***	0.37***	0.37***	0.37***	0.37***	0.37***	0.37***

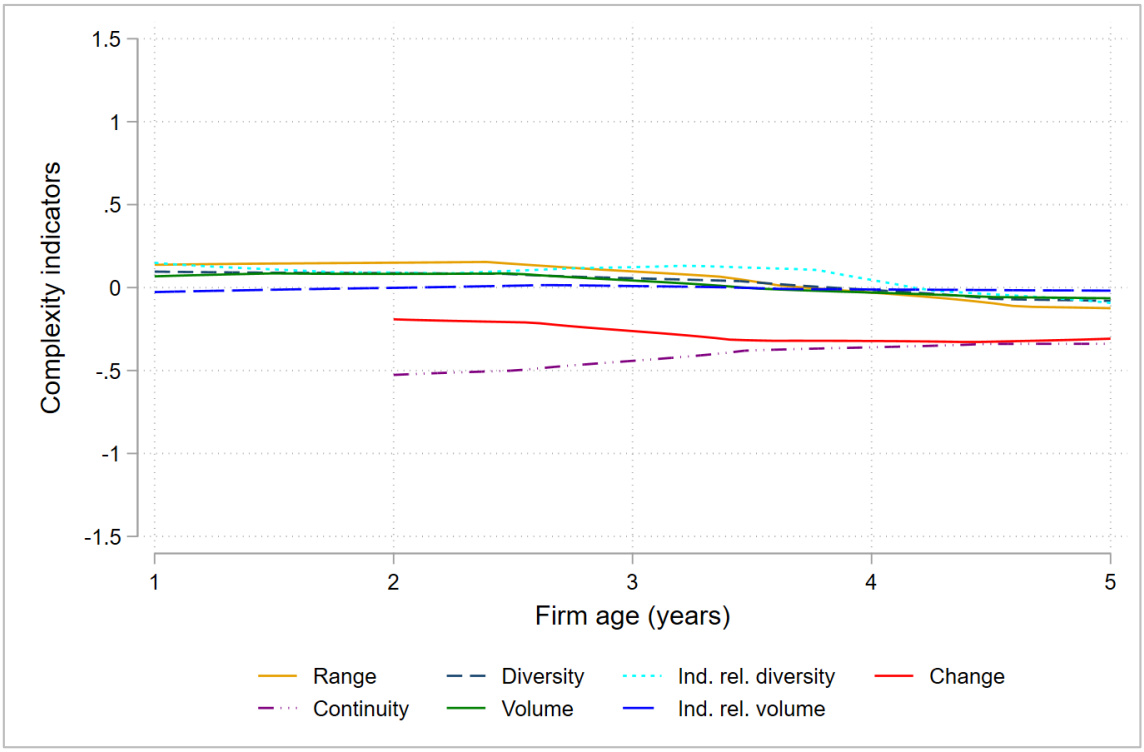
**** p<0.01, ** p<0.05, * p<0.1*
(1) N = 913

Figure 5. Scatter diagram of the scores of the range and diversity indices, measuring the variety of the types of competitive actions



On average, as observed in Figure 6, the indicators of complexity show intermediate levels as well as a relatively stable or slightly declining longitudinal profile at these intermediate levels, except for the *continuity* indicator that increases over time.

Figure 6. Mean standardized values of the clustering variables (indicators of complexity) over the first five years



We explore the existence of temporal patterns of the complexity of the repertoires of competitive actions. For this, our analysis consists of three main steps. The first step concerns the computation of the inter-firm distances, calculated by distances between firms in the time-series (or sequences) of each clustering indicator. This step results in several single indicator-related matrices of inter-firm distances. Second, a multidimensional scaling approach to aggregate the matrices into a global matrix of inter-firm distances is applied. Third, cluster analysis is run to develop the taxonomy of temporal patterns. Time-series clustering has recently received considerable attention under the context of data mining and pattern discovery

techniques. It is a type of clustering analysis to deal with dynamic data. For each stage of the analysis, we use well-established methods as described in Lombardo (2016) and Amerise (2017).

Data structure and computing inter-firm distances. We use the Dynamic Time Warping[10] (DTW) method to compute the inter-firm distances in terms of their temporal sequences (i.e. time-series) of the clustering indicators. DTW is a well-stablished peer-reviewed methods to assess dissimilarity between time-series offered by the R software package TSclust (Montero and Vilar, 2014). The DTW approach relies on a concept of dissimilarity based on a "shape-based" (comparison of geometric profiles of the series) rather than on a "structure-based" (comparison of underlying dependence structures, also called model-based) dissimilarity concept. "Shape-base" dissimilarities like, for example, the Euclidean distance, work well with short time-series (Montero and Vilar, 2014), as are the time-series we have in our sample. A key issue in time-series cluster analysis is to determine the correct dissimilarity measure between two time-series. We tested an alternative method to compute dissimilarity, the Discrete Wavelet transform (DWT), and carried out some sensitivity analyses using both distance methods and several clustering algorithms and came up with the DTW distance providing the optimal performing solution for our cluster analysis. Both methods offer a technique for comparing and measuring the dissimilarity between time-series and are fully implemented in the R software (R Core Team, 2013).

Several steps are involved in computing inter-firm distances. First, we organised the multiple multivariate time-series in the form of matrices. We have for each $k(= 1, \dots, K)$ clustering indicator a set of I time series, each of which is a single-variate vector $X_i = (x_{i,1}, \dots, x_{i,N})$, where *I* is the number of firms in our sample $(I = 126)$. All vectors X_i have the

[10] DTW algorithms were proposed around 1970 in the context of speech recognition and have been used in different research fields (Giorgino 2009).

same length N, where N are the number of periods (in our sample $N = 5$). In doing so, our data can be organized in K datasets that can be written as a I –by– N matrix.

$$X_k = \begin{pmatrix} x_{1,k,1} & x_{1,k,2} & \dots & x_{1,k,N} \\ x_{2,k,1} & x_{2,k,2} & \dots & x_{2,k,N} \\ \dots & \dots & \dots & \dots \\ x_{I,k,1} & x_{I,k,2} & \dots & x_{I,k,N} \end{pmatrix}, \text{ where } n(= 1,2, \dots, N) \text{ are the time periods.}$$

Using the R software and the DTW approach, we have computed K dissimilarity matrices, each one including the pairwise distances between the 126 firms' time-series concerning a single clustering indicator. The only input to the DTW algorithm is our data matrix X_k. When conducting pairwise comparisons of the I time-series, $X_1 = (x_{1,1}, \dots, x_{1,N})$ to $X_i = (x_{i,1}, \dots, x_{i,N})$, for each indicator, it is assumed that a non-negative, local dissimilarity function f is defined between any pair of elements $x_{i,n}$ and $x_{j,n}$ as follows (Giorgino, 2009):

$$d(X_i, X_j) = f(x_{i,n}, x_{j,n})$$

When $i = j$ the computed distance is zero (diagonal of the distance matrix). We use the default options of the DTW function, which compute a global alignment with the Euclidean distance. The core of the methodology relies on the warping curve, whose implementation in R is fully explained in Giorgino (2009).

Computing a global inter-firm distance matrix. The computed distances can be used to perform cluster analysis with conventional clustering algorithms (Montero and Vilar, 2014) and as input into multidimensional scaling analysis, in our case, the Distatis procedure (Abdi *et al.*, 2005), which we use to combine the K distance matrices into a global one. The aggregation of the indicator-related distance matrices is done with the Distatis procedure available from the software R, which combines them into a common structure, the compromise matrix representing the best aggregate of the original ones (Abdi *et al.*, 2005). We report the results into a *I*-by-*I* matrix, the matrix D, constituted by the generic element $d_{i,j}$.

Cluster analysis. The objective of this step is to find a taxonomy of temporal patterns of complexity empirically. We use the global distance matrix as input into the partitioning around medoids (PAM) clustering algorithm (Kaufman and Rousseeuw, 2009; Amerise, 2017). The PAM clustering algorithm does not require any parameter settings beyond the number of clusters, and it works well with the DTW distance matrix. PAM is fully described in Kaufman and Rousseeuw (2009) and represents a modern and robust alternative to k-means cluster analysis. In particular, compared to the k-means it is more robust because instead of a sum of Euclidean distances it minimizes the sum of dissimilarities (Maechler, 2018). The medoid is a representative object of the cluster. It consists of the observation within each cluster for which the sum of the distances between this observation and all the other members of the cluster is a minimum (Kaufman and Rousseeuw, 2009). Using the R software, we fed our distance matrix D into the PAM clustering algorithm, and the software computed the clustering solution (Montero and Vilar, 2014) where the number of clusters *k* must be set a priori. We use several well-established measures to validate the solution (Kaufman and Rousseeuw, 2009; Brock *et al.*, 2011), and we interpret the clusters or temporal patterns in terms of the clustering and other (profiling) variables. However, as cluster analysis does not provide an overall "right" solution, we must make explicit the criteria that guide the selection of the solution (Dess and Davis, 1984). Specifically, we determine the final number of clusters taking into account three aspects: (1) the statistical properties of the solution through the well-established Silhouette index and several stability indices, (2) the possibility of interpretation (statistical significance) of the clusters as different patterns of complexity of strategic repertoires (internal and external validity) through multiple analysis of variance (MANOVA), one-way analysis of variance (ANOVA) and pairwise comparisons to conduct the multiple comparison tests, and (3) the number of NVs per cluster.

Cluster solution. The results of the time-series cluster analysis confirm H1 that expects to find four alternative patterns of the complexity of the repertoires of competitive actions representing different levels and trends of the complexity of competitive repertoires. Specifically, compared to the baseline of all NVs (Figure 6), the most satisfactory solution identified two clusters with a relatively stable pattern over the early years, either at low—Cluster 1 (C1)-Simple stable— or high levels—Cluster 3 (C3)-Complex stable—, and two moving to higher—Cluster 2 (C2)-Towards complexity—or lower levels—Cluster 4 (C4)-Towards simplicity. We name each cluster or temporal pattern based on the level and longitudinal profile of the clustering variables (complexity indicators). Further below we provide an interpretation of each temporal pattern using the visual inspection of each cluster, the clustering and the profiling (variables not included in the clustering analysis) variables.

In a Euclidean space, the members of a cluster can be averaged with respect to the clustering variables, and we interpret each cluster in terms of these averages (or centroids) and their evolution over time. Accordingly, Table **15**Table 15 shows clustering variables' means for the four-cluster solution and the direction of the changes over the first five years. It also shows the medoid (NV in the cluster for which the sum of the distances between this NV and all the other cluster members is a minimum) or representative NV for each cluster. Furthermore, ANOVA results to test for differences in competitive behaviours (clustering indicators levels and their inter-temporal changes) across clusters are presented in Table 15 and analysed further below.

Table 15. Descriptive statistics (mean) and the indication of the direction of the five-years inter-temporal change (with the number of arrows signalling the steepness of the trend) of the four-cluster solution in terms of the clustering variables (including one-way ANOVA results for comparison of the clustering variables across clusters)

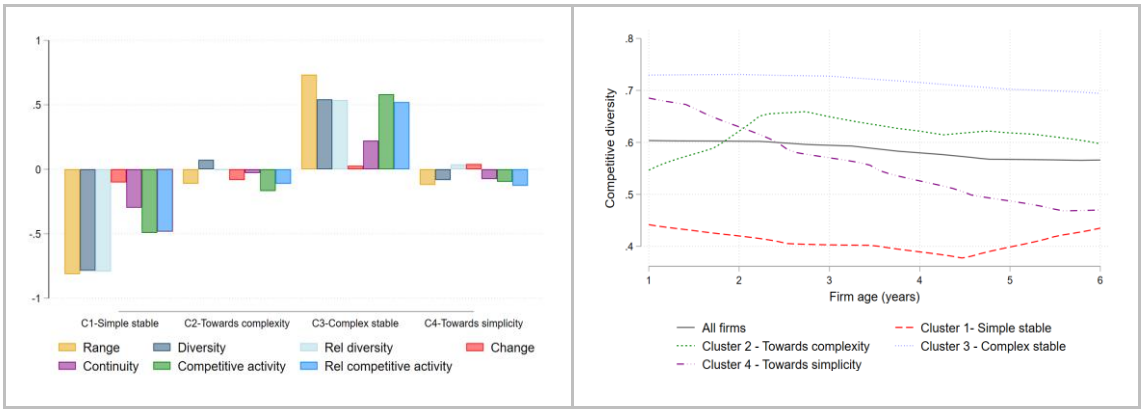
Variable	α[1]	Cluster 1 Simple stable[2]	Cluster 2 Towards complex[3]	Cluster 3 Complex stable[4]	Cluster 4 Towards simple[5]	Mean[6] F	Change[7] [8] F
Range	0.12	2.52 →	3.80 ↑	5.41 ↓	3.90 ↓↓	116.0***	54.4***
Diversity	0.12	.41 →	.61 ↑	.72→	.581 ↓↓	71.5***	33.4***
Industry relative diversity	0.19	.78 →	1.07↑	1.28 →	1.08 ↓↓	73.53***	27.4***
Change	0.13	1.48↓	1.70 ↓	1.92 ↓	1.73 ↓	1.6	84.3***
Continuity	0.16	.38↓	.44 ↓	0.48 ↓	0.43 ↓	2.8**	2.8**
Competitive activity	0.15	5.82 ↓	9.94 ↑	20.41 ↓	12.23 ↓↓	36.7***	9.0***
Relative competitive activity	0.13	.52 →	0.84 ↑↑	1.52 →	.94 ↓↓	28.9***	6.3***
Medoid NV (industry)		24 Impellam Group PLC (Support services)	102 Mediazest PLC (Media)	107 Malvern International PLC (Support Services)	115 SYNAIRGEN PLC (Pharma & Biotech)		

**** p<0.01, ** p<0.05, * p<0.1*

(1) The alpha indicates the weight of each variable in the Distatis procedure, which aggregates indicator-specific distance matrices into the global matrix that will enter as input in the clustering algorithm.
(2) N = 135
(3) N = 155
(4) N = 160
(5) N = 100
(6) Results of one-way ANOVA to test for the differences between the clustering variables means across clusters
(7) Results of one-way ANOVA to test for the differences between the cumulated change in the clustering variables across clusters
(8) Bartlett's test for equal variances was rejected for the variables diversity, industry relative diversity, change, competitive activity and relative competitive activity, which must be taken into account for the pairwise comparisons across cluster later.

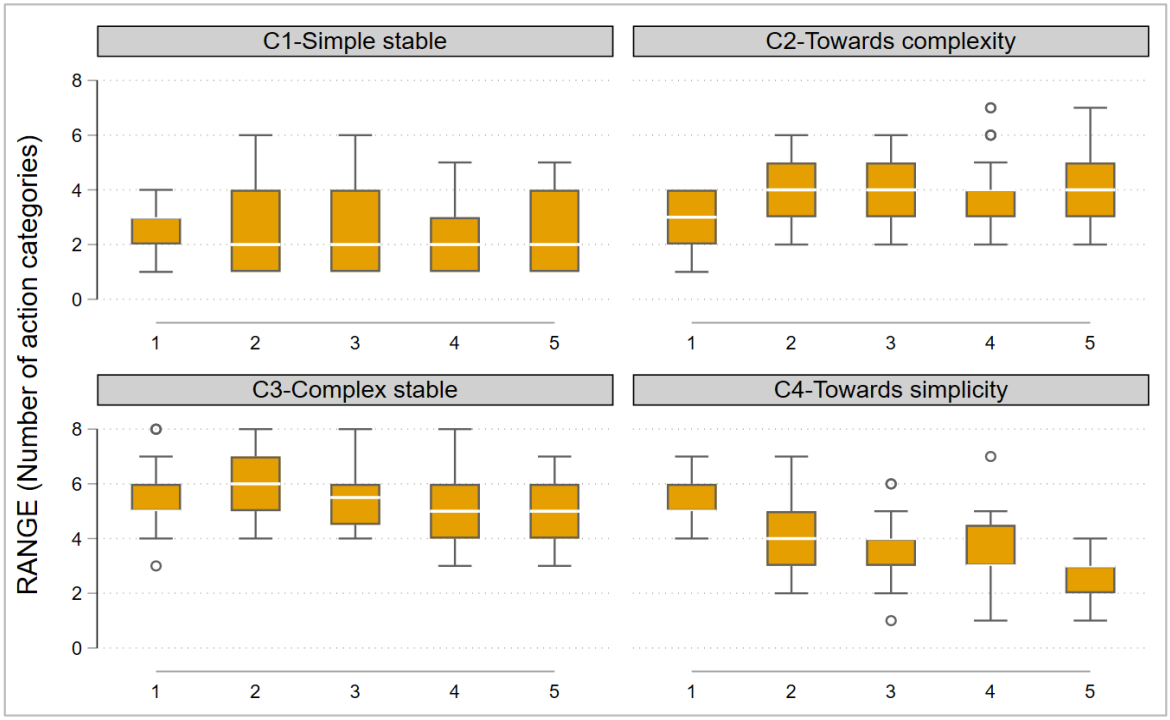
Figure 7 presents the four clusters' solution graphically in levels (left) and the longitudinal profile (right).

Figure 7. Mean standard values of the clustering variables for the four cluster's solution (left) and longitudinal profile over the first years for the variable diversity (right)



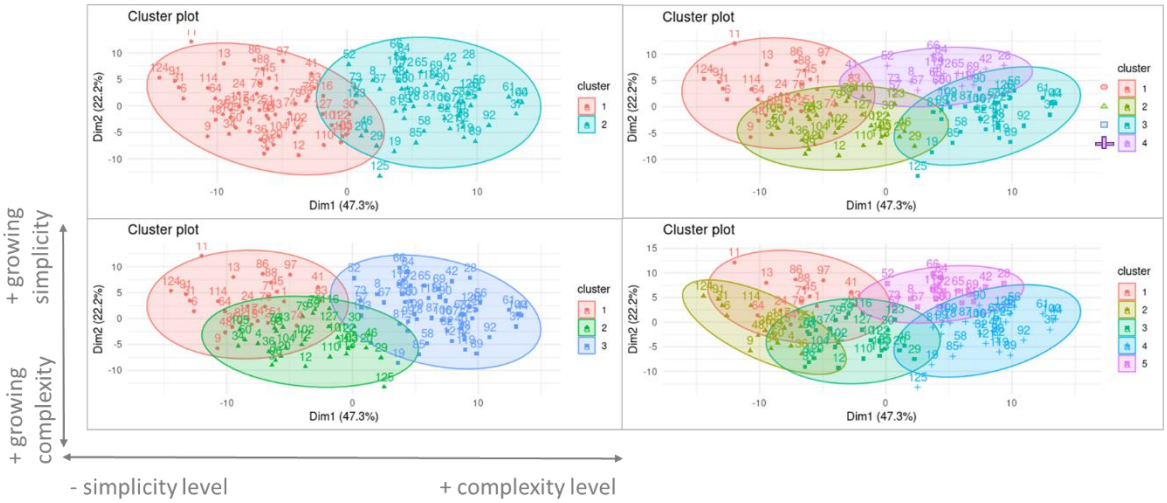
Alternatively, the box plots shown in Figure 8 reflect the levels and the longitudinal profile for the variable range.

Figure 8. Box plots of range values across clusters over the first years



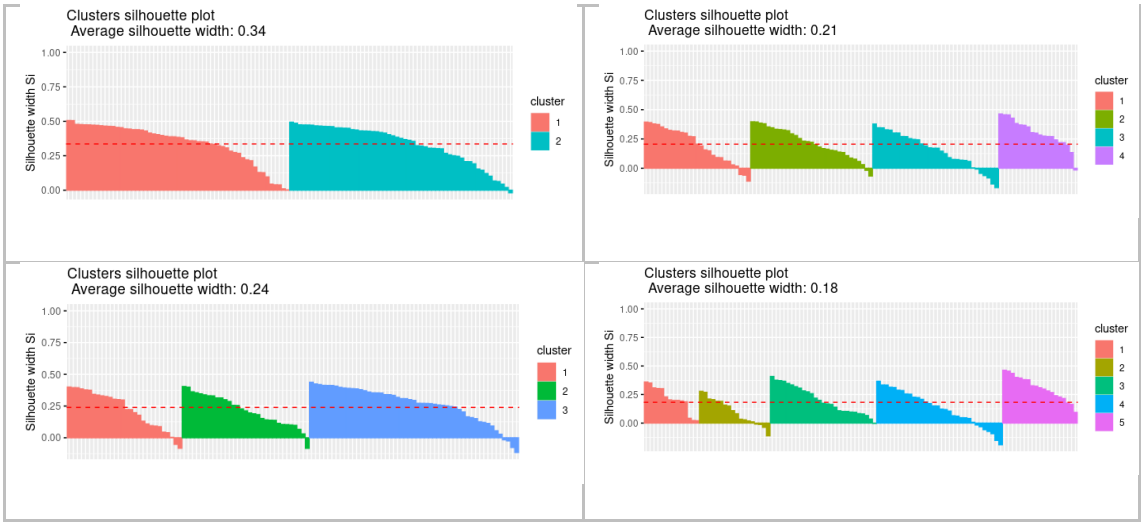
Several steps were involved in the selection of the number of clusters. First, we visualized the cluster solution in the two-dimensional space, which helps in interpreting the clusters or patterns that we encounter and in the decision about the number of clusters (Figure 9). Graphically we expect to see together firms that have similar levels and dynamics of the clustering variables. We interpret the dimensions as follows: (1) The dimension 1 (x-axis) seems to reflect the level of complexity of the strategic repertoires, with firms situated more to the right being more complex than firms situated to the left; (2) dimension 2 (y-axis) gives an idea of the trend over time.

