Organizational disruptions and firm performance

A quantitative study

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Publication date:
2012

Document Version
Tidlig version også kaldet pre-print

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June, 2012

Preface

This thesis could not have been accomplished without the help and support of a number of people. Firstly, I am grateful to my supervisors Michael S. Dahl and Olav Sorenson. Thank you for your invaluable inspiration and guidance. It has been a privilege being your PhD student. I am especially grateful to Michael for introducing me to the world of research in the first place, for encouraging me to write this dissertation and to pursue a career in academia and for co-authoring two of the papers contained in this thesis. I also want to thank Christina Guenther for her great co-authorship.

All of the papers that comprise this thesis have been presented at various conferences or seminars. I appreciate all of the suggestions and constructive criticism I have received. For their help in shaping this thesis, I thank the discussants and other participants at the DRUID Winter Conferences 2010 and 2011 in Rebild, the Schumpeter Conference 2010 in Aalborg, the DRUID Summer Conference 2010 in London, the EMAEE Conference 2011 in Pisa, the workshop on Unintended Organizational Change 2011 at the Max Planck Institute of Economics in Jena, the CCC Doctoral Student Conference 2011 at MIT in Boston and, finally, the participants at the Academy of Management in San Antonio in 2011.

During my PhD training, I also had the great opportunity to spend six months at the Scandinavian Consortium for Organizational Research (SCANCOR) at Stanford University in California. During my visit at SCANCOR, I was able to concentrate fully on my thesis during the final year of my PhD program. This focus helped me to clarify the objectives of my research, and I made considerable progress on my dissertation during these months. Moreover, SCANCOR provided a great opportunity to present my work and to interact with other scholars within my field of research. I have been very happy for the discussions I shared with the other SCANCOR scholars. I appreciate all your comments and feedback and, above all, I appreciate your friendship. You made my SCANCOR experience wonderful and unforgettable. In addition, my stay at SCANCOR provided a unique opportunity to present my work and receive feedback from leading scholars in my field. In that regard, I would like to thank the members of the Organizational Behavior group at the Stanford

Graduate School of Business. In particular, I owe many thanks to Glenn Carroll, Michael Hannan and Jesper Sørensen for taking the time to meet with me and comment on my research.

I would also like to thank to my colleagues at the Department of Business and Management and, in particular, my friends in the IKE and EOB research groups. I have benefited greatly from being part of such strong research communities. Thank you for your input, discussions and valuable feedback through seminars and during my pre-defense. I also want to thank Dorte Baymler and Jeanette Hvarregaard for assisting me in administrative matters and for creating a great working environment. Finally, I would like to acknowledge the Danish Social Science Research Council at the Danish Agency for Science, Technology and Innovation, which funded my PhD.

Above all, I wish to thank my family for their unconditional support, particularly my husband, Kristian. Thank you for tirelessly reading every version of my papers, for our many inspiring discussions, and for spending six wonderful months with me in California. Needless to say, without your support and encouragement, I would never have written this dissertation.

It goes without saying that I am solely responsible for the content and errors in this thesis.

Pernille Gjerløv-Juel

Aalborg, June 2012

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Chapter 1

Synopsis

1.1 Introduction

In his symposium on economic growth, Acemoglu (2012) emphasizes the role of organizations in recent studies on economic growth. *"Organizations play the role of coordinating economic activity and facilitating the use of existing technology"* (Acemoglu, 2012, p. 547). Improving firm performance and efficiency leads to economic gains. These economic gains can accrue and improve national competitiveness while leading to job creation and increasing tax revenues that support the welfare system. From a political and economic perspective, these benefits make organizational performance an interesting research topic.

Studies on organizational performance can be found in a wide range of disciplines from sociology to economics and management. While the environmental context plays an important role in organizational performance, many studies focus on the organizational characteristics as the determinants of performance. In his review of the literature on organizational routines, Becker (2004) describes the importance of organizational routines to firm efficiency. The routinization of organizational actions affects the functioning of the organization and hence its performance. These "patterns of organizational activity" may enhance the efficient coordination of tasks and the allocation of resources within the firm. Therefore, any factors that disrupt the internal processes of the organization affect its efficiency and thus performance.

Organizational disruptions are any events that alter organizational routines

or key features of the organization, thereby disrupting the internal organizational processes (Hannan and Freeman, 1977; Hannan and Freeman, 1984; Hannan and Freeman, 1989). These events can include both internal factors (e.g., a management decision or the loss of key employees) and external factors (e.g., a change in legislation). On one hand, organizational disruptions are sometimes essential to facilitate necessary organizational change and lead to positive performance outcomes (Tushman and Rosenkopf, 1996); on the other hand, these disruptions also involve a potentially troublesome process of response and/or remediation with possibly negative effects on the organization. While some studies argue in favor of organizational vulnerability to organizational disruptions, with inevitable consequences for employees and organizational performance (e.g., Hannan and Freeman (1984), Baron and Hannan (2002) and Dahl (2011)), others oppose this approach, arguing that organizations are already generally flexible and adaptive with fewer consequences for their employees and firm performance (e.g., Nelson and Winter (1982), Nadler and Tushman (1990) and Feldman (2000)). In response to this controversy, the primary research question of this paper-based thesis is as follows:

"What are the effects of organizational disruptions on firm performance?"

While the strength of structural inertia remains the subject of some disagreement, organizational ecologists still rely significantly on the premise that any shock to the key organizational features of a firm is disruptive to that firm's internal organizational processes with detrimental effects on firm performance (Hannan and Freeman, 1977; Hannan and Freeman, 1984; Hannan and Freeman, 1989; Hannan, 2005). Within the body of organizational ecology literature, previous studies have investigated the effects of organizational changes and disruptions on a firm's subsequent performance for a number of specific events, including managerial succession, technological change, regulatory change, the introduction of new products, and alterations to the organizational form (Carroll, 1984; Haveman, 1992; Barnett and Freeman, 2001; Baron and Hannan, 2002; Hannan et al., 2006; McKendrick and Wade, 2009; Dahl,

2011). Hannan et al. (2006) found that altering employment blueprints increases the hazard of exit in Silicon Valley start-ups. Similarly, Carroll (1984) found that publisher succession increases the hazard of exit in US newspaper organizations. These studies, however, focused on a limited number of disruptive and often endogenous events. Moreover, with Dahl (2011) as a notable exception, these studies' findings were relevant to specific industries.

The above arguments suggest that structural inertia might increase the vulnerability of firms to organizational disruptions. In other words, inert organizations, because of their greater resistance to change, might suffer significant setbacks in their performance in response to organizational disruptions. At the same time, however, organizational inertia implies a degree of accountability and reliability (Hannan and Freeman, 1984; Carroll and Hannan, 2000, Chapter 16). Furthermore, inertia implies the existence of routinized organizational behaviors and, possibly, of an optimized operational efficiency. Organizational activities require fewer resources when they are routinized, and routines enhance the efficient coordination of tasks and resources. Moreover, routines are built on prior experience, which may include experience in how to adapt to changing environments. In uncertain situations, organizational routines may chart a course of action (Cyert and March, 1963; Nelson and Winter, 1982; Cohen and Bacdayan, 1994; Tushman and Rosenkopf, 1996; Becker, 2004). However, because they are derived from previous experience, routines might not trigger an appropriate response to a new situation. Moreover, organizational inertia can retain the organization in a suboptimal position because it might legitimize inefficient behaviors (Nelson and Winter, 1982; Cohen and Bacdayan, 1994). Under these circumstances, organizational disruptions could benefit the organization by providing an opportunity to make the necessary organizational changes.

I argue that it is still largely an open question of *when* and at *what magnitude*, organizational disruptions will affect firm performance. For example, what types of organizational disruptions are likely to impact a firm's performance? How significant are these disruptions, and how does this differ for heterogeneous organizations? The three primary papers that are contained in this thesis and presented in Chapters 2-4 investigate various aspects of these questions. I investigate three different types of organizational disruptions and their

possible effects on a firms' subsequent performance. In the first paper, *"Heroes today but what about tomorrow? Gazelles and their long-term performance"*, I investigate the negative trade-off between an initially high rate of employment growth and firm performance in the long run (Chapter 2). I hypothesize that the inability to establish efficient organizational routines and structures and the eventually inevitable alterations in the initial organizational model explain the relatively poor long-term performance of gazelle companies. In Chapter 3, I present the paper *"The effects of top-employee migration and spin-offs on incumbent firms"*. This paper investigates the effects of different types of top-employee migration on firm performance. I argue that these events can trigger organizational disruptions, which may partly explain the frequently negative performance effects that result from top-employee migration. Following similar arguments, Chapter 4 investigates the performance effects from unexpected deaths in top management teams. The chapter is titled *"Who loses a leader without losing ground? Unexpected deaths in top management teams and firm performance"*. In addition to identifying the performance effect that result from an exogenous organizational shock, this paper investigates the organizational characteristics that can positively or negatively mediate the negative effect on the firm's subsequent performance. I hypothesize that stable, routinized and inert organizations are better prepared to handle this particularly type of organizational disruption, leading to higher post-death performance by these firms. This thesis also includes a fourth paper, Chapter 5, which serves as a background paper for Chapter 3. Chapter 5 is entitled *Spin-off growth and job creation: Evidence on Denmark"*, and it investigates the job creation capabilities of spin-off entrepreneurs in comparison with other new entrants. The final section provides a detailed summary of the four papers.

In the three primary papers that are presented in Chapters 2-4, organizational disruptions affect firm performance through various, but interrelated, elements of the organizations. The following section introduces the thesis' theoretical basis for explaining the process from an organizational disruption to the effects on firm performance. At the end of the section, Figure 1.1 provides a summary illustration of this theoretical foundation.

1.2 Key concepts in investigating the effects of organizational disruptions

It is important to make a clear distinction between organizational changes and organizational disruptions. While organizational disruptions includes organizational change, the reverse is not necessarily the case. Organizational ecologists only consider organizational changes to be disruptive when they alter the core features of the organization. Hence, the definition does not include peripheral organizational changes. Differentiating between core and peripheral organizational changes, Hannan and Freeman (1989) identify four core features of organizations. These are the organization's mission (stated goals), the form of authority, the core technology and the general marketing strategy (Hannan and Freeman, 1989; Hannan, 2005; Hannan et al., 2007). The structural inertia theory is not incompatible with the belief that organizations should have the ability and capacity to reorganize and adapt to changing environments. However, this ability is usually conceptualized, primarily with reference only to peripheral organizational changes. Core features of an organization may also be subject to (successful) modification, but because of inertial forces, the organization responds relatively slowly to these more central changes. Moreover, alterations to core features often result in multiple changes across the organization. Peripheral modifications by comparison can be isolated to a single routine or division of the organization. The following section explains this in more detail, presenting the concept structural inertia, which is the focal theoretical basis for answering the research question: what are the effects of organizational disruptions on firm performance?

Structural inertia and resistance to change

To explain the concept of structural inertia, I begin with an example that illustrates the strength and outcomes of inertial forces. Stinchcombe (1965) introduces the imprinting hypothesis, after observing that organizational characteristics (e.g., employment model and form of authority), generally persist over time. These characteristics continue to reflect the organization's founding contexts, even if substantial environmental changes have occurred in the intervening period, and more efficient organizational forms have developed. At the

time of its founding, an organization develops structures, routines and operations that function effectively in a particular environment and at a specific point in time. Moreover, the initial organizational form is limited by the available devices and social technology of the time. The original form becomes institutionalized over time and tends to remain relatively stable thereafter (Stinchcombe, 1965). At least two questions emerge from this observation: first, what are the sustaining forces within the organizations? Second, why are such organizations not outperformed by newer and potentially more efficient organizations? As to the latter question, Stinchcombe (1965) argues that it is not clear that the increased efficiency of new organizational forms is sufficient to dethrone older organizational forms. New organizational forms will not automatically replace existing ones simply because the former are generally more efficient. Firm production and productivity might rely more heavily on idiosyncratic resource endowments that were accumulated over time through experience and are based on learning and routinization, rather than on the resources from current activities (e.g., sales). Once an investment is made in idiosyncratic endowments, it becomes a type of sunk cost, i.e., irrelevant to considerations of current costs. This reflects a prioritization of the initial organizational form over potentially more competitive ones (Stinchcombe, 1965). This phenomenon of sunk costs might be sufficient to explain the persistence of initial structures.

Another preserving force that is highlighted by Stinchcombe is what he refers to as the *"traditionalizing forces, the vesting of interests, and the working out of ideologies"* (Stinchcombe, 1965, p. 169). This theory bears a strong resemblance to the structural inertia theory (Hannan, 2005). In introducing the concepts of organizational ecology and structural inertia, Hannan and Freeman (1977) argue that organizational structures contain a significant internal component, which increases the costs and heavily prolongs, or even prevents, the process of structural organizational changes. Hannan and Freeman (1977) list four internal structural constrains. First, in line with Stinchcombe (1965), they denominate an organization's investments in both physical and human capital as sunk costs. Moreover, these resources are not easily transferrable for fulfilling different tasks. The second constraint is a case of imperfect information. Because leaders rarely have full information on all activities within the

organization and the environmental constraints facing them, it is impossible to fully optimize the arrangement and functioning of organizational structures, and it may even be difficult to perceive the need to do so. Third, reorganization has the potential to disrupt the internal political equilibrium of an organization because it involves the redistribution of resources and authority among organizational members, oftentimes altering the prevailing hierarchies within the organization. Such disruptions are likely to spur resistance to reorganization, with short-run costs to the organization, which may discourage decision makers from restructuring plans. Fourth, in keeping with the arguments above, the organization gradually "routinizes" its production and the division of tasks and authority. Hannan and Freeman (1977) refer to this process as the emergence of normative agreements within the organization. Normative agreements help preserve organizational structures and constrain adaptive capacity, as they provide justification for the status quo and thus potentially disable an organization's ability and willingness to perceive and consider alternative models of operation, resulting in organizational inertia.

In Chapter 2, I illustrate the long-run organizational effects of imprinting. Organizations that experience an initial period of rapid growth will adopt an organizational form that is suited for that specific context. However, if growth rates eventually slow down and the initial organizational model becomes ill-suited to the shifting business climate, it can be a troublesome process to adapt to the new situation. This process of adaption can be a perilous exercise if core features of the organization are subject to change. Managers can even fail to perceive the need for making necessary changes. Moreover, structural changes may lack the necessary organizational support because routinization legitimizes the extant model of operations and hence supports the status quo. Finally, the restructuring of an organization can disrupt its internal political equilibrium, leading to further internal opposition toward these potentially inevitable organizational changes. This opposition both increases the costs associated with and prolongs the adaptation process, and in a worst-case scenario, such intransigence can result in firm failure. Similar mechanism are in play in Chapter 4, where I discuss the role of continuity in the top management team and the ways in which it preserves organizational structures and reinforces organizational inertia. I argue that this can lead to fewer and smaller organizational

changes in response to the exogenous shock of top management unexpected death.

Relying on a different line of reasoning, Argyris (1990) also argues in favor of organizational resistance to change. He refers to the notion of "organizational defense mechanisms", which, similar to organizational inertia, can make it increasingly difficult to detect and correct organizational errors. However, organizational defense mechanisms are distinct from the concept of organizational inertia: they are rules that are intended to prevent organizational members from experiencing embarrassment and threat. Because they are frequently and extensively used, these defensive actions are legitimized and become the norm. This develops into defense routines, and ignoring and hiding errors is considered not only appropriate but the rational response (Argyris, 1990). Moreover, these defense routines are reinforcing mechanisms that sustain the status quo, even in situations where self-examination and significant changes in actions are urgently called for (Argyris, 1996). The following section discusses the concept of organizational routines in more details.

In sum, because of inertial forces, the modification of the core features of an organization is a potentially conflictual and protracted process, involving moral and political opposition within the organization (Hannan and Freeman, 1989; Hannan, 2005; Hannan et al., 2007). However, structural inertia also implies the presence of increasingly routinized activities. As is discussed in the following section, this inertia may actually increase organizational efficiency. However, inert organizations may be more vulnerable to organizational disruptions with significant negative effects on organizational members and firm performance.

Organizational routines

I argue that organizational disruptions primarily affect performance through their negative effects on firm efficiency. One explanation for this drop in efficiency and performance involves the opposing, inertial forces that constitute organizational inertia, which are described in the section above. Another, perhaps more obvious effect on efficiency is the disruptive effect that core organizational change can have on organizational routines. In short, routines increase efficiency because they ensure the smooth functioning of organizations.

Through learning-by-doing experience and the formation of mutually reinforcing expectations by organizational members, recurrent patterns of activity become increasingly efficient. Routines improve the efficient coordination of tasks and allocation of resources by linking organizational (tacit) knowledge through the interactions of organizational members. Routines foster legitimacy, provide stability and direction, and in uncertain situations, routines can help organizational members to pick a course of action. Moreover, organizational activities require fewer resources when routinized, due to the semi-conscious nature of repeated actions (Cyert and March, 1963; Nelson and Winter, 1982; Cohen and Bacdayan, 1994; Becker, 2004). Therefore, when routines are disrupted or broken, one might expect the disruption to have a negative impact on a firm's performance. Moreover, because routines can increase efficiency, disrupted routines can lead to setbacks in a firm's relative efficiency, narrowing or eliminating its competitive advantage over other firms.

The disruption of organizational routines and the subsequent drop in efficiency and performance, underlie the central argument of the three focal papers presented in this thesis. For example, as discussed in Chapter 3 and Chapter 4, the loss of key employees through migration or death destabilizes organizational routines. The removal of one human link in the chain that constitutes an organizational routine represents a loss of the task-related knowledge that was associated with the organizational actions of a specific routine. Under these circumstances, the organization must restore or remediate the affected organizational routines. Re-establishing efficient patterns of activity involves re-instituting the tasks and restoring the knowledge of the employee that was lost. Moreover, it involves reforming the expectations of organizational members. As discussed in Chapter 3, top-employee migration can even result in the transfer of tacit knowledge and idiosyncratic routines to rival firms, harming the focal firm's competitive position.

Finally, even though the discussion above argues that organizational routines increase efficiency, they can also have the opposite effect. Recall that the routinizing of organizational behavior can spur the creation of normative agreements within the organization, leading to the legitimization and preservation of potentially suboptimal routines. In other words, organizational disruptions and the subsequent breaking down of potentially inefficient routines can have

positive effects on organizational performance in the long run. I return to this discussion in a later section.

Definition and application

The meaning of the concept of organizational routines is often implicitly understood, and no attempt is made to provide a precise definition. This implied definition stands for the three focal chapters of this thesis also. Therefore, the following section provides a brief discussion of the concept and its application in this thesis. I use the term "organizational routine" in a broad and flexible way, drawing on multiple definitions from the literature. Building on Becker's (2004) literature review on organizational routines, one reason for adopting this flexible understanding is that an unambiguous conceptualization of organizational routines does not exist in the literature today (Becker, 2004). More importantly, a precise and hence bounded definition of organizational routines does not serve the purpose of this thesis. First, I do not analyze or observe organizational routines per se, and my analyses do not depend on a distinct and measurable definition of the concept. Second, organizational disruptions, I argue, are likely to hit broadly, affecting several aspects of organizational routines. Third, these disruptions target different aspects of different organizations, depending on the type of disruption and organization. For these reasons, I do not employ one particular theoretical framework to define the concept of organizational routines; rather, I interpret the concept in broader terms in a manner that spans multiple dimensions in the literature. The following section introduces two general definitions that can be found in the literature. My interpretation and use of the concept of organizational routines draws on components from both.

The literature often defines organizational routines as either "behavioral regularities" or "cognitive regularities" or, simply, "behavior patterns" or "rules", respectively (Becker, 2004; Becker and Zirpoli, 2008). The first term, behavioral regularities, refers to recurrent patterns of activity. By repeating a task on a regular basis, an organization develops a pattern of action for how best to process this task. For example, standard phrases are adapted over time when approaching customers on the phone. In general, these are the patterns of activity and operational knowledge that underlie the entire process of transforming

inputs into outputs. The second term, cognitive regularities, refers to (codified) standard operating procedures, for example, the written guidelines on "best practices". However, *"even directives that appear to be in "plain English" often require interpretation in a manner that is quite specific to the organizational context"* (Nelson and Winter, 1982, p. 102). In other words, standard operating procedures, though documented, are never fully specified and still require context-specific, individual interpretation (Becker, 2004). Moreover, when organizational members follow these sets of rules, they often transform into behavioral patterns. Hence, the line between the two definitions is indistinct. My understanding of organizational routines embraces both, while putting greater emphasis on the former.

Many researchers describe routines as a collective phenomena involving multiple actors. Put differently, routines are the interplay of individual members' or subunits' routinized actions that make up the collective organizational routines. The literature makes a clear distinction between individual habits/rules and collective routines (Becker, 2004). However, I shall not attempt to separate the two in my interpretation and analysis. While I believe that organizational routines often emerge from and consist of interactions between multiple organizational members, I do not wish to leave out the possibility that individuals might carry out some (crucial) routines on their own as well. Furthermore, individuals, I argue, have the ability to trigger core organizational changes. For example, a manager might make a decision on his/her own to change an organization's strategy. As was emphasized in a previous section, such an action is likely to hit broadly, leading to multiple changes throughout the organization and to its routines. I will elaborate further on this below. Moreover, this might vary with different organizational characteristics, including the size of the organization, the type of routines, and the degree of individual specialization.

In Chapters 3 and 4, the organizational disruptions are triggered by individuals. In schematic terms, these events can affect routines in one of two ways. First, moving a central organizational member triggers a reorganization of roles within particular routines, thereby affecting collective organizational routines. The more routines he/she takes part in, the broader the disruption to the organization. Second, a top manager, for example, might carry the burden

of certain routines almost exclusively. These routines could include routines related to wage determination, strategic development or raising capital. Under these circumstances, an entire routine could be lost with him/her, triggering a potentially stronger, albeit similar reorganization, as others swoop in to fill this position. Therefore, the distinction between the collective and individual components of an organizational routines is neither necessarily meaningful nor essential. However, as this discussion illustrates, referring to individual routines can be misleading in the context of this thesis. The expected negative effects on firm performance are driven by the destabilization of collective routines or organizational change. The disruption of individual routines might be more accurately categorized, instead, as a loss of human capital.

Developing efficient routines

Developing efficient patterns of organizational activity takes time. Efficient routines evolve from learning-by-doing experience and stable repeated interactions between organizational members and involves the development of social trust relationships. Moreover, organizations continuously update and improve their existing routines (Tushman and Rosenkopf, 1996). As I argue above, the more routinized an organizational behavior becomes, the more efficient the production. However, while the argument for routinization's positive effect on productivity and performance may be intuitive, it is also important to note that organizational routines also affect an organization's ability to enhance existing routines and adapt to changing environments.

Nelson and Winter (1982) describe routines as the analogue of individual skills. The role of organizational routines, as well as individual skills, is to provide the capability (or choice) to ensure smooth functioning in a given context. Another shared characteristic of routines and skills is that both are programmatic and involve sequences of interdependent actions. Both routines and the exercising of skills involve numerous, but automatic, choices. Moreover, the knowledge underlying both routines and skillful performance is increasingly tacit knowledge and not easily articulated (Nelson and Winter, 1982, Chapter 4).

Nelson and Winter (1982) refer to organizational routines as "organizational memory": *"Essential coordinating information is stored in the routine functioning of the organization and remembered by doing"* (Nelson and Winter, 1982, p. 134). As I mentioned above, this also implies that routines are mostly based on tacit knowledge, built on experience. Cohen and Bacdayan (1994) extend this argument further, suggesting that organizational routines are stored and distributed as procedural memory by individuals (organizational members). First, this assumes that primarily recurrent organizational activities make up organizational routines (Becker, 2004). Moreover, it suggests that some organizations might be better at adapting to changing environments because they have experience with changing and adapting routines or because change and adaption are somehow built into some of the existing routines. This may include standardized procedures for searching for and developing new technologies and products. However, if decision rules are *"a legacy from the firm's past"* (Nelson and Winter, 1982, p. 165), they are unlikely to produce appropriate responses to novel, irregular or unexpected situations (Nelson and Winter, 1982). In addition, the routinizing of organizational behavior can lead to lock-in or accustomized behavior, which can make it difficult to escape prevailing routines, even in situations where these routines are suboptimal (Cohen and Bacdayan, 1994). *"Thus routines are like a two-edged sword. They allow efficient coordinated action, but also introduce risk of highly inappropriate response"* (Cohen and Bacdayan, 1994, p. 555). Cohen and Bacdayan (1994) also note that routines can include extraneous components or artifacts from previous periods. They argue that the procedural memories of organizational members partly explain this apparently non-rational organizational behavior and other counterintuitive properties of organizational routines, as well. Each members stores the repetitive actions that constitute routines as procedural (unconscious) memory (Cohen and Bacdayan, 1994). Cohen and Bacdayan (1994) emphasize the durability of procedural memory and its resistance to decay in explaining how routines transform into inert organizational behaviors.