Figure 9. Two-dimensional scatterplots of the sample of ventures in the two and four clusters solution.



Initially, we used in R the PAMK version (Hennig, 2007) of the PAM algorithm to estimate the number of clusters by optimal average silhouette width and obtained a solution in two clusters. The Silhouette index is a well-established measure when using the PAM algorithm (Kaufman and Rousseeuw, 2009) to evaluate the inter-cluster separation (as much as separated the better) and the intra-cluster compactness (the less separated, the better) and therefore to assess the goodness of the clustering solution. The silhouette width moves between 1 (best score) and -1 (worst score). Values close to zero indicate overlapping clusters (Maechler, 2018). The average silhouette width scores 0.34 for the two-cluster solution, 0.24 for the three-cluster solution, 0.21 for the four-cluster solution and 0.18 for the five-cluster solution. In the solution in two clusters, as we can observe in Figure 10, most firms are correctly allocated, while in the solution in three, four and five clusters, there are a few firms, which may be not correctly allocated (values below zero but far from -1).

Figure 10. Average silhouette width of the solution in 2 clusters (left top), 3 clusters (left-bottom), 4 clusters (right top) and five clusters (right-bottom)



We retain the four-clusters solution as it provides four groups with a balanced distribution of the number of firms and a higher granularity (as compared to the solution in two or three clusters), allowing for finer profiling of the patterns of the complexity of the repertoires while delivering an acceptable value (>0.20) of average silhouette width (Kaufman and Rousseeuw, 2009). Furthermore, the solution in four clusters also delivers minimal values of several cluster stability measures[11] varying between 0.0037 and 0.0536, which indicate highly consistent clustering results.

Next, we examined the solution's internal and external validity. Multiple analysis of variance (MANOVA) was applied to test for differences in the complexity indicators (clustering variables) across clusters or patterns of complexity. The cluster membership served as the independent variable, and the clustering variables were the dependent variables. A significant F-statistic (F = 31.58, p-value = .000) suggests that the pattern of complexity is more similar within the cluster than between clusters (greater variance between groups than within groups). Next, we applied one-way ANOVA (Table **15**) to examine specific univariate differences,

[11] The average proportion of non-overlap (APN), the average distance (AD), the average distance between means (ADM) and the figure of merit (FOM). APN, ADM and FOM range from 0 to 1, and AD ranges between 0 and infinity.

revealing significant relationships between cluster membership and all clustering variables except for *change* at the level of action category. However, the one-way ANOVA at the level of action subcategory confirmed the significance of the differences, indicating that the number of new action types (at the level of subcategory) introduced in each period is different across clusters and statistically significant. Pairwise contrasts between cluster means, tested by a t-statistic, were also calculated for all clustering variables.

Table 16. Pairwise comparison of cluster means for each of the clustering variables

	Competitive activity	Relative competitive activity	Range	Diversity	Industry relative diversity	Change	Continuity
	Contrast	Contrast	Contrast	Contrast	Contrast	Contrast	Contrast
C2-C1	4.13**	.32**	1.27*	.21*	.29*	.22	.05
C3-C1	14.60*	1.00*	2.88*	.31*	.50*	.44	.10**
C4-C1	6.42*	.42*	1.37*	.17*	.30*	.25	.05
C3-C2	10.47*	.67*	1.61*	.11*	.21*	.22	.05
C4-C2	2.28	.09	.1	-.03	.01	.03	-.00
C4-C3	-8.18*	-.58*	-1.51*	-.14*	-.20*	-.18	-.05

**** p<0.01, ** p<0.05, * p<0.1*

Note: Since the test of homogeneity of variances was rejected for diversity, industry relative diversity, change, competitive activity and relative competitive activity, we use for these variables Dunnett's C procedure (Dunnett, 1980) to conduct the multiple comparison tests. Otherwise, we use Tukey that assumes equal variances.

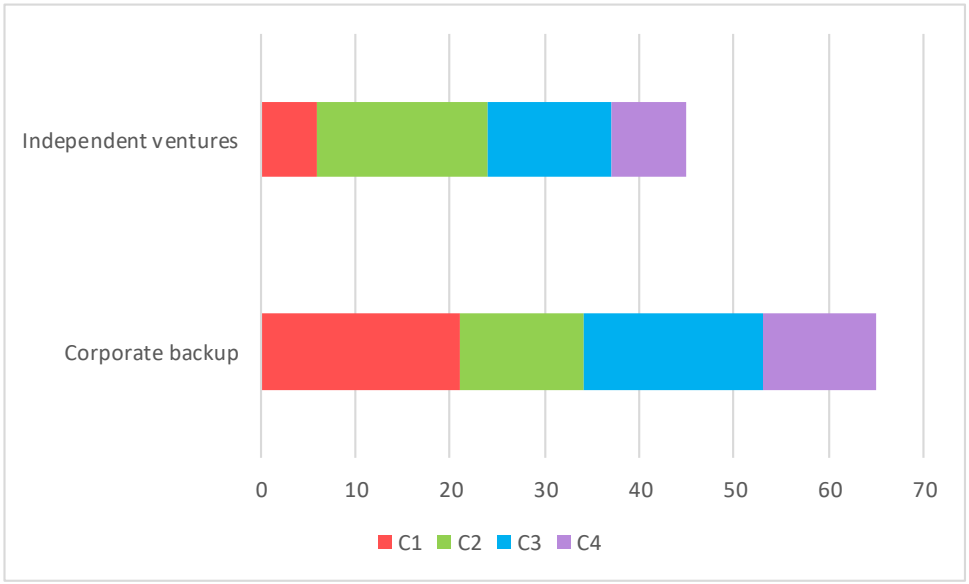
These tests delivered significant differences in all pairs of clusters comparisons for the range, diversity, industry relative diversity, competitive activity and industry relative competitive activity, except between C2-Towards simplicity and cluster C4-Towards complexity. However, when carrying out the tests year by year, we observe that the differences are statistically significant at the beginning (C4>C2) and the end (C2>C4) of the series and not statistically significant in the central years, confirming the opposite trends in the evolution of the repertoire complexity as observed in Figure 7 (right). In general, *change* and *continuity* of action categories did not differ significantly across the alternative clusters or patterns of complexity (only C3>C1). Despite this, we conclude that the manner (in terms of variety and industry-relative variety of competitive moves and activity volume) by which firms compete

does vary significantly according to cluster membership, confirming the internal validity of the solution. Therefore, we can interpret the clusters as different temporal patterns of complexity (significance of the solution).

In addition, the comparison across clusters of other variables not being part of the cluster analysis (*profiling variables*), such as variables of the environment, the industry, the firm and the strategy, help us to confirm the external validity of the solution and interpret the clusters (Cavusgil, Chan and Zhang, 2003). If the clusters do not differ on variables outside of the cluster analysis, they are unlikely to represent different empirical categories (Delmar, Davidsson and Gartner, 2003).

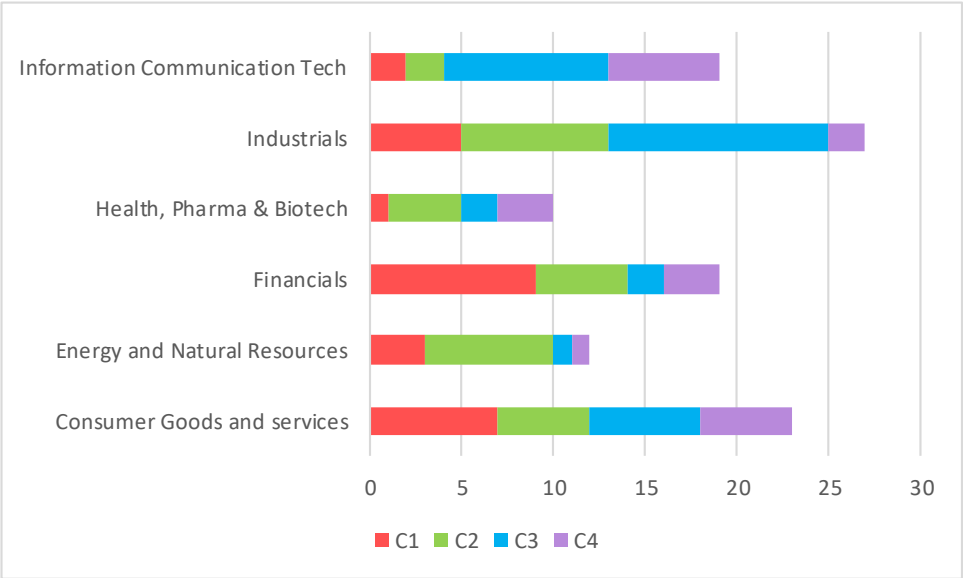
We test for the existence of an association between the origin of the NV (independent vs corporate backup), the industry affiliation and the size-class of the NV in terms of the number of employees (micro (<9), small (10 to 49), medium (50 to 249) and large (>249) at the business start and after five years of operations. A significant chi-square (chi-square = 7.68, p-value = .053) in contingency table analysis, where the rows are the NVs' clusters and the columns are the NV origin types (the null hypothesis H0 assumes that there is no association between rows and columns), rejects that NV origin and cluster membership are not associated. A corporate backup may imply a higher level of organizational capital at start-up than an independent origin, affecting subsequent growth (Stam *et al.*, 2008). Specifically, C1-Simple stable, C3-Complex stable and C4-Towards simplicity have larger shares of NV with a corporate backup (80%, 60% and 60% respectively) than C2-Towards complexity that has the largest share of NVs with independent origin (60%) (Figure 11).

Figure 11. Distribution of the NVs by origin across clusters



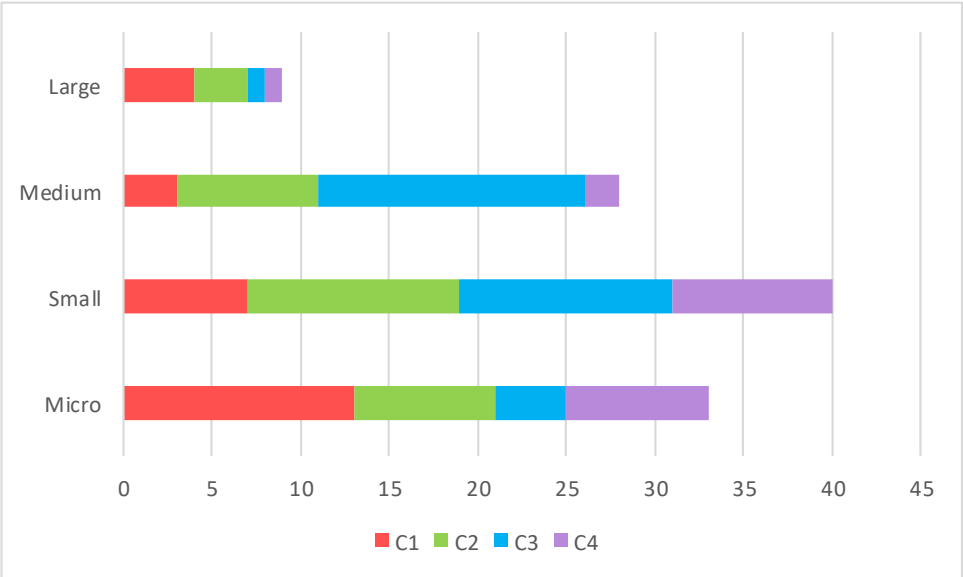
Concerning industry affiliation (Person chi-square(15)=29.87 and p-value=.012) also rejects that the industry affiliation is not related to the cluster membership. Specifically, in C1, most firms belong to the Financials or Consumer Goods and services sectors; in C3, most firms belong to Industrials and ICT sectors, whereas in C4, most belong to ICT and Consumer Goods and services sectors. C2 has firms distributed across all sectors with only slightly dominance of Industrials and Energy and Natural Resources sectors.

Figure 12. Distribution of the NVs by industry across clusters



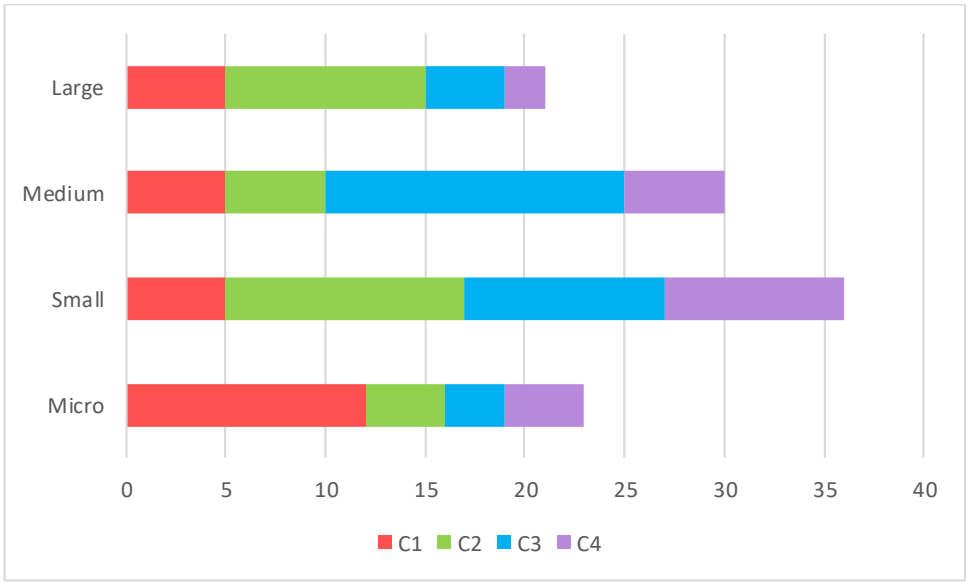
Furthermore, NV size at start (Pearson chi2(9) = 20.9695 and p-value = .013) and five years after start of operations (Pearson chi2(9) = 24.2237 and p-value = .004) also appear to be associated to the cluster membership. In particular, C1 and C4 consist mainly of micro (< 9 employees) and small firms (>9 and <50 employees), C2 consists mainly of small firms and C3 of small and medium-sized firms (>50 and <250 employees). The size at start-up is also considered a measure of the early organizational capital (Stam *et al.*, 2008).

Figure 13. Distribution of the NVs by size (in number of employees) at start of operations across clusters



Five years after the start of operations, C1 continue to consist mainly of micro-sized firms. In C2, the category of large firms grow. In C3, firms continue to be mainly medium-sized, and in C4, firms have gone from small to medium size. Furthermore, chi-square tests for contingency tables (start size-classes in rows and fifth-year size-classes in columns) for each cluster confirm that the start size-class is related to the size-class later.

Figure 14. Distribution of the NVs by size (in number of employees) across clusters five years after the floating



Since we observed that the number of NVs created vary considerably between the years before and after the great financial recession of 2007-2008, we analyse the relationship between the year of admission to AIM (in which we start tracking the implemented competitive actions) and the cluster membership or pattern of complexity of the overall set of competitive actions. A Pearson chi2(15) = 16.3965 and p=value = .356 confirm that the year of registration to AIM is not related to the cluster classification.

Table 17. Contingency (two-way) table showing the number of NVs by year of admission to AIM (rows) and cluster (trajectory) affiliation (columns)

Year admission AIM		C1	C2	C3	C4	Total
	2004	4	8	8	2	22
	2005	4	7	12	5	28
	2006	10	12	6	7	35
	2007	6	3	4	6	19
	2008	2	1	2	0	5
	2010	1	0	0	0	1
Total		27	31	32	20	110

Note: The only firm entering AIM in 2009 from our total sample of 126 NVs is not part of the final sample of 110, where only NVs for which ARs for the first five years are available are taken into account.

We also look at the relationship between the cluster membership and the reason for abandoning AIM (our proxy for survival) and we do not find and an association between these variables.

Furthermore, one-way ANOVA tests confirm that market munificence does not significantly differ across clusters but so does environmental dynamism, though only in the case of C3 (Stable complex) with firms experiencing higher levels of dynamism than in C1 (Stable simple) and C4 (Towards simplicity) as confirmed by pairwise contrasts between clusters means. Furthermore, the contrasts for firm size (in the number of employees and the value of total assets), founding team or TMT size and strategic emphasis reveal statistically significant differences in these factors across clusters.

Table 18. Pairwise comparison of cluster means of market, firm and strategy variables

	Market munificence	Dynamism	TMT size	Firm size (staff)	Firm size (assets)	R&D emphasis	Organic vs external growth emphasis	International emphasis
	Contrast	Contrast	Contrast	Contrast	Contrast	Contrast	Contrast	Contract
C2-C1	5.57e-12	2.03e-11	.12	84.25*	-56.53*	0.01**	.87*	0.01
C3-C1	6.41e-12	2.39e-11*	.38**	18.37	-61.56*	0.04**	1.19*	0.07**
C4-C1	1.68e-11	-8.58e-13	-.08	.22	-19.87	0.02**	.66	0.03**
C3-C2	8.38e-13	3.59e-12	.25	-65.88*	-5.03	0.03**	.32	0.06**
C4-C2	1.12e-11	-2.12e-11	-.20	-84.03*	36.66	0.01	-.21	0.02
C4-C3	1.04e-11	-2.48e-11*	-.46**	-18.15	41.69**	-0.03**	-.52	-0.04**

**** p<0.01, ** p<0.05, * p<0.1*

Note: Since tests of homogeneity of variances was rejected for competitive activity, relative competitive activity, diversity, industry relative diversity and change, we use for these variables Dunnett's C procedure (Dunnett, 1980) to conduct the multiple comparison tests.

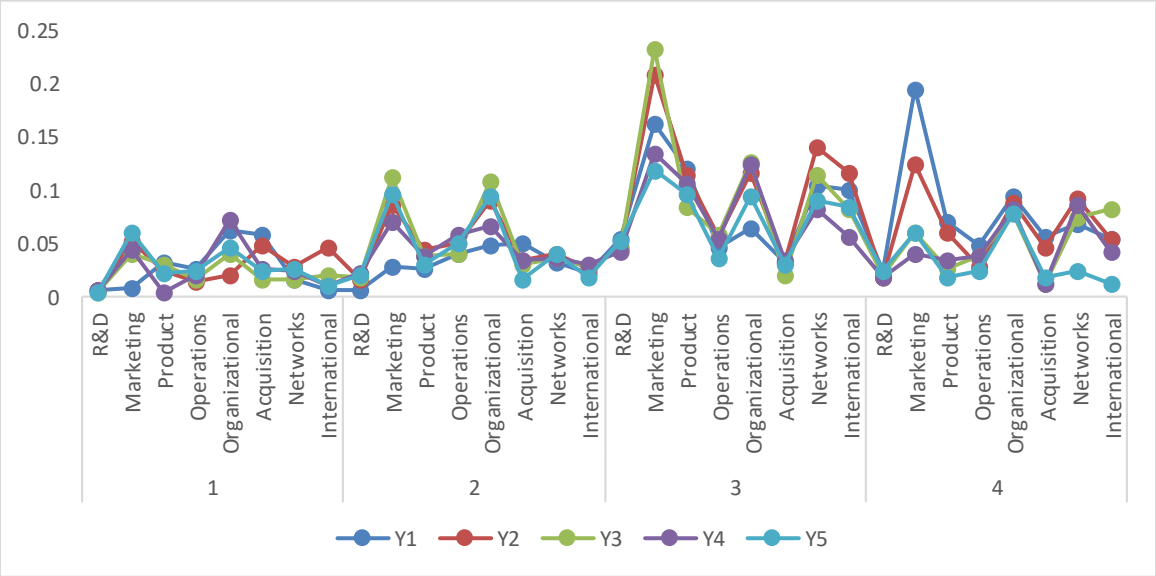
The literature suggests that young firms over time tend to grow more organically than externally (Davidsson, Achtenhagen and Naldi, 2010), and our data tend to confirm this on average. It appears that the most considerable emphasis on acquisitions is at the start of the company in all clusters, and over time, it diminishes. The organic vs external growth emphasis indicator that increases over time in all clusters confirms this. We look further in detail into the composition of the organic emphasis of the competitive activity. Specifically, R&D activity in C1-Simple stable scores consistently the lowest, C3-Complex stable scores consistently the highest, and this activity remains relatively stable as time passes, except in C2-Towards complexity where it increases. Marketing emphasis in C4-Towards simplicity is significantly higher than in C1-Simple stable and C2-Towards complexity in the first periods of the time series but not at the end of the time series. C3- Complex stable keeps the highest levels of emphasis in marketing activities over time, but the difference with C2-Towards complexity is not statistically significant towards the end of the time series, and it becomes statistically significant with respect to C4-Towards simplicity (C3>C4). In the case of product launches, again, C3-Complex stable maintains the leadership over time with respect to the other clusters, while the other clusters do not

present significant differences between each other. The emphasis on operations activities and on organizational activities does not differ significantly across clusters over time.

The emphasis on firm acquisitions is not statistically significantly different across clusters. In contrast, cooperation and networking between firms is higher in C3- Complex stable and C4-Towards simplicity than in the rest of the clusters. Thus, the evidence appears to point to the relevance of networking and alliancing for the competitive activity in C3-Complex stable and C4-Towards simplicity. When it comes to internationalisation, C3-Complex stable is the most international at all times, although, towards the end of the five years, C2-Towards complexity also begins to internationalise so that the difference with C3-Complex stable is no longer statistically significant.

Interestingly, we observe in Figure 15 that, over time, C4-Towards simplicity firms not only simplify the strategy by focusing on fewer categories of action but clearly the dominant category changes from marketing in the first period (dark blue line) to organizational efficiency in the fifth period (light blue line). In contrast, in C3-Complex stable, despite the marketing emphasis also declines over time, it remains at similar levels like other categories of action. C3-Complex stable reflects stability in the composition of action categories over time the same as C1-Simple stable at lower levels. C2-Towards complexity reflects the changing patterns increasing the emphasis of action in all categories, particularly in marketing and organizational efficiencies.