As I have previously described, Chapter 2 offers an example of the negative consequences for firm performance that result when organizations are faced with the need to realign organizational actions. When growth rates decline,

firms might need to switch focus away from, for example, research and development and other expansionary efforts to focus on consolidating their position in existing markets. At the same time, these firms may wish to increase their efficiency through routinization, in response to increased competitive pressure. All of these efforts involve altering the prevailing organizational behavior and reallocating tasks and resources, with potentially negative effects on subsequent performance.

Organizational members

The above suggest that organizational disruptions may reduce firm performance because of organizational inertia and an inability to respond in a flexible manner. Opposing, inertial forces to change reflect the reactions of organizational members, and it is these same members who carry out the organizational routines. In other words, as Nelson and Winter (1982) describe it: *"An organization's behavior is, in a limited but important sense, reducible to the behavior of its members"* (Nelson and Winter, 1982, p. 172). Therefore, organizational members play a central role in shaping how organizational disruptions will affect a firm's performance. Developing and illustrating this argument in more detail, this section discusses the role of organizational members and defines the concept of organizational membership, itself.

When I refer to organizational members throughout this thesis, I am primarily referring to members within an organization, i.e., the employees, management team and owners. Sometimes, however, it is useful to consider external members, such as customers, suppliers and creditors. This situation is observed when organizational disruptions challenge organizational legitimacy, for example, or disrupt the social bonds of trust, which have negative consequences for firm performance. This situation is observed when an organization's credibility with external parties is built on social relationships that are contingent upon the credibility of individual organizational members. In Chapter 4, which investigates the impact of unexpected deaths in top management teams, we see that this scenario might be relevant to some organizations. A charismatic leader might be perceived as being synonymous with the organization he/she represents. The organization's credibility to external stakeholders and customers might therefore rely heavily on this one individual and potentially suffer

in the wake of that person's death.

In investigating the performance effects of organizational disruptions, my unit of analysis is the firm itself. Dahl (2011) moves this discussion (on the effects of organizational change) to the individual level, investigating the relationship between organizational changes and employee health. Because firm efficiency and performance rely primarily on employee productivity (Dahl, 2011), organizational members play a key role in this thesis, linking organizational routines and inertia with firm efficiency and performance. In other words, the effects of organizational disruptions on a firm's performance are primarily driven by its employees.

Dahl (2011) lists various explanations for why organizational change might spur negative emotions among employees. Changing core organizational features and structures can alter organizational reliability and accountability, shift the internal balance of power, and erode the implicit contract between employer and employees. As a result, organizational disruptions often engender the negative emotions of confusion and frustration, demotivation and dissatisfaction, leading to decreased employee loyalty and even significant psychological outcomes, such as employee stress (Dahl, 2011). Dahl found that significant organizational changes, particularly multiple concurrent changes, increase the risk that employees will receive stress-related medication. This finding has obvious implications for the structural inertia argument, underscoring the fact that core organizational changes can engender moral and political opposition within the firm (Hannan and Freeman, 1989). Changing organizational structures alters the political base and/or power status of certain members and involves the reallocation of organizational tasks and responsibilities. This process can give rise to uncertainty and frustration among employees regarding the future goals and direction of the organization. Moreover, the inevitable questions regarding one's own future role in the altered organization are also likely to spur frustration and uncertainty. Members may be wondering, "Will I be able to do as good a job when my tasks change? Am I going to get fired or lose status/authority within the organization?" Such questions reflect common employee frustrations and uncertainty and are likely to be relevant to all situations in the three focal papers presented here.

Employee dissatisfaction might arise when gazelle companies change their

initial organizational model. This scenario is discussed in Chapter 2. As was previously argued, this change might explain the negative trade-off between an initially high growth rate and a firm's performance over the long run. Even high-growth start-ups have the potential to become increasingly bureaucratic and routinized and to implement hierarchical structures. However, if their employees were attracted by and have grown accustomed to an entrepreneurial, innovative, and stimulating growth environment, such changes to the organizational model are likely to be met with resistance from organizational members. In Chapters 3 and 4, the internal political equilibrium is disrupted when firms lose key organizational members. These events are likely to trigger the reallocations of tasks and responsibilities and may potentially alter organizational routines and structures. Furthermore, in Chapter 4, I suggest that employees can experience the organizational shock from an unexpected death in top management and the subsequent structural changes as a violation of their psychological contract with the firm (Robinson and Rousseau, 1994; Morrison and Robinson, 1997). I argue that this shock can increase employee dissatisfaction and uncertainty, leading to reduced employee productivity and potentially higher rates of employee turnover.

From organizational disruption to firm performance

In sum, this thesis primarily builds on the organizational ecology literature, relying on the premise that organizations are inherently inert and hence resistant to change. I hypothesize that organizational disruptions are likely to have negative effects on a firm's performance, due to the internal opposition to change and involving disruptive and negative effects on organizational routines and efficiency. The mechanisms of this process rely heavily on the organizational members, and on employees in particular, making them the primary factor mediating the relationship between organizational disruptions and firm performance.

Figure 1.1 illustrates the sequence from the onset of an organizational disruption to an effect on firm performance and summarizes the key concepts that were discussed throughout this section. Organizations can experience a shock to one or more of their core features. Significant disruptions can spread throughout an organization, and organizational members play a central role in

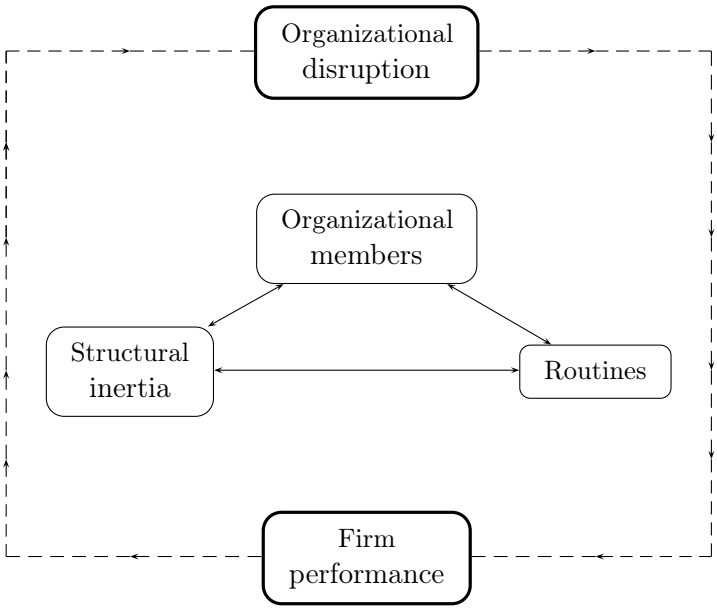

Figure 1.1: From organizational disruption to firm performance

determining the consequences of these disruptions for firm performance. Disruptions to firm efficiency are potentially detrimental to the firm's subsequent performance. This process and its outcomes are the common denominator of Chapters 2 to 4. I must emphasize that Figure 1.1 is not exhaustive in illustrating the sequence from a disruption to its effects on firm performance. Moreover, the arrows in Figure 1.1 do not represent causal relationships.

Finally, while organizational disruptions are potentially detrimental to firm performance, these events can also motivate organizational improvements and the acceptance of changes that eventually become inescapable. At the same time, other studies contradict the notion that organizations and routines are inert and resistant to change (Becker, 2004). For example, Feldman (2000) argues that routines are essential, not oppositional, to organizational flexibility and for facilitating significant change and adaptation. She argues that organizational members continuously reflect upon their actions, evaluate the

outcomes of routines, consider potential improvements, and adjust their actions accordingly. Essentially, *"engaging in organizational routines can be a process of learning"* (Feldman (2000), p. 625). I do not dispute the individual and collective ability of organizational members to learn and reflect and improve upon existing routines. However, while acknowledging the power of routines to facilitate incremental improvements and adaptation, the arguments contained in this thesis advocate primarily in favor of the competing notion. Thus, I do not argue that organizational routines are unable to accommodate significant changes. However, applying an organizational ecology theory perspective, I argue that changing the core features of organizations is a generally slow process because of the opposing, inertial forces in place and that sudden changes are generally disruptive and hazardous to organizational performance. I return to this discussion in the concluding section.

1.3 Method

All of the four papers that constitute this thesis are quantitative studies of organizational performance. The primary source for these empirical studies is the comprehensive, linked employer-employee database, the "Integreret Database for Arbejdsmarkedsforskning" ("Integrated Database for Labor Market Research"). The database is often referred to by its Danish acronym, IDA. This section provides an overview of the IDA and its applications.[1] I also discuss how I approached the evaluation of firm performance followed by a discussion of the strengths and limitations of the data and research approach.

Introducing the data

The IDA is maintained by Statistics Denmark, and it was developed specifically for research purposes. It contains longitudinal register data with information on all Danish plants, firms and individuals older than 16 years of age from 1980 onward. The data are collected annually, and the information refers to the month of November for any given year. The most recent data that were

[1] The separate papers provide a more detailed description of the data and its use.

available for the purpose of this thesis were from 2007.[2] Statistics Denmark collects the information in the IDA from the official registers of the Danish government. Because of the extensive nature of the Danish welfare system, these registers contain highly detailed information. For example, on the individual level, the IDA includes information on one's salary, wealth, education, work experience, unemployment, age, residence, cohabitation and family. On the firm level, the IDA provides information on a firm's accounting figures, ownership, start-up year, and industry among other variables. All (legitimate) firms have an identification number that is listed in the official tax registers. Similarly, all individuals have a social security number, which is automatically assigned at birth. These individual and firm identification numbers are anonymized in the IDA but can be linked together to trace employer-employee relations over time (Dahl, 2011). In addition, the IDA can be linked to the Entrepreneurship database. Relying on board and registration information, this database contains an annual census of the main founders of all new firms in Denmark from 1994 to 2004. The thesis also utilizes the available deceased dates for all individuals. This information is also provided by Statistics Denmark, and can be linked to the IDA. For a more extensive description of the IDA and a discussion of its uses and limitations, see Timmermans (2010).

The Danish longitudinal data receives international recognition for its value to social science research, and the IDA is increasingly being utilized (Dahl, 2011). Examples of previous studies using the IDA are: Albæk and Sørensen (1998), Sørensen and Sorenson (2007), Sørensen (2007), Dahl and Sorenson (2010), Nanda and Sørensen (2010) and Dahl (2011).

Firm performance

Organizations or groups can take many forms. For example, political parties, religious groups, sports clubs, charities, families, militaries and other public institutions just to name a few (Stinchcombe, 1965). I interpret the concept of "organizations" in a very narrow sense, excluding everything but commercial organizations, i.e., firms. I also excluded hobby and one-man businesses. While

[2] One exception to this is the paper in Chapter 5. The most recent data that were available when that paper was conducted were from 2006.

I acknowledge the economic significance of small businesses, I argue that the overriding purposes of these businesses are likely to be something other than profit maximization. I define hobby businesses as firms with no employees except for the founder. I do not dispute that larger companies might also pursue goals other than profit maximization, for example, corporate social responsibility. However, I will ignore this gray area throughout the thesis.

In line with the above definitions, my definition of firm performance is limited to measures of economic performance. I operationalize firm performance as firm failure, employment growth and sales growth. However, the IDA provides information on additional performance variables, including value added. While value added might seem to be an obvious candidate for assessing firm performance, several breaks in this variable due to changes in the method of accounting would have restricted the investigation period to only a few years. This restriction would have both lowered the number of subjects and limited the investigation to an assessment of more short-term effects. The IDA also contains data on profits, but a great number of missing observations for this category, in comparison with survival, employment and sales, would have invited similar problems. Regardless, Delmar et al. (2003) have identified sales and employment as the most commonly used measures of performance in empirical studies of firm growth. Moreover, they emphasize a number of shortcomings associated with the use of other growth indicators, which limit their applicability to certain industries and time periods. For these reasons, the three main articles contained in this thesis estimate the performance effects of organizational disruptions by assessing the post-disruption effects on firm sales, employment, and survival.

The three performance variables of sales, employment, and survival have different applications and serve different purposes in this thesis, depending on the research question, target audience and aim of the given paper. From an organizational ecology perspective, survival is the accepted and most easily understood measure of firm performance (Haveman, 1993; Barnett and Carroll, 1995). However, depending on the type of organizational disruption, firm failure can be an unhelpfully long-term indicator and therefore not always capturable within the observation period. Moreover, organizational disruptions might also have smaller and more short-lived effects on firm performance that

are not always detected in a survival analysis. From a firm-based perspective, sales might be a more interesting performance indicator than employment, assuming that the former better approximates profits. Moreover, sales are an indicator of demand. Two weaknesses of this performance indicator, however, are its sensitivity to inflation and currency exchange rates (Delmar et al., 2003). While the latter might only be problematic in comparative studies, I account for inflation by including only the real values of sales using the GDP deflator. Nonetheless, increased and sustainable job creation might be a higher priority for policymakers than sales growth, and it may makes sense to focus on employment growth and firm survival as indicators of firm performance, when concerned with the firms' economic contributions. However, one obvious drawback to using employment as a performance indicator is that it is affected by labor productivity and machine-for-man substitutions (Delmar et al., 2003). From both a political and firm-based perspective, other alternative and equally interesting performance variables could have been the subject of investigation, as well. For example, innovativeness and job satisfaction are highly relevant measures of firm performance. However, the data at hand restricts me from studying these aspects of performance.

Finally, it is important to note that organizational growth can be achieved in numerous ways, such as through organic or acquired growth. Moreover, patterns of growth vary significantly among heterogeneous organizations and over time and particularly with demographic factors, such as firm size, age, governance and industry (Delmar et al., 2003). I account, at least partly, for this by controlling for various firm characteristics, region, industry-, and time-specific factors. It is important to note that survival and firm exits from the market are not necessarily equivalent to success and failure, respectively. Exit is not always synonymous with bankruptcy. For example, a firm might close down because the founder retires. In the current context, the risk of mistaking mergers and acquisitions for failure is of greatest concern. With reference to the cases presented in Chapters 2 and 4, one could expect that the organizational disruptions in question might lead to mergers and acquisitions for some organizations. Accounting for this, I discounted firm exits in Chapters 2 and 4, when I suspected that a merger or an acquisition might have taken place.

Strengths and weaknesses of the data and methodological approach

In relation to this thesis, one obvious advantage of the IDA is that it provides observations on firms and employees over a period of consecutive years. Equally important, it spans a wide range of industries and heterogeneous organizations, encompassing the entire Danish economy. The degree of comprehensiveness differentiates this thesis from many previous studies on, for example, high-growth firms, labor mobility and organizational disruptions with a limited focus on specific industries. While industry-specific studies are helpful in developing and testing hypotheses, the question of generalizability often remains open. By exploiting the availability of comprehensive databases, this thesis extends and contributes to the findings from previous strudies, assessing if the results generalize to other industries (and economies). Moreover, these unique longitudinal databases allow for the development and testing of new hypothesis as well[3], thereby contributing both theoretically and empirically to the literature.

In comparison with more qualitative work and questionnaire surveys, I can construct and test objective measures of organizational disruptions. This objectivity is important, as firms undeniably differ in their perception of what constitutes an organizational disruption and the point at which they are detected, making self-reported surveys problematic. Similarly, asking firms to describe the performance-effects of a given event (e.g., top-employee migration) is likely to yield variable and imprecise responses. First, it is highly uncertain that firms are capable of providing such an estimate, even if they wanted to. Second, there is a risk of underestimation (or exaggeration) in self-report, especially if, for example, poor managerial abilities constitute part of the problem. In contrast, register data does not suffer from non-response bias, and the richness of the IDA data allowed me to adjust for the various empirical issues that plagued previous studies, such as the potential for endogeneity or selection bias. Furthermore, verifying that a theory applies widely and that the conclusions that derive from it are generalizable to most industries has a

[3]For example, the problematization of young high-growth firms in Chapter 2.

greater political impact and is more likely to arouse the general public's interest. Together with the development of new hypotheses and arguments, this approach helps to guide the political agenda as well, by demonstrating the need for an increased focus in a variety of areas. In other words, the empirical investigations that are contained in this thesis and build primarily on the IDA source data, have both economic and political implications. I shall return to this discussion in more detail in the concluding section.

Timmermans (2010) notes a number of limitations of the IDA. Two of these limitations are especially relevant for this thesis and include the presence of breaks in several variables and the late introduction of key variables. These problems affect, in particular, the observations related to industry and sales, which narrows the starting period of investigation in this thesis to either 1993 or 1995, depending on the research question at hand.[4] Nevertheless, this approach still left more than ten years of longitudinal data, which was sufficient for undertaking the empirical studies presented in this thesis. More importantly, however, Timmermans (2010) further mentions the limitations of annual observations and register data. First, while annual observations might be sufficient to study performance effects of organizational disruptions, some details are inevitably lost. Firms are likely to differ significantly in their short-run responses to organizational disruptions. However, the data at hand only allow for the identification of longer-term effects. Second, while the IDA has a number of advantages over survey data or qualitative studies, it also has disadvantages. One drawback of register data that is relevant for this thesis is the potential bias that comes from the omission of certain variables. This potential problem emerges because I cannot observe the exact circumstances surrounding the different types of focal organizational disruptions. In Chapter 3, for example, I do not know the cause of top-employee migration. More importantly, however, I do not know how top-employee migration might relate to both the firm's previous and subsequent performance. In this thesis, I address this uncertainty by estimating the magnitude and direction of the bias and with a matching approach. In Chapter 4, I eliminate the endogeneity-related issue of any potential correlation between the organizational disruption and a firm's

[4] I describe this in more detail in the separate chapters.

ex-ante performance by exploiting the exogenous variation in firm performance due to the unexpected deaths of top managers.

Finally, although I might succeed in eliminating potential problems of endogeneity, the data do not provide much information on how different firms deal with organizational disruptions. Do the firms prepare their employees for organizational change, and how? Do they exercise different managerial styles or differ in their organizational structure? Such factors will obviously influence how a given organizational disruption affects the organization and its subsequent performance. However, the data are not rich enough to enable an investigation of such idiosyncratic organizational responses and characteristics. While this deficiency does not necessarily affect the studies' validity, it limits the depth and the degree of detail. In other words, the available data limits the thesis' conclusions and, hence, limits its application to general firm characteristics based on the register data. This imply that the findings of this thesis are often limited to providing explorative hypotheses on "best practices" at the firm level. The ability to draw conclusions that offer immediately implementable advice on management or organizational forms, for example, would require interviews or survey data. The findings from such research efforts could supplement the analyses of this thesis by further exploring and confirming (or rejecting) the hypotheses provided here.

1.4 Conclusion

Organizations are not static entities. Changing markets, shifting demands and technological progress require organizations to adjust their activities. This condition suggests that organizations are generally flexible and adaptive (Nelson and Winter, 1982; Nadler and Tushman, 1990; Feldman, 2000). Hence, changing core organizational features can be a generally smooth process with little internal opposition and insignificant effects on the firm's subsequent performance. Furthermore, even though organizational disruptions can affect firm performance, the effect is not bound to be adverse. In fact, organizational disruptions can help inert organizations escape or improve upon their suboptimal routines. However, my findings suggest a different view on *the effects of organizational disruptions on firm performance*. The focal hypothesis of this thesis

suggests that the overall effect of organizational disruptions on firm performance is an adverse one. In this thesis, three empirical studies on different types of organizational disruptions support this view.

The previous sections presented three key mechanisms that elucidate the link between organizational disruptions and firm performance and suggest an overall negative correlation between the two. Figure 1.1 illustrates this process. The essence of the argument is that organizational disruptions primarily affect firm performance through their negative effect on firm efficiency thereby reducing competitiveness and thus performance. This drop in efficiency stems specifically from the disruption to organizational routines and from inertial forces opposing structural changes. Moreover, the organizational members drive both mechanisms. This process and its outcomes are the common denominator for the three focal papers that compose this thesis.

In addition to the literature presented throughout the previous sections, this thesis also embraces other fields of research. Each paper acknowledges the significance of multiple factors and the interdependency with other disciplines. I attempt to balance my hypotheses and empirical investigations to counteract a one-sided focus on organizational disruptions in explaining the performance effects of three different and potentially disruptive events. For these reasons, all three of the papers presented here take a multidisciplinary approach, drawing from the organizational ecology perspective in combination with other streams of literature. This approach will become evident in the following section that provides a brief summary of the four papers.

Effects of organizational disruptions on firm performance

Organizational disruptions can take many forms. In this thesis I investigate three, including top-employee migration, unexpected deaths among top management teams, and the high rates of employment growth in start-up firms. As was previously described, I investigated these examples of organizational disruptions and their effects on firm performance in three separate papers. These papers form the focal elements of this thesis, each one directly addressing the unifying research question. The three papers are each built on the principles illustrated in Figure 1.1 but emphasize different mechanisms of organizational disruptions. In addition, this thesis includes a fourth paper that investigates

how spin-offs' job creation differs from that of other entrant firms. This section provides a short description of the four papers in turn.

Chapter 2 presents the first paper, *"Heroes today - but what about tomorrow? Gazelles and their long-term performance"*, which investigates the long-term performance of young, high-growth firms. With reference to Figure 1.1, the paper first focuses on the importance of organizational routines to firm efficiency and performance. We argue that high initial growth rates impede the emergence of stable and efficient routines and structures in newly founded ventures, especially if the expansion is undertaken too hastily. This impedance in turn, decreases their long-term performance, as the initial composite of structures and routines or the lack thereof has a long-lasting effect on an organization's development. Supporting this hypothesis, we found that a high initial employment growth rate negatively affects the long-term survival and employment growth rates of these companies and increases employee turnover in the long run. Moreover, we find that this trade-off between an initially high growth rate and a firm's long-term performance is partly explained by the higher initial rate of employee turnover in these high-growth firms. We argue that a high rate of employee turnover can hinder the efficient integration of new members into the organization and hamper the development of a shared organizational culture and norms and of efficient organizational routines. Thus, organizational members play a key role by both contributing to organizational disruptions and by driving the effect of these disruptions on firm performance. This result illustrates the imprinting and inertia in organizational structures and emphasizes the time aspect in establishing efficient routines and the importance of organizational foresight in choosing an organizational model at the time of founding. In addition, this finding shows the limited capacity of firms to integrate new members efficiently into their organization, which significantly restricts the pace at which firms can successfully expand. This study raises important political questions about industrial policy initiatives that promote the development of high-growth start-ups over other entrants. Such initiatives might come at the cost of forgoing the creation of more sustainable jobs.

In Chapter 3, the second paper, *"The effect of top-employee migration and spin-offs on incumbent firms"*, investigates the performance effects of top-employee migration, with a special focus on top employees who depart to

spin-off entrepreneurship. In addition to its disruptive effect on organizational routines, we argue that top-employee migration is largely detrimental to firm performance because it results in a loss of human capital and increasing competitive pressure when top employees resign to work for spin-offs or incumbent rivals. We found negative performance effects from top-employee migration regardless of where the employees end up working once they leave the parent firm. While the departure of top employees to found spin-offs has a negative effect on the parent firm's performance, the effect is not significantly different from when top employees resign to work for competing incumbent firms. Moreover, all negative effects decrease over time. This study suggests that disrupting organizational routines is detrimental for firm performance, supporting the focal hypothesis of this thesis. However, the positive effects from organizational readjustments and knowledge inflow have the potential to mitigate or even reverse this effect over time. We also find that the effect differs with the type of organizational disruption and that it depends on the migrating organizational member and his/her destination. Finally, the paper emphasizes the importance of top employees to firm performance. The decrease in post-departure performance explains, and to some degree incites, the extensive focus on employee retention through, for example, non-competition clauses.

In Chapter 4, I present the third paper *"Who loses a leader without losing ground: Unexpected death in top management teams and firm performance"*. This paper exploits the exogenous variation in firm performance due to a sudden death among the top management to investigate the consequences of a disruptive organizational shock. Hence, the paper directly addresses the problem of endogeneity that has plagued previous studies on organizational disruptions. This paper seeks to identify which firms are better and faster at absorbing the impact of this shock with fewer negative effects on their performance. Although heavily routinized and inert organizations may, under some circumstances, be more vulnerable to organizational disruptions, this paper hypothesizes that structural inertia oftentimes protects organizations against organizational disruptions and reduces any negative effects on firm performance. This organizational resilience is due to greater resistance to change and higher levels of operational efficiency at baseline. In support of this, I found that an

extended tenure of and among the top management team mitigates the negative shock effect, leading to a higher post-death event performance. I argue that this is due to the continuity of and within the top management team, which increases organizational stability and facilitates routinization. Finally, in line with Chapter 3, these results point to the value of focusing on efforts to retain top management personnel.