Figure 15. Competitive emphasis in each competitive category across clusters over firm age (2004 to 2014)



Finally, in this dissertation, we are interested in understanding if firms grow and perform differently as a function of the cluster or temporal pattern of the complexity of the competitive repertoire of actions to confirm the external validity of the encountered patterns. Since growth measured by different indicators and profitability are not always associated; for example, a firm may grow in sales but not in employment or profitability, we use several performance indicators to contrast differences across clusters (Delmar, McKelvie and Wennberg, 2013). The results from ANOVA tests confirmed statistically significant differences across the clusters in employment growth, ROA and market capitalization, confirming the external validity of the encountered temporal patterns of complexity with respect to several performance measures. Growth in assets and market capitalization do not differ significantly across clusters. According to pairwise comparisons, C1-Simple stable presents a statistically significant higher ROA than C2-Towards complexity, C3-Complex stable and C4-Towards simplicity, which may indicate the short-term focus of managers on profitability as compared to firms with longer development periods and more long-term oriented. However, this higher ROA may also be conditioned because many firms in C1-Simple stable belong to the financial sector. Over time, the statistically significant difference in ROA between C1-Simple stable and C3-Complex stable and C1-Simple stable and

C4-Towards simplicity disappear. The effect of time on employment growth will be analysed in the next section of this dissertation.

Cluster interpretation

C1–Simple stable ("Focused", red coloured): It represents 25% of the firms (N=27); they are mainly micro-sized and have a corporate backup. They adopt only a handful of actions in each year, predominantly from 1 to 3 different action types. They stably conform to their industry concerning the diversity in their action types at intermediate levels. However, NVs in C1 belong predominantly to the financial/investment sector, which may explain the low profile of complexity compared to the other clusters or patterns.

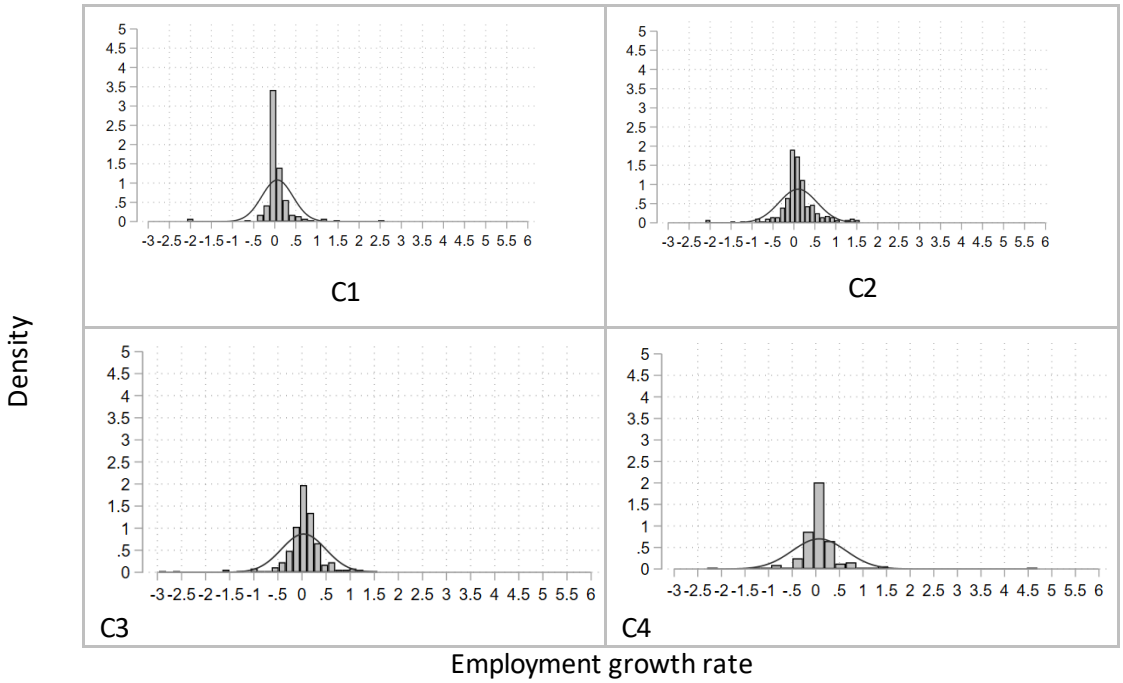
C2–Towards complexity ("Path creators/ambitious growth", green coloured): It represents 28% (N=31) of the firms and are mostly small-sized. They start at low levels of complexity, but over time, they take more actions of higher variety (range and diversity) and increasingly tend to conform to their industry and introduce changes (but at a declining rate). A distinctive characteristic of this cluster is that most ventures have an independent origin, which explains the increasing variety because of the trial and error and exploration process linked to their novelty in the business.

C3–Complex Stable ("Explorers", blue coloured): It represents 29% (32) of the firms and are predominantly small and medium-sized. They explore a broad and diverse array of different action types and capabilities steadily, keep competitive activity intense though slightly declining over time and show similar levels of competitive diversity as compared to the industry norm. Both growing continuity and introduction of new types reflect consistencies with the past and the competitive arena. A large share of NVs in C3 have a corporate backup origin explaining maybe the stability and the resources and capabilities to explore a more comprehensive array of activity types, together with a possible explorative and long-term orientation of managers.

C4–Towards simplicity ("Exploiters/early success", purple coloured), NVs represent the 18% (N=20) of the sample. They start at mid-high levels of activity volume of a wide variety and industry conformity, but over time, these NVs somehow concentrate on fewer actions of less variety while become increasing non-conform to the industry means. The increasing average duration of action types deployed may indicate that these types are seen as the good performers (reinforcing positive performance feedback). A large share of NVs have a corporate backup that may explain the available resources and capabilities to start with a wide array of different actions types. In contrast, the simplification of the strategy may be related to the exploitative orientation of the competitive behaviour.

Consistent with previous research on NV growth, it groups around zero for all NVs independently of the cluster membership though graphically we can observe differences in the distribution of growth across clusters.

Figure 16. Annual employment growth rates distribution by cluster or pattern of complexity



These comparisons across clusters compare levels but not the growth path. We are interested in the effect of the cluster or pattern of complexity in the short and long-term growth.

The path of growth in employment by cluster (Figure 17) allows to intuitively seeing certain growth patterns associated with the alternative patterns (criterion validity). Consistent with the literature on firm growth, firms tend to grow over time at declining growth rates, and this is the case in all clusters, except C1 and C3 from the fourth year. While C1 and C3 grow on average at the beginning at lower rates than C2 and C4, in the longer term, C1 and C3 growth trend seem to curve into a U-shape overtaking at certain point C2 and C4 that follow quasi-linear declining trends. In Figure 17, the different slopes of the trend lines reflect these ideas, also reflected in Figure 18, representing the evolution of growth rates in box plots. Regression analysis in the next section is expected to bring clarity to these caveats.

Figure 17. Annual employment growth rates by cluster or pattern of complexity

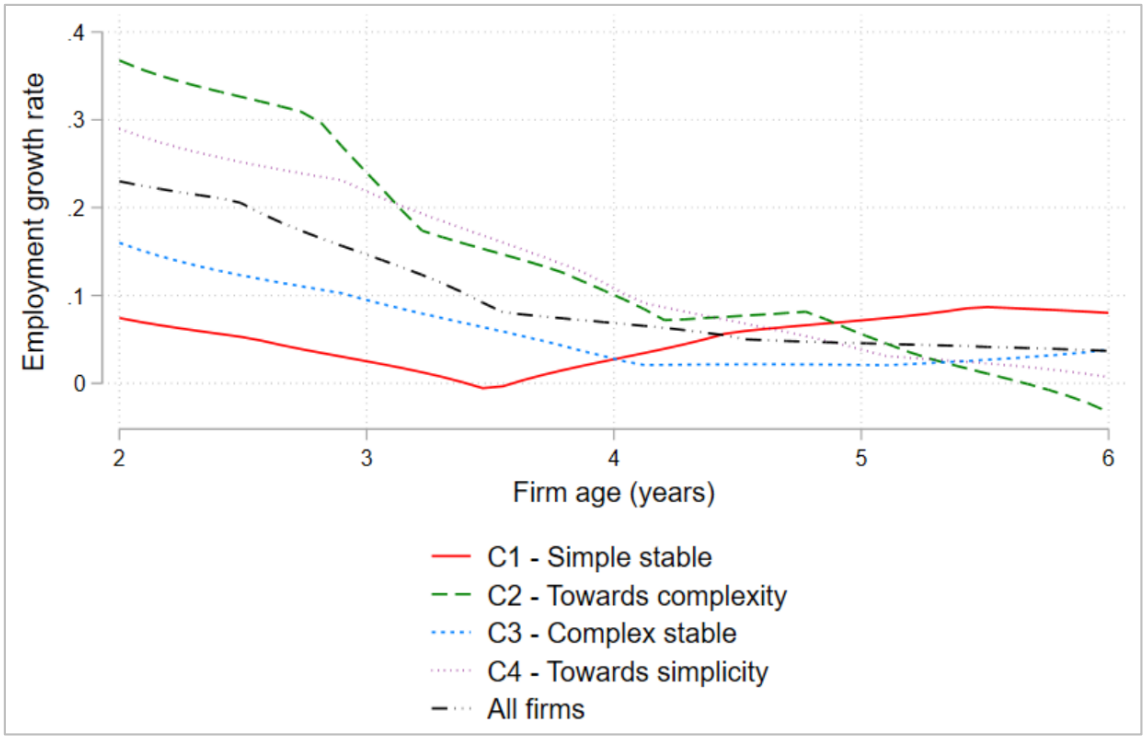
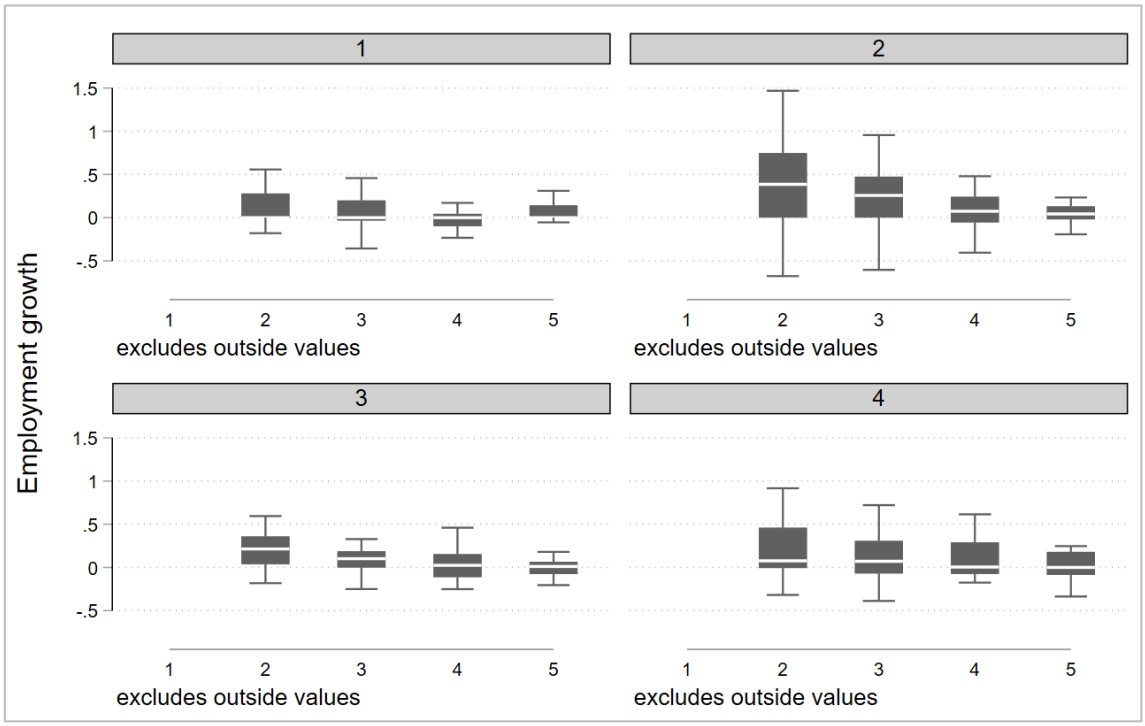


Figure 18. Annual employment growth rates in box plots by cluster or pattern of complexity



4.3.2 Phase 2: Growth implications and Contingency

Table 19 displays the mean values, standard deviations, and inter-correlations for all study variables, taking annual growth rates (short-term perspective) and the five-year growth trend (long-term perspective) as dependent variables.

As Table 19 shows, short-term growth (annual growth rates) is positively and significantly correlated with size (.140), dynamism (.099), and market capital (.128). In addition, five variables are positively correlated with medium/long-term growth: size (.215), size square (.154), market capital (.316), total assets (.117), and ROA (.128).

Table 19. Mean, SD and correlations DV: early years' annual (year-to year) growth rate (short-term)

N	Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Annual growth rate	0.09	0.44	1																		
2	5-years growth trend	0.05	0.19	0.09	1																	
3	Size (N employees)	137.14	230.8	0.14***	0.22***	1																
4	Size (N employees) SQ	72,020.89	260,058.40	0.06	0.15***	0.82***	1															
5	Munificence	0	0	-0.05	0.01	0.01	0.01	1														
6	Dynamism	0	0	0.10***	-0.03	-0.13***	-0.10***	-0.16***	1													
7	Industry	3.53	1.67	-0.02	0.04	-0.09**	0.02	0	0.01	1												
8	Origin	0.42	0.49	0	-0.03	-0.11***	-0.06*	0	0	0.13***	1											
9	Market capital	42.84	84.54	0.13***	0.32***	0.36***	0.39***	0	-0.09***	0.06*	-0.01	1										
10	Total assets	73.69	134.75	-0.06	0.12***	0.10***	0.11***	0.02	-0.04	0.08**	-0.04	0.20***	1									
11	ROA	-13.72	26.65	0.02	0.13***	0.33***	0.14***	-0.04	0.01	0.08**	-0.21***	0.19***	0.09**	1								
12	TMT Size	2.94	1.32	0.06	0.01	0.18***	0.07**	0.01	0.01	-0.06	-0.04	0.11***	-0.02	0.13***	1							
13	International growth emphasis	0.04	0.09	0.01	0.03	-0.03	-0.08**	0.02	0.07**	-0.06*	0.07**	0.04	-0.04	0	0.06*	1						
14	Development growth emphasis	0.02	0.07	-0.01	-0.05	-0.10***	-0.06*	0.03	-0.01	0.08**	0.17***	0.28***	0.04	-0.04	0.04	0.04	1					
15	Internal VS external growth emphasis	1.8	2.24	-0.02	0.02	0.11***	0.07*	0.05	0.04	-0.09**	-0.03	0	-0.03	0	0.10***	-0.08**	0.15***	1				
16	Complexity trajectory 1 (Simple)	0.22	0.41	-0.03	-0.04	-0.11***	-0.07**	0.02	-0.03	0.06**	-0.22***	-0.10***	0.14***	0.16***	-0.05	-0.15***	-0.14***	-0.19***	1			
17	Complexity trajectory 2 (Towards complexity)	0.25	0.43	0.04	0.04	0.11***	0.05	-0.01	0.06*	-0.21***	0.18***	-0.06*	-0.05	-0.05	-0.03	-0.13***	-0.08**	-0.01	-0.31***	1		
18	Complexity trajectory 3 (Complex)	0.26	0.44	-0.03	-0.05	-0.08**	-0.12***	-0.02	0.09***	0.02	-0.02	0.08**	-0.10***	-0.03	0.14***	0.27***	0.24***	0.15***	-0.32***	-0.35***	1	
19	Complexity trajectory 4 (Towards simplicity)	0.16	0.37	0	-0.02	-0.10***	-0.03	0.02	-0.04	0.16***	-0.02	-0.04	0.07**	-0.09**	-0.07**	-0.02	-0.01	-0.02	-0.23***	-0.26***	-0.26***	1

*** p<0.01, ** p<0.05, * p<0.1

Short term analysis

To test hypothesis 2, a regression analysis that is usually used in previous analyses of firm growth rate was conducted (Yasuda, 2005). We adopt a cross-sectional methodology with one-period lagged explanatory variables. The inclusion of lagged explanatory variables as corrections for endogeneity and simultaneity bias is inherent in this kind of analysis (Barge-Gil and López, 2014; Badillo and Moreno, 2016). The regression models include control variables (Model 1), whereas the main effects come from the temporal patterns (typical trajectories or longitudinal clusters) of complexity that result from the dynamic cluster analysis (i.e. from clustering the aggregated DTW distances) (Model 2).

Specifically, we estimated the following equations:

$$\boldsymbol{Model\ 1}\text{: } Y_{i,t+1} = \gamma\, P_{i,t} + \delta Q_i \qquad [1]$$

where i denotes a firm and t denotes the time (year). $Y_{i,t}$ is the dependent variable (i.e. employment growth rate), and $P_{i,t}$ are the various time-variant control variables such as firm size, firm size-squared, munificence, dynamism, market capitalization, total assets, ROA, TMT size, international growth emphasis, R&D growth emphasis and organic vs external growth emphasis. Additionally, Q_i are the time-invariant control variables such as industry and the NV origin.

$$\boldsymbol{Model\ 2}\text{: } Y_{i,t+1} = \beta_0\ \text{complexity pattern} + \gamma\, P_{i,t} + \delta Q_i \qquad [2]$$

Where $complexity\ pattern$ takes the value of 1 for C1 (Simple stable) firms, 2 for C2 (Towards complexity) firms, 3 for C3 (Complex stable) firms and 4 for C4 (Towards simplicity) firms. The inclusion of dynamic or longitudinal cluster as dummies has been found useful in regression analysis (Prinzie and Van den Poel, 2006). Table 20 shows the results of the regression models, where for each NV, we have 5-year observations immediately after the NV entering AIM.

Table 20. Regression model with dependent variable: Annual (year-to-year) growth rate (short-term)

VARIABLES	Model 1	Model 2
Firm size (N employees)	-0.157***	-0.129*
	(0.054)	(0.075)
Firm size (N employees SQ)	0.020	-0.001
	(0.017)	(0.033)
Munificence	0.017	0.026
	(0.018)	(0.018)
Dynamism	0.014	0.015
	(0.026)	(0.030)
Industry = 2, Industrials	0.320***	0.248***
	(0.065)	(0.069)
Industry = 3, Consumer Goods & Services	0.300***	0.235**
	(0.066)	(0.091)
Industry = 4, Health, Pharmaceuticals & Biotechnology	0.354***	0.264***
	(0.087)	(0.090)
Industry = 5, Information Communication Technologies	0.246***	0.196**
	(0.072)	(0.086)
Industry = 6, Financials	0.101	0.061
	(0.064)	(0.070)
Origin = 1, Independent	0.094*	0.022
	(0.049)	(0.052)
Market capitalization	0.124***	0.117**
	(0.039)	(0.050)
Total assets	0.005	0.009
	(0.031)	(0.026)
ROA	0.071***	0.071***
	(0.026)	(0.026)
TMT size	0.000	0.024
	(0.021)	(0.023)
International growth emphasis	-0.312	-0.327
	(0.335)	(0.398)
R&D growth emphasis	-0.562***	-0.437**
	(0.150)	(0.207)
Organic VS external growth emphasis	-0.004	-0.016**
	(0.007)	(0.007)
Complexity pattern = 2, Towards complexity		0.227***
		(0.078)
Complexity pattern = 3, Stable complex		0.104
		(0.089)
Complexity pattern = 4, Towards simplicity		0.160*
		(0.092)
Firm age = 2	-0.096	-0.122*
	(0.066)	(0.069)
Firm age = 3	-0.139**	-0.171**
	(0.068)	(0.077)
Firm age = 4	-0.184**	-0.184**
	(0.074)	(0.077)
Firm age = 5	-0.197***	-0.212***
	(0.061)	(0.069)
Observations	414	374
R-squared	0.248	0.274

Clustered robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Explanatory variables in the analysis have been standardized

In model 2, the firm size coefficient is negative and significant, implying that larger firms have lower employment growth rates. The coefficients of market capitalization and ROA are positive and significant, suggesting their favourable impact on firm growth. The coefficients of R&D growth emphasis and organic vs external growth emphasis are negative and significant, indicating that organically growing firms and firms emphasizing R&D activities grow at lower growth rates. Additionally, we compared the results of early year's annual growth rates among different complexity patterns, with interest in distinguishing possible significantly different behaviours between them. To this end, we conducted a post-estimation test (Lincom—linear combinations of parameters), which involved processing linear combinations of coefficients. Stata 15 Lincom analysis gave us a confidence interval and a test of the null hypothesis where the difference between coefficients was zero.

Table **21** shows us the results of this coefficient comparison test. Intuitively, we saw above in Figure 17 these results, which support hypothesis 2. Specifically, NVs deploying competitive repertoires dynamically changing in complexity will be associated with higher short-term growth rates than NVs deploying stable competitive repertoires. Notably, there are no statistically significant differences between the clusters representing patterns changing in complexity towards different levels—becoming either simpler (C4-Towards simplicity) or more complex (C2-Towards complexity)—or between the clusters representing stable patterns of complexity—either at low (C1-Simple stable) or high levels (C3-Complex stable).