Chapter 5 includes the background paper *"Spin-off growth and job creation: Evidence on Denmark"*. This chapter is particularly relevant to Chapter 3, which takes a different approach to a related topic. This chapter adds to the series of studies in the entrepreneurship literature that focus on spin-offs as a particularly successful type of entrant with superior capabilities in comparison with other start-ups and sometimes even incumbent firms. However, the apparently superior performance of spin-offs almost exclusively refers to their higher survival rates. Does this higher survival imply that spin-offs are universally the best type of entrant? We addressed this question by conducting a detailed empirical study of performance differences between spin-offs and other entrant firms in terms of their employment growth and job creation. We found that spin-offs are not only surviving longer, as the existing literature suggests, but that they are also relatively more important for job creation in the economy. This finding has important implications for industrial policy and suggests that substantial gains may result from targeted entrepreneurial policies that favor spin-offs over other entrants. Hence, Chapters 3 and 5 supplement one another, with both addressing the economic effects of employee migration and spin-off entrepreneurship, while illustrating two different sides of the story. These studies were not designed to assess the aggregated economic effects of spin-off entrepreneurship, but they do call attention to the complexity that is inherent to the process of determining the economic consequences of spin-off entrepreneurship. This tension is illustrated by two economic outcomes that pull in opposite directions. At a minimum, industrial policymakers must consider the potential for either or both to occur.

Contributions

The aim of this thesis was to illuminate *the effects of organizational disruptions on firm performance*. The focal hypothesis suggests that organizational

disruptions are detrimental to firm performance because of a negative effect on firm efficiency, which reduces competitiveness and therefore performance. However, organizational disruptions can sometimes have beneficial effects on firm performance by helping firms escape or improve upon suboptimal organizational routines. From a political and economic perspective, enhanced firm performance and efficiency leads to economic gains and increased standards of living, all things being equal. Therefore, this thesis has obvious macro economic relevance, as it explores one of the various factors that affect firm efficiency and thereby the overall productivity level of the economy.

This thesis has microeconomic relevance as well, and the issues investigated here are relevant for a wide range of organizations, especially start-ups, growing, inert and transitioning firms. The findings discussed here have implications for organizational behavior and provide insight into how a firm's actions, organizing, decision making, and even external events affect its performance. My work makes specific contributes to the literature on organizational behavior and organizational ecology in particular. Within this framework, I study the emergence, imprinting and inertia of organizational routines and organizational willingness and/or ability to change and adapt under different circumstances. Moreover, I study the consequences of different organizational disruptions and the capability of heterogeneous organizations to resist and overcome disruptive events. Individually and collectively, these contributions increase the understanding of organizational processes.

Overall, this thesis adds to the stream of literature on inert organizations, arguing that radical organizational changes are potentially disruptive. There is significant evidence that stands in favor of this notion, and the content of this thesis has broad implications for the management of the internal environment of organizations. Successful firms establish the "right" organizational model at the time of their founding and demonstrate caution, thoughtfulness and foresight when implementing any structural changes. The evidence presented in this thesis underscores the benefits of organizational stability and reliability as a "defense mechanism", preparing firms for organizational shocks. Finally, this evidence highlights the important role of managers and other key employees in creating stable and efficient organizations, and the role of other employees as well, as the implementers of organizational routines.

The evidence I present in this thesis supports the structural inertia argument. This argument does not imply that organizations should never initiate pervasive changes, especially if the environmental context or other factors make such a change imperative. However, this thesis does imply that organizations should implement such substantive changes with caution, awareness, foresight, and with consideration for inert forces and the possible consequences for performance. The practicalities of this approach, which go beyond the considerations I mention above, are beyond the scope of this thesis.

Discussion

Enhanced firm efficiency and performance can lead to economic gains. However, as has been discussed, this gain is not always observed. For example, determining the economic consequences of top-employee migration into spin-off entrepreneurship is not an easy task. The negative effects on parent firm performance underlie the increasing use of non-competition clauses. At the same time, the economic gains from spin-off entrepreneurship, in terms of higher job creation, advocate in favor of top-employee migration. Put somewhat differently, urging incumbent firms to intensify their efforts for employee retention to avoid the detrimental organizational disruption of losing a top employee does not take into account the aggregated effects of such protective measures on the economy. From this broader perspective, and after relaxing the implicit assumption that all else is equal, one may draw different conclusions about the value of top-employee migration. This discussion illustrates the need for caution in deriving direct policy recommendations based on the above conclusions. Nevertheless, the following pharagraphs engage in discussing potential implications, emphasizing my contributions and the need for increased focus and further debate as well, in a number of areas noted in the thesis.

One fundamental goal of industrial policy should be to facilitate the establishment of the best possible conditions for firms under the current economy.[5] This entails setting the terms for employee mobility and providing a good framework of conditions to nurture entrepreneurship. In particular, market

[5]Of course, "best possible" is a vague term in this context, as politicians also take their constituents, their own political convictions and other factors into consideration.

failures in the labor market might call for regulation. The results of Chapters 3 and 4 emphasize the important role of key employees in firm performance and organizational stability, which underscores the value of an increased focus on employee retention. Previous studies have confirmed that non-competition covenants are efficient tools for reducing inter-firm mobility and entry into entrepreneurship (Stuart and Sorenson, 2003; Marx et al., 2009). From an economic perspective, however, reducing employee mobility implies reducing knowledge flows, as well. Hence, restricting the efficient allocation of labor potentially stanches innovation and economic growth. At the same time, high levels of inter-firm mobility and knowledge sharing might reduce a firm's incentives for investing in research and development. Finally, while non-competition clauses can succeed in retaining top employees, they also limit the firm's access to new employees (Marx et al., 2009). Thus, for both the economy and individual firms, efforts to enhance employee retention have conflicting effects.

Another similar subject for discussion emerges from Chapters 3 and 5. On one hand, the creation and entry of new firms into the market heralds the positive economic effects that result from increased competition, job creation, and productivity enhancement. On the other hand, these economic gains may come at the cost of development, growth, and job creation by the incumbent firms. From an economic perspective, this might not be desirable, considering that, on average, older and larger firms tend to have higher productivity levels than start-ups, which have modest success rates (Økonomi- og Erhvervsministeriet, 2007; Dahl et al., 2009; Idson and Oi, 1999; Parisi et al., 2009). Moreover, the increased competition for labor can lead to wage increases, with adverse effects on competitiveness. I do not argue against policies that promote entrepreneurship; rather, my aim is to illustrate the complexity of and the conflicting elements in discussions of these topics and to emphasize that an unambiguous answer does not exist. Similarly, Chapter 2 brings the subject of short-term versus long-term economic gains up for discussion. This chapter highlights the political conflict that results when the immediate and rapid job creation by gazelle companies comes at the cost of forgoing the creation of more sustainable jobs.

While this thesis brings into focus the negative effects of organizational disruptions on firm performance, it is important also to emphasize the possible

positive outcomes of organizational change. In the three focal papers presented here, significant changes to the employee and/or management composition decrease the subsequent performance of a firm. However, one way or another, these events might also signal the inflow of new organizational members, who, once they acquire an organization-specific skillset, have the potential to renew and strengthen the firm's competencies. Bringing new knowledge, perspectives, ideas, and social relations to the firm, these new members are likely to eventually increase the firm's efficiency and competitiveness (Tushman and Rosenkopf, 1996; Kaiser et al., 2008; McKendrick et al., 2009; Corredoira and Rosenkopf, 2010; Eriksen, 2011). In addition, organizational changes are, of course, sometimes imperative. The relative efficiency of any firm can decrease over time and eventually lead to failure, if the organization and/or appropriate management team do not perceive the need for imperative organizational change and adaption. In this regard, certain types of organizational disruptions might even provide the opportunity to make the necessary changes to core organizational features with fewer disruptive effects (Tushman and Rosenkopf, 1996; Baron and Hannan, 2002).

In keeping with the above arguments and findings, routinization and stability enhance firm performance and may act to cushion disruptive organizational shocks. However, the significant routinization of firm operations can prevent organizations from perceiving the need for making needed adjustment, while also potentially legitimizing less efficient and non-rational patterns of activity. For example, firms that automatically favor the knowledge, ideas, and perspectives from organizational members over those of outsiders can miss out on worthwhile opportunities. This resistance to external knowledge has been labeled the "not-invented-here syndrome". This internally focused approach can lock organizations into inefficient routinized actions in which they fail to acquire and exploit the best available knowledge and technology (de Araújo Burcharth and Fosfuri, 2012). Ultimately, organizational disruptions can sometimes be beneficial to firms. Moreover, the above arguments point to an upper limit to the positive effects of organizational stability, beyond which the mitigating effects of stability diminish.

Two broad findings are common to the three focal papers contained in this thesis; these are adverse affects associated with organizational disruptions,

and there are benefits to organizational stability and reliability. However, as discussed above, it is not evident that these conclusions are applicable to all firms and all types of organizational disruptions, and I do not argue that these conclusions are generalizable to all other types of organizational disruptions not addressed here. However, I do argue that the call for caution, thoughtfulness and foresight when initiating structural changes applies broadly. My results consistently support this approach. Similarly, the ability of organizational stability to mitigate the detrimental effects of negative organizational shocks generalizes beyond the scenario of unexpected deaths among top management personnel (Chapter 4). This finding is particularly true for other internal shocks. Some types of external shocks (e.g., demand shocks), on the other hand, might call for firm reorganization and a shift in focus.

Furthermore, because this thesis relies solely on Danish panel data, one might argue that the results are limited to this geographic or cultural context. One obvious point for discussion are the labor market differences that exist between countries, particularly since labor mobility and the role of organizational members are discussed extensively throughout this thesis. Sørensen (2007) and Dahl and Klepper (2008), who also rely on the IDA database, argue that the labor market in Denmark resembles the American labor market in many ways. In comparison with many other European countries, the Danish and the American labor markets are considered to be relatively flexible because the employers' cost of firing employees is low. Moreover, the annual rates of job creation and destruction, the average firm tenure, and employee turnover rates are similar in the two countries (Sørensen, 2007; Dahl and Klepper, 2008). Higher rates of employee turnover might imply less incentive for employers to invest in their employees' firm-specific human capital. By comparison, this may suggest that the perceived significance of employees to a firm's performance and particularly their role in achieving stable and efficient organizations might be greater in other European countries. However, in contrast to the U.S., the Danish economy comprises many small and medium-sized companies, which may suggest the greater reliance of Danish firms on their employees.

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Part I

What are the effects of organizational disruptions on firm performance?

Chapter 2

Heroes today - but what about tomorrow?

Gazelles and their long-term performance[1]

Abstract: *Young high-growth firms, or gazelles, have been investigated predominantly with respect to their outstanding short-term performance. The paper at hand adopts a different approach by analyzing the long-term performance of such firms to shed light on the sustainability of these job-creating machines. Using the Danish Integrated Database for Labour Market Research, we find that former gazelles are not able to sustain their headstart in terms of performance in the long run. We demonstrate that gazelles are often outperformed by initially slower growing competitors, as high initial growth negatively affects a firm's long-term survival. We also find that high-growth start-ups ultimately achieve lower employment growth and higher employee turnover. We explain these counterintuitive findings by arguing that an initial period of rapid employment growth impedes the emergence of a stable and efficient routine structure within the newly founded venture if expansion is undertaken too hastily. In turn, this impediment decreases these firms' long-term performance, as the initial set of structures and routines or the lack thereof has a long-lasting effect on the organization's development.*

[1] Co-authored with Christina Guenther, Max Planck Institute of Economics in Jena.

2.1 Introduction

Birch demonstrated that new and young firms create more jobs than mature firms (Birch, 1981). This concept has subsequently been supported by several scholars (e.g., Davis et al. (1997) and Dahl et al. (2009)).[2] Therefore, during the current global economic crisis, many have pointed to entrepreneurs as being part of the solution. In particular, young high-growth firms - or gazelles - have received significant attention in this context. Over the past two decades, a growing area of literature focusing on high-growth firms has emerged. Scholars have focused on the disproportionate economic contributions that these firms have made through innovations and job creation (Parker et al., 2010). The evidence of their economic significance has sparked increasing interest among policy makers and researchers, who ask how the number of these gazelles can be increased (Halabisky et al., 2006; Stangler, 2010; OECD, 2010; Lopez-Garcia and Puente, 2011).

Initial high growth rates signal that a new entrant is productive and competitive relative to both its peers and incumbent firms in the market. Moreover, employment growth is argued to increase survival chances, especially when growth occurs early in a firm's life (Phillips and Kirchhoff, 1989; Almus, 2004). Consequently, high-growth entrants are expected to survive longer and perform better than the average start-up. Conversely, although the positive short-term effects on economic growth and job creation originating from gazelles are indisputable, the long-term economic gains resulting from these high-growth start-ups are less obvious. The above-stated long-term performance prediction for high-growth start-ups is not evident. Our empirical findings suggest that although they begin with a flying start, high-growth start-ups are often eventually outperformed by slower growing entrants. We find that an initial period of rapid employment growth eventually reduces survival chances and leads to lower employment growth and higher employee turnover. Thus, an active industrial policy that works to ensure the best conditions for high-growth start-ups and the possible promotion of potential gazelles over other entrants does not guarantee the creation of sustainable firms (Stangler, 2010).

Despite the significant interest in this topic, we have limited knowledge

[2] See Henrekson and Johansson (2008) for a review of this area of the literature.

on the long-term performance of high-growth start-ups. Because of gazelles' initial disproportionate contributions towards job creation, which signals a high-quality business idea and concept, above-average production efficiency, and favorable market conditions, it is assumed that gazelles can contribute more than other entrants to sustainable employment and economic growth. In opposition to this assumption, we argue that although high-growth start-ups outperform other entrants in the short-term, their rapid employment expansion causes initial instability, which leads to long-term disadvantages, as their organizational setup tends to be less efficient. This suggestion implies a trade-off between firms' initial employment growth and their long-term performance.

Within this paper, we offer an organizational theory perspective for explaining this counterintuitive trade-off between early and long-term performance. One argument for the negative effects of initial growth on long-term performance rests on the liability of newness hypothesis (Stinchcombe, 1965). Although high-growth firms do not necessarily lack the access to critical resources that other new entrants suffer, they are identical to their slower growing competitors in their deficiency of a stable organizational structure, processes, routines, and clear distribution of roles. Without exception, newly founded ventures must first establish this initial organizational setup, which includes employees' obtainment of applied experience among the employees within the specific organizational context, the development of strong social trust relationships, and the realization of the organizational vision, or blueprint, as phrased by organizational ecologists (Carroll, 1983; Freeman et al., 1983; Hannan and Freeman, 1984; Carroll and Hannan, 2000; Hannan et al., 2007). We argue that this process takes time and requires stability among the organizational members to ensure the emergence of an efficient structure. We argue that high employment growth rates prolong the process of establishing initial organizational efficiency in terms of routines or a blueprint. When this process is prolonged, the organization expands faster than its members can gain experience with each other and the firm, and thus the organization cannot manage to efficiently integrate new members (Penrose, 1995; Garnsey et al., 2006). We thus argue that although high-growth start-ups outperform other entrants in the short run, early rapid employment expansion causes organizational instability that leads to long-term disadvantages and lower performance because

their organizational setup tends to be less efficient.

To our knowledge, no previous studies have empirically tested the above propositions. This lack of evidence might exist because of a lack of applicable data, as such an analysis places extensive demands on the data source. We use a unique and comprehensive Danish panel dataset that provides annual observations of all new firms in terms of such aspects as employment, firm formation, and exits. In accordance with the above line of reasoning, we focus our analysis on how initial growth rates might facilitate the explanation of performance differences among surviving firms. In other words, we investigate gazelles' long-term performance and compare them with their surviving counterparts that experienced lower growth rates during their early years. In support of our hypothesis, we find evidence that high-growth start-ups are often eventually outperformed by more slowly growing entrants. We find that initial high growth and concurrent high employee turnover have persistent negative effects on firms' long-term performance. Higher initial growth reduces survival chances and leads to lower employment growth and higher employee turnover in the long run. Although these negative effects on firm performance decrease over time, we find that they persist even beyond the tenth year. We also demonstrate that higher turnover among high-growth entrants partially accounts for these negative effects. We conclude that attaining a larger size via continuous moderate growth or higher growth at a later stage is superior to attaining this size quickly through early, rapid employment growth.

The paper proceeds as follows. First, we briefly present the phenomenon being studied: gazelles and their unexpected poor long-term performance as compared with their slower growing competitors. Subsequently, we develop our hypotheses and explain why initial rapid employment growth has persistent negative effects on firms' long-term performance. Moreover, we elaborate on the argument that hasty expansion is likely to result in higher turnover rates in both the long and short run, which further fosters the organizational instability that may threaten a firm's long-term performance. Next, we present the data and elaborate on the methodology. After presenting our results and a discussion of these results, we conclude.

The phenomenon

Because of their disproportionate economic contributions, high-growth start-ups have received significant attention from both researchers and politicians. Intuitively, growth signals efficient production, and we might expect that early employment growth reflects new firms' competitiveness. Although gazelles' positive short-term effects on economic growth and job creation are indisputable, the long-term economic gains acquired by these high-growth start-ups are less obvious. In opposition to the previously mentioned popular belief regarding high-growth entrants' sustainable economic contributions, we argue that initial organizational instability, caused by these firms' rapid employment expansion, has persistent and negative consequences for these firms' long-term performance, including lower survival chances. To provide an empirical reference point for the paper's conceptual contributions, this section illustrates the counterintuitive empirical phenomenon, i.e., the negative trade-off between initial high employment growth and firms' long-term performance. Before proceeding with this empirical evidence, we discuss and clarify the relevant definitions.

The literature generally refers to high-growth firms as firms with relatively high growth rates regardless of age, whereas a gazelle company usually implies a younger firm. However, previous studies differ in terms of both their definition of "high growth", and which companies they consider "young". For example, OECD (2008) defines high-growth enterprises as firms with an average annual growth (in terms of either employment or sales) of 20 % or more over a three-year period. Moreover, OECD restricts the definition to companies with ten employees or more in the first year. Gazelles are defined as a subset of this population, so firms older than five years are excluded (OECD, 2008). Similar definitions are found in other studies of young high-growth firms, but they vary in terms of observation period, firm age, and performance measure (e.g., Halabisky et al. (2006), Acs and Mueller (2008) and Stangler (2010)). In this paper, we define gazelles in relative terms. We examine the long-term effects of initial employment growth over the entire spectrum of growth rates instead of focusing on a subpopulation of extraordinarily high-growth firms.

When comparing the long-term performance of gazelles with that of their less rapidly expanding counterparts, an initial requirement for all firms is survival. Although new entrants that exit during the initial years of existence might

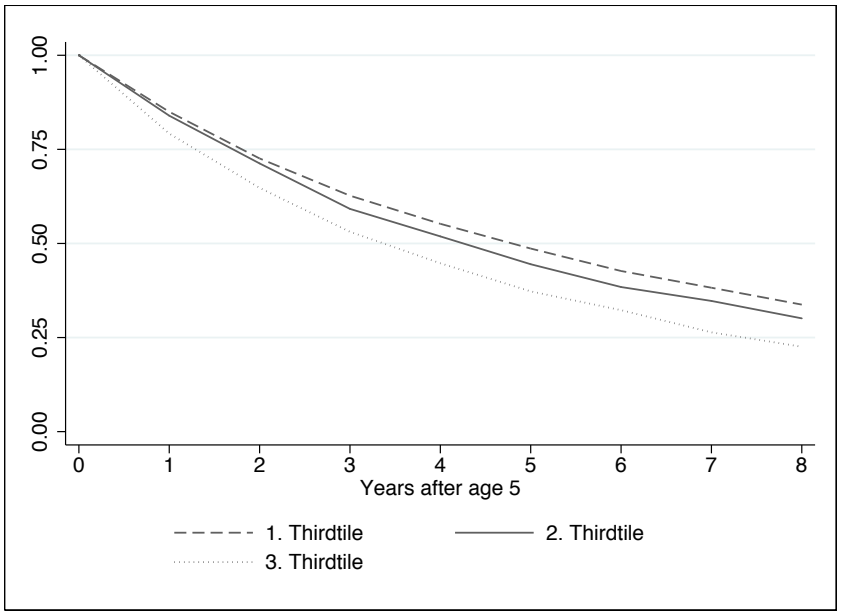

Figure 2.1: Kaplan-Meier survival estimates for three categories of ln(employment growth)$_{0-2}$, adjusting for ln(employees)$_t$ and ln(employees)$_0$. The first thirdtile exhibits low or negative growth, the second thirdtile exhibits moderate growth, and the third thirdtile exhibits high growth.

also have lasting effects on the economy, for example, through innovation spillovers, we argue that persistent positive economic effects and sustainable job creation are primarily realized by surviving firms. Therefore, we follow Acs and Mueller's (2008) example, defining gazelles as high-growth firms that are five years of age or younger. Consequently, we analyze their long-term performance from the sixth year onwards, and we exclude firms that exit prior to this point in time.

Figure 2.1 shows Kaplan-Meier survival estimates for young firms from age 5 to 13. These firms are divided into three groups according to their initial employment growth.[3] We define initial growth as total employment growth during the two years following start-up. We elaborate on this definition below. Figure 2.1 shows that firms with lower employment growth during the initial

[3]Dividing firms into four groups gives a similar result. However, many firms' initial growth rates equal the 25th or the 75th percentile intersection points, thus resulting in an uneven distribution of firms among the quartiles. For this reason, we use thirdtiles instead.

years (first thirdtile), have the highest likelihood of survival, whereas firms within the third thirdtile (highest initial growth rates) have the lowest survival rates.[4] The aim of this paper is to explain this apparent counterintuitive trade-off between initial growth and long-term performance.

2.2 Theoretical background and hypotheses

Growth rates serve as a major firm performance indicator that is generally interpreted as a sign of a firm's efficient production, thus its competitiveness. Early rapid employment growth could signify favorable market conditions, low competitive pressure, and a first-mover advantage. Firms might utilize high employment growth rates to realize economies of scale, and growth can thus conduce further growth (Garnsey et al., 2006). Moreover, firms benefit from newly hired employees, as they contribute new knowledge, networks, and new perspectives and ideas to the company, thereby strengthening and renewing the firms' competences (McKendrick et al., 2009; Eriksen, 2011). This resource inflow further enhances a company's resource base so that it can identify and realize additional growth opportunities (Penrose, 1995; Garnsey et al., 2006). Despite these positive attributes of growth, some scholars have emphasized the inability of especially young and small firms to sustain high growth rates. A firm requires more resources when growing. Although employment growth increases a firm's resource base, a delay exists in the planning and efficient integration of these acquired resources, which limits the firm's growth opportunities (Penrose, 1995; Garnsey et al., 2006). Coad (2007) provides another interesting study on firm growth patterns. In this study, which addresses serial growth correlation, Coad (2007) finds that while larger firms are typically subject to positive autocorrelation, small firms are unlikely to experience above average performance for two consecutive years. This negative correlation in growth rates is especially significant for small high-growth firms. As firm size and age are often correlated, one might expect similar results for young high-growth firms.

In the following sections, we develop two arguments for why initial rapid

[4] Not adjusting for $ln(employees)_0$ in Figure 2.1 does not alter this picture.

employment expansion might negatively affect a firm's long-term performance. First, we argue that an organization requires time to establish efficient structures and routines. Employees also need time to gain experience with each other and with the firm. We argue that these aspects are particularly important within the first years of a venture's lifetime. These factors limit the growth rate at which an organization can efficiently expand. Growth rates beyond this point are harmful to an organization because high growth postpones the point at which an organization can finally develop persistent, efficient routines based on the continuous presence of experienced organizational members. High initial employment growth may disrupt this process and prolong the liability of newness. Second, we argue that the organizational blueprint that corresponds with the challenges of high-growth start-ups eventually becomes ill-suited to the organization. The subsequent inevitable change of the organizational form's core features may place the organization in a life-threatening situation. Both arguments affirm that overly rapid employment growth has a negative effect on long-term firm performance.

Becoming an efficient organization

Within the disciplines of economics, as well as business, an extensive area of literature has emerged on performance and survival among new and young firms. Most studies in this area concentrate on explaining the frequently observed low survival rates of new and young firms. The baseline argument is summarized in the "liability of newness" or, as firm age and size tend to correlate, the "liability of smallness" hypotheses (Aldrich and Auster, 1986; Brüderl and Schüssler, 1990; Audretsch and Mahmood, 1994). First, new and young firms lack legitimacy and networks, which might limit their access to customers and resources, for example, capital and employees. Similarly, it might also be more difficult for smaller firms to attract resources. In addition, smaller firms have higher unit production costs, as they cannot utilize economies of scale (Stinchcombe, 1965; Freeman et al., 1983; Brüderl and Schüssler, 1990; Brüderl et al., 1992; Hager et al., 2004). However, these points do not particularly apply to young high-growth firms. On the contrary, one might argue that initial high growth signifies efficient production, indicating that the new firm is competitive in comparison with its peers, as well as incumbent firms within

the same market. This signal of superior efficiency might increase legitimacy and render the attraction of resources, especially talented employees, easier for these firms. However, even these high-growth firms are subject to a second aspect of the liability of newness, as they also lack efficient procedures and organizational routines.

An organization's ability to coordinate its skills effectively lies in the quality of its routines. Routines are thus essential to the efficient exploitation and integration of knowledge. Routines are the repeated interactions within a firm, and routines evolve from practical experience, including the development of social trust relationships (Nelson and Winter, 1982). Therefore, it takes time to develop these efficient organizational activity patterns. Building strong social relationships characterized by trust among the employees and among the employees and the management also takes time (Stinchcombe, 1965). However, within young high-growth firms, these processes are repeatedly disrupted and, hence, efficient developments are prevented. High employee turnover and expanding business render the distribution of roles unclear, as employees and the job functions continuously change, and the development and implementation of stable and efficient organizational routines becomes infeasible. Moreover, the organizational structure, including the explicit line of authority, the implicit hierarchy, and the distribution of roles might be unclear, thus further hampering the development of efficient organizational routines.

An efficient allocation of tasks and resources and the development of efficient organizational routines also include organizational members' acquisition of experience with each other and with the firm. Penrose (1995) was the first to make note of this growth-limiting factor:

"if a firm deliberately or inadvertently expands its organization more rapidly than the individuals in the expanding organization can obtain the experience with each other and with the firm that is necessary for the effective operation of the group, the efficiency will suffer, even if the optimum adjustments are made in the administrative structure; in the extreme case this may lead to such disorganization that the firm will be unable to compete efficiently in the market, and a period of stagnation may follow" (Penrose, 1995, p. 47).

Because of the necessity of the individual obtainment of experience with one another and the firm to establish an efficient structure, there is a limit to firm growth, beyond which, a firm becomes inefficient (Penrose, 1995). Only by gaining these types of experience and obtaining knowledge of and establishing confidence in each other are employees able to provide valuable services to the firm according to its unique vision and setting not only individually but also as cogwheels within the organization as a whole. Although, a clear picture, plan or blueprint of a sizable organization might exist, it is simply impossible to continue *"to hire people to fill the various positions and carry out functions laid down in detailed job descriptions"* (Penrose (1995), p. 46). Newly hired individuals require not only instruction but also time to obtain the required experience in various dimensions to become an efficient part of the organization. Consequently, only moderate growth rates allow for this experience to be obtained, thus for the development of stable, efficient procedures.

The organizational blueprint: not built to last

Although the above requirements for an efficient organizational behavior are valid throughout a venture's lifetime, we argue that they are especially crucial directly after a firm's foundation. During this very early stage, the organization must establish the very first set of processes and procedures so that the original blueprint and business vision can be realized. The organization must establish its fundamentals of interaction on which grounds the future organization will evolve.

The organizational blueprint is imprinted at birth and during the initial years, and organizations will retain their founding structures for long periods of time (Stinchcombe, 1965). We utilize the definition of the organizational blueprint or simply, the organizational form, as proposed by Hannan and Freeman (1977): "an organizational form is a blueprint for organizational action, for transforming inputs into outputs" (Hannan and Freeman, 1977, p. 935). This definition includes i) the formal structure of the organization, ii) the patterns of activity within the organization, and iii) normative order (Hannan and Freeman, 1977). According to the imprinting hypothesis, it is the environment (external and internal circumstances at the time of founding) that shapes - or imprints - a firm's unique organizational characteristics (Delacroix and Carroll,

1983; Phillips, 2005; Beckman and Burton, 2008). This hypothesis suggests not only that origin matters but also that imprinting has long-term or even lifelong effects on the organization. Thus, when an organization achieves high growth during its initial years, it will establish an organizational form suited to that specific context. However, we argue that this strategy might not be suitable in a more stable environment where growth rates eventually slow. For example, if the organizational form that was appropriate during the initial high-growth phase becomes ill-suited at some point because of external threats, such as increased competition or a decrease in demand, the organization might find it very difficult to change and adapt to the new conditions, even to a point at which change will become a perilous exercise. This transition is especially perilous if core features that are embedded in the organizational blueprint are subject to change (Baron and Hannan, 2002; Hannan et al., 2006). With reference to the industry life cycle literature (Klepper, 1996; Agarwal et al., 2002), we thus propose that although the initial organizational form might be the optimal choice during the entrepreneurial phase, industries eventually stabilize, thus rendering this organizational form unsuitable, independent of the managerial professionalism upon which it was originally built.

In sum, although exceedingly fast growth during the very early years of a venture's lifetime follows a clear expansion plan, it might ultimately harm the organization. This harm may either result from an inefficiency that decreases the initial comparative advantage, as argued in the Penrosean framework, a delay in the emergence of solid and efficient organizational routines, or the alteration of an organizational form that ultimately proves to be incompatible. It follows that, independent of which organization theory lens we apply, all frameworks univocally suggest that extraordinarily high growth during the initial life cycle stage of an organization has negative effects on performance, though because of varying reasons. Therefore, we hypothesize the following:

Hypothesis 1: High initial employment growth has persistent negative effects on firms' long-term performance

High growth, employee turnover and long-term performance

The following sections are built on the premise that an initial period of rapid employment growth has persistent negative effects on firms' long-term performance (Hypothesis 1). To explain and investigate this counterintuitive trade-off in more detail, we rely on a more explorative approach than above because, as previously noted, previous research on this particular topic is limited. Although we also acknowledge the existence of potential supplementary explanations, we choose to focus on the employees and, in particular, employee turnover, as the key mechanism to further explain why excessively high initial employment growth rates result in poorer long-term performance. Previous studies have shown that employee turnover has negative effects on a firm's productivity and financial performance (revenue and return over assets) (Baron et al., 2001; Eriksen, 2011; Eriksen, 2012). These results suggest that high initial growth can be harmful to the organization's long-term performance because high employment growth is often associated with higher rates of employee turnover (Baron et al., 2001). In this section, we propose that there is a correlation between initial high growth and employee turnover. We argue that initial growth increases early employee turnover rates and that it also has persistent effects on firms' long-term employee turnover ratios. We also suggest that initial high turnover ratios might make an imprint on the organization and lead to consistent higher employee turnover in the future. If high employee turnover has disruptive effects on mature firms, as well as on young firms, this proposition can facilitate the illumination of the mechanisms behind initial high growth's negative effect on firms' long-term performance. We return to this discussion of the employee turnover's negative effects in the next section.

Long-term employee turnover as a consequence of high initial growth

In this section, we will argue that both the type of employees typically employed by rapidly growing start-ups, as well as the dominant employment model within these firms, are likely to entail (additional) challenges to the organization's achievement of high long-term performance by increasing long-term employee turnover ratios. First, in the very early days, gazelles clearly

benefit from their premium access to talented employees by offering an innovative and vivid growth environment, which allows their employees to address, for example, technical challenges, without contending with a confining bureaucratic apparatus (Baron et al., 2001). However, as we argue above, the development of a solid set of procedures and routines is necessary for ensuring an efficient course of action and enhancing survival chances. The eventual implementation of hierarchies, thus bureaucracy, is inevitable. Consequently, as the former gazelle company ages and becomes increasingly bureaucratic and routinized, its highly valuable technical labor force, with its *"renowned antipathy to rigid bureaucracy"* (Baron et al. (2001), p. 976), is very likely to leave the organization to strive for higher financial rewards and challenges in new ventures. In addition, Baron et al. (2001) point to other arguments for why high-growth start-ups are likely to experience higher turnover rates than their competitors. First, high growth often stresses organizational members, potentially because of the lack of stability. Second, as these high-growth start-ups are forced to expand the level of employment, quick or even hasty hiring decisions are likely to result in mistakes. In turn, this lack of stability and poor hiring decisions lead to premature employment contract terminations. Finally, gazelles are often active in flourishing and growing industries. Therefore, the labor market in their environment tends to be highly competitive, and valuable employees might simply be headhunted by competitors.

Second, although the organization cannot control some of these factors, to a certain extent, it can control the applied employment model. As we argue above, founders choose an organizational form, i.e., a coordination mechanism, including an employment model, that fits the internal and external environment during the early phases of the organization. As newly founded ventures do not have an established bureaucratic apparatus, they tend to rely on coordination mechanisms based on peer group control, attachment via challenging tasks, and emotional commitment to the organization's vision, and these organizations often allow their members to have a certain degree of autonomy. Alternatively, the employment model can be based on a rather formal pure money-for-work exchange relationship, in which employees are selected based on their skills rather than on their potential or fit within the organizational

culture (Baron et al., 2001; Baron and Hannan, 2002). All of these employment models could be applicable and structure and guide the expansion of a newly founded high-growth firm. Thus, we do not argue that high-growth firms run a greater risk of choosing the wrong employment model per se. However, the crucial point is that, ultimately, even the optimal choice of any of these employment models might not be optimal. External factors, such as the product or industry life cycle, change over time and enter new stages, and firms' growth rates eventually decrease. Therefore, changing the original employment model, which was designed to optimize the rapid expansion of the high-growth firm's business, becomes inevitable. Although some employment models are more difficult to change than others, merely having to change the employment model, and thus, one of the core features of the organizational blueprint, challenges the organization's coherence and threatens the organization's survival. The unavoidable increase in turnover associated with altering the deeply rooted organizational blueprint constitutes one of the most severe consequences in this respect.

In accordance with the organizational ecology line of reasoning, which suggests an internal resistance to core organizational changes (Hannan et al., 2007), we argue that increased turnover can be expected among not only employees with a long tenure in the organization but also, perhaps less obviously, among newly hired personnel. First, Baron et al. (2001) find evidence that employees with higher tenure are more likely to leave when an organization alters its employment model. In addition, they propose that changing the organization's employment model might also lead to early contract terminations among newly hired employees. Although the original organizational model might be known by the outside labor force, thus attracting a certain type of employees, the new model lacks awareness and legitimacy with regard to the external environment, which increases the risk of a mismatch between newly hired employees and the new organizational form (Baron et al., 2001).

In sum, we argue that the type of employee in gazelle companies and the potential mistakes resulting from hastily made hiring decisions, will ultimately lead to higher employee turnover. We also suggest that, although optimal in the short run, these gazelles' initial employment models must eventually be altered as growth rates slow. We expect this potentially disruptive and

destabilizing change in the organization's core features to increase long-term turnover rates. Therefore, we hypothesize the following:

Hypothesis 2a: Higher initial employment growth ultimately increases employee turnover

Hypothesis 2b: Higher initial employee turnover ultimately increases employee turnover

Employee turnover's negative performance effect

The positive correlation between initial employment growth and employee turnover, which we suggested in the previous section, can be an important factor in explaining the negative trade-off between initial and long-term performance if employee turnover impedes firm performance. The most obvious reason why employee turnover is expected to negatively affect firm performance is employee outflow, as it implies the loss of human capital. More precisely, the company risks losing crucial knowledge, including not only technical knowledge but also idiosyncratic and tacit knowledge of the organization and its interaction style (Eriksen, 2011). Consequently, the organization suffers from this employee outflow, as it loses valuable resources that originally determined its success. This loss of skills might cause a decline in productivity. Eriksen (2011) further adds that the normally steeper learning curve that exists during the early years might suggest that the initial employees' accumulation of firm-specific human capital is especially important.

When employees leave a firm, it needs to fill the resulting gaps. Therefore, the costs of employee turnover also include recruiting and training expenses (Eriksen, 2012). These expenses do not include only new rounds of recruiting. More importantly, these new members must be instructed, trained and integrated into the organization so that they can efficiently contribute to firm performance. However, of course, turnover is not a one-way street. Some employee turnover might actually be beneficial if companies use it to eliminate poor performers. Moreover, employee inflow increases the company's competences and refreshes its knowledge base, especially in terms of innovation

purposes (McKendrick et al., 2009; Eriksen, 2011). Although this effect certainly holds for mature firms, we claim that, during organizations' early days, the harm of high inflow rates, and thus high turnover, is potentially equal to the aforementioned intuitively perceivable negative effects of employee outflow. Obviously, young high-growth firms experience a predominantly high inflow of new employees to achieve their growth. However, in accordance with Penrose's (1995) initial quote, high inflow clearly counteracts the necessity of employee obtainment of sufficient experience with one another and with the firm. In an organization with continuous high employee turnover that exists primarily because of the frequent addition of new members, the potential to establish an efficient system is clearly hindered. If the system is meant to be efficient and able to create value beyond the sum of its individual parts, merely fine-tuning of the employees' repeated interactions is required. As we have previously argued, this process takes time. However, this process is disrupted or even restarted when too many new members are added to the organization. One major difficulty of this process is that an efficient system requires a stable, shared understanding of the organizational form, routines and norms. If the ratio of new to old employees becomes too large because of the continuous inflow of new members, it becomes increasingly difficult for the old members to pass on organizational norms, for example, to the new employees. However, this knowledge sharing is necessary for the efficient integration of the new members.

Furthermore, the organization remains in a rather fluid state when it experiences a high inflow of new members, and employees will dedicate less effort to acquiring organization-specific skills in this instable environment (Hannan and Freeman, 1984). If employees hesitate to invest and engage themselves fully in a transient organizational form, despite a firm's great potential, inefficient production might result. We could even argue that remaining in this fluid state without stable routines and structures constitutes nothing else but a prolongation of the liability of newness. All in all, excessively high growth leads to an inefficient integration of new employees, and thus, the inability to perform competitively in the market, thus the firm might stagnate or lose its competitive advantage altogether (Penrose, 1995).

Building on the above arguments, we suggest that high initial employee turnover has a persistent negative effect on firms' long-term performance. We

emphasize that in the context of young high-growth firms, this effect is not predominantly driven by employee outflow and the subsequent loss of human capital. Instead, we claim that the high initial inflow of new employees represents the major obstacle to gazelles' establishment of a stable and efficient system, which, in turn, negatively affects their long-term performance. Therefore, we hypothesize the following:

Hypothesis 3a: Higher initial employee turnover has a persistent negative effect on firms' long-term performance

Hypothesis 3b: Higher initial inflow of new employees has a persistent negative effect on firms' long-term performance

Furthermore, we argue that if the presence of experienced old members to pass on shared understanding, routines and norms constitutes one of the crucial transmission channels for the efficient integration of new members, it follows that increasing employee tenure during the early years should have a positive effect on firms' long-term performance. In particular, higher tenure renders the establishment of (efficient) routines easier, given the possibility of stable repeated interactions. Moreoever, higher tenure increases the capacity to integrate new employees. Therefore, we hypothesize the following:

Hypothesis 3c: Higher initial employee tenure has a persistent positive effect on firms' long-term performance

These hypotheses and the preceding argumentation contribute to the previous line of arguments that despite the potential benefits of high employment growth, such as economies of scale and the inflow of new knowledge, networks, perspectives and ideas (Garnsey et al., 2006; McKendrick et al., 2009), initial high employment growth and concurrent high employee turnover have negative effects on firms' long-term performance.

2.3 Data and method

Data

We investigate the effects of initial high growth using the comprehensive Danish panel dataset: the Integrated Database for Labour Market Research (referred to by its Danish acronym, IDA). The IDA is maintained by Statistics Denmark, and it is a linked employer-employee database that contains annual observations on Danish firms and their employees for the years 1980 to 2007. As, for example, industry classifications were gradually changing (and more industries were added) until 1994, our sample only includes (active) start-ups that began between 1994 and 2004. We exclude all firms from the public sector and the heavily regulated primary sector. In accordance with Dahl et al. (2009), we define an active start-up as a new firm that employs a minimum of one full-time-equivalent employee. Using this definition, we define the entry year as the first year of observed activity. Similarly, firm exit is defined as two successive years of no activity (zero employees).

A general critique of empirical analysis built on national firm panel datasets such as the IDA is the inability to control for mergers and acquisitions, which are instead coded as exits. This issue is perhaps of even greater concern when investigating high-growth firms. Therefore, we apply a conservative strategy of censoring firm exits if a firm's largest plant (at the time of exit) is still active the following year under a different owner code (a different company).

We hypothesize that an organization's ability to establish *initial* organizational structures has long-term consequences for firm performance. Therefore, we only include new entrants, i.e., new firms with no organizational history. For this reason, we do not allow for re-entry. Extending back to 1980, we ensure that a firm's identification number did not exist prior to the start-up date. Furthermore, we ensure that the largest plant within each firm is not partly preserved from the prior year. This process provides us a sample of 74,189 new entrants. Then, we exclude firms with more than 20 full-time-equivalent employees in the first year because of doubts regarding whether these firms are true start-ups.[5] This step reduces the sample to 73,187 new entrants. Finally,

[5]We tested our results' sensitivity to this factor by estimating the survival models, including all start-ups regardless of start-up size. This test did not alter our conclusions.

our focus of analysis is the effects of initial employment growth on long-term performance. We investigate whether differences in initial growth patterns can explain differences in the performance of mature firms. To shed light on this relationship, we analyze differences in firm performance from the firms' fifth year onwards. For this specification, we follow the OECD's (2008) definition. When firms have survived for five years or more, we argue that they have reached a certain degree of maturity and are thus no longer considered gazelles. Therefore, we further exclude firms from the sample that exit prior to the fifth year. Using the same argument, we exclude observations that are censored before the fifth year. The latter includes all firms that were established after 2001. This method reduces the final sample to 15,007 start-ups from 1995 to 2001.

Estimations

In our analysis, we investigate how initial employment growth affects newly founded firms' long-term performance. Our analysis consists of three steps. First, we investigate how initial growth affects a firm's long-term chances of survival. Organizational mortality is the favored measure of organizational performance when investigating the effects of organizational change using an organizational ecology model framework. Firm survival is the ultimate performance variable and is comparable across firms, industries, and contexts (Barnett and Carroll, 1995). Second, we estimate the effects of initial growth on long-term employment growth. Garnsey et al. (2006), who discuss the attributes of diverse growth measures, point to employment growth as the best growth measure because of its provision of standardized and comparable data on firm expansions. Employment growth is also the standard indicator in studies on firm growth patterns. Other obvious performance variables, such as profit and sales, suffer from more limitations than employment growth. For example, firm profit constitutes a manner of increasing firm valuation or avoiding tax liabilities (Garnsey et al., 2006). Finally, we investigate the ultimate effects of initial growth and initial employee turnover on employee turnover. In all analyses, long-term performance is defined by a firm's performance after the fifth year, as outlined in the previous section.

For the first part of our analysis, we utilize exponential regressions in accelerated failure-time form (AFT)[6]:

$$ln(t_i|x_{ki,t}) = \beta_0 + \beta_g ln(g_{i,2}) + \beta_1 x_{1i,t} + ... + \beta_k x_{ki,t} + \epsilon_{i,t}, \qquad (2.1)$$

this estimation predicts time to failure, assuming that the baseline hazard, τ_i, follows an exponential distribution with mean e^{β_0} (Cleves et al., 2004).

For the second and third parts of our analysis, we follow Baron et al. (2001) and use generalized estimation equation (GEE) panel regressions (Zenger et al., 1988) to estimate the models of employment growth and employee turnover. This method is appealing, as it accounts for within-group correlation. Unlike a firm fixed effects approach, this approach allows us to include our key explanatory variables of initial organizational characteristics and initial growth, although they do not vary over time (Baron et al., 2001). We treat within-firm correlation as autoregressive (AR1), and we report semi-robust standard errors using the Huber/White/Sandwich estimator of variance. This method requires a minimum of two observations per firm and thus excludes firms that exit during the sixth year. To consider these firms when making the estimations, we further include the fifth year's observation by adding an additional observation for all firms in the sample, as we estimate the models of employment growth and employee turnover. To investigate the firms' long-term employment growth, we estimate the linear model:

$$g_{i,t} = \alpha + \beta_g ln(g_{i,2}) + \beta_1 x_{1i,t} + ... + \beta_k x_{ki,t} + \epsilon_{i,t}, \qquad (2.2)$$

where $g_{i,t}$ is the annual growth in the number of full-time equivalents from year $t-1$ to t, relative to the average employment level within the two-year period of $t-1$ to t (see equation 2.4). $g_{i,t}$ is provided in percentage form. Similarly, we estimate the model of the employee turnover rate for firm i at time t:

$$Turnover_{i,t} = \alpha + \beta_g ln(g_{i,2}) + \beta_1 x_{1i,t} + ... + \beta_k x_{ki,t} + \epsilon_{i,t} \qquad (2.3)$$

[6]In addition, we estimated models of firm survival using the Weibull (AFT), the log-logistic (AFT) and the Gompertz hazard model. Our results are robust over these various specifications.

We measure the employee turnover rate at time t as the total inflow and outflow of employees during a given period, $t-1$ to t, relative to the average number of employees during this period (see equation 2.9). $Turnover_{i,t}$ is provided in percentage form and ranges from 0 to 200.

Key explanatory variables

We utilize four explanatory variables to test our hypotheses: employment growth, employee tenure, employee turnover rate, and employee inflow rate. We measure these variables for the first two years following start-up and estimate their effects on firm survival, employment growth and the employee turnover rate from the sixth year onwards.

we argue that the early years of an organization's life are crucial to its long-term performance. We define this period as the two years following start-up. First, in line with the liability of newness hypothesis, the literature on new firm survival demonstrates that the selection process is most distinct among new and younger firms, and this group of firms exhibits low survival rates. For example, as it is found in Chapter 5, a third of Danish start-ups (with employees) do not survive the first two years. Similarly low survival rates are reported in other countries and for different industries (see, e.g., Audretsch (1991); Mata and Portugal (1994); Taylor (1999)). Second, as we discussed above, the important and persistent effects of an organization's founding context and its initial choices, such as its initial strategy and employment model, are supported by the imprinting hypothesis. The imprinting literature most often refers to the founding context, which includes the external conditions and founder characteristics prevailing at the time of start-up. We extend this period to include the first two years after start-up, arguing that, for example, the organizational routines and norms for solidifying and realizing the firm's initial strategy evolve during this period. Only referring to the founding conditions would thus exclude the initial realization of the organizational blueprint, including the crucial phase of establishing the initial set of procedures and processes, which have long-term consequences for the organization's performance. In her study of start-ups in the mini computer industry, Romanelli (1989) finds that the majority of firms develop a stable

market strategy within the first two years. This finding provides us with confidence that we chose a reasonable time frame for the initial growth spell, as establishing a stable market strategy goes hand in hand with creating the first set of processes, procedures and structures for realizing this aim. Although one might claim that a longer initial phase (of potentially up to five years) might constitute an equally reasonable choice, we argue that the initial two years is the best match for our theoretical framework. Moreover, we test the sensitivity of our results to this time period, expanding it to include the first three, four and five years. We note that, restricting the initial phase to simply two years does not have a decisive impact for our results.

In accordance with the above arguments, we suggest that the initial employment growth rate, the initial employee tenure, the initial employee turnover rate, and the initial inflow of new employees reflect a firm's initial growth pattern and initial organizational context. We elaborate on this suggestion below. First, Hypothesis 1 suggests that initial high growth has negative effects on a firm's long-term performance, as expanding business and high employee turnover postpone the formation of stable organizational structures and routines. To estimate this effect, we include the initial two-year employment growth rate in logged percentages. In accordance with Davis and Haltiwanger (1992), we calculate the initial growth rate, $g_{i,2}$, as the difference between the number of full-time equivalents in the second year and the number of full-time equivalents at start-up, relative to the average number of employees during the two years. The latter partly accounts for the intuitive relation between size and growth, in which growth rates decline with firm size:

$$g_{i,2} = \frac{E_{i,2} - E_{i,0}}{X_i} * 100 \tag{2.4}$$

$$X_i = \frac{E_{i,2} + E_{i,0}}{2} \tag{2.5}$$

$$ln(g_{i,2}) = ln(g_{i,2}) \text{ if } g_{i,2} > 0 \tag{2.6}$$

$$ln(g_{i,2}) = ln(\mid g_{i,2} \mid)(-1) \text{ if } g_{i,2} < 0 \tag{2.7}$$

$$ln(g_{i,2}) = 0 \text{ if } g_{i,2} = 0 \tag{2.8}$$

We estimate the effect of $ln(g_{i,2})$, controlling for both start-up size and the number of employees at time t. As we argue above, we expect $ln(g_{i,2})$ to have

a negative effect on firm survival and employment growth.