Table 21. Comparison of regression coefficients of short-term growth between different complexity patterns (cluster membership)

LINCOM	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]		
C1 - C2	-0.270	0.081	-3.330	0.001	-0.430	-0.110	C1<C2
C1 - C3	-0.129	0.104	-1.24	0.216	-0.334	0.076	
C1 - C4	-0.200	0.109	-1.84	0.067	-0.414	0.014	C1<C4
C2 - C3	0.204	0.068	2.99	0.003	0.070	0.338	C3<C2
C2 - C4	0.070	0.088	0.80	0.424	-0.103	0.244	
C3 - C4	-0.132	0.069	-1.9	0.059	-0.268	0.005	C3<C4

Long term analyses of the growth trend

In the next step of the analysis, we run a panel data regression to identify the differences in the medium/long-term growth trend between clusters or typical patterns of the complexity of the competitive repertoires of the NVs in our sample. The panel is unbalanced because not all ventures in the sample are tracked for the same length of time. We use Arellano-Bond GMM estimators with Stata 15 command, xtabond2, because of potential endogeneity issues (Roodman, 2009).

Precisely, to control for endogeneity, we use the lagged-dependent variable, past medium/long-term growth, as part of our independent variables, as often done using the GMM approach (Roodman, 2006, 2009). We also treat some variables as endogenous such as firm size and its squared term and market capitalization. We use a maximum of 2-years lags for instrumenting past growth and for instrumenting the endogenous variables. Finally, we use the two-step estimator with a robust option, which matches the one- and two-step results (Arellano and Bond, 1991). The robust option provides standard errors that are robust to heteroskedasticity and arbitrary patterns of autocorrelation within individuals. In this two-step estimation, where the errors are already robust, robustness triggers the Windmeijer correction. Applying this approach (Windmeijer, 2000, 2005), it is possible to correct the part of downward

bias that can arise in the standard errors when samples are small. We employ a version of this correction applicable to GMM models.

Lastly, the output from the analyses we have just described provides several post-estimation tests in GMM, enabling us to determine possible problems arising from autocorrelation (Arellano-Bond test), over-identification (Hansen test of over-identification), and endogeneity of instruments (Difference-in-Hansen tests of exogeneity of instrument) in first differences. The results of these post-estimation tests suggest that our empirical model is appropriate.

Table 22 presents the results of the panel data analyses including the identification of the models and the quality of the estimation. The regression models include control variables (Model 1) and the main effect of the temporal patterns (or trajectories) of complexity (Model 2).

Table 22. GMM estimates for medium/long-term growth.

VARIABLES	Model 1	Model 2
Past medium/long-term growth trend	1.223***	1.127***
	(0.203)	(0.183)
Firm size (N employees)	-0.410**	-0.527**
	(0.195)	(0.242)
Firm size (N employees SQ)	0.256***	0.328***
	(0.062)	(0.109)
Munificence	-0.011	-0.003
	(0.026)	(0.020)
Dynamism	0.005	-0.013
	(0.052)	(0.031)
Industry = 2, Industrials	0.165**	0.136
	(0.083)	(0.117)
Industry = 3, Consumer Goods & Services	0.047	0.132
	(0.138)	(0.204)
Industry = 4, Health, Pharmaceuticals & Biotechnology	0.049	0.058
	(0.073)	(0.059)
Industry = 5, Information Communication Technologies	0.008	0.177
	(0.120)	(0.134)
Industry = 6, Financials	0.037	0.025
	(0.068)	(0.061)
Origin = 1, Independent	0.045	0.140
	(0.081)	(0.108)
Market capitalization	-0.014	0.086
	(0.125)	(0.089)

VARIABLES	Model 1	Model 2
Total assets	0.039	0.050
	(0.070)	(0.067)
ROA	-0.014	-0.017
	(0.049)	(0.031)
TMT size	0.033	0.031
	(0.024)	(0.031)
International growth emphasis	0.030	0.080
	(0.139)	(0.081)
R&D growth emphasis	0.070	-0.261
	(0.309)	(0.273)
Organic VS external growth emphasis	0.010	0.020*
	(0.009)	(0.011)
Complexity pattern = 2, Towards complexity		-0.133*
		(0.080)
Complexity pattern = 3, Stable complex		-0.071
		(0.104)
Complexity pattern = 4, Towards simplicity		-0.176**
		(0.077)

Standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1;
Dummy years and constant included

Table 23. GMM quality estimation

Quality of estimation	**Model 1**	**Model 2**
Observations	378	349
Number of groups	115	101
Number of instruments	70	73
Wald chi2	731.71	554.04
p-value	0.000	0.000
AR(1)	-0.626	-0.751
p-value	0.531	0.453
AR(2)	1.896	1.831
p-value	0.058	0.067
Hansen test of overidentification (H0: The model is identified)	52.77	48.78
p-value	0.171	0.252
Difference in Hansen test of exogeneity of instruments subsets		
(H0: the instruments are exogenous)		

Quality of estimation	Model 1	Model 2
GMM instruments for levels	23.41	20.10
p-value	0.220	0.388
GMM (Medium/ long term trend)	18.83	12.85
p-value	0.064	0.303
GMM (Size of firm)	22.81	22.61
p-value	0.063	0.067
GMM (Size of firm SQ)	19.14	15.01
p-value	0.085	0.241
GMM (Market capital)	16.79	8.87
p-value	0.267	0.840
IV (Exogenous variables)	22.84	29.20
p-value	0.244	0.139

Model 1, which only includes the study's control variables, shows that the addition of independent variables significantly increases the Wald-chi statistics, indicating a better fit. Five conditions could be verified from the results. First, the number of groups is greater than the number of instruments in the models. Second, the Wald test is statistically significant (all p-values = .000). Third, there is no second order autocorrelation in any of the two models (AR(2) p-values> .05). Fourth, the Hansen test for over-identification is accepted (as the null hypothesis is that the model is identified, and the p-values are between .1 and .8. in model 1 and model 2. Finally, the instruments are exogenous in both the GMM and the IV estimations. Overall, the quality of the model keeps improving as we approach the full model. Model 1 shows that some of the control variables are statistically significant: firm size (negative) and its square term (positive), confirming the curvilinear effect with U-shape (Haans, Pieters and He, 2016). Model 2 partially supports H3, showing different long-term employment growth trends between NVs deploying stable competitive repertoires in terms of complexity (associated with C1-simple

stable and C3-complex stable) and NVs deploying dynamically changing competitive repertoires (associated with C2-towards complexity and C4-towards simplicity).

Interestingly, the results of an additional Lincom post-estimation test also show different growth trends between the patterns of complexity. Table 24 displays the results of the Lincom post-estimation, and we can see how the trend of growth of NVs in C1-simple stable is higher than the trend of NVs in C2-Towards complexity and C4-towards simplicity. We have seen more graphically these differences in the representation in Figure 17.

Table 24. Comparison of regression coefficients of medium/long-term growth trend between different complexity patterns (cluster membership)

LINCOM	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
CT1 - CT2	0.133	0.080	1.660	0.096	-0.024	0.290	C1>C2
CT1 - CT3	0.071	0.104	0.68	0.498	-0.134	0.275	
CT1 - CT4	0.176	0.077	2.28	0.023	0.025	0.327	C1>C4
CT2 - CT3	-0.062	0.111	-0.56	0.575	-0.281	0.156	
CT2 - CT4	0.043	0.063	0.68	0.498	-0.080	0.165	
CT3 - CT4	0.105	0.109	0.96	0.336	-0.109	0.319	

To ensure the validity of the results, an additional robustness check was conducted. In particular, the results do not provide significant differences between C3-Complex stable and the complexity patterns C2-Towards complexity and C4-Towards simplicity. Visually C3 shows in the early years a similar declining trend to C2 and C4 but indeed appears to curve over time (Figure 17).

Curvilinear effect

Although previous literature had established a negative relationship between employment growth rate and firm age (Evans, 1987), it appears to vary depending on the temporal pattern or cluster of complexity, giving rise to potential curvilinear relationships

(Figure 17). For this reason and due to the null result of H3 for the temporal pattern of complexity C3-Complex stable, we additionally wanted to compare the relationship between employment growth and time passed since the floating of the NV across the different temporal patterns and, in turn, provide an additional robustness check for our model. Therefore, we also tested for the presence of curvilinearity by including the quadratic term of the age of firm (Model 1) and its interaction with the complexity pattern C3-Complex stable vs C4-Towards simplicity (Model 2) and C3-Complex stable vs C2-Towards complexity (Model 3). We re-ran the analysis for the short-term growth, the results of which are presented in Table 25.

Specifically, we estimated the following equations where first we added to equation [1] (above) the linear $(firm\ age_i)$ and quadratic $\left(firm\ age_i^2\right)$ terms of firm age to test if there is an overall curvilinear relationship between employment growth and firm age (Henderson, 1999; Haans, Pieters and He, 2016; Assaf and Tsionas, 2019).

$$\boldsymbol{Model\ 1}\text{: } Y_{i,t+1} = \beta_1\ firm\ age_{i,t} + \beta_2\ firm\ age_{i,t}^2 + \gamma\ P_{i,t} + \delta Q_i \qquad [3]$$

where i denotes a firm and t denotes the time (year). Y_{it} is our dependent variable (i.e. employment growth rate) and $P_{i,t}$ are the various time-variant control variables and Q_i are the time-invariant control variables of our employment growth model.

Second, we added to equation [3] the linear and quadratic interaction between firm age and the complexity temporal pattern to test if the relationship between employment growth and firm age varies depending on whether the complexity profile is C3-Complex stable or C4-Towards simplicity.

$$\begin{aligned}\boldsymbol{Model\ 2}\text{: } Y_{i,t+1} = {} & \beta_0\ complexity\ pattern_i + \beta_1\ firm\ age_{i,t} + \beta_2\ firm\ age_{i,t}^2 \\ & + \beta_3\ firm\ age_{i,t} \times \text{complexity pattern}_i + \beta_4\ firm\ age_{i,t}^2 \\ & \times \text{complexity pattern}_i + \gamma\ P_{i,t} + \delta Q_i\end{aligned} \qquad [4]$$

Here, $complexity\ pattern_i$ is a dummy variable with a value of 1 for C3 (Complex stable) firms and 0 for C4 (Towards simplicity) firms. Third, similarly to model 2, in model3 we specify the equation to test if the relationship between employment growth and firm age varies depending on whether the complexity profile is C3-Complex stable or C2-Towards complexity.

$$\boldsymbol{Model\ 3}\text{: } Y_{i,t+1} \quad [5]$$
$$= \beta_0\ complexity\ pattern_i + \beta_1\ firm\ age_{i,t} + \beta_2\ firm\ age_{i,t}^2$$
$$+ \beta_3\ firm\ age_{i,t} \times \text{complexity pattern}_i + \beta_4\ firm\ age_{i,t}^2$$
$$\times \text{complexity pattern}_i + + \gamma\ P_{i,t} + \delta Q_i$$

Here, $complexity\ pattern_i$ is a dummy variable with a value of 1 for C3 (Complex stable) firms and 0 for C2 (Towards complexity) firms. These specifications allow for curvilinearity and will reveal differences over time across complexity patterns.

Table 25. Regression model with dependent variable: Annual (year-to-year) growth rate, including the square term of firm age and its interaction with the complexity pattern as explanatory variables

VARIABLES	All firms Model 1	C3 vs C4 Model 2	C3 vs C2 Model 3
Firm age	0.021	-0.002	0.099
	(0.053)	(0.087)	(0.066)
Firm age^2	-0.011	-0.010	-0.025**
	(0.009)	(0.016)	(0.012)
Firm age x complexity pattern (=3, complex)		-0.347**	-0.408***
		(0.156)	(0.149)
Firm age^2 x complexity pattern (=3, complex)		0.057**	0.067***
		(0.025)	(0.025)
Complexity pattern		0.380*	0.347*
		(0.223)	(0.205)
Firm size (N employees)	-0.146**	-0.187*	-0.159
	(0.057)	(0.111)	(0.099)
Firm size (N employees SQ)	0.016	-0.003	0.011
	(0.019)	(0.081)	(0.044)
Munificence	0.013	0.048*	0.015
	(0.018)	(0.026)	(0.017)
Dynamism	0.024	-0.013	0.014
	(0.025)	(0.043)	(0.036)
Industry = 2, Industrials	0.258***	0.332***	0.287***

VARIABLES	All firms Model 1	C3 vs C4 Model 2	C3 vs C2 Model 3
	(0.074)	(0.081)	(0.102)
Industry = 3, Consumer Goods & Services	0.240***	0.321***	0.266**
	(0.080)	(0.090)	(0.104)
Industry = 4, Health, Pharmaceuticals & Biotechnology	0.296***	0.515***	0.296**
	(0.091)	(0.111)	(0.123)
Industry = 5, Information Communication Technologies	0.189**	0.278***	0.222
	(0.081)	(0.081)	(0.134)
Industry = 6, Financials	0.043	0.200*	0.029
	(0.073)	(0.108)	(0.106)
Origin = 1, Independent	0.081*	0.009	-0.013
	(0.049)	(0.049)	(0.056)
Market capitalization	0.126***	0.107*	0.135**
	(0.040)	(0.055)	(0.066)
Total assets	0.004	0.017	0.018
	(0.029)	(0.028)	(0.048)
ROA	0.072***	0.051	0.063*
	(0.025)	(0.032)	(0.035)
TMT size	-0.003	-0.000	0.027
	(0.022)	(0.028)	(0.036)
International growth emphasis	-0.359	0.073	0.189
	(0.344)	(0.173)	(0.179)
Development growth emphasis	-0.545***	-0.525**	-0.329
	(0.154)	(0.252)	(0.263)
Organic VS external growth emphasis	-0.005	-0.012	-0.009
	(0.007)	(0.009)	(0.009)
Observations	414	201	247
R-squared	0.241	0.307	0.321

Robust clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Explanatory variables in the analysis have been standardized

Model 1 in Table 25 shows that the firm age-squared term's coefficient (β_2 = -0.011, p = 0.232) is not significant. Therefore, a curvilinear relationship between the rate of employment growth and firm age cannot be confirmed for the entire sample of NVs. Model 2 and 3 serve to assess the complexity longitudinal profile's moderating effect on the relationship between employment growth and firm age.

In Model 2, we entered the linear and quadratic interaction terms of firm age and complexity pattern and firm age-squared and complexity pattern, the latter taking the value of 1 for C3-Complex stable NVs and 0 for C4-Towards simplicity NVs. The results of Model 2 show that the coefficient of the quadratic term of firm age is not significant (β_2 = -0.010, p = 0.516),

implying that a curvilinear relationship for C4 NVs cannot be confirmed. In contrast, the interaction term between firm age-squared and complexity pattern is positive and significant (β_4=0.057, p <0.05) with $(\beta_2 + \beta_4) > 0$ and significant ($(\beta_2 + \beta_4) = 0.047, p < 0.05$) and a significant turning point $\left(\frac{-\beta_1 - \beta_3\, complexity\ pattern\ (=1)}{2\,\beta_2 + 2\,\beta_4\, complexity\ pattern\ (=1)} = 3.046, p < 0.01\right)$ within the observed years' range (1 to 5), implying a U-shape relationship between the rate of employment growth and firm age for C3 NVs. Moreover, the H2 in our short-term analysis predicted that annual employment growth rates were higher during the early years, short after founding (up to the fifth year) in C4-Towards simplicity NVs than in C3-Complex stable NVs. This involves differences across complexity patterns and would be confirmed if $(\beta_3\, firm\, age + \beta_4\, firm\, age^2) < 0$ (Henderson, 1999). Model 2 shows a negative and significant coefficient (β_3 = -0.347, p <0.05) associated with the $firm\ age\ x\ complexity\ pattern$ term, of a much larger magnitude than the positive and significant coefficient (β_4 = 0.057, p <0.05) of the $firm\ age2\ x\ complexity\ pattern$ term. Therefore, C3 NVs had lower employment growth rates than C4 NVs until about the age of five (see Figure 19), further validating the results obtained in our short-term analysis for H2.

The results of Model 3 show that the coefficient of the quadratic term of firm age is negative and significant (β_2 = -0.025, $p < 0.05$) and the turning point $\left(\frac{-\beta_1}{2\beta_2} = 1.967, p < 0.01\right)$ is significant and within the observed years' range (1 to 5), suggesting an inverted U-shape relationship between employment growth and firm age for C2 firms. However, adding the cubic term of firm age suggests an S-shape relationship. The interaction term between firm age-squared and complexity pattern is positive and significant (β_4=0.067, p <0.01) with $(\beta_2 + \beta_4) > 0$ and significant and a significant turning point $\left(\frac{-\beta_1 - \beta_3\, complexity\ pattern\ (=1)}{2\,\beta_2 + 2\,\beta_4\, complexity\ pattern\ (=1)} = 3.04, p < 0.01\right)$ within the observed years' range (1 to 5), implying a U-shape relationship between the rate of employment growth and firm age for C3. Moreover, with a coefficient of the $firm\ age\ x\ complexity\ pattern$ term (β_3) of -0.408 and significant (p <0.01) and a

coefficient of the $firm\ age2\ x\ complexity\ pattern$ term (β_4) of 0.067 and significant (p <0.01), it is satisfied that ($\beta_3\ firm\ age + \beta_4\ firm\ age^2$) < 0. Therefore, C3 firms show lower employment growth rates than C2 firms during the early years, validating the results obtained in the short-term analysis for H2.

To interpret the results, we plotted them, as shown in Figure 19. It indicates that when the NVs belong to C3 (Complex stable), the employment growth rate decreases less steeply as time passes due to its presented U-shape relationship than in C4 (Towards simplicity) and C2 (Towards complexity) firms.

Figure 19. Moderating effect of the patterns of complexity on the relationship between employment growth rate and firm age

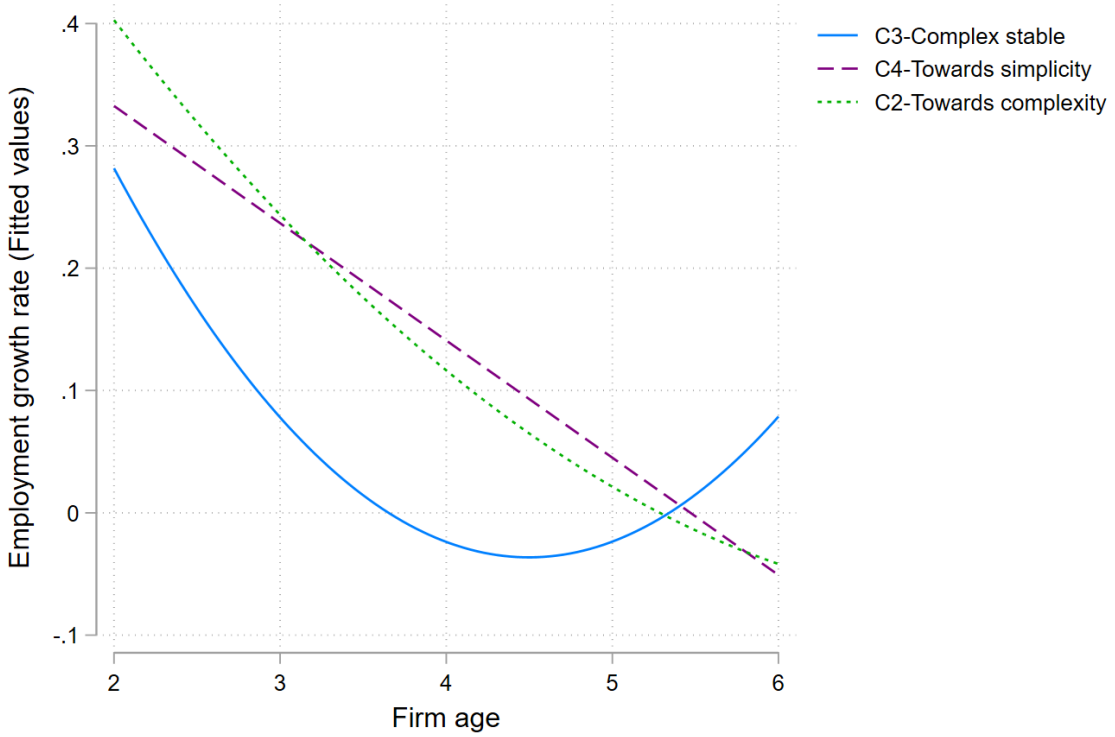


Table 26 (below) summarises the results of all of the hypotheses tested.

Table 26. Summary of hypotheses and results.

Hypothesis	H	Description	Result
Alternative patterns of the complexity or competitive repertoires in the early years of NVs	H1	Alternative patterns in the complexity of competitive repertoires can be observed across NVs over their early years following the floating. Specifically, two stable patterns (at either low or high levels of complexity) and two changing patterns towards different levels of complexity.	Supported
Association between alternative complexity patterns and NV growth	H2	The patterns of the complexity of the competitive repertoire of NVs are associated with their short-term growth rates in employees over the early years following the floating. Specifically, NVs deploying competitive repertoires dynamically changing in complexity are associated with higher annual growth rates (short-term) than NVs deploying stable competitive repertoires.	Supported
	H3 Main analyses	The patterns of the complexity of the early competitive repertoire of a NV will be associated with its long-term growth trend. Specifically, NVs deploying stable competitive repertoires will be associated with more sustained long-term growth trends than NVs deploying dynamically changing competitive repertoires.	Partially supported
	H3 Additional test	The complex stable pattern (C3) has a U-shaped growth rate trend along the five first years following the NV floating translating into a less steep decline of employment growth rates than the changing pattern towards simplicity (C4) and the changing pattern towards complexity (C2) that present no curvilinear relationship but a declining linear trend.	Supported

CHAPTER 5. DISCUSSION AND CONCLUSIONS

5.1 Overview

For decades, researchers have tried to explain why some new firms grow and others do not, why new firms grow at different paces and the implications for NV survival (Coad, Daunfeldt and Halvarsson, 2018; Coad, Frankish and Storey, 2020). Researchers observe that the way firms orchestrate competitive actions from the various key strategic areas—i.e. producing, marketing and selling, delivering, and supporting its products or services (Porter, 2001)—and entrepreneurial areas—i.e. as R&D, new product introductions, entry to new markets and forming alliances (Ireland *et al.*, 2001)—and learn from it influences firm performance and growth. As a result, a major question at the intersection of research in strategy and entrepreneurship to which this dissertation seeks to contribute is how competitive actions lead to the growth of NVs during their early years (McMullen, 2015). In doing so, this dissertation approaches the study of growth-oriented NVs (entering AIM within their first two years of operation) and their strategy by focusing on the pattern of actual (not planned or intended) strategic actions initiated by managers and entrepreneurs and the related growth. The competitive repertoire of the venture encompasses all these actions and offers a holistic view of the NV strategy and its competitive posture (Miller and Chen, 1996b; Connelly *et al.*, 2017).