Our second set of hypotheses (2a and 2b) develops the argument that higher initial employment growth and the accompanying higher initial employee turnover increase long-term employee turnover. We measure these effects using the initial growth rate, as well as initial employee turnover, during the first two years (equations 2.4 and 2.9, respectively). The long-term effect is measured from year five onwards. We measure employee turnover at time t as the total inflow and outflow of employees during a given period, $t-1$ to t, in proportion to the average number of employees during that period:

$$Turnover_{i,t} = \frac{E_{IN_{i,t}} + E_{OUT_{i,t}}}{X_{i,t}} * 100 \tag{2.9}$$

$$E_{IN_{i,t}} = \sum_{n=0}^{\infty} (e_{n,i,t} \neq e_{n,i,t-1}) \tag{2.10}$$

$$E_{OUT_{i,t}} = \sum_{n=0}^{\infty} (e_{n,i,t-1} \neq e_{n,i,t}) \tag{2.11}$$

$$X_{i,t} = \frac{E_{i,t-1} + E_{i,t}}{2}, \tag{2.12}$$

Employee inflow, $E_{IN_{i,t}}$, is the sum of employees in the firm at time t that were not employed in the firm the previous year, time $t-1$. Similarly, employee outflow, $E_{OUT_{i,t}}$, is the sum of employees employed at time $t-1$ but not at time t.

The final set of hypotheses relies on the association between initial high employment growth and higher employee turnover. We argue that the accompanying initial high turnover has a negative effect on a firm's long-term performance (Hypothesis 3a). Moreover, we stated that this initial high turnover is predominantly a sign of the high initial inflow of new members. Therefore, in particular, the rapid initial inflow of new employees produces the effect on performance (Hypothesis 3b). To investigate Hypothesis 3a, we estimate the effect on firm performance from the average yearly turnover rate, $Turnover_{i,t}$, from age 0 to 2, controlling for employee turnover at time t. Similarly, we test Hypothesis 3b by estimating the effect on firm performance from the average yearly inflow ratio from age 0 to 2 and controlling for the current inflow and outflow of employees.

In Hypothesis 3c, we argued that the negative effect of initial high employee turnover is driven by an excessively high ratio of new-to-old employees, which makes it difficult for old members to pass on, for example, organizational norms. We argue that this issue might prolong the liability of newness, implying a negative effect on long-term performance. To capture this effect, we include the average employee tenure (years) two years after start-up.

Controls

In addition to our key explanatory variables, we further include a number of controls when estimating firm performance. This section provides a description of these variables. The literature on new firm survival stresses that the founder or the founding team plays a significant role in the process of overcoming the liability of newness. The founder plays a key role in outlining the initial strategy by defining the organization's culture, implementing routines, and so on (see, e.g., Phillips (2005)). As we argue above, the organizational blueprint is indisputably key to high firm performance and is not easily altered, rendering the founder's initial imprint on the organization highly significant for long-term performance. Previous studies point to several important founder characteristics. One argument for the high variance in new firm performance is the heterogeneity of founders' human capital. Founders have varying endowments of skills, knowledge and experiences, which influence their entrepreneurial abilities (e.g., the ability to identify opportunities), and it is argued that greater human capital improves production efficiency. The founder also makes initial strategic decisions based on his/her stock of human capital. Therefore, greater human capital might lead to better strategic decisions and the implementation of better organizational routines, thus increasing the firm's likelihood of survival and growth (Brüderl et al., 1992). Entrepreneurs accumulate human capital primarily through education and work experience, the latter being of the greatest importance (Brüderl et al., 1992; Taylor, 1999). Our study focuses on firms that have already survived the initial turbulent years, as we only include observations of firms after the fifth year. However, the effects on firm survival and growth because of founder characteristics are often found to persist even beyond these first difficult years. Therefore, we include controls for founders' work experience and education.

In the context of founders' work experience, three points must be highlighted. First, it is argued that entrepreneurs often build on organizational routines familiar to them, adapting the organizational features of their previous employer (Hannan and Freeman, 1986; Baron and Hannan, 2002; Phillips, 2005). This argument indicates that the parent firm plays a role in shaping the new organization. Second, employment at a superior firm might increase the founder's social capital (better network relations) and human capital (through better access to knowledge). Whether better is equivalent to larger in this context is debatable. Although employment at larger (and more successful) firms increases human capital, it might also lead to skill specialization. Sørensen and Phillips (2011) and Dahl et al. (2009) suggest that work experience obtained in smaller parent firms is more valuable to founders. They argue that employees of smaller firms are less specialized than employees of larger firms, and thus, organizational structure and routines are more suitable for new and often small firms. Third, pre-founding experience has been highlighted as one of the key determinants of new firm survival. This effect is especially strong when the founder(s) has pre-founding experience in the same industry. That is, these start-ups are founded by former employees of incumbent firms in the same industry and are often referred to as spin-offs. Since Garvin (1983), many studies have demonstrated that these spin-offs tend to outperform other new entrants (see, e.g., Klepper (2001), Phillips (2002) and Agarwal et al. (2004)). Moreover, Dahl et al. (2009) note that Danish spin-off have a higher likelihood of survival after the fifth year than other young firms. To identify the founder(s) of each new entrant, we imply the approach developed by Sørensen (2007), with the modifications proposed in Chapter 3. This approach draws on observations from both the IDA and the Entrepreneurship database. The latter database contains information on the primary founders of all new businesses in Denmark. The Entrepreneurship database is maintained by Statistics Denmark and can be merged with the IDA. Combining the two databases allows us to identify more than one founder per firm. See Chapter 3 for a detailed description of this approach.

Given the above arguments and previous empirical findings, our controls for founder heterogeneity include the following: a spin-off dummy (employed at an incumbent firm in the same industry, same 4-digit SIC-code), founder

age (years), an entrepreneurial experience dummy, a managerial experience dummy and founder education (years). The dummy variables refer to the last year's observation prior to start-up. If the company has more than one founder, we require that only one founder meet the dummy variable criteria. Moreover, if a firm has more than one founder, the continuous variables refer to the mean values of the founding team. To control for the influence of parent firm performance, we include a dummy for parent firm size (50+ employees). In addition to the covariates described above, we control for firm heterogeneity in terms of the following: start-up size (full-time equivalents, logged), firm size (full-time equivalents, logged), founding team size (no. of founders), legal form (dummy for personal liability), and employee education (years). The employee turnover models also control for employee tenure (years). To control for industry- and region-specific factors, as well as various economic conditions, we include the following: market concentration (Herfindahl index, normalized), GDP growth (yearly real growth rate, pct.), firm age (8 dummies), industry (41 dummies), entry year (8 dummies), and labor market region (77 dummies). Descriptive statistics are presented in Table 2.1.

2.4 Results

Firm survival

Table 2.2 depicts our analysis of the negative effects of high initial growth and employee turnover on firm survival. Estimations are based on 50,027 firm-year observations from 1999 to 2006[7] for 15,007 unique firms within the age range of 5 to 12 years.

Model 1, Table 2.2, reveals that firm size$_t$ and founder capabilities (spin-off, entrepreneurial experience, age, and education) increase the expected time until failure. When controlling for start-up size and firm size$_t$, the model finds that employment growth during the first two years has a negative effect on survival time, which supports Hypothesis 1. We expect that the negative effect of initial growth diminishes over time. Therefore, we introduce the interaction

[7]We do not include observations for 2007, as we cannot observe if firms exit this year; i.e., we cannot observe whether firms were still active in 2008.

Table 2.1: Descriptive statistics

Description	**All (1994-2007)**		**Firm age ≥ 5 (1999-2006)**	
No. of observations	277,790		50,027	
No. of unique firms	73,084		15,007	
No. of firm failures	36,687		4,197	
	Mean	Std. dev.	Mean	Std. dev.
Ln(emp growth), age 0-2	2.20	2.83	2.40	2.74
Ln(inflow ratio), age 0-2	2.44	1.75	2.55	1.42
Tenure, age 0-2 (years)	1.26	0.60	1.28	0.58
Turnover ratio, age 0-2	35.53	29.37	37.59	27.10
No. founders at start-up	1.52	0.83	1.55	0.85
Employees at start-up	2.24	2.54	2.39	2.74
Founder age at start-up, yrs	41.11	8.69	42.83	7.62
Founder edu at start-up, yrs	12.70	2.13	12.74	2.02
Age_t (years)	2.68	2.81	6.85	1.83
$\text{Full-time equivalents}_t$	4.59	12.94	7.41	20.34
$\text{Employment growth}_t$, pct.	9.10	49.79	2.36	46.65
$\text{Ln(inflow ratio)}_t$	1.66	1.99	2.00	1.80
$\text{Ln(outflow ratio)}_t$	1.49	1.83	2.09	1.80
Turnover ratio_t	39.10	48.29	47.58	43.71
$\text{Emp tenure (years)}_t$	1.47	1.76	3.52	2.09
$\text{Emp education (years)}_t$	12.40	1.83	12.38	1.69
	No. firms	Share (pct.)	No. firms	Share (pct.)
Personal liability	34,088	46.64	6,408	42.70
Spin-off	15,168	20.75	3,840	25.59
Entrepreneurial exp	24,431	33.43	5,167	34.43
Parent firm 50+ empl.	16,868	23.08	3,628	24.18
Managerial exp	14,644	20.04	4,043	26.94
Growth, age 0-2:		1. Thirdtile	2. Thirdtile	3. Thirdtile
No. firms (age 2)*		12,065	7,972	7,624
Surviving firms (age 5), pct.*		48.30	58.82	58.91

Mean and standard deviation are based on 277,790 and 50,027 observations for the total population and the final sample, respectively.
*This sample only includes start-ups from 1994 to 2001.

term *"Years after age 5* x *ln(employment growth, age 0-2)"* in Model 2, allowing the effect of initial employment growth to decrease over time. However, this variable is not significant in any of the survival models. This lack of significance suggests that the effect of initial growth on survival does not vary over time within our sample (age 5 to 12). This result provides strong support for Hypothesis 1, indicating that initial higher employment growth has *persistent* negative effects on firms' long-term performance. Testing this claim further, we also estimated Model 1, excluding firms younger than ten years of age (see

Table 2.2: Exponential survival models (1999-2006) - Accelerated failure-time form

	(1)	(2)	(3)	(4)	(5)	(6)
Ln(ft. equivalents), t	0.842**	0.842**	0.876**	0.881**	0.786**	0.884**
	(0.025)	(0.025)	(0.024)	(0.024)	(0.027)	(0.024)
Ln(Emp at start-up)	-0.409**	-0.408**	-0.360**	-0.329**	-0.301**	-0.347**
	(0.030)	(0.030)	(0.029)	(0.030)	(0.030)	(0.029)
Ln(emp growth, age 0-2)	-0.046**	-0.041**	-0.031**	-0.025*	-0.014	-0.025*
	(0.006)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Clock5_ln(emp g., 0-2)		-0.002	-0.003	-0.002	-0.002	-0.002
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Emp turn ratio, t			-0.006**	-0.005**		-0.006**
			(0.000)	(0.000)		(0.000)
Turn ratio, age 0-2				-0.004**		
				(0.001)		
Ln(inflow ratio, age 0-2)					-0.060**	
					(0.012)	
Ln(inflow ratio), t					0.108**	
					(0.010)	
Ln(outflow ratio), t					-0.147**	
					(0.008)	
Emp tenure, age 2						0.150**
						(0.029)
No founders (initially)	-0.053*	-0.053*	-0.043†	-0.041†	-0.041†	-0.048*
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Emp education (yrs), t	0.005	0.005	0.000	-0.003	0.004	-0.000
	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)
Personal liability	-0.111**	-0.111**	-0.109**	-0.110**	-0.080*	-0.110**
	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Founder age (yrs)	0.014**	0.014**	0.010**	0.009**	0.011**	0.009**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Founder edu (yrs)	0.028**	0.028**	0.026**	0.027**	0.024*	0.026*
	(0.011)	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)
Spin-off	0.159**	0.159**	0.140**	0.134**	0.148**	0.137**
	(0.041)	(0.041)	(0.041)	(0.041)	(0.040)	(0.041)
Entrepreneurial exp.	0.114**	0.114**	0.091*	0.077*	0.096**	0.088*
	(0.037)	(0.037)	(0.037)	(0.037)	(0.036)	(0.037)
Parent firm 50+ emp	-0.064	-0.064	-0.067†	-0.061	-0.060	-0.066†
	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Managerial exp	0.017	0.017	0.010	-0.003	0.007	0.006
	(0.039)	(0.039)	(0.038)	(0.038)	(0.038)	(0.038)
Market Concent., t	4.812*	4.823*	4.801*	4.785*	4.577*	4.827*
	(2.166)	(2.165)	(2.139)	(2.166)	(2.197)	(2.157)
Constant	0.642**	0.637**	1.143**	1.339**	1.071**	0.975**
	(0.234)	(0.234)	(0.234)	(0.238)	(0.237)	(0.237)
Log-likelihood	-5840	-5840	-5665	-5647	-5643	-5652
Observations	50,027	50,027	50,027	50,027	50,027	50,027
Firms	15,007	15,007	15,007	15,007	15,007	15,007
Firm failures	4,197	4,197	4,197	4,197	4,197	4,197

The models only include observations of firms if age $\geq$ 5. All regressions include unreported controls for GDP growth, Age (7 dummies), Entry (7 dummies), Industry (40 dummies), and Region (76 dummies). Clustered standard errors in parentheses. Significance levels: † : 10% * : 5% ** : 1%

Model 1, Table 2.5). The model finds that initial employment growth has a negative effect on the expected survival time even after the tenth year. Thus, within our sample, we can confirm the hypothesis that higher initial growth has a persistent negative effect on firm performance.

In Model 3, Table 2.2, we further include the employee turnover ratio$_t$. When controlling for employee turnover$_t$, Model 3 reveals that initial growth has a negative effect on firm survival. A one percent increase in the initial growth rate (age 0 to 2) decreases the expected survival time by 3.05 %.[8] Furthermore, Model 3 shows that employee turnover$_t$ has a negative effect on firm survival. This result might reflect the potential loss of human capital. We suspect that the negative effect of employee turnover is caused by an (on average) higher outflow than inflow of new employees in older firms. This suspicion is supported by the literature on job creation (see, e.g, Davis et al. (1997)). We investigate this issue in more detail in Model 6. Furthermore, we might expect employee turnover to improve performance in mature firms, as a continuing inflow of, for example, new knowledge and ideas are important factors in development and growth.

In Model 4, Table 2.2, we introduce the variable *"employee turnover ratio, age 0-2"* to test Hypothesis 3a. We expect that higher initial employee turnover increases the long-term hazard of exit. Confirming this expectation, Model 4 shows that, when controlling for current employee turnover, higher initial turnover decreases survival time after the fifth year. An increase in the initial turnover ratio by one standard deviation, decreases the expected time to failure by 10.27 %.

The investigation of employee turnover in the above models does not allow us to differentiate between employee inflow and outflow. However, the negative effect on survival could be driven by the latter, as employees "leave the sinking ship" or leave because the firm downsizes before exiting (Almus, 2004). For these reasons, Model 5 separates turnover into employee outflow and inflow. As we would expect, Model 5 shows that employee outflow$_t$ has a negative effect on firm survival and that employee inflow$_t$ has a positive effect, reflecting that growing firms are more likely to survive and vice versa. Moreover, Model 5

[8] We calculate the percentage of change in time to failure as follows: $100 * (e^{\hat{\beta}_k * \delta} - 1)$, e.g., $100 * (e^{(-0.031*1)} - 1) = -3.05\%$.

finds that higher initial employee inflow has a negative effect on firm survival. In accordance with Hypothesis 3b, this result suggests that there is a limit to the relative number of new employees that a firm is able to integrate during its initial years without jeopardizing (long-term) performance through disorganization and loss of efficiency. Similarly, we hypothesize that higher average employee tenure after two years has a positive effect on long-term firm survival (Hypothesis 3c). In support of our hypothesis, we find that an increase in initial employee tenure by one standard deviation increases the expected time to failure by 9.09 %.

Finally, in strong support of Hypothesis 1, initial employment growth's negative effect on firm survival remains significant in most models. However, the effect is slightly reduced when controlling for initial employee tenure and turnover. Moreover, the effect is no longer significant when we introduce the initial inflow of new employees. These results indicate that these variables at least partially explain initial high growth's negative effects on firms' long-term performance.

Firm growth

To control the results of the above analysis, we further estimate employment growth models (equation 2.4) using GEE regressions. Estimations are based on 74,788 yearly observations from 1998 to 2007 for 15,007 unique firms (Table 2.3). The models only include firms that are active after the fifth year.

Changing our measure of firm performance (from survival to employment growth), does not alter the previous conclusions. Thus, all models in Table 2.3 find that initial growth has a negative effect on firms' employment growth after the fifth year. This finding confirms Hypothesis 1, which suggests that a lack of organizational stability in terms of employee composition during the early years has persistent and negative effects on firms' long-term performance. Moreover, Table 2.3 shows that higher initial turnover and a higher initial inflow of new employees have negative effects on surviving firms' long-term employment growth, in support of Hypothesis 3a and Hypothesis 3b, respectively. Finally, we find that higher initial employee tenure increases employment growth after the fifth year, in support of Hypothesis 3c.

In Hypothesis 2a and Hypothesis 2b we proposed that initial high growth

Table 2.3: Employment growth rate ($t-1$ to t), pct. (1998-2007) - GEE regression

	(1)	(2)	(3)	(4)	(5)
Emp at start-up	-0.517**	-0.688**	-0.636**	-0.434**	-0.671**
	(0.052)	(0.054)	(0.054)	(0.041)	(0.054)
Ft. equivalents, t-1	-0.005	-0.013	-0.007	-0.011	-0.009
	(0.010)	(0.011)	(0.011)	(0.008)	(0.011)
Firm age, t	-0.841**	-0.731**	-0.734**	-0.455**	-0.728**
	(0.085)	(0.084)	(0.084)	(0.070)	(0.084)
Ln(emp growth, age 0-2)	-0.699**	-0.925**	-0.816**	-0.685**	-0.821**
	(0.076)	(0.076)	(0.077)	(0.066)	(0.077)
Clock_5 x ln(emp growth, 0-2)	0.053*	0.062**	0.065**	0.056**	0.064**
	(0.021)	(0.021)	(0.021)	(0.018)	(0.021)
Emp turn ratio, t		0.116**	0.129**		0.124**
		(0.005)	(0.006)		(0.005)
Turn ratio, age 0-2			-0.060**		
			(0.005)		
ln(Inflow, age 0-2)				-0.214**	
				(0.078)	
Ln(inflow), t				10.929**	
				(0.111)	
Ln(outflow), t				-9.463**	
				(0.120)	
Emp tenure, age 2					2.168**
					(0.249)
Emp edu(years), t	-0.532**	-0.318**	-0.382**	-0.236*	-0.339**
	(0.122)	(0.121)	(0.121)	(0.096)	(0.121)
Personal liability	-0.434	-0.370	-0.491†	0.088	-0.415
	(0.280)	(0.280)	(0.278)	(0.217)	(0.278)
Founder age (yrs)	-0.115**	-0.022	-0.044**	-0.037**	-0.036*
	(0.016)	(0.016)	(0.016)	(0.013)	(0.016)
Founder edu (yrs)	0.477**	0.484**	0.488**	0.169*	0.480**
	(0.090)	(0.088)	(0.088)	(0.069)	(0.088)
Spin-off	-0.464†	-0.279	-0.363	-0.407†	-0.381
	(0.278)	(0.279)	(0.278)	(0.210)	(0.278)
Entrepreneurial exp	0.187	0.536*	0.314	0.309	0.449†
	(0.273)	(0.271)	(0.271)	(0.211)	(0.270)
Parent firm 50+ emp	0.748**	0.563†	0.629*	0.439*	0.541†
	(0.288)	(0.289)	(0.288)	(0.216)	(0.289)
Managerial exp	0.094	0.036	-0.096	-0.360†	0.004
	(0.276)	(0.275)	(0.274)	(0.211)	(0.274)
Market Concentration, t	16.897	21.096	20.835	19.147	20.664
	(14.433)	(15.034)	(15.034)	(12.548)	(15.023)
Constant	16.353**	2.613	5.902†	7.324**	0.255
	(3.201)	(3.220)	(3.208)	(2.803)	(3.244)
chi2	863	1336	1393	11204	1367
Observations	74,788	74,788	74,788	74,788	74,788
Firms	15,007	15,007	15,007	15,007	15,007

The models only include observations of firms if age ≥ 5. All regressions include unreported controls for GDP growth, Year (9 dummies), Industry (40 dummies), and Region (76 dummies). Clustered standard errors in parentheses.
Significance levels: † : 10% * : 5% ** : 1%

and employee turnover increase long-term employee turnover. This point is important, as excessively high employee turnover might have negative effects on firm performance. In support of this idea, Baron et al. (2001) demonstrate that employee turnover has a negative effect on firms' revenue growth. Moreover, we find that higher employee turnover$_t$ decreases expected survival time (Table 2.2). Therefore, if these initial factors increase employee turnover after the fifth year, the trade-off between initial growth and firms' long-term performance might be further explained. We investigate this issue below.

Employee turnover

In Table 2.4, we estimate the employee turnover ratio (equation 2.9), using GEE regression. Estimations are based on 74,788 firm-year observations from 1998 to 2007 for 15,007 unique firms. The models only include firms that are active after the fifth year.

We argue that high initial employment growth might lead to hasty and potentially mistaken hiring decisions, thus increasing long-term employee turnover. Moreover, employees who thrive in an innovative and vivid growth environment are likely to leave the previous gazelle company if (or when) growth rates decline and bureaucracy is initiated. Thus, Hypothesis 2a suggests that higher initial employment growth eventually increases employee turnover. All of the models in Table 2.4 show that initial growth has a positive effect on employee turnover after the fifth year, which strongly supports this hypothesis. Model 1 finds that an increase in the initial employment growth rate by one percent leads to an increase in the turnover ratio of 1.42 percentage points. In all models, the effect decreases with time. An additional year decreases the effect by -0.30 percentage points per percentage increase in initial employment growth. This result suggests that the counterbalancing effect of time reverses the positive effect of initial growth on employee turnover after 9.7 years (after start-up). Therefore, the model only partially supports the hypothesis regarding the persistent effects of initial growth on employee turnover.

In Models 2 to 4 in Table 2.4, we investigate Hypothesis 2b, which suggests that higher initial employee turnover increases long-term turnover. In support of this hypothesis, when controlling for initial employment growth, we find that higher initial employee turnover ultimately increases employee turnover. Thus,

Table 2.4: Employee turnover ratio (1998-2007) - GEE regression

	(1)	(2)	(3)	(4)
Emp at start-up	0.667**	0.494**	0.515**	0.651**
	(0.071)	(0.067)	(0.070)	(0.070)
Firm age, t	4.933**	4.597**	4.757**	4.830**
	(0.136)	(0.135)	(0.137)	(0.137)
Ft. equivalents, t-1	-0.047**	-0.061**	-0.052**	-0.050**
	(0.012)	(0.012)	(0.012)	(0.012)
Ln(emp growth, age 0-2)	1.421**	1.033**	0.952**	1.302**
	(0.095)	(0.093)	(0.102)	(0.099)
Clock_5 x ln(emp growth, 0-2)	-0.300**	-0.291**	-0.296**	-0.298**
	(0.030)	(0.029)	(0.029)	(0.029)
Turn ratio, age 0-2		0.190**		
		(0.008)		
ln(Inflow, age 0-2)			2.137**	
			(0.157)	
Emp tenure, age 2				-2.356**
				(0.517)
Emp tenure (yrs), t	-12.528**	-11.729**	-12.142**	-12.300**
	(0.130)	(0.136)	(0.137)	(0.138)
Emp education (yrs), t	-0.515**	-0.361*	-0.444**	-0.504**
	(0.155)	(0.153)	(0.155)	(0.155)
Personal liability	-0.381	0.007	-0.671	-0.331
	(0.420)	(0.408)	(0.418)	(0.419)
Founder age (yrs)	-0.212**	-0.151**	-0.177**	-0.201**
	(0.022)	(0.022)	(0.022)	(0.022)
Founder edu (yrs)	-0.291*	-0.271*	-0.292*	-0.280*
	(0.114)	(0.112)	(0.114)	(0.114)
Spin-off	-0.197	0.033	-0.174	-0.099
	(0.408)	(0.400)	(0.407)	(0.408)
Entrepreneurial exp.	-0.787†	-0.122	-0.516	-0.709†
	(0.402)	(0.395)	(0.401)	(0.402)
Parent firm 50+ emp	0.788†	0.568	0.706	0.816†
	(0.433)	(0.423)	(0.432)	(0.433)
Managerial exp	-0.945*	-0.452	-0.807†	-0.886*
	(0.417)	(0.407)	(0.414)	(0.418)
Market Concent., t	-21.309	-20.350	-21.638	-20.845
	(19.959)	(19.906)	(19.958)	(19.952)
GDP growth, t	-0.470	-0.579	-0.509	-0.480
	(0.639)	(0.635)	(0.638)	(0.639)
Constant	82.611**	70.129**	76.007**	84.902**
	(3.142)	(3.124)	(3.148)	(3.182)
Year (9 dummies)	yes	yes	yes	yes
Industry (40 dummies)	yes	yes	yes	yes
Region (76 dummies)	yes	yes	yes	yes
chi2	16410	19566	18226	16576
Observations	74,788	74,788	74,788	74,788
Firms	15,007	15,007	15,007	15,007

The models only include observations of firms if age ≥ 5.
Clustered standard errors in parentheses.
Significance levels: † : 10% * : 5% ** : 1%

Model 3 suggests that a one standard-deviation increase in initial turnover increases the turnover ratio at time t by 5.15 percentage points. Furthermore, we show that a higher initial inflow of new employees increases the long-term turnover ratio (Model 3), whereas, conversely, higher initial employee tenure ultimately leads to lower employee turnover (Model 4).

Discussion and additional tests

Although the above analyses strongly support our hypotheses, several aspects are subject to criticism. Therefore, we conduct various additional tests in order to address these queries and pursue alternative explanations for our findings.

First, in Figure 2.1, we showed that new firms with low or moderate employment growth ultimately outperform high-growth start-ups. However, one might argue that this apparent trade-off between initial high growth and long-term performance is driven by differences in frailties among surviving firms, and not by the negative effects of initial organizational instability caused by high employment growth. If lower initial growth rates are associated with higher selection pressure, this could explain our findings. If initial competitive pressure is low, we should expect that the risk of firm failures over time will follow a pattern of liability of adolescence or aging (Le Mens et al., 2011), as well as higher growth rates for new firms. Conversely, low initial growth rates might reflect a more competitive market, and, hence, higher selection pressure, suggesting that fewer but relatively more competitive start-ups survive until the fifth year. To address this concern, we first examine the five-year survival rates for firms from each of the three categories (1. thirdtile to 3. thirdtile). Table 2.1 shows the share of firms from each category that are included in our final sample, as they did not exit before the fifth year. In accordance with the above argument, we should expect the lowest survival rates for the first and the second thirdtile and the highest survival rates for the high-growth entrants. Consistent with this hypothesis, Table 2.1 shows that young firms within the first thirdtile exhibits the lowest five-year survival rate. However, firms with moderate and high growth (2. and 3. thirdtile, respectively) exhibit very similar survival rates, indicating that the two categories face an equal initial selection pressure. According to the above argument, this indication would imply that more relatively weaker firms from these two categories are included

in our sample, leading to equally higher exit risks after the fifth year. However, contrary to this prediction, Figure 2.1 shows that firms with initial moderate growth have a significantly higher survival rate than high-growth start-ups. Moreover, this result is buttressed by the above survival analysis (Table 2.2). We argue that this result implies that initial differences in the selection pressure facing firms in the three categories cannot explain the trade-off between initial high growth and long-term performance.

The above analysis implicitly assumed that higher initial growth affects survival time within the three categories equally. Model 2 and Model 3 in Table 2.5 investigate this assumption further through the inclusion of dummy variables for the three growth categories. First, Model 2 confirms that higher initial employment growth decreases the expected time to failure when we control for the three growth categories. Moreover, Model 2 finds a longer expected survival time for firms in the second thirdtile than for firms in the first thirdtile, all else being equal, whereas high-growth firms (3. thirdtile) exhibit lower survival rates than firms in the first thirdtile. In Model 3, Table 2.5, we include the interaction term between time (years after age 5) and the growth categories, allowing a potential time-effect of initial growth to vary among the three categories. The model repeats the trade-off between excessively high initial growth and long-term performance that we illustrated in Figure 2.1. For the firms in the second thirdtile, the expected survival time is 1.19 times the expected survival time for firms in the first thirdtile, whereas the expected survival time is lower for firms in the third thirdtile than for the reference group, all else being equal. However, by definition, the three groups differ in their initial growth rates. When considering the average initial growth rates of each category (see Table 2.6), the aggregated effect of the second thirdtile is (only) an average increase in the expected survival time of 2.46 %. Correspondingly, the aggregated average effect on the expected survival time for the third thirdtile is -39.56 %.

Second, we hypothesize that slower growing entrants might eventually outperform gazelle companies. In support of this possibility, we find strong evidence that initial higher growth has a persistent negative effect on expected survival time. However, employment growth implies a simultaneous increase in firm size, which, conversely, exhibits positive effects on survival. We must

Table 2.5: Exponential survival model (1999-2006) - Accelerated failure-time form

	Firm age $\geq$ 10	**(2)**	**(3)**
Ln(full-time equivalents), t	0.861**	0.884**	0.884**
	(0.084)	(0.025)	(0.025)
Ln(Employees at start-up)	-0.465**	-0.467**	-0.467**
	(0.101)	(0.032)	(0.032)
Ln(total employment growth, age 0-2)	-0.065**	-0.047**	-0.047**
	(0.021)	(0.014)	(0.014)
2. Thirdtile, dummy		0.146†	0.176†
		(0.078)	(0.093)
3. Thirdtile, dummy		-0.216*	-0.218*
		(0.086)	(0.103)
No. yrs after age 5 x 1. Thirdtile			0.041†
			(0.023)
No. yrs after age 5 x 2. Thirdtile			0.030
			(0.023)
No. yrs after age 5 x 3. Thirdtile			0.041†
			(0.025)
Number of founders (initially)	0.104	-0.043†	-0.043†
	(0.085)	(0.024)	(0.024)
Employee education (years), t	-0.000	0.005	0.004
	(0.043)	(0.013)	(0.013)
Company with personal liability	-0.031	-0.116**	-0.116**
	(0.137)	(0.040)	(0.040)
Founder age at start-up (years)	-0.002	0.013**	0.013**
	(0.008)	(0.002)	(0.002)
Founder education at start-up (years)	-0.007	0.027*	0.027*
	(0.037)	(0.011)	(0.011)
Spin-off	0.127	0.161**	0.161**
	(0.140)	(0.041)	(0.041)
Entrepreneurial exp., dummy	0.203	0.102**	0.102**
	(0.133)	(0.037)	(0.037)
Parent firm had 50+ empl., dummy	0.167	-0.056	-0.056
	(0.155)	(0.040)	(0.040)
Managerial experience, dummy	-0.062	0.020	0.020
	(0.133)	(0.039)	(0.039)
Market Concentration, t (norm.)	15.315	4.871*	4.884*
	(28.684)	(2.177)	(2.179)
GDP growth, t	-0.253	-0.005	-0.005
	(0.218)	(0.016)	(0.016)
Constant	1.614	0.676**	0.630**
	(1.688)	(0.235)	(0.238)
Log-likelihood	-333	-5808	-5808
Observations	5,423	50,027	50,027
Firms	2,844	15,007	15,007
Firm failures	351	4,197	4,197

Models 2 and 3 only include observations of firms if age $\geq$ 5. All regressions include unreported controls for, Age (2 or 7 dummies), Entry (2 or 7 dummies), Industry (40 dummies), and Region (76 dummies). Clustered standard errors in parentheses. Significance levels: † : 10% * : 5% ** : 1%

Table 2.6: Descriptive statistics II (Firm age ≥ 5), standard deviations in parentheses

No. employees at start-up:		1-5	6-20
Ln(employment growth), age 0-2		2.43	1.83
		(2.75)	(3.12)
Full-time equivalents at start-up		1.67	9.63
		(1.05)	(3.74)
Full-time equivalents, age 5		5.13	19.47
		(14.10)	(28.04)
No. employees, age 5:	0-5	6-20	+20
Ln(employment growth), age 0-2	1.68	3.62	4.26
	(2.83)	(2.15)	(1.66)
Full-time equivalents at start-up	1.63	3.64	6.61
	(1.43)	(3.39)	(5.22)
Full-time equivalents, age 5	2.35	10.04	44.61
	(1.35)	(3.82)	(59.04)
Industry:	Service	Trad. Manufact.	High Tech
No. observations	43,546	2,763	3,718
No. firms	13,076	1,018	1,071
No. firm failures	3,727	229	241
Exit rate, pct	28.50	22.50	22.50
Ln(employment growth), age 0-2	2.21	2.75	2.99
	(2.81)	(2.72)	(2.51)
Full-time equivalents at start-up	2.32	2.56	2.99
	(2.67)	(2.63)	(3.30)
Full-time equivalents, age 5	5.84	10.27	10.05
	(13.83)	(21.71)	(31.77)
Growth, age 0-2:	1. Thirdtile	2. Thirdtile	3. Thirdtile
Ln(emp growth), age 0-2	-0.88	3.91	4.74
	(1.76)	(0.44)	(0.21)
Full-time equivalents at start-up	2.13	2.98	2.09
	(2.52)	(3.26)	(2.20)
Full-time equivalents, age 5	2.64	5.68	12.08
	(6.34)	(6.98)	(27.23)

consider this counterbalancing effect of firm size when proposing an eventual aggregated lower performance for gazelles. Furthermore, one might hypothesize that the apparent trade-off between initial high growth and firms' long-term performance is driven by small and stable organizations (low employment growth and turnover). If their costs of remaining in business are small relative to larger organizations, these stable and low-growth firms might choose to continue activities for a longer period of time, despite potential low efficiency. This possibility suggests an alternative scenario in which small firms' relative low costs of continuing business activities are mistaken for a negative effect

of initial higher employment growth. To test this alternative explanation and to consider the counter-balancing effect of firm size, we divide the firms into three size categories: 0 to 5, 6 to 20 and more than 20 full-time equivalents (see descriptive statistics in Table 2.6). Then, we estimate Model 1 in Table 2.2 separately for each firm $size_t$ category. First, we estimate the effect of initial higher growth for firms that employ 0 to 5 full-time equivalents when they enter the estimation sample at age 5 (see Model 1, Table 2.7). As we expected, the model shows that initial higher growth has a negative effect on survival. When investigating the alternative explanation that small firms with only minor costs of staying in business dominate our results, Models 2 and 3 exclude the smallest firms from the sample. Model 2 in Table 2.7 predicts the effect of initial growth on survival for firms with 6 to 20 employees. The model shows a greater negative effect for medium-sized firms than for the smallest firms, which results in the rejection of the alternative explanation. Similarly, Model 3 investigates the effect of initial growth for firms with more than 20 employees. The model does not find initial higher growth to have an effect on survival for the largest firms. However, note that this category only includes 5 % of the population. The lower number of observations and, in particular, firm failures, might explain the absent effect. Nevertheless, we can confirm that the negative effect of initial high growth on long-term performance is significant for the vast majority of firms in the population. In addition, Models 4 and 5 in Table 2.7 show that this result also holds if we instead categorize firms by start-up size. Finally, within the existing empirical framework, we cannot overlook the potential offsetting of the negative effect of initial high growth by increase in firm size. Thus, we cannot provide conclusive evidence that, on average, gazelles are eventually outperformed by slower growing entrants. However, based on this analysis, we can conclude that although more employees increase survival, attaining a larger firm size through continuous moderate growth is preferable to attain this size quickly through initial high growth rates.

Third, recall that our sample includes start-ups emerging between 1994 and 2001. This period coincides with the rise and fall of many high-tech and Internet-based companies. Therefore, we might suspect that the above results are driven by such high-growth start-ups, which exited when the "dot-com

Table 2.7: Exponential survival model (1999-2006) - Accelerated failure-time form

	Employees, age 5			Employees, start-up	
	(0-5)	**(6-20)**	**(21+)**	**(1-5)**	**(6-20)**
Ln(emp), t	1.087**	0.918**	0.715**	0.847**	0.804**
	(0.034)	(0.060)	(0.109)	(0.028)	(0.057)
Ln(Emp at start-up)	-0.419**	-0.273**	0.009	-0.351**	-0.625**
	(0.037)	(0.061)	(0.113)	(0.040)	(0.170)
Ln(emp growth, age 0-2)	-0.041**	-0.076**	0.051	-0.042**	-0.069**
	(0.007)	(0.024)	(0.052)	(0.007)	(0.019)
No of founders (age 0)	-0.089**	0.027	-0.041	-0.057*	-0.045
	(0.030)	(0.047)	(0.092)	(0.027)	(0.053)
Emp education (yrs), t	0.012	-0.019	0.167†	0.012	-0.022
	(0.014)	(0.039)	(0.087)	(0.013)	(0.057)
Personal liability	-0.131**	-0.035	-0.251	-0.094*	-0.037
	(0.043)	(0.106)	(0.315)	(0.041)	(0.167)
Founder age (yrs)	0.013**	0.014*	0.039*	0.013**	0.042**
	(0.002)	(0.006)	(0.017)	(0.002)	(0.009)
Founder edu (yrs)	0.020†	0.038	0.061	0.022*	0.033
	(0.012)	(0.026)	(0.051)	(0.011)	(0.043)
Spin-off	0.169**	0.081	0.097	0.180**	0.089
	(0.047)	(0.088)	(0.202)	(0.043)	(0.120)
Entrepreneurial exp	0.135**	0.076	-0.610**	0.126**	0.210
	(0.039)	(0.107)	(0.234)	(0.038)	(0.175)
Parent firm 50+ emp	-0.026	-0.119	-0.339†	-0.035	-0.242†
	(0.046)	(0.090)	(0.190)	(0.043)	(0.128)
Managerial exp	-0.005	0.117	-0.109	0.010	-0.046
	(0.044)	(0.093)	(0.199)	(0.041)	(0.138)
Market Concent., t	0.062	-0.352	-3.596**	-0.177	-2.458†
	(0.706)	(1.198)	(1.346)	(0.640)	(1.287)
GDP growth, t	-0.014	0.055	-0.049	-0.002	0.002
	(0.018)	(0.040)	(0.099)	(0.016)	(0.058)
Constant	0.883**	0.334	-3.403*	0.812**	0.558
	(0.181)	(0.511)	(1.347)	(0.171)	(0.812)
Age (7 dummies)	yes	yes	yes	yes	yes
Entry (7 dummies)	yes	yes	yes	yes	yes
Industry (6 dummies)	yes	yes	yes	yes	yes
Copenhagen (1 dummy)	yes	yes	yes	yes	yes
Log-likelihood	-4287	-1254	-224	-5437	-435
Observations	34,165	13,135	2,727	45,474	4,553
Firms	10,461	3,791	754	13,665	1,342
Failures	3,402	669	126	3,896	301

The models only include observations of firms if age ≥ 5.
Clustered standard errors in parentheses.
Significance levels: † : 10% * : 5% ** : 1%

era" ended. Testing this alternative explanation, we re-estimate all models, excluding firms from the IT sector. However, we do not find that this alteration changes the above conclusions.[9]

Fourth, we implicitly suggest that initial high growth and employee turnover have negative effects on firms' long-term performance in all industries. However, different factors might have greater significance when explaining the negative effects on performance across industries. For example, the lack of investments in fixed capital might weigh highly, thus explaining the negative effects of initial high growth in traditional manufacturing, whereas the lack of efficient organizational routines might be the dominant explanation in the service industries. The Service industry is the dominant industry in Denmark, accounting for approximately two-thirds of the GDP. This industry distribution is also reflected in our sample (see Table 2.6). This distribution suggests that the above effects might be particularly pronounced in the Service industry (although industry fixed effects were controlled for in our analysis). Thus, it is not certain whether the above results present an accurate picture for all industries. Testing this possibility, we estimate the firm failure models (Table 2.2) separately for the three industries: Service, High-Tech and Traditional manufacturing.[10]

The industry distribution in our sample suggests that the Service industry might dominate our results. In support of this possibility, we find that initial tenure and initial turnover do not affect survival in the Traditional manufacturing and High-Tech industries, whereas the effects on the Service industry echo the results in Table 2.2. Similarly, initial higher inflow of new employees decreases the expected time to failure in the Service industry but is insignificant in the High-Tech industry. Conversely, initial employee inflow has a positive effect on survival time for firms within the Traditional manufacturing industry. Hypothesis 3 (a, b and c) is thus primarily supported in terms of the Service industry. Finally, we find evidence that initial higher growth has

[9]The results are available upon request.

[10]Because of the smaller number of observations, we replace the labor market region dummies with a dummy variable for the capital area when estimating the models for the Traditional manufacturing and the High-Tech industries. The results are available upon request.

Table 2.8: Exponential survival model (1999-2006) - Accelerated failure-time form

	(1)	(2)	(3)	(4)
Ln(full-time equivalents), t	0.842**	0.829**	0.826**	0.775**
	(0.025)	(0.027)	(0.028)	(0.033)
Ln(Employees at start-up)	-0.409**	-0.397**	-0.393**	-0.339**
	(0.030)	(0.031)	(0.033)	(0.037)
Ln(total emp growth, age 0-2)	-0.046**			
	(0.006)			
Ln(total emp growth, age 0-3)		-0.032**		
		(0.006)		
Ln(total emp growth, age 0-4)			-0.026**	
			(0.007)	
Ln(total emp growth, age 0-5)				-0.003
				(0.008)
No of founders (age 0)	-0.053*	-0.061*	-0.064**	-0.072**
	(0.024)	(0.024)	(0.024)	(0.024)
Employee education (years), t	0.005	0.004	0.005	0.004
	(0.013)	(0.013)	(0.013)	(0.013)
Company with personal liability	-0.111**	-0.107**	-0.109**	-0.110**
	(0.040)	(0.040)	(0.040)	(0.040)
Founder age at start-up (yrs)	0.014**	0.014**	0.014**	0.015**
	(0.002)	(0.002)	(0.002)	(0.002)
Founder edu at start-up (yrs)	0.028**	0.027*	0.027*	0.028**
	(0.011)	(0.011)	(0.011)	(0.011)
Spin-off	0.159**	0.154**	0.151**	0.149**
	(0.041)	(0.041)	(0.041)	(0.041)
Entrepreneurial exp., dummy	0.114**	0.122**	0.122**	0.126**
	(0.037)	(0.037)	(0.037)	(0.037)
Parent firm had 50+ empl., dummy	-0.064	-0.066†	-0.068†	-0.070†
	(0.040)	(0.040)	(0.040)	(0.040)
Managerial experience, dummy	0.017	0.017	0.015	0.015
	(0.039)	(0.039)	(0.039)	(0.039)
Market Concentration, t (norm.)	4.812*	4.832*	4.920*	5.010*
	(2.166)	(2.164)	(2.171)	(2.168)
GDP growth, t	-0.004	-0.003	-0.004	-0.003
	(0.016)	(0.016)	(0.016)	(0.016)
Constant	0.642**	0.625**	0.605**	0.565*
	(0.234)	(0.235)	(0.235)	(0.235)
Age (7 dummies)	yes	yes	yes	yes
Entry (7 dummies)	yes	yes	yes	yes
Industry (40 dummies)	yes	yes	yes	yes
Region (76 dummies)	yes	yes	yes	yes
Log-likelihood	-5840	-5854	-5859	-5867
Observations	50,027	50,027	50,027	50,027
Firms	15,007	15,007	15,007	15,007
Firm failures	4,197	4,197	4,197	4,197

The models only include observations of firms if age ≥ 5.
Clustered standard errors in parentheses.
Significance levels: † : 10% * : 5% ** : 1%

negative effects on firms' long-term performance within each of the three industries, which supports Hypothesis 1. However, the separate analysis reveals that initial high growth has a greater negative effect on survival time for firms in the High-Tech industry.

Fifth, as previously outlined, our results are not restricted to the choice to define the initial phase as the first two years of an organization's existence. One might argue that measuring initial growth within the first three years (or more) provides a better indicator of initial organizational setup than our current definition. Testing our results' sensitivity to the length of the initial growth spell, we re-estimate Model 1 in Table 2.2, including the following variables: *ln(employment growth, 0-3)*, *ln(employment growth, 0-4)* and *ln(employment growth, 0-5)* (see Table 2.8). When expanding the initial growth period, performance gradually converges to the long-term state. Therefore, we expect that the negative effect of initial high growth on expected survival time diminishes as we approach the cut-off point (firm age $\geq$ 5 years). Therefore, Model 4 in Table 2.8 shows that the effect of initial high growth becomes insignificant when we extend the growth spell to include the fifth year after start-up. However, Table 2.8 confirms that the above conclusions are not sensitive to the length of the initial growth spell, as Models 3 and 4 show that initial high growth has negative effects on firms' long-term survival.

2.5 Conclusion and implications

Over the past two decades, there has been an increase in studies on high-growth companies sparked by these firms' disproportionate economic contributions, particularly in terms of job creation. Therefore, the current financial crisis has intensified the (already high) political interest in high-growth firms, especially gazelle companies. This paper contributes to the literature on high-growth firms by investigating a thus far underexplored aspect, the question of gazelles' long-term performance. We apply an organizational theory perspective to explain the correlation between firms' initial growth trajectory and their long-term performance. Within this context, we contribute to the understanding of how organizational blue-prints emerge and effect gazelles' long-term performance. Our analyses also emphasize the persistence with which initial

factors make imprints in organizations, with long-term and, in many cases, even life-long effects on performance.

Our analyses reveal that although gazelle companies begin a flying start, they are not able to sustain this lead. Even worse, initial high growth has persistent negative effects on firms' long-term performance. First, we argue that this effect occurs because initial high growth hampers the organizational members' establishment of solid and efficient organizational routines. Second, we claim that a hasty expansion is likely to lead to errors in hiring decisions and thus to high turnover rates, resulting in frequent inflow and outflow as part of the organization's long-term employment scheme. Third, the necessity of adjusting the organizational form according to inevitable changes in the internal or external environment implies further turnover among the employees and marks a crucial disruption to the organization, which was presumably perfectly equipped to master the challenges of a high-growth environment. Basing our analyses on the Integrated Database for Labour Market Research (1994 to 2007), we confirm all hypotheses. Using survival analyses and generalized estimation equations panel regressions of employment growth, we demonstrate that high initial growth rates lead to a decrease in long-term performance in comparison with firms exhibiting initially moderate growth. Because higher initial growth implies larger firms, and firm size is known to increase survival, we cannot provide conclusive evidence that initially moderately growing firms eventually outperform gazelles. However, the results are in favor of this notion. Nevertheless, the evidence are conclusive in terms of the idea that attaining a larger size through continuous moderate growth or, perhaps, a larger start-up size or higher growth at a later stage, after efficient routines are established, are preferable paths to attaining this size quickly through initial high growth rates. Moreover, we demonstrate that high initial growth implies persistent higher employee turnover. Under the assumption that high employee turnover is harmful to firm performance, this positive correlation between initial high growth and long-term employee turnover might contribute to the explanation of the trade-off between initial growth and firms' long-term performance.

The above results supported the argument that a lack of organizational stability in terms of employee composition during gazelles' early years facilitates the explanation of the trade-off between initial high growth and long-term

performance. However, our analysis further revealed that the inevitable higher employee turnover in high-growth firms can only partially account for the negative long-term effects of initial high employment growth. Therefore, future research should strive to continue uncovering the factors that drive the negative trade-off between initial high growth and long-term performance. For example, in immediate continuation of our theoretical framework, one might derive the hypothesis that high variation in employment growth has the greatest destabilizing effect in comparison with, for example, a longer period of high growth. Furthermore, the lines of arguments presented in this paper can potentially be extended to high-growth incumbent firms. In other words, we might expect high employment growth to have similar destabilizing effects in mature firms as well, with potentially serious implications for their future performance. Finally, we hypothesize that initial high growth hampers the establishment of efficient organizational structures and routines. Recall that founder characteristics are argued to play a significant role in new firm performance. In particular, spin-off entrepreneurs are highlighted as a particular successful type of entrant. One argument for spin-offs' superior performance is their frequent adoption of the organizational form of the parent firm and the utilization of organizational routines familiar to them. Moreover, spin-offs recruitment of former colleagues from the parent firm might further ease the process of establishing an efficient organization, as they can build on existing relations, shared values, and routines. This possibility suggests that spin-offs might be more skilled at handling initial high growth. However, we leave these thoughts as suggestions for future research.

Based on the above results, giving a second thought to the current political tendency to prioritize the enablement and fostering of prosperous conditions for the emergence and settlement of gazelles is worthwhile. Of course, the short-term effects of high-growth start-ups with regard to job creation are indisputable. However, we argue that to actively pursue such short-term economic gains of high-growth start-ups is to risk the consequences of initial high growth in terms of a higher tendency to eventually lose these jobs once again. We claim that trimming political initiatives to specifically provide gazelles' requirement might come at the cost of forgoing more sustainable jobs and potentially hinder long-term expansion in terms of production efficiency. As we

have argued, production efficiency requires routinized, stable and, most importantly, surviving organizations. From an economic perspective, it is thus dangerous to focus solely on short-term job creating machines with foreseeable long-term disadvantages.