In the case of NVs, usually born small (Geroski, 1995), early growth is essential for survival, in particular, to develop the resources and capabilities to overcome the liability of newness and establish legitimacy to ultimately gain a competitive advantage in the market place against competitors (Penrose 1959). Unlike research that has focused on the effects of different types of competitive actions individually (e.g. R&D, marketing, product launches and alliancing), this dissertation has taken the repertoire approach considering the overall set competitive actions and their characteristics—notably, the complexity— to study how NVs evolve and grow. Our focus is on companies that go public very soon after their creation, which allows them to raise funds, constituting a springboard for their development and growth. These are high potential ventures with high growth aspirations. The competitive actions they take sequentially

enable NVs to grow, develop resources and capabilities and obtain legitimacy, all of which are essential for their survival. Importantly, the degree of complexity (or variety) in the types of the overall set of competitive actions (i.e. competitive repertoire) determines the breadth of knowledge and the underlying capabilities the venture develops (Miller and Chen, 1996b; Ferrier, Smith and Grimm, 1999; Ferrier and Lyon, 2004; Lumpkin and Dess, 2006; Carnes *et al.*, 2019). Moreover, establishing the repertoire of competitive actions and its complexity is an intricate process that unfolds over time. Thus, time and the feedback loop (of the entrepreneurial learning process) between actions, interpretations of performance feedback (in several time horizons) and the breadth of capabilities (operational and dynamic) of the NV play an important role in setting the evolutionary pattern of complexity (that parallels the development of the breadth of capabilities), and this on setting the NV growth.

We know that because resources are scarce in NVs, and NVs face the liability of newness (Stinchcombe, 1965), conflicts between complexity and simplicity arise due to the competing demand for resources and capabilities. Despite these constraints, some NVs start competing comprehensively, using a wide variety of competitive action types (complex repertoire), while others concentrate on one or two types of actions (simple repertoire) (Miller *et al.*, 1996). Previous literature acknowledges a trade-off between a simple repertoire's efficiency for short-term results and the flexibility of a more complex repertoire for long-term sustained results (Eisenhardt, Furr and Bingham, 2010; Eisenhardt and Piezunka, 2011), introducing the idea of different time horizons in the decision-making process (Chen, Miller and Chen, 2019). This trade-off reflected in Miller's (1990) work, inspired by the Icarus' paradox, has prompted researchers to theorise about the optimal level of repertoire complexity mainly from a contingency and established firm perspective and with no conclusive results. Recently, Connelly et al. (2017) found that the complexity of the repertoire has different outcome effects in the short-term (negative) *versus* the long-term (positive). In the context of NVs, this trade-off may imply the significant dilemma for the entrepreneur of choosing between exploiting the available

capabilities for survival (short-term/efficient) or develop (explore) also capabilities for future growth (dynamic/flexible). The challenge in NVs is related to the lack of experience, lack of knowledge of competitive alternatives or the skills to carry them out, but also from the associated high costs, temporary inefficiency and uncertainties (Gruber, 2004) and possibly different stakeholder audiences who want to see results in the short or long term (Bird, 1992). Simplicity can be useful to develop specific distinctive competencies underlying the initial idea or opportunity, but *complexity* will help to learn from the evolving business environment, e.g. market, competitors, customers, products and the regulatory framework, which leads to the dilemma of finding the right simplicity-complexity balance.

Yet, within this discussion, one issue stands out. The simplicity *versus* complexity trade-off is not a one-time decision. The current breadth of choices is determined by a sequence of decisions depending on the past and affecting the path ahead through the (more or less) path-dependent capabilities developed to sustain the competitive repertoire (McMullen, 2015), highlighting the idea of the strategy as a cumulative process (Penrose, 1959). In turn, the sequence of competitive actions and the related breadth of capabilities that sustain it is expected to affect the NV's growth pace, a growth process that is not sufficiently understood (Davidsson, Achtenhagen and Naldi, 2010). Particularly, understanding employment growth is important because it is the measure that best captures the development of resources and capabilities (Penrose, 1959) and provides a measure of firm assets as human resources are among the most critical assets of the NV (Stam *et al.*, 2008). Moreover, it provides a measure of job creation from NVs.

The solution to the complexity-simplicity dilemma is, therefore, temporal and dynamic. This hints at the relevance of dynamic capabilities—i.e. developed at a certain moment for later use—(Eisenhardt, Furr and Bingham, 2010) and ambidexterity—i.e. the ability to exploit and explore at the same time—(Dai et al. 2017; Sinha 2015), in particular, for which entrepreneurs

must combine different decisional time horizons simultaneously (Chen, Miller and Chen, 2019). A more complex repertoire of actions may support wider learning and dynamic capabilities in the NV. However, the entrepreneur or founding team's initial resources and effective choices will determine not only the degree of complexity of the initial repertoire but also its further development. The NV could be led into the failure trap if a too complex and exploratory repertoire prevents exploitation of discoveries that work. Also, the NV could be lead into the competence or learning trap if a repertoire evolves into a too simple one that would constrain NV knowledge and further adaptation as it may also constrain the absorptive capacity key in integrating new knowledge (Ben-Oz and Greve, 2015).

Most of existing theoretical and empirical research on the evolution of the complexity of the repertoire of competitive actions refers to the competence trap where the reinforcing mechanism of the learning process subsequently favours the selection and retention of previously successful actions leading to a pattern of simplification of the strategy (Miller and Chen, 1996b; Connelly *et al.*, 2017). Most significantly, the simplification patterns limit the scope of knowledge and skills for further adaptation. However, what is missing in this perspective, in the particular case of NV that lack operating history and associated inertia, is knowing if there are alternative patterns where sequential variation occurs driven by the aspirations and exploratory nature of entrepreneurs and founding teams (Aldrich, 1999; Ben-Oz and Greve, 2015). It is also missing considering how the sequence matter. For example, moving from complex to simple has been largely documented; however, there is no previous evidence about the possibility of moving from a simple to complex repertoire.

For this reason, in this dissertation, the focus is not on the repertoire as the portfolio of actions associated with resources and capabilities that a NV uses at each specific period of time to compete and achieve superior advantage (which is transitory) but on the temporal sequence of competitive repertoires over time with a focus on their temporal interdependencies.

By doing so, this dissertation attempts to extend our understanding of the choice of the complexity (breadth or variety) of the strategy of a NV through the recognition of the importance of the trade-offs between the efficiency of simplicity (short-term) *versus* the flexibility of complexity (capacity to adapt/longer-term) and the inter-temporal consequences for the NV strategy and performance. This dissertation also highlights the relationship between the temporal patterns of complexity of the competitive repertoire and NVs growth in the short versus the long term.

To this end, this dissertation has addressed four main objectives. They were first, disentangling the concept of inter-temporal change in the degree of complexity of the competitive repertoire. For that purpose, we have used several indicators from the literature that measure different nuances of the competitive repertoire complexity. Specifically, we account for: (1) the variety and diversity in the competitive action types deployed by a NV; (2) the diversity relative to the industry; (3) the inter-temporal variation among competitive action types by accounting for the newly introduced action in each year; and (4) activity volume to control for the total number of competitive actions or moves. We have measured each NV/year indicator level to establish the sequence and have measured the change from one year to the next. The correlations among the four distinct aspects of complexity measured are significant and positive with different strengths, indicating they move in the same direction. However, each reflects a different aspect of complexity and together configure the complexity profile of the NV. We observe that increasingly complex NVs are conforming more and more to their industry's norms, while increasingly simple ones are moving away from the industry mean positions. Interestingly, those keeping relatively stable profiles of complexity also maintain a stable complexity in relation to the industry means.

Second, we have applied an innovative pattern discovery technique to develop a taxonomy of alternative temporal patterns of the complexity of the competitive repertoires of

NVs during their early years of operations. The importance of the sequence relies on its ability to reveal where the NV is moving to in terms of the complexity of its competitive actions and arguably on the related breadth of capabilities that sustain them. Much of the theory on the evolution of the complexity of competitive repertoires refers to established firms. It draws on the learning or success bias, very well exemplified in the Icarus paradox (Miller, 1990), that favour the exploitation and retention of successful actions (simplification) and underinvestment in exploration or variation depending on whether superior alternatives can be devised (Williamson 1999). Particularly, in NVs that have a short history, other patterns may be possible and equally probably. Our results over the first five years of our sample of NVs point precisely to this direction as firms are relatively evenly spread across the four patterns identified: two stable patterns at either high or low levels of complexity and two patterns changing towards higher or lower levels of complexity. All NVs in our sample survive the threshold of five years following their floating.

Third, drawing on existing research, we theorize about the potential drivers of alternative temporal patterns of the complexity of the strategy and the behavioural mechanisms of pattern formation. We suggest that NVs start at different levels of complexity depending on the initial awareness-motivation-capabilities of the entrepreneurs/founding teams and the financial resources NVs have at hand. Subsequent competitive repertoires will depend on their interpretation of performance feedbacks relative to their short- and long-term aspirations. The temporal horizon of decision-making will play an important role in devising the next repertoire of actions in several ways:

(i) Immediate positive results will create satisfied performance aspirations generating positive reinforcements towards previously successful action types that foster their selection and retention (exploitation) (remaining simple or moving towards simplicity).

(ii) Lack of immediate positive results will create unsatisfied short-term aspirations that will drive exploration increasing the range of action types deployed or continuing exploring a wide range of actions (remaining complex or moving towards complexity).

Interestingly, we do not find temporal patterns or sequences that go back and forth between simplicity and complexity, highlighting the cumulative nature of strategy. Option (ii) means, at minimum, rethinking their strategies and ensuring the path to future profits. However, we cannot rule out that option (ii) requires knowledge of competitive alternatives and the critical skills to carry them out, as well as financial resources. There is usually little slack in NVs that can be used to explore new competitive strategies or resources to hire new employees with the right skills to tap into those skills when they are needed quickly. All NVs in our sample manage to pass the five years' survival threshold following their IPO. However, it should not be forgotten that these start-ups have entered the AIM, which provides them with a certain amount of resources to develop a richer repertoire, although the managerial skills for a good interpretation and judgement of the current and future environment and good use of resources will remain essential. In these early years, managerial skills are more important than potential technological skills at the base of the NV's funding. Similarly, the market orientation of the management team appears critical to achieving the desired and difficult market penetration in the case of NVs. Previous research highlights the importance of the diversity of capabilities in founding teams to choose the right level of complexity ("requisite variety"). Further research could address how the diversity of experience and backgrounds of the founding team and their evolution determine the pattern of complexity.

Forth and finally, in this dissertation, we determine the trade-offs between the encountered alternative temporal patterns (considering the inter-temporal change of the complexity of the repertoire of competitive actions) in terms of their effects on NV's short-term

vs long-term growth trend in the number of employees, while controlling by a variety of factors that affect growth. Specifically, consistent with recent research, we find that NVs with the highest early growth rates cannot keep their pace of growth, whereas NVs with more moderate growth rates sustain a more stable growth trend (Coad, Frankish and Storey, 2020).

5.2 Implications for theory

This dissertation provides theoretical and empirical contributions to research in competitive dynamics and entrepreneurship. At the broadest level, we add the temporal and sequential dimension to the study of the complexity of the competitive repertoire. This helps to understand how NVs learn from the breadth of past competitive actions, interpreting their results (Chen, Miller and Chen, 2019) to make subsequent strategy decisions that require the allocation of resources to build (more or less path-dependent) capabilities to sustain the selected competitive repertoire. Much of the theory on the evolution of the competitive repertoires' complexity refers to established firms and draws on the biases of success and learning. This is, generally, firms select and retain those actions that they do best and allocate more resources, efforts and time to them, underinvesting in variation or exploration of other actions depending on whether superior alternatives can be devised (Williamson, 1999). We empirically find that, particularly in NVs with a short history and great uncertainty about what really works, other patterns are possible. Employment growth is part of the NV development process, being the measure that best capture the development of competences and capabilities in the NV (Penrose, 1959; Lockett *et al.*, 2011). Furthermore, it is considered a target for small firms that struggle to reach the minimum efficient size-scale and for policymakers interested in creating new jobs (Coad, 2007a).

Our study makes three important contributions to the competitive dynamics and NV growth literature. First, our study contributes to our understanding of longitudinal processes

that characterize strategy implementation as the sequence of actual actions (Chen and Miller 2012) by developing a typology of alternative temporal patterns of NVs' competitive repertoire complexity during their early years of activity that can sustain future insights and serve as a foundation for future studies (Miller, 1996). Typologies are important for developing the predictive task and testing the factors moderating the relationships (Miller, 1996). We illustrate the linkages between competitive actions over time through the interpretation of their performance and their influence on the path-dependent capabilities of firms at their early stages of development (Chen and Miller 2015; Connelly et al. 2017; Ferrier and Lee 2002).

For some time now, researchers have conceptualized strategy as a sequential set of a variety of actions underlying a sequential and temporal decision-making process (Mintzberg, 1987; D'Aveni, Dagnino and Smith, 2010; Shi and Prescott, 2011). Still, some researchers conclude that the competitive dynamics research has suffered from aggregating actions over a given year in order to associate such actions to firm capabilities and annual performance data that are only available at the year/firm unit of analysis (D'Aveni, Dagnino and Smith, 2010). Associating temporal patterns instead can help to solve this issue. However, assessing the pattern is challenging. The importance of the pattern or sequence relies on the fact that measuring complexity provides snapshots at each measured time point of the firm strategy, but the sequence indicates where the NV is going and at what pace in terms of the complexity of the competitive repertoire and the associated capabilities. New pattern discovery techniques such as time-series clustering have made it possible to identify four typical temporal patterns of the complexity of competitive repertoires of NVs. Importantly, future research can draw on these identified patterns and relate them to extensive research on management and strategy about teams, capabilities, firm and industry levels to articulate various theoretical mechanisms underpinning the managerial decision-making process, leading to our next contribution.

Second, we contribute to the AMC framework and entrepreneurial learning, suggesting that indeed entrepreneurial managers' initial motivations, awareness of options and capabilities determine the initial level of complexity of their ventures' competitive repertoires as shown in two possible starting points for the competitive repertoire of NVs: more or less simple or complex. In subsequent decisions, entrepreneurial managers interpret their performance in a feedback process affected by their short- and long-term aspirations to shape their subsequent competitive actions and capability development, which will to some extent, constrain future choices. By exploring how the competitive repertoires' complexity evolve over time, we theorize the pattern formation and evolution of the competitive repertoire as an interactive and interdependent temporal process, through the more or less path-dependent (and more or less dynamic) capabilities that sustain the repertoire of competitive actions, answering to recent calls for a more in-depth examination of time and the longitudinal perspective of strategy. As mentioned earlier, further research could draw upon our proposed typology to develop theoretically based hypotheses on the relationship between the temporal patterns of complexity and the evolving characteristics of the entrepreneurs or founding teams as well as of the business environment. Also interesting for further research is to study if the evolving characteristics of the entrepreneurs or founding teams moderate the strategy-performance relationship. Further research could also study how the entrepreneurial or founding team's evolving characteristics regulate the strategic-entrepreneurial action tension that parallels the exploitation-exploration dilemma in NVs and could shed light on the development of dynamic capabilities.

The third contribution arises from the connection of these alternative patterns of competitive repertoire complexity with distinct effects on NV growth when accounting for the role of time. We observe that the growth rates are relatively different in all NVs across alternative patterns of complexity, and so are the rhythms or paths of growth, which the literature suggests have implications for survival (Coad, Frankish and Storey, 2020). Knowing

from previous research that firms' growth rates tend to diminish over time, we find that over time stable patterns of complexity are associated with a more stable growth pace than patterns moving towards other levels (dynamically changing patterns of complexity), though the latter show the highest growth rates in the early years. This confirms that the early, very high growth rates do not tend to be sustained over time and that the pattern of complexity influences the pace of decline (or growth). We contribute to recent calls to the investigation of the mechanisms behind the different paces of growth. Growing new businesses is widely regarded as a major source of wealth creation. As such, advancing our knowledge about the drivers of particularly employment growth while NVs overcome the liability of newness is a worthwhile issue. Recent research has highlighted the need for growth to be profitable to sustain further growth. For this reason, future research could examine the influence of the pattern of complexity on the profitability of the NVs. Further research could explore the effects of the alternative patterns of complexity in other performance variables, such as profits or sales.

Furthermore, the support found for H2 (NVs deploying competitive repertoires changing in complexity will be associated with higher short-term growth rates than NVs deploying stable competitive repertoires) and H3 (NVs deploying stable competitive repertoires will be associated with more sustained long-term growth trend than NVs deploying changing competitive repertoires) suggests that, though change leads to higher short-term NV growth, from a longer-term perspective stable patterns of complexity appear to allow better strategy-market fit and more stable growth. Importantly, stable patterns imply developing the scope of capabilities, which are path-dependent (they take time and commitment of resources to build) and can therefore not be continuously changed back and forth. Stable patterns may achieve a better exploitation-exploration balance than patterns moving towards simplicity, thus enhancing exploitation and patterns moving towards complexity, thus enhancing exploration.

We have found that moving from simple to complex is possible but not without obstacles as the development of new capabilities partly through hiring new employees takes time and requires adjustment of organizational and management structures, which sets limits to fast growth (Penrose, 1959). Interestingly, the fact that NVs starting and keeping complex patterns have a corporate origin may reflect a more extensive availability of various capabilities, know-how, and more complex management structures than independent NVs that may be very simple and underdeveloped in organizational and management structures. This calls for understanding how independent ventures can assemble the capabilities they need to develop and set adequate growth strategies and how to promote them. Undoubtedly, entering AIM in the early years reflects the growth orientation of these NVs while providing them with the initial funding resources to pursue a growth strategy. Further research could investigate how the richness of the repertoire of actions and its trajectory in independent and corporate NVs affects subsequent capital raises and subsequent growth.

5.3 Implications for practice

From a practical perspective, there is no one best way of designing their competitive repertoires over time for all NVs, but this depends on both internal and external factors. Yet, entrepreneurs can profit from understanding the competitive alternatives, the efficiency-flexibility trade-offs associated with the choice between simplicity and complexity, which appear to have different short- and long-term consequences, and the temporal consequences from their decisions about the degree of complexity of their action repertoires, particularly given the path-dependent evolution of competitive actions and organizational capabilities. It also serves to think around the dilemma of exploiting the available capabilities for NV survival through efficient and effective strategic actions or exploring a wider repertoire of competitive actions for sustaining NV long-term competitive advantage, driving the construction of dynamic capabilities. A simple

repertoire may provide focus and efficiency, but a more complex repertoire may provide the flexibility and slack resources to address the changing competitive landscape and adapt in the event of market shocks. Entrepreneurs and funding teams can ask themselves if they are on the right trajectory for long-term competitive advantage, and if not plan the change. The competitive repertoire provides information about the moment; a better understanding of the sequence provides information about where the NV is heading. The strategy-making process and its implementation in the repertoire of actions is not a stable phenomenon but rather evolves over time in a dependent manner, affecting the cumulative process of building knowledge, skills, and capabilities. Also important, associating the alternative patterns to NV growth in the number of employees is of interest for entrepreneurs who need to achieve size-scale and policymakers to answer questions such as how to generate stable employment growth, which is the output of a strategic process and a target for policymakers. Policymakers should develop policies supporting entrepreneurship and NVs not only at the founding stage but also over the earlier years.

The arguments developed can be used by entrepreneurs to help them think of the importance of including short and long-term horizons in their decision-making process by considering how the breadth of knowledge and skills is created and extended through subsequent action within their ventures and what the temporal dependencies are in order to avoid possible traps. For this, incubator environments have been suggested to be valuable not only at the start-up stage but also during the growth phase to support the development of a repertoire that can sustain growth, secure further capital, and avoid failure. As Venkataraman and Van de Ven (1998) put forward, *"Subventions and public support to start-ups should be based not only on start conditions but subject to on subsequent action during the early years."* Finally, departing from Chen and Miller's (2015) idea of the repertoire as an action toolkit to compete and cooperate with the various actors, with the action types and their boundaries (geography and industry) being key elements, we propose the repertoire of competitive actions

as a dynamic tool to understand the trajectory of development of the NV and scope of capabilities.

5.4 Conclusions, limitations and future research

We started this work noting the relevance of early growth in NVs that are generally small, have limited human and financial capital and lack reputation, routines, and processes (the so-called *liability of newness*), to develop the skills and capabilities needed to enter the market. Some literature analyses individually different types of competitive strategies and, for example, reveals the importance of research and development strategies for building innovation capabilities or setting alliances or other forms of collaborations with other companies to acquire relevant skills not currently developed internally in the NV. Against this background, in this dissertation, we draw on competitive dynamics research and the underlying AMC framework and follow a repertoire approach. We explore the relevance for NVs' growth of how NVs orchestrate competitive actions and choose the evolving degree of complexity (or variety in the types of action), taking into account competing demands for the scarce resources (efficiency-flexibility trade-off) and the relationships of dependency that emerge between the complexity of the competitive repertoire and the organizational capabilities that sustain it through the organizational learning. We look at the sequence of the complexity of subsequent competitive repertoires because it reflects the development of the breadth and scope of actions and implicitly the related set of organizational skills and capabilities that sustain them. There is consensus in the literature that the effective accumulation of NV resources and scope of capabilities and the NV capacity of learning at the early stages of existence are key factors in explaining their survival and growth. Moreover, because of the cumulative nature of strategy and the related (more or less) path-dependent capabilities, alternative temporal patterns of the complexity of the competitive repertoire may have differential impacts on immediate vs

medium/long-term growth, affecting the pace of NV growth. We analyse employment growth because it is the measure best captures the development of organizational capabilities.

The literature on the competitive repertoire approach looks at the entire set of actions that firms put in place to gain a competitive advantage over competitors. Yet, most of this research looks at the repertoire at subsequent points in time but has paid less attention to the developed sequence or time pattern. Most studies that consider time and the evolution of the competitive repertoire relate to established firms and describe the simplification pattern that emerges through the reinforcement mechanism of positive feedback of previous actions, driving firms to concentrate as time passes on those competitive actions have proven to yield successful results.

In this dissertation, we identify alternative temporal patterns in the complexity of the competitive repertoires of NVs and theorize about the mechanisms behind pattern formation. These include pressures for short-term results (efficiency) and long-term sustainable competitive advantage (flexibility), related to entrepreneurs and founding teams' (short- and long-term) aspirations and capabilities which are at the basis of the interpretation of results and subsequent action guided by the path-dependent learning process. We find that the more stable patterns of complexity (either at high or low levels) present more stable employment growth trends than patterns changing to different complexity levels.

This study is not without limitations, some of which offer interesting avenues for future research—first, the relatively small sample. A sample of 126 firms and 630 firm-year observations may be considered small in the broad strategic management literature; however, it is consistent with sample sizes of similar research approaches using content analysis and selecting only firms with comparable scope of operations, competition domain and age (Miller and Chen, 1996a, 1996b; Andrevski and Ferrier, 2019). Second, selecting a services industry sample of firms listed on a single stock market may limit the generalizability of the results found

in this study. On the other hand, this selection ensured that all firms were competing in similar industries and market environments, with comparable access to financial resources and had similar early growth ambitions.

The third limitation of this study arises from the nature of the data collection approach. Our study relies on data from structural content analysis based on the manual codification of competitive actions and action types extracted from the firms' annual reports. Validity issues can be raised concerning the annual report information's bias and the codifiers' bias (we rely on what is published in the annual reports and is captured by the codifiers). Additional information sources and data source triangulation could serve to reduce the information bias. In this study, to avoid the codifiers' bias, we triangulated the results of the several codifiers and solved possible disagreements. Future research could use text-mining techniques that could reduce the codifiers' bias while at the same could help to cover a larger number of information sources (allowing information triangulation), NVs, countries and stock markets. The fourth limitation concerns the measurement of repertoire complexity. Although we use several well-established indicators that measure various aspects of repertoire complexity and our approach combines them into a more nuanced concept of repertoire complexity, the selection of indicators and weights could be contested, and the implications of each indicator may be confounded in a combined measure. On the positive side, this measure provides a more comprehensive indicator of complexity.

Finally, though we rely on established theory to theorize about the drivers of the patterns of complexity, we obtain these patterns inductively using a pattern discovery technique. It would be interesting to further examine the drivers and implications by explicitly exploring the effect of the argued determinants. These patterns can serve as a basis for theorizing about their consequences and antecedents and testing the theories. For example, we have previously suggested that it would be interesting to assess from a dynamic perspective

how the evolving characteristics of the management team may influence pattern formation in terms of their overall complexity of actions and in terms of their emphasis on more entrepreneurial (innovative and longer-term focused) vs strategic (operational and efficiency-focused) actions. Future research could as well assess the impact on other performance measures, such as profitability, which seems essential for sustainable long-term growth and the ability of the NV to raise funds subsequently to continue to support the development of the NV.

In practice, as entrepreneurs and founding teams sense the opportunities and assemble the resources and capabilities to seize them, they must be conscious that the entrepreneurial process is dynamic. They must subsequently take actions to develop the range of capabilities needed in the short-term (to exploit the opportunity) for survival and in the long-term to sustain the competitive advantage, considering that the complexity of choices taken today affects the sequence of future choices through the path-dependent evolution of organizational capabilities. This should help entrepreneurs and managers reflect on whether they are on the right track, looking not only at present but also at the medium and long term, and think about whether they need to change their competitive trajectory.

Finally, NV growth is an essential source of wealth creation. Therefore, it is worth making progress in understanding the factors that drive, in particular, the employment growth of NVs in connection with the patterns of the complexity of the competitive repertoires. Competitive complexity is not only a key aspect of competitive behaviours, but its evolution reflects the scope and trajectory of capability development, considering the cumulative nature of the process of building knowledge, skills, and experience. The above limitations offer opportunities for further research, such as delving deeper into the drivers and consequences of alternative patterns of the complexity of NVs in a broader context and considering other relevant measures of NV growth and performance, including the capability to subsequently raise the funding to sustain the firm's development and its competitive advantage. We believe in the promise of addressing

the multiple questions about the drivers and outcomes of strategic decisions affecting the competitive repertoire of NVs hinted at by the conclusions of this dissertation.

REFERENCES

Abdi, H. *et al.* (2005) 'DISTATIS: The analysis of multiple distance matrices', in *2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'05)-Workshops*. IEEE, p. 42.

Aguilera, R. V and Jackson, G. (2010) 'Comparative and international corporate governance', *Academy of Management annals*, 4(1), pp. 485–556.

Aldrich, H. (1999) 'Evolving Organisations'. London: Sage Publications.

Aldrich, H. and Yang, T. (2014) 'How do entrepreneurs know what to do? Learning and organizing in new ventures', *Journal of Evolutionary Economics*, 24(1), pp. 59–82.

Allinson, C. W., Chell, E. and Hayes, J. (2000) 'Intuition and entrepreneurial behaviour', *European Journal of Work and Organizational Psychology*, 9(1), pp. 31–43.

Amerise, I. L. (2017) 'CLUSTERING PANELS OF SHORT TIME SERIES.', *Statistica & Applicazioni*, 15(1).

Andrevski, G. and Ferrier, W. J. (2019) 'Does it pay to compete aggressively? Contingent roles of internal and external resources', *Journal of Management*, 45(2), pp. 620–644.

Arellano, M. and Bond, S. (1991) 'Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations', *The Review of Economic Studies*, 58(2), pp. 277–297. doi: 10.2307/2297968.

Argote, L. (2011) 'Organizational learning research: Past, present and future', *Management learning*, 42(4), pp. 439–446.

Ashby, W. R. (1957) 'An introduction to cybernetics'.

Assaf, A. G. and Tsionas, M. G. (2019) 'Revisiting shape and moderation effects in curvilinear models', *Tourism Management*, 75, pp. 216–230.

Badillo, E. R. and Moreno, R. (2016) 'What drives the choice of the type of partner in R&D cooperation? Evidence for Spanish manufactures and services', *Applied Economics*, 48(52), pp. 5023–5044. doi: 10.1080/00036846.2016.1170932.

Barge-Gil, A. and López, A. (2014) 'R&D determinants: Accounting for the differences between research and development', *Research Policy*, 43(9), pp. 1634–1648. doi: doi:10.1016/j.respol.2014.04.017.

Barnett, W. P. and Burgelman, R. A. (1996) 'Evolutionary perspectives on strategy', *Strategic Management Journal*, 17(S1), pp. 5–19.

Barney, J. (1991) 'Firm resources and sustained competitive advantage', *Journal of management*, 17(1), pp. 99–120.

Baron, D. P. (1995) 'Integrated strategy: Market and nonmarket components', *California management review*, 37(2), pp. 47–65.

Bartlett, C. A. and Ghoshal, S. (2002) 'Building competitive advantage through people', *MIT Sloan management review*, 43(2), p. 34.

Beckman, C. M. (2006) 'The influence of founding team company affiliations on firm behavior', *Academy of Management Journal*, 49(4), pp. 741–758. doi: 10.5465/AMJ.2006.22083030.

Beckman, C. M. and Burton, M. D. (2008) 'Founding the future: Path dependence in the evolution of top management teams from founding to IPO', *Organization science*, 19(1), pp. 3–24.

Ben-Oz, C. and Greve, H. R. (2015) 'Short-and long-term performance feedback and absorptive capacity', *Journal of Management*, 41(7), pp. 1827–1853.

Bettis, R. A. and Weeks, D. (1987) 'Financial returns and strategic interaction: The case of instant photography', *Strategic Management Journal*, 8(6), pp. 549–563.

Biggadike, E. R. (1979) *Corporate diversification: Entry, strategy, and performance*. Division of Research, Graduate School of Business Administration, Harvard ….

Bingham, C. B. and Davis, J. P. (2012) 'Learning sequences: Their existence, effect, and evolution', *Academy of Management Journal*, 55(3), pp. 611–641.

Bingham, C. B. and Eisenhardt, K. M. (2011) 'Rational heuristics: the "simple rules" that strategists learn from process experience', *Strategic management journal*, 32(13), pp. 1437–1464.

Bird, B. J. (1992) 'The operation of intentions in time: The emergence of the new venture', *Entrepreneurship Theory and Practice*, 17(1), pp. 11–20.

Blank, S. (2013) 'Why the lean start-up changes everything', *Harvard business review*, 91(5), pp. 63–72.

Brock, G. *et al.* (2011) 'clValid: Validation of clustering results', *R package version 0.6-4*.

Bruderl, J. and Schussler, R. (1990) 'Organizational mortality: The liabilities of newness and adolescence', *Administrative science quarterly*, pp. 530–547.

Brush, C. G., Greene, P. G. and Hart, M. M. (2001) 'From initial idea to unique advantage: The entrepreneurial challenge of constructing a resource base', *Academy of Management Perspectives*, 15(1), pp. 64–78.

Brush, C. G., Manolova, T. S. and Edelman, L. F. (2008) 'Properties of emerging organizations: An empirical test', *Journal of business venturing*, 23(5), pp. 547–566.

Calabretta, G., Gemser, G. and Wijnberg, N. M. (2017) 'The interplay between intuition and rationality in strategic decision making: A paradox perspective', *Organization Studies*, 38(3–4), pp. 365–401.

Calvino, F., Criscuolo, C. and Menon, C. (2015) 'Cross-country evidence on start-up dynamics'.

Capron, L., Dussauge, P. and Mitchell, W. (1998) 'Resource redeployment following horizontal acquisitions in Europe and North America, 1988–1992', *Strategic management journal*, 19(7), pp. 631–661.

Carmona-Lavado, A., Cuevas-Rodríguez, G. and Cabello-Medina, C. (2010) 'Social and organizational capital: Building the context for innovation', *Industrial Marketing Management*, 39(4), pp. 681–690.

Carnes, C. M. *et al.* (2019) 'How Competitive Action Mediates the Resource Slack–Performance Relationship: A Meta-Analytic Approach', *Journal of Management Studies*, 56(1), pp. 57–90.

Carter, N. M. *et al.* (1994) 'New venture strategies: Theory development with an empirical base', *Strategic Management Journal*, 15(1), pp. 21–41.

Cavusgil, S. T., Chan, K. and Zhang, C. (2003) 'Strategic orientations in export pricing: a clustering approach to create firm taxonomies', *Journal of International Marketing*, 11(1), pp. 47–72.

Celuch, K., Murphy, G. B. and Callaway, S. K. (2007) 'More bang for your buck: Small firms and the importance of aligned information technology capabilities and strategic flexibility', *The Journal of High Technology Management Research*, 17(2), pp. 187–197.

Chandler, A. D. (1962) 'Strategy and structure. Cambridge, MA: MIT Press'.

Chandler, G. N., McKelvie, A. and Davidsson, P. (2009) 'Asset specificity and behavioral uncertainty as moderators of the sales growth—Employment growth relationship in emerging ventures', *Journal of Business Venturing*, 24(4), pp. 373–387.

Chen, H. *et al.* (2017) 'Munificence, dynamism, and complexity: How industry context drives corporate sustainability', *Business Strategy and the Environment*, 26(2), pp. 125–141. doi: 10.1002/bse.1902.

Chen, J., Chen, M.-J. and Tsai, W. (2017) 'Time Horizon Diversity, Competitive Repertoire Balance, and Firm Performance', in *Academy of Management Proceedings*. Academy of Management Briarcliff Manor, NY 10510, p. 11305.

Chen, J., Miller, D. and Chen, M.-J. (2019) 'Top management team time horizon blending and organizational ambidexterity', *Strategic Organization*, p. 1476127019883669.

Chen, J. and Nadkarni, S. (2017) 'It's about time! CEOs' temporal dispositions, temporal leadership, and corporate entrepreneurship', *Administrative Science Quarterly*, 62(1), pp. 31–66.

Chen, M. (1996) 'Competitor analysis and interfirm rivalry: Toward a theoretical integration', *Academy of management review*, 21(1), pp. 100–134.

Chen, M. and Hambrick, D. C. (1995) 'Speed, stealth, and selective attack: How small firms differ from large firms in competitive behavior', *Academy of management journal*, 38(2), pp. 453–482.

Chen, M. and Miller, D. (1994) 'Competitive attack, retaliation and performance: an expectancy-valence framework', *Strategic Management Journal*, 15(2), pp. 85–102.

Chen, M. and Miller, D. (2012) 'Competitive dynamics: Themes, trends, and a prospective research platform', *The Academy of Management Annals*, 6(1), pp. 135–210.

Chen, M. and Miller, D. (2015) 'Reconceptualizing competitive dynamics: a multidimensional framework', *Strategic Management Journal*, 36(5), pp. 758–775.

Chen, M., Smith, K. G. and Grimm, C. M. (1992) 'Action characteristics as predictors of competitive responses', *Management science*, 38(3), pp. 439–455.

Chen, M., Su, K. H. and Tsai, W. (2007) 'Competitive tension: The awareness-motivation-capability perspective', *Academy of Management Journal*, 50(1), pp. 101–118. doi: 10.5465/AMJ.2007.24162081.

Child, J. (1972) 'Organizational structure, environment and performance: The role of

strategic choice', *sociology*, 6(1), pp. 1–22.

Chiu, Y.-C. and Liaw, Y.-C. (2009) 'Organizational slack: is more or less better?', *Journal of Organizational Change Management*, 22(3), pp. 321–342.

Choi, Y. R. and Shepherd, D. A. (2004) 'Entrepreneurs' decisions to exploit opportunities', *Journal of management*, 30(3), pp. 377–395.

Churchill, N. and Lewis, V. (1983) 'The five stages of small business growth', *Harvard Business Review*, 61(3), p. 30.

Clarysse, B., Bruneel, J. and Wright, M. (2011) 'Explaining growth paths of young technology-based firms: structuring resource portfolios in different competitive environments', *Strategic Entrepreneurship Journal*, 5(2), pp. 137–157.

Coad, A. (2007a) 'A closer look at serial growth rate correlation', *Review of Industrial Organization*, 31(1), pp. 69–82.

Coad, A. (2007b) 'Exploring the" mechanics" of firm growth: evidence from a short-panel VAR'.

Coad, A. (2009) *The growth of firms: A survey of theories and empirical evidence*. Edward Elgar Publishing.

Coad, A. (2010) 'Neoclassical vs evolutionary theories of financial constraints: Critique and prospectus', *Structural Change and Economic Dynamics*, 21(3), pp. 206–218.

Coad, A. *et al.* (2013) 'Growth paths and survival chances: An application of Gambler's Ruin theory', *Journal of Business Venturing*, 28(5), pp. 615–632.

Coad, A. *et al.* (2014) 'Whom do high-growth firms hire?', *Industrial and Corporate Change*, 23(1), pp. 293–327.

Coad, A., Cowling, M. and Siepel, J. (2017) 'Growth processes of high-growth firms as a four-dimensional chicken and egg', *Industrial and Corporate Change*, 26(4), pp. 537–554.

Coad, A., Daunfeldt, S.-O. and Halvarsson, D. (2018) 'Bursting into life: Firm growth and growth persistence by age', *Small Business Economics*, 50(1), pp. 55–75.

Coad, A., Frankish, J. S. and Storey, D. J. (2020) 'Too fast to live? Effects of growth on survival across the growth distribution', *Journal of Small Business Management*, 58(3), pp. 544–571.

Coad, A. and Rao, R. (2010) 'Firm growth and R&D expenditure', *Economics of Innovation and New Technology*, 19(2), pp. 127–145.

Cohen, W. M. and Levinthal, D. A. (1990) 'Absorptive capacity: A new perspective on learning and innovation', *Administrative science quarterly*, 35(1), pp. 128–152.

COM (2019) *The European Green Deal*. Brussels. Available at: https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf.

Connelly, B. L. *et al.* (2017) 'Competitive repertoire complexity: Governance antecedents and performance outcomes', *Strategic Management Journal*, 38(5), pp. 1151–1173.

Cope, J. (2005) 'Toward a dynamic learning perspective of entrepreneurship',

Entrepreneurship theory and practice, 29(4), pp. 373–397.

Criscuolo, C., Gal, P. N. and Menon, C. (2014) 'The dynamics of employment growth: New evidence from 18 countries'.

D'Aveni, R. A., Dagnino, G. B. and Smith, K. G. (2010) 'The age of temporary advantage', *Strategic management journal*, 31(13), pp. 1371–1385.

Dahl, M. S. and Klepper, S. (2015) 'Whom do new firms hire?', *Industrial and Corporate Change*, 24(4), pp. 819–836.

Dai, Y. *et al.* (2017) 'Ambidexterity in new ventures: The impact of new product development alliances and transactive memory systems', *Journal of business research*, 75, pp. 77–85.

Daunfeldt, S.-O. and Halvarsson, D. (2015) 'Are high-growth firms one-hit wonders? Evidence from Sweden', *Small Business Economics*, 44(2), pp. 361–383.

David, P. A. (2001) 'Path dependence, its critics and the quest for "historical economics"', *Evolution and path dependence in economic ideas: Past and present*, 15, p. 40.

Davidsson, P. (2006) 'Nascent entrepreneurship: empirical studies and developments', *Foundations and Trends® in Entrepreneurship*, 2(1), pp. 1–76.

Davidsson, P., Achtenhagen, L. and Naldi, L. (2010) *Small firm growth*. Now Publishers Inc.

Davidsson, P., Delmar, F. and Wiklund, J. (2006) *Entrepreneurship and the Growth of Firms*. Edward Elgar Publishing.

Delmar, F. (2006) 'Measuring growth: methodological considerations and empirical results', *Entrepreneurship and the Growth of Firms*, 1(1), pp. 62–84.

Delmar, F., Davidsson, P. and Gartner, W. B. (2003) 'Arriving at the high-growth firm', *Journal of business venturing*, 18(2), pp. 189–216.

Delmar, F., McKelvie, A. and Wennberg, K. (2013) 'Untangling the relationships among growth, profitability and survival in new firms', *Technovation*, 33(8–9), pp. 276–291.

Dencker, J., Gruber, M. and Shah, S. (2009) 'Individual and opportunity factors influencing job creation in new firms', *Academy of Management journal*, 52(6), pp. 1125–1147. doi: 10.5465/AMJ.2009.47084648.

Derfus, P. J. *et al.* (2008) 'The Red Queen effect: Competitive actions and firm performance', *Academy of Management Journal*, 51(1), pp. 61–80.

Dess, G. G. and Beard, D. W. (1984) 'Dimensions of organizational task environments', *Administrative Science Quarterly*, pp. 52–73.

Dess, G. G. and Davis, P. S. (1984) 'Porter's (1980) generic strategies as determinants of strategic group membership and organizational performance', *Academy of Management journal*, 27(3), pp. 467–488.

Diamantopoulos, A., Fritz, W. and Hildebrandt, L. (2013) *Quantitative Marketing and Marketing Management: Marketing Models and Methods in Theory and Practice*. Springer.

Diambeidou, M. B. *et al.* (2008) 'An empirical taxonomy of start-up firms' growth trajectories', *The dynamics between entrepreneurship, environment and education*, p. 193.

Dianoux, C. *et al.* (2019) 'Nudge: A relevant communication tool adapted for agile innovation', *Journal of Innovation Economics Management*, (1), pp. 7–27.

Dierickx, I. and Cool, K. (1989) 'Asset stock accumulation and sustainability of competitive advantage', *Management science*, 35(12), pp. 1504–1511.

Donati, C. (2017) 'Service industries, growth dynamics and financial constraints', *Service Industries Journal*, 37(3–4), pp. 190–205. doi: 10.1080/02642069.2017.1304927.

Douglas, E. J. (2013) 'Reconstructing entrepreneurial intentions to identify predisposition for growth', *Journal of Business Venturing*, 28(5), pp. 633–651.

Dunne, P. and Hughes, A. (1994) 'Age, size, growth and survival: UK companies in the 1980s', *The Journal of Industrial Economics*, pp. 115–140.

Dunnett, C. W. (1980) 'Pairwise multiple comparisons in the unequal variance case', *Journal of the American Statistical Association*, 75(372), pp. 796–800.

Eisenhardt, K. M., Furr, N. R. and Bingham, C. B. (2010) 'CROSSROADS—Microfoundations of performance: Balancing efficiency and flexibility in dynamic environments', *Organization science*, 21(6), pp. 1263–1273.

Eisenhardt, K. M. and Martin, J. A. (2000) 'Dynamic capabilities: what are they?', *Strategic management journal*, 21(10-11), pp. 1105–1121.

Eisenhardt, K. M. and Piezunka, H. (2011) 'Complexity theory and corporate strategy', *The SAGE handbook of complexity and management*, pp. 506–523.