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Chapter 3

The effect of top-employee migration and spin-offs on incumbent firms[1]

Abstract: *Spin-offs are know to be superior performers compared to other de novo entrants. Spin-offs are thus expected to accrue greater and more long-term welfare effects than other start-ups, but if spin-offs are founded on the intellectual capital accumulated at their parent firms, they may be potentially harmful to those firms. However, similar effects on the performance of parent firms might be expected for top-employee migration to rival incumbent firms, or even for top employees who migrate to non-competitive destinations. Using the comprehensive Danish linked employer-employee database, we investigated how top-employee migration to spin-off, rival incumbent firms, and non-competitive destinations affect parent firms' hazard of exit, sales growth and employment growth. We found negative performance effects from top-employee migration independent of where employees migrate. Although departures of top employees to spin-offs were found to have negative effects on parent-firm performance, and this negative effect is greater than for the non-competitive departures, the effect is not significantly different from that of top employees who move to competing incumbent firms. We studied this phenomenon using different methods, including matched models adjusting for parent-firm heterogeneity.*

[1]Co-authored with Michael S. Dahl, Aalborg University.

3.1 Introduction

Many industry studies have illustrated how employees who leave incumbent firms to found their own firms in the same industry are remarkably more likely to succeed compared with other *de novo* entrants (see Klepper (2009) for a recent review). This form of entrepreneurship has been labeled *spin-offs*.[2] Although increasing attention is paid to these spin-offs, little evidence of the effects that spin-offs have on the parent firms exists (Klepper, 2009). The seminal work of Phillips (2002), a notable exception using data on Silicon Valley law firms, shows that the hazard of exit of parent firms initially rises when a highly ranked employee leaves to found a spin-off. Similar results of spin-offs are found for the hazard of exit for Dutch accounting firms (Wezel et al., 2006), US law firms (Campbell et al., 2012) and for the technological performances of parent firms in the US hard drive industry (McKendrick et al., 2009).

Across these three studies, parent firms experience lower performance when employees found spin-offs, at least initially. The question of whether this result holds when controlling for the general migration of employees (e.g., to rival incumbent firms) remains open, a factor for which only Phillips (2002) has data to account for. In addition, these three studies are conducted on three specific industries where it is more likely that spin-offs are based on customer relations from the parent firm, which is a convincing explanation for why spin-offs are harmful. In other industries, spin-offs might not be as harmful, because the overlap between spin-offs and parent companies is smaller (Chatterji, 2009). Moreover, McKendrick et al. (2009) indicates that the negative effect is only temporary and that parent firms are likely to perform better after the spin-offs have departed, possibly because stronger firms spawn more spin-offs.

Based on this evidence, we argue that it is still largely an open question whether spin-offs are harmful for parent firms and, if so, whether they are more or less harmful than other types of top-employee migration. We build on prior studies and focus on the effect of top-employee migration to three different

[2]In the existing literature, the superior performance of spin-offs almost exclusively refers to their higher survival rates. In Chapter 5, we conduct an empirical study that compares spin-offs' job creation to that of other entrant firms. This study concludes that spin-offs are more important to the job creation in the economy than other entrants.

destinations: spin-offs, competing incumbent firms, and non-competing firms. The latter category serves as the baseline of our analysis. If top-employee migration generally reduces the parent firms' stocks of human capital and destabilizes organizational routines, the effect on parent-firm performance might be independent of the destination for the departure. This hypothesis suggests that the departure of top employees to spin-off entrepreneurship might not induce additional negative effects on parent-firm performance. We used a unique dataset to study the effects on 29,271 parent firms in a wide range of private-sector industries in Denmark from 1993 to 2006. More specifically, we studied the effect of top-employee migration on future survival, sales growth and employment growth of the parent firm. Top employees are defined as employees placed among the top 25% wage-earners in the parent firm. Although several explanations may exist for the mechanism behind a potentially harmful effect on a parent firm, we highlighted these mechanisms and studied the direction of effects.

The decision to migrate could be endogenous to past or expected future performance of the parent firm. We accounted for this concern, at least partly, by matching the parent firms to one another based on their observable characteristics and performance history. This study design enabled us to study the effect of top-employee migration in a more conservative setting. The matching models estimated only the cases where parent firms have one or zero departing top employees to isolate the effect of migration on subsequent performance.

Our study contributes to the literature that examines the consequences and effects of spin-offs and top-employee migration and knowledge spillovers between rivals, incumbent firms and startups. Spin-offs are expected to accrue greater and more long-term welfare effects, due to their superior performances compared with that of their peers, suggesting that industrial policy should encourage spin-off entrepreneurship (Klepper, 2009). In Chapter 5, we provide evidence in favor of this notion. However, if there is a negative performance effect from parenting spin-offs, this strategy becomes more questionable and requires more evidence on the effect on parent firms. The expectation of a negative effect by parent firms may lead them to try to prevent or fight spin-offs (Carnahan et al., 2012), possibly through non-compete covenants, which have been shown to decrease inter-firm mobility and entry into entrepreneurship

(Stuart and Sorenson, 2003; Marx et al., 2009).

3.2 Effects of top-employee migration on incumbent firms

Spin-off migration

New firms differ greatly in terms of performance. Spin-offs have often been highlighted as a particularly successful type of entrant in specific industry studies (Agarwal et al., 2004; Klepper and Sleeper, 2005) and in general (Dahl and Reichstein, 2007b; Dahl et al., 2009). Explanations of the success of spin-offs typically argue that founders accumulate organizational and firm-specific knowledge at their previous employers (the parent firms) that enables them to outperform other entrants. This firm-specific knowledge could include knowledge about products, production, technologies, routines and structures, but it may also include knowledge regarding strategy, markets and other processes (Sørensen, 1999; Klepper, 2001; Helfat and Lieberman, 2002; Phillips, 2002; Wezel et al., 2006) that might not directly conflict with the intellectual property of parent firms (Cooper, 1985; Roberts, 1991; Shane, 2003). This capital is well suited if the new firm is established in the same industry. The founder's experiences in that particular industry give her a head start compared with her peers (Agarwal et al., 2004) and assist her in overcoming the liability of newness (Stinchcombe, 1965).

Departing entrepreneurs might also take other resources with them to their own business. Former colleagues might be offered positions in the new venture. The parent firm risks losing personnel and firm-specific knowledge simultaneously. By definition, spin-offs are established in the same industry as the parent firm, implying that they potentially compete directly with the parent firm. Compared with other new rivals, spin-offs could pose a greater competitive threat because they are based on knowledge, organizational routines and potentially also employees from the parent firm (Agarwal et al., 2004; Wezel et al., 2006), which increases the potential similarity in products, technology and markets or strategies and, thus the departure of an employee to a spin-off might increase the hazard of failure for parent firms. The negative effect on the parent firm's performance might increase in proportion to the overlap in

products and markets between the parent firm and the spin-off (Phillips, 2002; Wezel et al., 2006).

The departure of employees to spin-off entrepreneurship may decrease the parent firms' stock of human capital and increase competition, and it might also disrupt organizational routines and increase the need for organizational restructuring (Phillips, 2002; McKendrick et al., 2009). When an employee leaves a firm to begin entrepreneurship, her departure and subsequent replacement might trigger an organizational restructuring in the parent firm, a more likely case the higher the rank of the employee and the more important she is to the parent firm (McKendrick et al., 2009). Recent studies show that employees with longer educations, higher job performance and higher wages are more likely to enter and succeed in entrepreneurship (Braguinsky and Ohyama, 2007; Groysberg et al., 2009; Elfenbein et al., 2010; Carnahan et al., 2012). If spin-offs are generally initiated by top employees, their departure might further increase the need for organizational restructuring, leading to a decline in the parent firms' performance and a greater loss of human capital that is costly to replace.

The preceding arguments suggest a negative effect on the parent firm's performance following a spin-off. This drop in performance could stem from the loss of human capital and organizational change triggered by the departure of a top employee, potentially destabilizing the organization, due to missed opportunites (Hannan and Freeman, 1977,9; McKendrick et al., 2009). In addition, it could be an effect of the formation of a new competitor and the loss of knowledge, resources and social relations. In either case, we expect spin-offs to have a negative effect on the performance of parent firms.

Top-employee migration in general

Although the preceding arguments suggest a negative performance effect from parenting spin-offs, we argue that these proposed effects from spin-offs might not differ from the negative effects of other types of top-employee migration. In this paper, we distinguish between three destinations for top-employee migration; top employees who depart to spin-offs, competing incumbent firms, and non-competing destinations. The possibility that a departure to spin-off do not impose an additional negativ effect on a parent firm's performance compared

to other types of top-employee migration, importantly, questions whether the parent firms' apparent greater resistance toward spin-offs is rational or based on a fallacy. We argue that the answer depends on the actual mechanisms driving the effects. In the following, we hypothesize that the determining factor concerns whether the effects are mainly driven by (i) organizational destabilization and loss of human capital, (ii) increased competition triggered by loss of knowledge and loss of social capital (relationships) or (iii) loss of intellectual capital (organizational routines) to rival companies, i.e., spin-offs and competing incumbent firms.

Loss of human capital and organizational disruption

By definition, a top employee possesses high stocks of human capital, making her important or even indispensable to her employer. For that reason, losing a top employee to a spin-off implies a decrease in human capital and, potentially, a negative performance effect. This drop in the parent firm's stock of human capital is unrelated, however, to the top employee's post-departure occupation. As a consequence, we should expect an equivalent performance drop following any top employee's departure. A similar argument can be made regarding the proposed increased need for organizational change resulting from executive migration (McKendrick et al., 2009). If either the loss of human capital or organizational disruption drives the negative performance effects associated with top employees leaving for spin-offs, we should expect similar effects when top employees depart to other destinations than spin-off entrepreneurship.

Increased competition

The previous arguments build on the assumption that departing top employees equally reduce the parent firm's stock of human capital and trigger organizational change. However, if departures for spin-off also increase competitive pressure, this finding might make spin-offs even more harmful than other types of top-employee migration. This increased competitive threat emerges from the transfer of knowledge (e.g., idiosyncratic knowledge regarding products, technologies and strategy) or the transfer of social relationships. The latter could be harmful losses of clients and within-firm relationships (Corredoira and Rosenkopf, 2010). This loss of social relations happens when top employees

sustain customer relations upon departure. Although this might increase competitive pressure on the firms that parent spin-offs, the loss of social relationships is also an obvious risk when top employees depart to rival incumbent firms. The same argument thus also applies when a departing top employee transfers intellectual capital from a parent firm to a rival incumbent firm. This suggests that the proposed negative effects on parent-firm performance from spin-offs will be similar to the performance effects from top employees who migrate to incumbent rivals.

In contrast, Wezel et al. (2006) argue that the loss and subsequent replication of parent firms' routines induce more distinct competitive consequences if top employees resign to work at a newly founded firm (spin-off), as opposed to an incumbent rival. The reason for this finding is that new firms are not yet locked into a particular organizational structure or a specific set of routines. No pre-existing patterns restrain them from adapting or replicating the best features of the routines of the parenting firms. Incumbent firms, on the other hand, already have established organizational features that are not readily altered or influenced by a new top employee (Schein, 1983; Dahl and Reichstein, 2007b; Wezel et al., 2006). If spin-offs are imitating the organizational structure of their parents, it implies greater similarity in products and strategy and, hence, competition for the same markets. This result means that they are competing for the same customers and resources, for example, funding and employees. Such a loss of intellectual capital might, therefore, cause more harm in the case of spin-offs.

Although spin-offs are established in the same industry as the parenting firms, they may not engage in direct competition with them or win the same resources. Cassiman and Ueda (2006) and Hellmann (2007) suggest that spin-offs exploit opportunities already rejected by the parent firms. As a result, the overlap is likely to be small (Chatterji, 2009). This condition may open the door for potential synergies and mutually beneficial cooperation between parent firms and spin-offs. If spin-offs complement their parents, rather than compete for the same markets, the parent firm's performance might be positively impacted. Moreover, the potential positive effects to the industry from agglomeration, selection and legitimation might also suggest additional positive effects from spin-offs, if such positive industry effects would offset the

negative effects on the individual firm. We expect, however, that such positive effects of employee mobility will benefit the industry or region more than the individual firm (Baron et al., 2001).

In general, the departure of top employees is not solely associated with losses to the parenting firms, for example, the loss of human capital. If these are replaced, the new employees also imply a potential inflow of new knowledge and social relations (Kaiser et al., 2008; Corredoira and Rosenkopf, 2010). This finding is a part of the organizational restructuring that follows the resignation of top employees and potentially includes a re-evaluation of managerial practices and a realignment of organizational structures or improved strategies. Implementing these changes in the organization might be a lengthy and troubling process. Nevertheless, we expect that any negative effects on parent-firm performance following top-employee migration will decrease over time.

Although top employees' departure into spin-offs entrepreneurship might potentially harm parent-firm performance, we argue that similar negative effects might be expected for top-employee migration in general, independent on their post-departure occupation. If either loss of human capital or organizational disruption drives the negative effects on parent-firm performance, the proposed negative effects from spin-offs should not differ from the effects of other types of top-employee departure. However, if transfer of knowledge and social capital from the parent to a potential competitor increase the competitive threat facing the parent firm, both departure for spin-offs and competing incumbent firms cause more harm to the parent firm than departures to entrepreneurship in remote industries, to non-rival incumbents, and other non-competitive destinations. Furthermore, for spin-off entrepreneurship, imitation of the parent firm's organizational structure might increase similarity and competition, suggesting a relatively stronger negative effect on parent-firm performance.

Finally, firm performance might be subject to opposite effects from the departure of top employees, especially when top employees depart to spin-offs. This possibility includes the inflow of new knowledge and social relations if the departing top employee is replaced. Potential synergies between spin-offs and parent firms and positive industry effects might also offset the proposed negative effects of spin-offs and top-employee migration in general.

In sum, the overall effects from top-employee migration in general, to spin-offs and to competitive incumbent firms depend on the relative effects from loss of human capital, social relations, knowledge and resources and those of organizational change and increased competition. The outcome is dependent on the mechanisms driving the strongest effects on parent firm performance.

3.3 Method

Data

We analyzed the effects on parent firms' performance following spin-off and other types of top-employee migration using a linked employer-employee database from Denmark. The Danish Integrated Database for Labor Market Research (referred to by its Danish acronym, IDA) contains information on the economy from 1980 to 2007 and is maintained by Statistics Denmark. The IDA contains demographic information on all individuals, plants and firms in the Danish labor market. Its paneled structure enables tracing all observations annually. The complete system for social security numbers enables the faithful combination of a large collection of government registries, which are maintained closely, due to the extensive welfare system. This data is used increasingly in the social sciences, for example, Albæk and Sørensen (1998), Sørensen and Sorenson (2007), Sørensen (2007), Dahl and Sorenson (2010) and Dahl (2011). For a thorough description of this database and its structure, see Timmermans (2010).

In our sample, we included all active incumbent firms from 1993 to 2006. Firms from the public sector and the heavily regulated primary sector were excluded because other factors affect firm performance in those sectors. To be considered active, a firm must employ a minimum of one full-time equivalent employee. Using this definition, we determined firm age as the first observed activity within an observation period starting in 1980. If a firm had less than one full-time employee for two consecutive years, we considered the firm closed. We allowed for a single year without activity, but we allowed no reentry. Subsequent observations were dropped, providing a more conservative dataset of 196,839 incumbent firms.

We did not expect departures of all types of employees to have equal effects

on the performance of firms. Blue-collar workers might not have a measurable impact on a firm when they resign, and the migration of lower wage workers might even increase firm performance (Carnahan et al., 2012). Therefore, we restricted ourselves only to examine top employees, defined as full-time employees with a salary equal to or above the 75th percentile of full-time salaries in each firm.[3] The legal individual owner(s) and founder(s) are top employees regardless of their salary.

Parent firms are firms that lost one or more top employees during the period of investigation. The preceding argument implies that only top employees have the ability to affect parent-firm performance. In smaller firms, however, all employees might cause such effects, independent of their salary. The latter implication does not match the objective of this analysis, and parent firms are, therefore, restricted to those firms that employ a minimum of ten full-time equivalents at the time of resignation. In order for firms in the dataset to be comparable, we only include firms that have ten full-time equivalents or more in at least one out of two years from 1993 to 2007, reducing our sample to 29,271 firms.

Depending on their post-departure employment, we divided the departing top employees into three categories: (i) spin-off entrepreneurs, (ii) employees at rival incumbent firms or (iii) non-competitive destinations, including entrepreneurs in other industries, employees at non-rival incumbent firms, retirees, students and even deaths as investigated in Chapter 4. A spin-off is a new business founded in an industry closely related to the industry of the parent firm, i.e., designated by the same four-digit SIC-code. Along similar lines, a departure to a rival incumbent firm is a departure to a firm within the same four-digit SIC-code industry as the parent firm. Incumbent firms include firms of all ages except start-ups (firms aged zero).

[3]We have tested the robustness of our results concerning this threshold and estimated Model 1 to Model 14 using the 90th percentile. This does not alter our findings, indicating that our results are robust to alternative definitions. These estimations are available upon request.

Identifying entrepreneurs and spin-off departures

The Danish data allows for two methods to identify entrepreneurs. An additional database containing information on the primary founder of new Danish businesses relying on board and registration information can be merged with the IDA. This database contains only one founder for each business, however, and we preferred to allow for a group of top employees founding a firm as a team. As a result, we chose to rely on the IDA for the identification of entrepreneurs and spin-offs following Sørensen (2007). Statistics Denmark provides annual information on the occupation of all individuals that we used to identify the entrepreneurs behind all businesses with personal liability including self-employed individuals with or without employees.

However, the occupation variable does not identify the entrepreneurs behind incorporated ventures. Using IDA, we further identified all newly founded firms in Denmark from 1981-2007 in accordance with Sørensen (2007). Following these criteria, entrepreneurial entry occurs when a firm appears as a new employer. The first observation determines the start-up year, and we omitted all subsequent observations and excluded firms from the public and primary sectors. We identified the founder(s) from the pool of individuals employed in the start-up year by, including (i) all employees present in a new firm if it has three employees or less. For firms larger than this, the decision criteria include: (ii) all individuals with the status of CEO or top manager or (iii) individuals with an occupational code as wage earner on the highest level. We identified as many as five founders based on this criterion (selection is based on highest salary). (iv) We also included individuals listed with unspecified occupation codes who might be the rightful founders, and we listed these individuals as founders if they belonged to the top three highest paid employees, replacing up to three individuals from category (iii). Finally, (v) if no one fulfilled the preceding four criteria, we treated the three employees with the highest salary as founders.

Explanatory variables

We followed the precedent of McKendrick et al. (2009) concerning most of the explanatory variables of interest. Accordingly, we included a dummy variable for spin-offs that takes a value of one in all years after an incumbent firm has

had its first spin-off. If the last observation of the top employee at the parent firm is in year t, then the spin-off dummy takes the value one in this year and all following years.

We also included a clock variable, counting the number of years since the last spin-off to analyze how the effect of spin-offs evolves over time. For instance, this clock variable takes on the value zero in year t, value one in year $t+1$ and value two in year $t+2$. We reset the clock each time an incumbent firm spawned a spin-off. By definition, this variable refers to the number of years since the incumbent has had a spin-off. Theoretically, we expect spin-offs to have initial negative effects on parent-firm performance. A negative effect from the spin-off dummy variable will confirm this hypothesis, but we expect this effect to diminish over time. If so, the spin-off variable will show a positive estimate in the regressions.

We accounted for the effect of departures of top employees in general and top employees departing to rival incumbent firms. For each, we introduced two equivalent variables: a dummy for departures and a clock variable for the time since the most recent departure. The former effect accounts for the departure of all top employees, i.e., including entry into spin-off entrepreneurship, departures to rival incumbent firms, and non-competitive destinations.[4] We expected an initial negative effect on performance captured by our top-employee departure dummy, but, eventually, incumbent firms should recover from their loss, as indicated by a positive estimate on the clock-variable. If spin-offs have no additional effect on firm performance, when controlling for the migration of top employees in general, the previous spin-off variables will be insignificant. The same holds for departures to rival incumbent firms.

Carnahan et al. (2012) hypothesize that, conditional to mobility, top employees are more likely to enter entrepreneurship. Entrepreneurship offers a direct link between individual performance and pay and attracts high-performers seeking to improve their earnings (Carnahan et al., 2012; Elfenbein et al., 2010). We tested this hypothesis on our dataset, and, conditional on mobility, we

[4]Notice that there is no overlap between the two variables "departure to spin-off entrepreneurship" and "departure to an incumbent rival firm". Spin-offs are only treated as newly founded firms during the start-up year. The previous criteria identify the founders. Top-employee migration to the spin-off in years subsequent to the start-up year is treated as departure to an incumbent rival firm.

found that top employees departing for spin-offs were more likely in the upper percentile of the top 25% of wage earners in each firm.[5] To contain additional adverse impacts from spin-offs driven by the loss of above-average human capital, we controlled for the departing top employee's rank in the firm. We gave top employees a wage score between zero and ten based on their relative salary.

In general, entry rates are higher in entrepreneurial regimes where entry barriers are low (Klepper, 1996; Agarwal et al., 2002). If motivated by the prospect of improved earnings, top employees might depart for spin-offs when market concentration is low and economic profits are available. This might result in a smaller negative performance effect from departures for spin-off compared to top employees' departure to rival incumbents in more competitive markets. Moreover, market concentration affects firm performance independently of executive migration. We controlled for industry concentration, measuring it using the normalized Herfindahl index (41 industries; see, e.g., Hall and Tideman (1967)).[6]

In addition to the covariates described previously, we included controls for firm age (logged), size (number of full-time equivalents, logged), size group (discrete variable, three categories; 10 to 19, 20 to 49, and 50+ employees, after the number of full-time equivalents in the majority of years from 1993 to 2007), industry (dummy for each two digit SIC-code, 41 categories), legal form (dummy for unlimited liability), wage level (average gross wage level of CEO,

[5]We tested the hypothesis using a negative binomial model (results are available upon request). The dependent variable is the wage score as described below. We include 4,671,045 observations of top employees from 1993 to 2006, including 606,812 departures. We controlled for age, age squared, tenure, tenure squared, work experience (logged), education (years), gender (dummy for male) and children (dummy for children age 0 to 12). Moreover, we controlled for firm characteristics including: industry (dummy for each two digit SIC-codes, 41 categories), legal form (dummy for unlimited liability), year dummies, labor market region dummies (77 categories), size (number of full-time equivalents, logged), top employees (number of top employees, logged) and dispersion in compensation structure (difference between the 75th and 100th percentile salary, logged). We found a small negative effect on wage score from top employees departing in general. This indicates that relatively higher salary reduces the likelihood of departure. Conditional on mobility, we found that top employees departing for spin-offs have a higher wage score. We also identified a small positive effect from top employees departing for rivals.

[6]The Herfindahl index range from 1/N to 1. We normalized it to range from zero to one.

Table 3.1: Descriptive statistics

	None		Before		After	
Survival (1993-2006)	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age, years	7.66	6.47	7.45	5.70	11.86	7.00
Full-time equivalents, logged	2.47	0.43	2.43	0.58	3.25	1.00
Salary blue-collar, logged	12.46	0.28	12.41	0.29	12.42	0.24
Salary white-collar, logged	12.49	0.35	12.52	0.36	12.58	0.34
Salary CEO, logged	12.69	0.56	12.68	0.56	12.88	0.61
Real GDP growth, pct	2.50	1.23	2.74	1.32	2.26	1.16
Wage score, all top emp dep	0		0		5.49	2.33
Wage score, departure to spin-off	0		0		6.26	2.81
Wage score, departure to rival	0		0		5.54	2.57
Time since last top emp dep	0		0		1.61	1.43
Time since last spin-off dep	0		0		0.28	1.22
Time since last rival inc dep	0		0		1.29	2.03
Top emp turn, share of top emp	0		0		25.35	
Emp turnover, share of ft. emp	14.10		18.16		23.77	
Personal liability, pct.	19.50		15.57		12.36	
No. of observations	12,385		28,951		173,146	
No. of unique firms	3,438		9,609		25,833	
No. of firm failures	2,077		0		11,482	
No. of top emp, total	43,173		92,350		2,868,700	
No. of top emp, per firm	3.49		3.19		16.57	
Top emp departures, total	0		0		418,403	
Top emp departures, per firm	0		0		2.42	
Top emp to spin-off, total	0		0		3,995	
Top emp to rival inc, total	0		0		94,447	

Categories: *None* : No top employees depart within the observation period. *Before* : Observations before one or more top employees depart. *After* : Observations after one or more top employees have departed.

white collar and blue collar workers, respectively (all logged)),[7] year dummies, GDP growth (yearly growth rate, percent) and labor market region dummies (77 categories). Tables 3.1 and 3.2 present descriptive statistics.