Eisenhardt, K. M. and Schoonhoven, C. B. (1990) 'Organizational growth: Linking founding team, strategy, environment, and growth among US semiconductor ventures, 1978-1988', *Administrative Science Quarterly*, 35(3), pp. 504–529. doi: 10.2307/2393315.

Eisenmann, T. R. (2013) 'Entrepreneurship: A working definition', *Harvard Business Review*, 10.

Elbanna, S. and Child, J. (2007) 'Influences on strategic decision effectiveness: Development and test of an integrative model', *Strategic Management Journal*, 28(4), pp. 431–453.

European Parliament (2019) *Enabling SMEs' access to capital markets*, *EU Legislation in Progress*. Available at: https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/630311/EPRS_BRI(2018)630311_EN.pdf.

European Parliament and Council (2006) 'Regulation (EC) No 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No 3037/90 as well as certain EC Regula'.

Eurostat (2018) *Business demography statistics*. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Business_demography_statistics.

Eurostat (2020) *Structural business statistics overview*.

Evans, D. S. (1987) 'The relationship between firm growth, size, and age: Estimates for 100 manufacturing industries', *The journal of industrial economics*, pp. 567–581.

Ferrier, W. J. (2001) 'Navigating the Competitive Landscape: the Drivers and Consequences of Competive Aggressiveness', *The Academy of Management Journal*, 44(4), pp. 858–877. doi: 10.2307/3069419.

Ferrier, W. J. *et al.* (2002) 'The impact of performance distress on aggressive competitive behavior: A reconciliation of conflicting views', *Managerial and Decision Economics*, 23(4-5), pp. 301–316.

Ferrier, W. J. and Lee, H. (2002) 'Strategic aggressiveness, variation, and surprise: how the sequentian pattern of competitive rivalry influences stock market returns', *Journal of Managerial Issues*, 14(2), pp. 162–180.

Ferrier, W. J. and Lyon, D. W. (2004) 'Competitive repertoire simplicity and firm performance: The moderating role of top management team heterogeneity', *Managerial and decision economics*, 25(6-7), pp. 317–327.

Ferrier, W. J., Smith, K. G. and Grimm, C. M. (1999) 'The role of competitive action in market share erosion and industry dethronement: A study of industry leaders and challengers', *Academy of management journal*, 42(4), pp. 372–388.

Fiol, C. M. and Lyles, M. A. (1985) 'Organizational learning', *Academy of management review*, 10(4), pp. 803–813.

Freeman, J. and Engel, J. S. (2007) 'Models of innovation: Startups and mature corporations', *California Management Review*, 50(1), pp. 94–119.

Frigotto, M. L., Coller, G. and Collini, P. (2014) 'Exploration and exploitation from start-up to sale: A longitudinal analysis through strategy and MCS practices', in *Exploration and Exploitation in Early Stage Ventures and SMEs*. Emerald Group Publishing Limited.

Garnsey, E. (1998) 'A theory of the early growth of the firm', *Industrial and corporate change*, 7(3), pp. 523–556.

Garnsey, E., Stam, E. and Heffernan, P. (2006) 'New Firm Growth: Exploring Processes and Paths', *Industry and Innovation*, 13(1), pp. 1–20. doi: 10.1080/13662710500513367.

Gartner, W. B. (1985) 'A conceptual framework for describing the phenomenon of new venture creation', *Academy of management review*, 10(4), pp. 696–706.

Gartner, W. B. (1988) '"Who is an entrepreneur?" is the wrong question', *American journal of small business*, 12(4), pp. 11–32.

Garud, R., Kumaraswamy, A. and Karnøe, P. (2010) 'Path dependence or path creation?', *Journal of Management Studies*, 47(4), pp. 760–774.

Geroski, P. A. (1995) 'What do we know about entry?', *International Journal of Industrial Organization*, 13(4), pp. 421–440.

Geroski, P. A. (2005) 'Understanding the implications of empirical work on corporate growth rates', *Managerial and Decision Economics*, 26(2), pp. 129–138.

Gersick, C. J. G. (1994) 'Pacing strategic change: The case of a new venture', *Academy of management journal*, 37(1), pp. 9–45.

Gibrat, R. (1931) 'Les inégalités économiques: applications: aux inégalitês des richesses, à la concentration des entreprises, aux populations des villes, aux statistiques des familles, etc: d'une loi nouvelle: la loi de l'effet proportionnel.'

Gilbert, B. A., Mcdougall, P. P. and Audretsch, D. B. (2006) 'New Venture Growth: A Review and Extension', *Journal of Management*, 32(6), pp. 926–950. doi: 10.1177/0149206306293860.

Giorgino, T. (2009) 'Computing and visualizing dynamic time warping alignments in R: the dtw package', *Journal of statistical Software*, 31(7), pp. 1–24.

Gnyawali, D. R., He, J. and Madhavan, R. (2006) 'Impact of co-opetition on firm competitive behavior: An empirical examination', *Journal of Management*, 32(4), pp. 507–530. doi: 10.1177/0149206305284550.

Grant, R. M. (1996) 'Toward a knowledge-based theory of the firm', *Strategic management journal*, 17(S2), pp. 109–122.

Greve, H. R. (2008) 'A behavioral theory of firm growth: Sequential attention to size and performance goals', *Academy of Management Journal*, 51(3), pp. 476–494.

Gruber, M. (2004) 'Marketing in new ventures: theory and empirical evidence', *Schmalenbach business review*, 56(2), pp. 164–199.

Gruber, M., MacMillan, I. and Thompson, J. (2012) 'From minds to markets how human capital endowments shape market opportunity identification of technology start-ups', *Journal of Management*, 38(5), pp. 1421–1449.

Guerras-Martín, L. Á., Madhok, A. and Montoro-Sánchez, Á. (2014) 'The evolution of strategic management research: Recent trends and current directions', *BRQ Business Research Quarterly*, 17(2), pp. 69–76.

Haans, R. F. J., Pieters, C. and He, Z.-L. (2016) 'Thinking about U: Theorizing and testing U- and inverted U-shaped relationships in strategy research', *Strategic Management Journal*, 37(7), pp. 1177–1195. doi: 10.1002/smj.2399.

Hambrick, D. C., Cho, T. S. and Chen, M.-J. (1996) 'The influence of top management team heterogeneity on firms' competitive moves', *Administrative science quarterly*, pp. 659–684.

Hambrick, D. C. and Mason, P. A. (1984) 'Upper echelons: The organization as a reflection of its top managers', *Academy of management review*, 9(2), pp. 193–206.

Hannan, M. T. and Freeman, J. (1977) 'The population ecology of organizations', *American journal of sociology*, 82(5), pp. 929–964.

Harms, R. (2015) 'Self-regulated learning, team learning and project performance in entrepreneurship education: Learning in a lean startup environment', *Technological forecasting and social change*, 100, pp. 21–28.

Harms, R. and Schwery, M. (2020) 'Lean startup: Operationalizing lean startup capability and testing its performance implications', *Journal of small business management*, 58(1), pp.

200–223.

Hart, M. M., Stevenson, H. H. and Dial, J. (1995) 'Entrepreneurship: a definition revisited', *Frontiers of entrepreneurship research*, 15(3), pp. 54–63.

Hastie, R. (2001) 'Problems for judgment and decision making', *Annual review of psychology*, 52(1), pp. 653–683.

Henderson, A. D. (1999) 'Firm strategy and age dependence: A contingent view of the liabilities of newness, adolescence, and obsolescence', *Administrative Science Quarterly*, 44(2), pp. 281–314.

Hennig, C. (2007) 'The fpc Package'.

Henrekson, M. and Johansson, D. (2010) 'Gazelles as job creators: a survey and interpretation of the evidence', *Small business economics*, 35(2), pp. 227–244.

Hillman, A. J. and Keim, G. D. (2001) 'Shareholder value, stakeholder management, and social issues: what's the bottom line?', *Strategic management journal*, 22(2), pp. 125–139.

Hitt, M. A. *et al.* (2001) 'Strategic entrepreneurship: Entrepreneurial strategies for wealth creation', *Strategic management journal*, 22(6-7), pp. 479–491.

Hitt, M. A. *et al.* (2002) 'Strategic entrepreneurship: Integrating entrepreneurial and strategic management perspectives', *Strategic entrepreneurship: Creating a new mindset*, 1, p. 16.

Hitt, M. A., Boyd, B. K. and Li, D. (2004) 'The state of strategic management research and a vision of the future, Research Methodology in Strategy and Management (Research Methodology in Strategy and Management, Volume 1)'. Emerald Group Publishing Limited.

Hitt, M. A., Ireland, R. D. and Stadter, G. (1982) 'Functional importance and company performance: Moderating effects of grand strategy and industry type', *Strategic management journal*, 3(4), pp. 315–330.

Den Hond, F. (1996) 'A Capabilities Perspective on the Firm', *Search of a Useful Theory of Environmental Strategy*, pp. 49–74.

Huber, G. P. (1991) 'Organizational learning: The contributing processes and the literatures', *Organization science*, 2(1), pp. 88–115.

Hughes-Morgan, M., Ferrier, W. J. and Labianca, G. (2011) 'The joint effect of top management team heterogeneity and competitive behavior on stock returns and risk', *The Handbook of Research on Top Management Teams, Edward Elgar, Cheltenham*, pp. 261–283.

Hughes-Morgan, M., Kolev, K. and Mcnamara, G. (2018) 'A meta-analytic review of competitive aggressiveness research', *Journal of Business Research*, 85, pp. 73–82.

Ireland, R. D. *et al.* (2001) 'Integrating entrepreneurship and strategic management actions to create firm wealth', *Academy of Management Perspectives*, 15(1), pp. 49–63.

Jenkinson, T., Ljungqvist, A. and Ljungqvist, A. P. (2001) *Going public: The theory and evidence on how companies raise equity finance*. Oxford University Press on Demand.

Johnson, S. and Van de Ven, A. H. (2017) 'A framework for entrepreneurial strategy', in Hitt, M. A. et al. (eds) *Strategic entrepreneurship: Creating a new mindset*. Wiley Online Library,

pp. 66–85.

Jovanovic, B. (1982) 'Selection and the Evolution of Industry', *Econometrica: Journal of the Econometric Society*, pp. 649–670.

Kaufman, L. and Rousseeuw, P. J. (2009) *Finding groups in data: an introduction to cluster analysis*. John Wiley & Sons.

Keats, B. W. and Hitt, M. A. (1988) 'A Causal Model of Linkages Among Environmental Dimensions, Macro Organizational Characteristics, and Performance', *Academy of Management Journal*, 31(3), pp. 570–598. doi: 10.5465/256460.

Keck, S. L. (1997) 'Top Management Team Structure: Differential Effects by Environmental Context', *Organization Science*, 8(2), pp. 143–156. doi: 10.1287/orsc.8.2.143.

Kirzner, I. M. (1997) 'Entrepreneurial discovery and the competitive market process: An Austrian approach', *Journal of economic Literature*, 35(1), pp. 60–85.

Kor, Y. Y. (2003) 'Experience-Based top management team competence and sustained growth', *Organization Science*, 14(6), pp. 707–719. doi: 10.1287/orsc.14.6.707.24867.

Krausert, A. (2019) 'From Time Compression Diseconomies to Lag Effects: A Temporal Perspective on HRM', in *Academy of Management Proceedings*. Academy of Management Briarcliff Manor, NY 10510, p. 12827.

Krishnan, H. A. and Park, D. (2005) 'A few good women—on top management teams', *Journal of Business Research*, 58(12), pp. 1712–1720. doi: 10.1016/j.jbusres.2004.09.003.

Kritikos, A. S. (2014) 'Entrepreneurs and their impact on jobs and economic growth', *IZA World of Labor*.

Krugman, P. (1991) 'Geography and Trade. Cambridge', *MIT Press.. 1991b. Increasing returns and economic geography. Journal of Political Economy*, 99(31), pp. 483–499.

Lacetera, N., Cockburn, I. M. and Henderson, R. (2004) 'Do firms change capabilities by hiring new people? A study of the adoption of science-based drug discovery', in *Business strategy over the industry lifecycle*. Emerald Group Publishing Limited, pp. 133–159.

Lamberg, J. *et al.* (2009) 'Competitive dynamics, strategic consistency, and organizational survival', *Strategic Management Journal*, 30(1), pp. 45–60.

Larrañeta, B., Zahra, S. A. and Galán González, J. L. (2014) 'Strategic repertoire variety and new venture growth: The moderating effects of origin and industry dynamism', *Strategic Management Journal*, 35(5), pp. 761–772. doi: 10.1002/smj.2103.

Larrañeta, B., Zahra, S. A. and González, J. L. G. (2012) 'Enriching strategic variety in new ventures through external knowledge', *Journal of Business Venturing*, 27(4), pp. 401–413.

Lefebvre, V., Certhoux, G. and Radu-Lefebvre, M. (2020) 'Sustaining trust to cross the Valley of Death: A retrospective study of business angels' investment and reinvestment decisions', *Technovation*, p. 102159.

Leiblein, M. J. and Reuer, J. (2019) 'Foundations and futures of strategic management', *Available at SSRN 3396754*.

Lengnick-Hall, C. A., Beck, T. E. and Lengnick-Hall, M. L. (2011) 'Developing a capacity for

organizational resilience through strategic human resource management', *Human resource management review*, 21(3), pp. 243–255.

Levinthal, D. A. and March, J. M. (1993) 'The myopia of learning', *Strategic Management Journal*, 14(2), pp. 95–112.

Levinthal, D. A. and Marino, A. (2015) 'Three facets of organizational adaptation: Selection, variety, and plasticity', *Organization Science*, 26(3), pp. 743–755.

Levitt, B. and March, J. G. (1988) 'Organizational learning', *Annual review of sociology*, 14(1), pp. 319–338.

Liu, W. (2006) 'Knowledge exploitation, knowledge exploration, and competency trap', *Knowledge and Process Management*, 13(3), pp. 144–161.

Lockett, A. *et al.* (2011) 'Organic and Acquisitive Growth: Re-examining, Testing and Extending Penrose's Growth Theory', *Journal of Management Studies*, 48(1), pp. 48–74. doi: 10.1111/j.1467-6486.2009.00879.x.

Lombardo, R. (2016) 'Is there also a North–South Divide in the Diffusion of Crime? A Cluster Analysis of Italian Provinces', *Review of Development Economics*, 20(2), pp. 443–455.

Lööf, H. and Nabavi, P. (2014) 'Survival, productivity and growth of new ventures across locations', *Small Business Economics*, 43(2), pp. 477–491. doi: 10.1007/s11187-014-9553-9.

Lopez-Cabrales, A., Valle, R. and Herrero, I. (2006) 'The contribution of core employees to organizational capabilities and efficiency', *Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management*, 45(1), pp. 81–109.

Lumpkin, G. T. and Brigham, K. H. (2011) 'Long–term orientation and intertemporal choice in family firms', *Entrepreneurship Theory and Practice*, 35(6), pp. 1149–1169.

Lumpkin, G. T. and Dess, G. G. (1995) 'Simplicity as a strategy-making process: The effects of stage of organizational development and environment on performance', *Academy of Management Journal*, 38(5), pp. 1386–1407.

Lumpkin, G. T. and Dess, G. G. (1996) 'Clarifying the entrepreneurial orientation construct and linking it to performance', *Academy of management Review*, 21(1), pp. 135–172.

Lumpkin, G. T. and Dess, G. G. (2006) 'The effect of "simplicity" on the strategy – performance relationship: A note', *Journal of management Studies*, 43(7), pp. 1583–1604. doi: 10.1111/j.1467-6486.2006.00652.x.

Lumpkin, G. T., Wales, W. J. and Ensley, M. D. (2006) 'Entrepreneurial orientation effects on new venture performance: The moderating role of venture age.', in *Academy of Management Proceedings*. Academy of Management Briarcliff Manor, NY 10510, pp. N1–N6.

MacMillan, I., McCaffery, M. L. and Van Wijk, G. (1985) 'Competitors' responses to easily imitated new products—Exploring commercial banking product introductions', *Strategic Management Journal*, 6(1), pp. 75–86.

Madrian, B. C. and Shea, D. F. (2001) 'The power of suggestion: Inertia in 401 (k) participation and savings behavior', *The Quarterly journal of economics*, 116(4), pp. 1149–1187.

Maechler, M. (2018) 'Finding Groups in Data'': Cluster Analysis Extended Rousseeuw et',

R Packag. version 2.0, 6.

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

Martín-de-Castro, G. *et al.* (2006) 'Organizational capital as competitive advantage of the firm', *Journal of Intellectual Capital*.

McDougall, P. P. *et al.* (1994) 'The effects of industry growth and strategic breadth on new venture performance and strategy content', *Strategic management journal*, 15(7), pp. 537–554.

McDougall, P. P. and Robinson Jr, R. B. (1990) 'New venture strategies: An empirical identification of eight "archetypes" of competitive strategies for entry', *Strategic Management Journal*, 11(6), pp. 447–467.

McKelvie, A. and Wiklund, J. (2010) 'Advancing firm growth research: A focus on growth mode instead of growth rate', *Entrepreneurship theory and practice*, 34(2), pp. 261–288.

McKelvie, A., Wiklund, J. and Brattström, A. (2018) 'Externally acquired or internally generated? Knowledge development and perceived environmental dynamism in new venture innovation', *Entrepreneurship Theory and Practice*, 42(1), pp. 24–46.

McKnight, B. and Zietsma, C. (2018) 'Finding the threshold: A configurational approach to optimal distinctiveness', *Journal of Business Venturing*, 33(4), pp. 493–512.

McMullen, J. S. (2015) 'Entrepreneurial judgment as empathic accuracy: A sequential decision-making approach to entrepreneurial action', *Journal of Institutional Economics*, 11(3), pp. 651–681.

McMullen, J. S. and Dimov, D. (2013) 'Time and the entrepreneurial journey: The problems and promise of studying entrepreneurship as a process', *Journal of Management Studies*, 50(8), pp. 1481–1512.

McMullen, J. S. and Shepherd, D. A. (2006) 'Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur', *Academy of Management review*, 31(1), pp. 132–152.

Miles, R. E. *et al.* (1978) 'Organizational strategy, structure, and process', *Academy of management review*, 3(3), pp. 546–562.

Miller, C. C. and Ireland, R. D. (2005) 'Intuition in strategic decision making: friend or foe in the fast-paced 21st century?', *Academy of Management Perspectives*, 19(1), pp. 19–30.

Miller, D. (1986) 'Configurations of strategy and structure: Towards a synthesis', *Strategic management journal*, 7(3), pp. 233–249.

Miller, D. (1990) 'The Icarus Paradox: How Exceptional Companies Bring About Their Own Downfall: New Lessons in the Dynamics of Corporate Success', *Decline, and Reneval (HarperBusiness, New York)*.

Miller, D. (1992a) 'Environmental fit versus internal fit', *Organization science*, 3(2), pp. 159–178.

Miller, D. (1992b) 'The Icarus paradox: How exceptional companies bring about their own downfall', *Business Horizons*, 35(1), pp. 24–35.

Miller, D. (1993a) 'Some organizational consequences of CEO succession', *Academy of Management journal*, 36(3), pp. 644–659.

Miller, D. (1993b) 'The architecture of simplicity', *Academy of Management review*, 18(1), pp. 116–138.

Miller, D. (1996) 'Configurations revisited', *Strategic management journal*, 17(7), pp. 505–512.

Miller, D. *et al.* (1996) 'The evolution of strategic simplicity: Exploring two models of organizational adaption', *Journal of Management*, 22(6), pp. 863–887.

Miller, D. and Chen, M. (1994) 'Sources and consequences of competitive inertia: a study of the U. S. airline industry. , 39(1), 1-23.', *Administrative science quarterly*, 39(1), pp. 1–23.

Miller, D. and Chen, M. (1996a) 'Nonconformity in competitive repertoires: A sociological view of markets', *Social Forces*, 74(4), pp. 1209–1234.

Miller, D. and Chen, M. (1996b) 'The simplicity of competitive repertoires: An empirical analysis', *Strategic management journal*, 17(6), pp. 419–439.

Miller, D., Dröge, C. and Toulouse, J.-M. (1988) 'Strategic process and content as mediators between organizational context and structure', *Academy of Management Journal*, 31(3), pp. 544–569.

Miller, D. and Friesen, P. (1980) 'Archetypes of organizational transition', *Administrative Science Quarterly*, pp. 268–299.

Miner, A. S., Bassof, P. and Moorman, C. (2001) 'Organizational improvisation and learning: A field study', *Administrative science quarterly*, 46(2), pp. 304–337.

Mintzberg, H. (1979) 'The structuring of organisations', *Organizations*.

Mintzberg, H. (1987) 'The strategy concept I: Five Ps for strategy', *California management review*, 30(1), pp. 11–24.

Mintzberg, H., Ahlstrand, B. and Lampel, J. (1998) 'Strategy safary: a guided tour through the wilds of strategic management', *The Free Press, Simon & Schuster Inc.*

Mintzberg, H. and Quinn, J. B. (1998) *Readings in the strategy process*. Prentice Hall Upper Saddle River, NJ.

Miozzo, M. and DiVito, L. (2016) 'Growing fast or slow?: Understanding the variety of paths and the speed of early growth of entrepreneurial science-based firms', *Research Policy*, 45(5), pp. 964–986.

Del Monte, A. and Papagni, E. (2003) 'R&D and the growth of firms: Empirical analysis of a panel of Italian firms', *Research Policy*, 32(6), pp. 1003–1014. doi: 10.1016/S0048-7333(02)00107-5.

Montero, P. and Vilar, J. A. (2014) 'TSclust: An R package for time series clustering', *Journal of Statistical Software*, 62(1), pp. 1–43.

Mousa, F.-T., Wales, W. J. and Harper, S. R. (2015) 'When less is more: EO's influence upon funds raised by young technology firms at IPO', *Journal of Business Research*, 68(2), pp. 306–313.

Nadkarni, S., Chen, T. and Chen, J. (2016) 'The clock is ticking! Executive temporal depth, industry velocity, and competitive aggressiveness', *Strategic Management Journal*, 37(6), pp. 1132–1153.

Nag, R., Hambrick, D. C. and Chen, M. (2007) 'What is strategic management, really? Inductive derivation of a consensus definition of the field', *Strategic management journal*, 28(9), pp. 935–955.

Nagel, C. (2016) 'Behavioural strategy and deep foundations of dynamic capabilities–Using psychodynamic concepts to better deal with uncertainty and paradoxical choices in strategic management', *Global Economics and Management Review*, 21(1–2), pp. 46–64.

Ndofor, H. A., Sirmon, D. G. and He, X. (2011) 'Firm resources, competitive actions and performance: investigating a mediated model with evidence from the in-vitro diagnostics industry', *Strategic Management Journal*, 32(6), pp. 640–657.

Nelson, R. R. (1991) 'Why do firms differ, and how does it matter?', *Strategic management journal*, 12(S2), pp. 61–74.

Nokelainen, T. (2008) 'A typology of competitive actions', *Tampereen teknillinen yliopisto. Julkaisu-Tampere University of Technology. Publication; 725*.

Norman, P. M., Artz, K. W. and Martinez, R. J. (2007) 'Does it pay to be different? Competitive non-conformity under different regulatory regimes', *Journal of Business Research*, 60(11), pp. 1135–1143.

O'Reilly III, C. A. and Tushman, M. L. (2008) 'Ambidexterity as a dynamic capability: Resolving the innovator's dilemma', *Research in organizational behavior*, 28, pp. 185–206.

OECD (2015) *New Approaches to SME and Entrepreneurship Financing: Broadening the Range of Instruments*. Paris. doi: https://doi.org/10.1787/9789264240957-en.

Offstein, E. H. and Gnyawali, D. R. (2005) 'CEO compensation and firm competitive behavior: Empirical evidence from the US pharmaceutical industry', *Journal of Engineering and Technology Management*, 22(3), pp. 201–225.

Penrose, E. (1959) *The theory of the growth of the firm*. Oxford, B. Blackwell.

Penrose, E. (2009) *The Theory of the Growth of the Firm*. Oxford university press.

Pisano, G. P. (1994) 'Knowledge, integration, and the locus of learning: An empirical analysis of process development', *Strategic management journal*, 15(S1), pp. 85–100.

Porter, M. E. (1980) 'Competitive strategy: Techniques for analyzing industries and competitors', *Editorial Free Pr, ISBN*, 13, p. 9780029253601.

Porter, M. E. (1985) 'Competitive Advantage: Creating and Sustaining Superior Performance. Free Press: N. Y'. New York.

Porter, M. E. (1991) 'Towards a dynamic theory of strategy', *Strategic management journal*, 12(S2), pp. 95–117.

Porter, M. E. (2001) 'The value chain and competitive advantage', *Understanding Business Processes*, pp. 50–66.

Powell, W. W., Koput, K. W. and Smith-Doerr, L. (1996) 'Interorganizational collaboration

and the locus of innovation: Networks of learning in biotechnology', *Administrative science quarterly*, pp. 116–145.

Prahalad, Ck. H. and Hamel, G. (1990) 'G.(1990).-"The Core Competence of the Corporation"', *Harvard Business Review*, 68(3), pp. 295–336.

Prinzie, A. and Van den Poel, D. (2006) 'Incorporating sequential information into traditional classification models by using an element/position-sensitive SAM', *Decision Support Systems*, 42(2), pp. 508–526.

Quinn, J. B. (1980) *Strategies for change: Logical incrementalism*. Irwin Professional Publishing.

R Core Team (2013) 'R: A language and environment for statistical computing', *R Foundation for statistical computing, Vienna*.

Rahmandad, H. (2012) 'Impact of growth opportunities and competition on firm-level capability development trade-offs', *Organization science*, 23(1), pp. 138–154.

Rauch, A. *et al.* (2009) 'Entrepreneurial orientation and business performance: An assessment of past research and suggestions for the future', *Entrepreneurship theory and practice*, 33(3), pp. 761–787.

Rauch, A., Frese, M. and Utsch, A. (2005) 'Effects of human capital and long–term human resources development and utilization on employment growth of small–scale businesses: A causal analysis', *Entrepreneurship theory and practice*, 29(6), pp. 681–698.

Rindova, V., Ferrier, W. J. and Wiltbank, R. (2010) 'Value from gestalt: how sequences of competitive actions create advantage for firms in nascent markets', *Strategic Management Journal*, 31(13), pp. 1474–1497.

Rindova, V. P. and Fombrun, C. J. (1999) 'Constructing competitive advantage: the role of firm–constituent interactions', *Strategic management journal*, 20(8), pp. 691–710.

Robinson, K. C. and Phillips McDougall, P. (2001) 'Entry barriers and new venture performance: a comparison of universal and contingency approaches', *Strategic Management Journal*, 22(6-7), pp. 659–685.

Roodman, D. (2006) 'How to Do xtabond2', *IDEAS Working Paper Series from RePEc*, 9(1), p. n/a. doi: 10.2139/ssrn.982943.

Roodman, D. (2009) 'How to do xtabond2: An introduction to difference and system GMM in Stata', *Stata Journal*, 9(1), pp. 86–136. doi: 10.2139/ssrn.982943.

Sarstedt, M. and Mooi, E. (2014) 'Cluster Analysis. In a Concise Guide to Market Research'. Springer Berlin, Heidelberg.

Schoar, A. (2010) 'The divide between subsistence and transformational entrepreneurship', *Innovation policy and the economy*, 10(1), pp. 57–81.

Schuler, R. S. and Jackson, S. E. (1987) 'Linking competitive strategies with human resource management practices', *Academy of Management Perspectives*, 1(3), pp. 207–219.

Schumacher, C. (2020) 'Biased Interpretation of Performance Feedback: The Role of CEO Overconfidence', *Strategic Management Journal*. doi: 10.1002/smj.3138.

Schumpeter, J. (1942) 'Creative destruction', *Capitalism, socialism and democracy*, 825, pp. 82–85.

Shane, S. (2009) 'Why encouraging more people to become entrepreneurs is bad public policy', *Small business economics*, 33(2), pp. 141–149.

Shane, S. and Venkataraman, S. (2000) 'The promise of entrepreneurship as a field of research', *Academy of management review*, 25(1), pp. 217–226.

Shepherd, D. A., McMullen, J. S. and Jennings, P. D. (2007) 'The formation of opportunity beliefs: Overcoming ignorance and reducing doubt', *Strategic Entrepreneurship Journal*, 1(1-2), pp. 75–95.

Shepherd, D. A., Souitaris, V. and Gruber, M. (2020) 'Creating New Ventures: A review and research agenda', *Journal of Management*, p. 0149206319900537.

Shepherd, D. A. and Wiklund, J. (2009) 'Are we comparing apples with apples or apples with oranges? Appropriateness of knowledge accumulation across growth studies', *Entrepreneurship Theory and Practice*, 33(1), pp. 105–123.

Shi, W. and Prescott, J. E. (2011) 'Sequence patterns of firms' acquisition and alliance behaviour and their performance implications', *Journal of Management Studies*, 48(5), pp. 1044–1070.

Short, J. C. *et al.* (2010) 'The concept of "opportunity" in entrepreneurship research: Past accomplishments and future challenges', *Journal of management*, 36(1), pp. 40–65.

Singer, J. D. and Willett, J. B. (2003) *Applied longitudinal data analysis : modeling change and event occurrence*. Oxford University Press.

Singh, J. V (1986) 'Performance, slack, and risk taking in organizational decision making', *Academy of management Journal*, 29(3), pp. 562–585.

Sinha, S. (2015) 'The exploration–exploitation dilemma: a review in the context of managing growth of new ventures', *Vikalpa*, 40(3), pp. 313–323.

Smith, K. G., Ferrier, W. J. and Grimm, C. M. (2001) 'King of the hill: Dethroning the industry leader', *Academy of Management Perspectives*, 15(2), pp. 59–70.

Smith, K. G., Ferrier, W. J. and Ndofor, H. (2001) 'Competitive dynamics research: Critique and future directions', *Handbook of strategic management,* 315, p. 361.

Smith, K. G., Grimm, C. M. and Grannon, M. J. (1992) *Dynamics of competitive strategy*. Newbury Park, CA: SAGE Publications.

Stam, E. *et al.* (2008) 'Employment growth of new firms', *Centre for Technology Management (CTM) Working Paper*, (2008/02).

Steiner, G. (1979) *A.(1979) Strategic Planning: What Every Manager Must Know*. The Free Press, New York.

Stevenson, H. and Jarillo, C. (1990) 'A paradigm of entrepreneurship as a field of research', *Academy of Management Review*, 3, pp. 45–57.

Stinchcombe, A. L. (1965) 'Organizations and social structure', *Handbook of organizations*, 44(2), pp. 142–193.

Suchman, M. C. (1995) 'Managing legitimacy: Strategic and institutional approaches', *Academy of management review*, 20(3), pp. 571–610.

Teece, D. J. (2007) 'Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance', *Strategic management journal*, 28(13), pp. 1319–1350.

Teece, D. J. (2019) 'A capability theory of the firm: an economics and (strategic) management perspective', *New Zealand Economic Papers*, 53(1), pp. 1–43.

Teece, D. J., Pisano, G. and Shuen, A. (1997) 'Dynamic capabilities and strategic management', *Strategic management journal*, 18(7), pp. 509–533.

Teece, D., Peteraf, M. and Leih, S. (2016) 'Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy', *California Management Review*, 58(4), pp. 13–35.

Venkataraman, S. and Van de Ven, A. (1998) 'Hostile environmental jolts, transaction set, and new business', *Journal of Business Venturing*, 13(3), pp. 231–255.

Venkatraman, N., Lee, C.-H. and Iyer, B. (2007) 'Strategic ambidexterity and sales growth: A longitudinal test in the software sector', in *Unpublished Manuscript (earlier version presented at the Academy of Management Meetings, 2005)*. Citeseer.

Weiblen, T. and Chesbrough, H. W. (2015) 'Engaging with startups to enhance corporate innovation', *California management review*, 57(2), pp. 66–90.

Weick, K. E. (1979) 'The social psychology of organizing Addison-Wesley', *Reading, MA*.

Weick, K. E. (1998) 'Introductory essay—Improvisation as a mindset for organizational analysis', *Organization science*, 9(5), pp. 543–555.

Wennberg, K. (2013) 'Managing high-growth firms: A literature review', in *Background Paper for OECD LEED Programme Workshop on "Management and Leadership Skills in High-Growth Firms", Warsaw*.

Wernerfelt, B. (1984) 'A resource-based view of the firm', *Strategic management journal*, 5(2), pp. 171–180.

Whetten, D. A. (1987) 'Organizational growth and decline processes', *Annual review of sociology*, 13(1), pp. 335–358.

Wiklund, J., Davidsson, P. and Delmar, F. (2003) 'What do they think and feel about growth? An expectancy–value approach to small business managers' attitudes toward growth', *Entrepreneurship theory and practice*, 27(3), pp. 247–270.

Wiklund, J. and Shepherd, D. (2003) 'Aspiring for, and achieving growth: The moderating role of resources and opportunities', *Journal of management studies*, 40(8), pp. 1919–1941.

Wiklund, J. and Shepherd, D. A. (2011) 'Where to from here? EO-as-experimentation, failure, and distribution of outcomes', *Entrepreneurship Theory and Practice*, 35(5), pp. 925–946.

Williams, J. R. (1992) 'How sustainable is your competitive advantage?', *California management review*, 34(3), pp. 29–51.

Williamson, O. E. (1999) 'Strategy research: governance and competence perspectives', *Strategic management journal*, 20(12), pp. 1087–1108.

Williamson, O. E. (2008) 'Outsourcing: Transaction cost economics and supply chain management', *Journal of supply chain management*, 44(2), pp. 5–16.

Windmeijer, F. (2000) 'Moment conditions for fixed effects count data models with endogenous regressors', *Economics Letters*, 68(1), pp. 21–24.

Windmeijer, F. (2005) 'A finite sample correction for the variance of linear efficient two-step GMM estimators', *Journal of Econometrics*, 126(1), pp. 25–51. doi: 10.1016/j.jeconom.2004.02.005.

Winter, S. G. (2003) 'Understanding dynamic capabilities', *Strategic management journal*, 24(10), pp. 991–995.

Wright, P. M., McMahan, G. C. and McWilliams, A. (1994) 'Human resources and sustained competitive advantage: a resource-based perspective', *International journal of human resource management*, 5(2), pp. 301–326.

Wright, P. M. and Snell, S. A. (1998) 'Toward a unifying framework for exploring fit and flexibility in strategic human resource management', *Academy of management review*, 23(4), pp. 756–772.

Yang, T. and Aldrich, H. (2011) 'All organizations were once new: revisiting stinchcombe's liability of newness hypothesis University of North Carolina-Chapel Hill'.

Yasuda, T. (2005) 'Firm growth , size , age and behavior in Japanese manufacturing', *Small Business Economics*, 24(1), pp. 1–15. doi: https://doi.org/10.1007/s11187-005-7568-y.

Youndt, M. A., Subramaniam, M. and Snell, S. A. (2004) 'Intellectual capital profiles: An examination of investments and returns', *Journal of Management studies*, 41(2), pp. 335–361.

Young, G., Smith, K. G. and Grimm, C. M. (1996) '"Austrian" and industrial organization perspectives on firm-level competitive activity and performance', *Organization science*, 7(3), pp. 243–254.

Zahra, S. A. and George, G. (2002) 'Absorptive capacity: A review, reconceptualization, and extension', *Academy of management review*, 27(2), pp. 185–203.

Zahra, S. A., Ireland, R. D. and Hitt, M. A. (2000) 'International expansion by new venture firms: International diversity, mode of market entry, technological learning, and performance', *Academy of Management journal*, 43(5), pp. 925–950.

ANNEXES

Annex 1. Competitive actions, categories, subcategories and other classifications

Table 27. Overview of the specific competitive actions types, categories, subcategories and classification in organic versus externalisation actions

Cat code	Action category	Subcat code	Action subcategory	Action type	Type code	Action type description	Code	Organic/ external
1	DEVELOPMENT	1	DEVELOPMENT_PS	RD_PS	1	Research and development products/services and technologies	rdp	organic
				DISCARD_DEV_PS	2	Discard research and development products/services and technologies	drd	organic
				ADVANCE_DEV	3	Advance research and development products/services and technologies	ard	organic
		2	TRIALS_TOTAL	TRIALS	4	Prototypes and trials	tr	organic
			DEVELOPMENT_INT	RD_INTERNAL	5	Research and development internal processes or systems (marketing, operations).	rdi	organic
				DISCARD_DEV_INT	6	Discard research and development internal processes or systems	dri	organic
		3	INVEST_RD_TOTAL	INVEST_RD	7	Investment in research capacities	ird	organic
				TECH_RIGHTS_IN	8	Acquisition of technology, rights. Patent in/Property rights/Technology in/License in	pi	organic
				LICENSE_TEC_IN	9	Obtaining licenses (technological)	lit	organic
		4	PATENT_APP_TOTAL	PATENT_APP	10	Patent filing or granting	pag	organic
2	OPERATIONS	5	CAPACITY	CAP_INC_ADJUST_COM	11	Capacity increases or adjustments commercial	rccom	organic
				CAP_INC_ADJUST_PROD	12	Capacity increases or adjustments production	rcprod	organic
				CAPACITY_REDUCTIONS	13	Capacity reductions	cr	organic
		6	OP_EFF_TOTAL	OP_EFF_ENHANCEMENT	14	Enhancement of operational efficiencies/Internal process adjustment	ip	organic
				PROCUREMENT	15	Enhancement of procurement processes	proc	organic
		7	HR	HR_RECRUITMENT	16	Recruitment	hrr	organic
				HR_DOWNSIZING	17	Major personal downsizing	hrd	organic
				HR_REINFORCEMENT	18	Personal training, improving of payment schemes	hrt	organic
3	MARKETING	8	COM_BRAND_PROM_T	COM_BRAND_PROM	19	Communication, branding and promotions	cb	organic
		9	PRICE_T	PRICE	20	Price measures	p	organic

Cat code	Action category	Subcat code	Action subcategory	Action type	Type code	Action type description	Code	Organic/ external
		10	DIST_CHANNEL_T	DIST_CHANNEL	21	Improvement of distribution channels	dc	organic
		11	SALES_FORCE_T	SALES_FORCE	22	Enhancement of sales capacities	sf	organic
		12	CUSTOMER_SERVICE_T	CUSTOMER_SERVICE	23	Customer Service	cs	organic
4	PRODUCT_SERVICES	13	NEW_PRODUCT_SERV_T	NEW_PRODUCT_SERV	24	Products/services launches	ps	organic
		14	PRODUCT_SERV_MODIF_T	PRODUCT_SERV_MODIF	25	Products/services modifications	psm	organic
		15	DISCARD_PRODUCT_SERV_T	DISCARD_PRODUCT_SERV	26	Discard products/services	dps	organic
		16	PRODUCT_SERV_ROLLOUT_T	PRODUCT_SERV_ROLLOUT	27	Roll-out of product/services	psr	organic
5	OTHER_CORPORATE	17	INTERNAL_OTHERS	TENDERING	28	Tendering activities (for public sector contracts and private sector)	ten	organic
				LAWSUITS	29	Lawsuits	law	organic
		18	ORG_EFFICIENCY	HR_TMT	30	Changes in tmt	hr	organic
				STRUCTURAL_CHANGES	31	Organizations reestructurations	str	organic
				CORPORATE_VENTURES	32	Corporate ventures	cv	organic
				BUSINESS_SALE	33	Business sales	bs	organic
				PARTIAL_BS	34	Partial business sale	pbs	organic
				COST_ADJ	35	Cost adjustment and cost control	c	organic
6	FIRM_ACQUISITION	19	ACQUISITIONS_TEC	ACQ_TEC	36	Technology oriented acquisitions and mergers	act	external
				PACQ_TEC	37	Technology oriented partial acquisitions	pact	external
		20	ACQUISITIONS_MARKET_OP	ACQ_MARKET	38	Market oriented acquisitions and mergers	acm	external
				ACQ_OP	39	Operation oriented acquisitions and mergers	aco	external
				PACQ_MARKET	40	Market oriented partial acquisitions	pacm	external
				PACQ_OP	41	Operation oriented partial acquisitions	paco	external
		21	FIRM_INVESTMENT	INVESTMENT_OTHER	42	Capital investments in other firms	io	external
				DIVESTMENT_OTHER	43	Capital divestment in other firms	do	external
				EXPL_BUSINESS_OPP	44	Exploring investment opportunities	exb	external
7	FIRM_COOPERATION	22	ALLIANCES_TEC	CATEC	45	Technology oriented customer agreements	catec	external

Cat code	Action category	Subcat code	Action subcategory	Action type	Type code	Action type description	Code	Organic/ external
				RCATEC	46	Reinforcement technology oriented customer agreements	rcatec	external
				COTEC	47	Technology oriented horizontal cooperation	cotec	external
				SUTEC	48	Technology oriented supplier agreements	sutec	external
				JV_TEC	49	Technology oriented joint ventures	jvt	external
				JV_UNIV	50	Technology oriented joint ventures with universities	jvu	external
				COOP_UNIV_TEC	51	Technology oriented cooperation with universities and research centers	allu	external
				LICENSES_OUT	52	Licenses out (technological)	lo	external
		23	ALLIANCES_MARKET_OP	CAM	53	Market oriented customer agreements	cam	external
				RCAM	54	Reinforcement market oriented customer agreements	rcam	external
				COM	55	Market oriented horizontal cooperation	com	external
				COOP	56	Operations oriented cooperation	coop	external
				SUOP	57	market oriented supplier cooperation (services)	suop	external
				JV_MARKET	58	Market oriented joint ventures	jvm	external
				COOP_UNIV_MARKET	59	Market oriented cooperation with universities	alluc	external
				LICENSES_IN_COM	60	Licenses in (commercial)	lic	external
				LICENSES_OUT_COM	61	Licenses out (commercial) B2B	loc	external
				DISTRIBUTION_AGREEMENTS	62	Distribution agreements	da	external
				FRANCHISING	63	Franchising	fra	external
				OUTSOURCING	64	Outsourcing	out	external
		24	OTHER_RELATIONS	MEMBERSHIP_ASSOC	65	Membership in associations	mf	external
				LOBBING	66	Lobbing activities (community, local autorithies)	pol	external
				TENTATIVE	67	Tentative relations	ti	external
				OTHER_REL	68	Other relations	or	external
		25	TERMINATIONS	TERMINATION	69	Termination of all type of relations	t	external
				PARTIAL_TER	70	Partial terminations	pt	external

Cat code	Action category	Subcat code	Action subcategory	Action type	Type code	Action type description	Code	Organic/ external
8	INTERNATIONALIZATION	26	DOWNSTREAM	I_DOWNSTREAM	71	International downstream activities	im	
				RED_DOWNSTREAM	72	Reduction international downstream activities	rdc	
				DISCARDMARKETS	73	Discard markets	dm	
		27	UPSTREAM	I_UPSTREAM	74	International upstream activities	imu	
				RED_UPSTREAM	75	Reduction international upstream activities	ruc	
				DISCARD_UPSTREAM	76	Discard upstream	du	