Estimations

We used three performance measures: firm failure, growth in sales and growth in employment. We investigated the effects of top-employee migration on the

[7]Missing values (given that not all firms have employees in all categories) were replaced with the industry average.

Table 3.2: Descriptive statistics

	None		Before		After	
Survival (1993-2006)	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Sales growth (1995-2005)						
Mean $sales_t$, logged	9.23**		10.11**			
Mean $sales_{t+1}$, logged	9.35**		10.14**			
Wage score, all departures	0		0		5.44	2.35
Wage score, departure to spin-off	0		0		6.19	2.82
Wage score, departure to rival inc	0		0		5.49	2.60
No. of observations	7,638		21,452		117,831	
No. of unique firms	1,599		7,770		19,816	
Employment growth (1993-2007)						
Full-time $equivalents_t$, logged	2.33**		3.10**			
Full-time $equivalents_{t+1}$, logged	2.47**		3.14**			
Wage score, all departures	0		0		5.46	2.34
Wage score, departure to spin-off	0		0		6.23	2.81
Wage score, departure to rival inc	0		0		5.52	2.59
No. of observations	12,845		43,897		171,407	
No. of unique firms	2,537		14,946		24,689	

Categories: *None* : No top employees depart within the observation period. *Before* : Observations before one or more top employees depart. *After* : Observations after one or more top employees have departed. T-test for ln(size): mean(none) vs. mean(before+after). Significance levels: † : 10% * : 5% ** : 1%

survival of the parent firms using the exponential survival model (accelerated failure-time form). Accordingly, we estimated time to failure (t_i), assuming that the baseline hazard, $\tau_i = e^{(-\beta_1 x_{1i,t} + ... + \beta_k x_{ki,t})t_i}$, follows an exponential distribution (Cleves et al., 2004):

$$ln(t_i) = \beta_1 x_{1i,t} + ... + \beta_k x_{ki,t} + \epsilon_{i,t} \tag{3.1}$$

We studied the effects on sales and employment following the approach used in Sørensen (1999), and we expressed growth as a function of firm size (S) and a number of covariates (x), where size is total sales or total number of full-equivalent employees:

$$ln(S_{i,t+1}) = \alpha \ln(S_{i,t}) + \beta_0 + \beta_1 x_{1i,t} + ... + \beta_k x_{ki,t} + \epsilon_{i,t+1} \tag{3.2}$$

Following McKendrick et al. (2009), we estimated population-averaged effects using Generalized Estimation Equation (GEE) regressions, which account for

within-group correlation in panel data (Zenger et al., 1988). The minimum requirement of the model is two subsequent observations, i.e., single-firm observations were excluded from the estimations. Correlation within firms was treated as autoregressive (AR1). Using the Huber/White/Sandwich estimator of variance, the estimation produces semi-robust standard errors. The dependent variable is continuous (assumed to be normally distributed). The GEE Panel regression uses $ln(sales)_{t+1}$ and $ln(full\text{-}time\ equivalent)_{t+1}$ as dependent variables, respectively. Both sets of models include the lagged value of the dependent variable as given in Equation 4.2. Data limitations restrict the observation period to 1995 to 2005, when estimating $ln(sales)_{t+1}$. Except for the size and age variables, both models of firm growth include the same set of covariates as the firm survival model.

3.4 Results

Firm survival

Table 3.3 presents results from exponential survival models estimating the effect from spin-offs and other types of top-employee migration on *ln(time to failure)*. The estimations are based on 214,482 firm-years from 1993 to 2006 for 29,271 unique incumbent firms. All models include size group, industry, region and year dummy variables and unreported controls for GDP growth. Model 1 presents the effects of general top-employee departure on survival. Having at least one top-employee departure from the firm has a significant, negative impact on survival, but the effect wears off over time. Losing a top employee decreases the expected time to failure by 38.9%, and each subsequent year increases the survival time by 5.2%, while a higher wage score has a negative effect. This means that it is generally negative to lose top employees independent of their destination. In general, large and incorporated firms have greater survivals. We also found that firms in less competitive industries and firms with higher wage levels for white-collar workers and CEOs have greater chances of survival.

Model 2 examines the effect of top employees departing to become spin-offs, i.e., to enter the same 4-digit SIC industry as entrepreneurs. This also has a negative effect on the incumbent firm's survival. Similarly, Model 3 shows

Table 3.3: Exponential survival model (1993-2006) – accelerated failure-time form

	(1)	(2)	(3)	(4)
Ln(full-time equivalent)$_t$	0.543**	0.514**	0.520**	0.541**
	(0.012)	(0.012)	(0.011)	(0.012)
Company with personal liability	-0.766**	-0.747**	-0.745**	-0.760**
	(0.024)	(0.024)	(0.024)	(0.024)
Ln(average gross income blue-collar)	-0.061	-0.048	-0.059	-0.068†
	(0.037)	(0.038)	(0.037)	(0.037)
Ln(average gross income white-collar)	0.078**	0.079**	0.080**	0.079**
	(0.028)	(0.029)	(0.028)	(0.028)
Ln(average gross income CEO)	0.266**	0.263**	0.263**	0.265**
	(0.016)	(0.016)	(0.016)	(0.016)
Market concentration (0-1)	1.007†	1.086†	1.056†	1.001†
	(0.606)	(0.604)	(0.602)	(0.604)
Wage score (0-10)	-0.027**	-0.061**	-0.053**	-0.027**
	(0.003)	(0.003)	(0.003)	(0.003)
Dummy: top-employee departure	-0.492**			-0.399**
	(0.035)			(0.036)
Clock: top-employee departure	0.051**			0.040**
	(0.006)			(0.006)
Dummy: Spin-off		-0.090*		-0.029
		(0.040)		(0.040)
Clock: Spin-off		0.012		0.006
		(0.010)		(0.010)
Dummy: Rival incumbent			-0.286**	-0.206**
			(0.021)	(0.022)
Clock: Rival incumbent			0.036**	0.024**
			(0.005)	(0.006)
Constant	-1.753**	-1.992**	-1.812**	-1.659**
	(0.567)	(0.573)	(0.569)	(0.566)
Size group (two dummies)	yes	yes	yes	yes
Industry (40 dummies)	yes	yes	yes	yes
Region (76 dummies)	yes	yes	yes	yes
Year	yes	yes	yes	yes
GDP Growth	yes	yes	yes	yes
Log-likelihood	-21937	-22025	-21954	-21901
Observations	214,482	214,482	214,482	214,482
Firms	29,271	29,271	29,271	29,271
Events (firm failure)	13,559	13,559	13,559	13,559

Standard errors in parentheses.
Significance levels: † : 10% * : 5% ** : 1%

a negative effect if a firm loses a top employee to an incumbent firm in the same 4-digit SIC industry. As seen for top employees in general, the latter effect is reduced over time. In our final model, we tested the effect of these two

types of top-employee migration in the same model. Thus, we examined the effect of these while controlling for the other type and the general departure of top employees (Model 4). We found that after controlling for the general departures of top employees and departures to rival incumbent firms, the effect of spin-offs is insignificant and indicates that they do not affect the survival of the parent firms. In contrast, top employees departing for incumbent rivals have a significant and negative effect on survival. Top employees migrating to incumbent rivals reduce the time to failure by an additional 18.6% compared to top-employee migration in general. This result suggests that top employees who resign to work for rival incumbent firms have relatively larger negative effects on firm performance compared with top employees who depart for spin-off entrepreneurship, the latter being no more harmful than top-employee migration to non-competing firms. These results question the competitive threat facing the parent firm from departure to spin-off entrepreneurship.

Firm growth

Table 3.4 presents results from the GEE panel regressions estimating the effect from spin-off and other types of top-employee migration on $ln(sales)_{t+1}$. The estimations are based on 146,921 firm-year observations from 1995 to 2005 using 22,004 firms. All models include size group, industry, region and year dummy variables, as well as unreported controls for GDP growth.

Overall, the estimates of migration on sales in the following year support the findings from the survival models. We found that departing top employees have a negative and significant effect on sales independent of where they are active afterwards (see Model 5), an effect that decreases over time. Top employees who leave as spin-off entrepreneurs also have a significant and negative effect on the sales of their parent firms (see Model 6), again an effect that significantly diminishes over time. We also found that top employees leaving for incumbent rivals have a significant and negative effect, reducing over time, on the sales of the parent firms (see Model 7). Adding these three types of top-employee migration to the same model (Model 8) indicated that top employees departing for spin-offs and incumbent rivals have negative effects on the sales of the parent firm after controlling for the general departure of top employees. Departure for spin-offs and rival incumbent firms reduce sales by an additional 1.6% and

Table 3.4: GEE panel regression of ln(sales)$_{t+1}$ (1995-2005)

	(5)	**(6)**	**(7)**	**(8)**
Ln(sales)$_t$	0.864**	0.858**	0.861**	0.865**
	(0.003)	(0.003)	(0.003)	(0.003)
ln(Age)	-0.043**	-0.047**	-0.046**	-0.042**
	(0.001)	(0.001)	(0.001)	(0.001)
Personal liability	-0.021**	-0.016**	-0.015**	-0.020**
	(0.004)	(0.004)	(0.004)	(0.004)
Ln(income blue-collar)	0.031**	0.039**	0.035**	0.028**
	(0.008)	(0.008)	(0.008)	(0.008)
Ln(income white-collar)	0.050**	0.051**	0.050**	0.050**
	(0.004)	(0.004)	(0.004)	(0.004)
Ln(income CEO)	0.029**	0.028**	0.028**	0.029**
	(0.002)	(0.002)	(0.002)	(0.002)
Market concentration (0-1)	0.382**	0.391**	0.386**	0.381**
	(0.124)	(0.124)	(0.124)	(0.124)
Wage score (0-10)	-0.004**	-0.011**	-0.010**	-0.004**
	(0.000)	(0.000)	(0.000)	(0.000)
Dummy: Top emp depart	-0.097**			-0.086**
	(0.004)			(0.004)
Clock: Top emp depart	0.005**			0.004**
	(0.001)			(0.001)
Dummy: Spin-off		-0.026**		-0.016*
		(0.007)		(0.007)
Clock: Spin-off		0.004**		0.003*
		(0.002)		(0.001)
Dummy: Rival incumbent			-0.042**	-0.027**
			(0.003)	(0.003)
Clock: Rival incumbent			0.005**	0.003**
			(0.001)	(0.001)
Constant	0.135	0.061	0.106	0.156
	(0.108)	(0.108)	(0.108)	(0.108)
Size group (2 dummies)	yes	yes	yes	yes
Industry (40 dummies)	yes	yes	yes	yes
Region (76 dummies)	yes	yes	yes	yes
Year	yes	yes	yes	yes
GDP Growth	yes	yes	yes	yes
Number of groups	22,004	22,004	22,004	22,004
Observations	146,921	146,921	146,921	146,921
Wald Chi-Squared	722104	698489	701780	723201

Standard errors in parentheses.
Significance levels: † : 10% * : 5% ** : 1%

2.7%, respectively. These effects do not differ significantly, indicating a similar increase in the competitive pressure from departures to both spin-offs and incumbent competitors.

Aggregating the effects from general migration, spin-off and wage score (the average is 6.19 and 5.54 for spin-offs and incumbent rivals, respectively), we found that having a top employee departing for spin-off reduces sales by 12.7%. Similarly, departure for incumbent rivals reduces sales by 13.5%, but executive migration in general only reduces sales by 10.8%. The effects diminish by 0.4% per year for all departures and an additional 0.3% per year for both spin-offs and incumbent rivals. The latter suggests a relatively faster recovery when top employees resign for spin-offs or rival incumbent firms. In the last year of the observation period (after 13 years), the model indicates a reduction in parent firms' sales of 5.6%, 3.6% and 4.6% for general migration, spin-offs and incumbent rivals, respectively.

We tested these findings against another dependent variable: *ln(full-time equivalents)* in the year after the departure of one or more top employees. Table 3.5 presents the results from the GEE Panel regression estimating the effect from spin-off and executive migration on *ln(full-time equivalents)*$_{t+1}$. The estimations are based on 228,149 firm-year observations from 1993 until 2006 using 27,226 unique firms. All models include size group, industry, region and year dummy variables and unreported controls for GDP growth. The regressions on firm growth are almost identical to the previous findings (see Models 9 to 12). We found that top employees founding spin-offs have a negative and significant impact on the future employment growth of the parent firm. At the same time, departures of top employees to incumbent rivals and other destinations have negative and significant effects, as well. All three effects significantly declined over time.

When we investigate the effect of executive migration on firm sales or employment growth, our estimates may be subject to a selection bias, as firms exit the population. We might experience this selection problem for exiting firms that would have been among the lowest performing firms in the population, potentially due to migration of top employees. Selection-corrected growth models can provide a control for this potential selection bias. In our sample, the likelihood of observing a given firm in the sample is equivalent to the likelihood of that firm having survived. Building on Hall (1987), the sales (or employment) growth rate from time $t-1$ to t might be an appropriate instrument variable. However, while this variable is significant in models of firm survival,

Table 3.5: GEE panel regression of ln(full-time equivalents)$_{t+1}$ (1993-2006)

	(9)	**(10)**	**(11)**	**(12)**
Ln(full-time equivalents)$_t$	0.772**	0.762**	0.767**	0.775**
	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Age)	-0.039**	-0.042**	-0.041**	-0.039**
	(0.001)	(0.001)	(0.001)	(0.001)
Personal liability	-0.011**	-0.007*	-0.005†	-0.009**
	(0.003)	(0.003)	(0.003)	(0.003)
Ln(income blue-collar)	-0.031**	-0.029**	-0.031**	-0.033**
	(0.005)	(0.005)	(0.005)	(0.005)
Ln(income white-collar)	0.018**	0.018**	0.018**	0.018**
	(0.003)	(0.003)	(0.003)	(0.003)
Ln(income CEO)	0.024**	0.024**	0.023**	0.024**
	(0.002)	(0.002)	(0.002)	(0.002)
Market concentration (0-1)	0.182*	0.184*	0.179*	0.179*
	(0.089)	(0.089)	(0.089)	(0.089)
Wage score (0-10)	-0.006**	-0.013**	-0.012**	-0.006**
	(0.000)	(0.000)	(0.000)	(0.000)
Dummy: Top emp depart	-0.089**			-0.074**
	(0.003)			(0.003)
Clock: Top emp depart	0.003**			0.001*
	(0.001)			(0.001)
Dummy: Spin-off		-0.034**		-0.025**
		(0.007)		(0.007)
Clock: Spin-off		0.006**		0.005**
		(0.002)		(0.002)
Dummy: Rival incumbent			-0.053**	-0.042**
			(0.003)	(0.003)
Clock: Rival incumbent			0.005**	0.004**
			(0.001)	(0.001)
Constant	0.608**	0.587**	0.607**	0.619**
	(0.073)	(0.073)	(0.073)	(0.072)
Size group (2 dummies)	yes	yes	yes	yes
Industry (40 dummies)	yes	yes	yes	yes
Region (76 dummies)	yes	yes	yes	yes
Year	yes	yes	yes	yes
GDP Growth	yes	yes	yes	yes
Number of groups	27,226	27,226	27,226	27,226
Observations	228,149	228,149	228,149	228,149
Wald Chi-Squared	459452	420238	423211	470839

Standard errors in parentheses.
Significance levels: † : 10% * : 5% ** : 1%

it is also significant in the sales (and employment) growth models. The latter indicates that this instrument is correlated with the error term in the explanatory equation, violating one of the requirements for using instrument variable

methods, potentially resulting in inconsistent estimates of the selection models. For that reason we leave out the selection-corrected models. Note, however, that we expect a positive selection bias because selection is associated with higher performance. This potential positive selection bias suggests that a top employee's departure could be even more harmful to parent-firm performance than our models in Tables 3.4 and 3.5 predict.

Endogeneity

Our results illustrate a negative effect of losing top employees in general, to spin-offs and to rival incumbent firms. The effects of losing top employees may occur because parent firms differ from other firms or the top employees may leave declining firms or firms with dark futures ahead of them, a hypothesis coined *the sinking ship hypothesis*. For spin-offs, however, this hypothesis goes against the majority of literature, which typically finds that the most successful parent firms also have the largest number of spin-offs (Klepper, 2007; McKendrick et al., 2009). Employees at successful firms are more exposed to unexploited (or underexploited) opportunities (Agarwal et al., 2004), and working at a successful firm might be a stamp of approval and enable the spin-off entrepreneur to raise capital and attract the most talented employees (Dahl and Reichstein, 2007a). Franco and Filson (2006) even suggests that potential entrepreneurs might accept a lower wage for "apprenticeship" at a successful parent firm, pointing to more spin-offs in the firms that have had the highest growth rates in the past years.

In general, high growth might increase the need for organizational restructuring. If organizational changes alter an organization's blueprint, it might increase employee turnover (Baron et al., 2001). Top employees might be in a more favorable position to find alternative employment (or receive more job offers) when employed by more successful firms, suggesting that parent-firm performance is associated with higher rates of top-employee migration. On the other hand, economic theory suggests that wage difference allocates labor among firms. More productive firms can pay higher salaries and thus attract the most talented employees. If parent firms are more successful, we would expect them to compensate top employees financially to prevent their departure. However, other studies that use the Danish database have found a

strong positive effect on employee salary from changing employers (e.g., Dahl and Klepper (2008) and Dahl et al. (2009)), indicating that employees (in Denmark) are forced to find a new employer to earn a high salary increase (Bingley and Westergaard-Nielsen, 2003), rejecting this hypothesis.

Endogeneity might also be associated with top-employee heterogeneity, if top employees departing for spin-offs and incumbent rivals differ from other top employees. As argued previously, high performers might seek to improve earnings through migration, for example, into spin-off entrepreneurship. This indicates that the stronger negative effects on firm performance from spin-offs and incumbent rivals could be driven by higher human capital among these top employees. We tested these hypotheses below.

First, we estimated negative binomial regressions for the number of top employees departing in each of the three categories. We controlled for the employment growth in the past three periods before the departure of top employees. Additional controls included GDP growth, wage levels, limited liability and size (logged) and dummy variables for size, industry, region and year.[8] We found that growing firms have a larger migration of top employees in general and to rival incumbent firms and spin-offs. One standard deviation increase in employment growth one year prior to departure increases the number of top employees departing to spin-offs and incumbent rivals by 0.1 and 0.03, respectively. The same holds for large firms and in years with greater GDP growth in the economy. Overall, these results disprove *the sinking ship hypothesis*.

Second, to test the effect of potential endogeneity on our results, we supplemented the preceding analysis with a matching approach to ensure that firms (and top employees) are completely comparable in the point of origin (the year of top employees' departure). Using nearest neighbor matching, we matched firms on their *ex ante* performance, including employment (logged), sales (logged) or survival (estimated) as our dependent variables. Table 3.6 illustrates our approach. We estimated two sets of matched models to adjust for parent-firm heterogeneity and top-employee heterogeneity, respectively. To adjust for parent firm-heterogeneity, we matched firms on size group (three categories), industry (41 categories), firm age and the average gross salary for

[8] Estimations are available upon request.

blue collar workers, white collar workers and CEOs, respectively. These variables all refer to the last observation before departure, time $t-2$ (see Table 3.6). To adjust for top-employee heterogeneity we matched top employees on wage score (0-10), tenure, education (years) and age and we matched firms on size group (three categories) and firm age.

Table 3.6: Matching approach

Time	Firm ID	Year_t	$\ln(\text{sales})_{t+1}$	$\ln(\text{sales})_{t-1}$	Departing top employee	Years since last departure
$t-8$	5	1994	80		1	0
$t-7$	5	1995	60		1	1
$t-6$	5	1996	25	80	0	1
$t-5$	5	1997	10	60	1	2
$t-4$	5	1998	20	25	**0**	1
$t-3$	5	1999	30	10	**0**	2
$t-2$	5	1999	10	20	**1**	3
$t-1$	5	2000	25	30	**0**	1
t	**5**	**2001**	**15**	**10**	**0**	**2**
$t+1$	5	2002	10	25	0	3

We applied a conservative design without allowing for collective or repeated migration. First, we restricted the sample to those firms experiencing only a single departure within a five-year window, meaning that no other top employees were allowed resignation two years prior and two years after this event (see Table 3.6). The firms satisfying these criteria were matched with a sample of firms that experienced no top-employee departures within a five-year window. Referring to the latter as "controls", we matched the two groups based on performance and firm characteristics at time $t-2$ in every case. We then compared the performance of the "treated" and "controls" at time t, two years after a potential departure. We matched each "treated" with the two nearest "controls".[9] Table 3.7 describes the categorization into different treatment and control groups.

We estimated the effect of migration comparing employment (logged) and sales (logged) and estimated the mean survival time for each firm by re-using the specification from Model 4 in Table 3.3. Estimating the effect on survival, we used both a five-year-window and a three-year-window, but when using

[9] Using a single-match approach might rely on too little information. On the other hand, using too many matches incurs a risk of incorporating dissimilar observations (Abadie et al., 2001). For these reasons, we used two matches as a standard.

Table 3.7: Categories in Table 3.8

0)	Treatment:	One top employee departs.
	Control:	No top-employee departures within the five-year-window.
1)	Treatment:	One top employee departs to spin-off entrepreneurship.
	Control:	One top employee departs for other reasons (excluding departures to an incumbent rival).
2)	Treatment:	One top employee departs to an incumbent rival.
	Control:	One top employee departs for other reasons (excluding departures into spin-off entrepreneurship).
3)	Treatment:	One top employee departs to spin-off entrepreneurship.
	Control:	One top employee departs to an incumbent rival.

the five-year-window, the sample was conditional on survival because we only included firms that survived until time t. This is the case for both the "treated" and the "controls". Thus, we compared the estimated mean survival time at time t. Matching firms from the treatment group with the control group, we only matched on their expected survival at time $t-2$. Using the three-year-window, we also compared the estimated mean survival time at time t. However, if a firm exited on or prior to time t, we replaced the dependent variable value with -1 and 0 for firms exiting at time $t-1$ and t, respectively. Using the three-year-window, we included all matching variables (e.g., firm size, age and industry).

Following the preceding order, we first investigated the effect of general executive migration to provide the baseline effect. Next, we estimated the effect of spin-off by matching firms with one top employee departing for spin-off with other single top-employee departures (see Table 3.7). Following a similar procedure, we estimated the effect of departure to an incumbent rival. Finally, the matching approach permits a direct test for differences in effects from departure for spin-offs and incumbent rivals. Investigating the effect on employment (logged), sales (logged) and survival (three-year-window), we estimated two sets of matched models accounting for firm heterogeneity and top-employee heterogeneity, respectively. When estimating the effect on survival (five-year-window), we only included one set of matched models because we only matched firms on their expected survival at the time of top employee departure.

First, we adjusted for firm heterogeneity, matching solely on firm characteristics. We estimated the effect of one top employee departing independently

of the post-departure occupation and no longer found a significant effect on employment growth from migration in general (see Table 3.8). However, the negative effects on sales and survival remain significant. We then matched departures to spin-off with migration in general, not including departures to rival incumbent firms, and found a negative effect on both employment and sales. On average, losing a top employee to spin-off entrepreneurship decreased employment by 6% and decreased sales by nearly 20%, relative to departures to non-competitive destinations. Table 3.8 further indicates a negative but barely significant effect on survival. The models for departure to incumbent rivals also confirmed our previous findings, but the effect on employment and sales were smaller than for spin-offs. On the other hand, we found a stronger negative effect on survival from departure to an incumbent rival. When we adjusted for top-employee heterogeneity and matched primarily on top-employee characteristics, we found similar results.

The preceding findings suggest a larger effect from spin-off on employment and sales relative to incumbent rivals. Conversely, these findings indicate that departure to competitive incumbent firms has a greater effect on parent firms' survival than spin-offs. Matching spin-offs and incumbent rivals, however, we found no clear evidence that the effects on parent-firm performance differ between departures for spin-offs and incumbent rivals, but some evidence did indicate that spin-offs are more harmful to parent firms' sales.

Overall, the matched models support our previous findings, but it is important to emphasize that this analysis is not directly comparable with the former (see Tables 3.3-3.5). Because the matching approach requires one departure (or none) within a five year period, the estimates are biased toward the smaller firms in the population. For this reason, the previous analysis is necessary to obtain a more accurate picture of how top-employee migration affects parent-firm performance. The matching approach should therefore be treated as a supplement to the previous analysis and as a control of potential endogeneity.

The endogeneity problem can be regarded as an omitted variable bias. Our dependent variables might be related to unobservables before the resignation, for example, strategic decisions and innovations. We cannot observe all relevant information and have not identified suitable instrument variables. Nor can we

Table 3.8: Matched models

	Ln(ft equivalents)$_t$	**Ln(sales)$_t$**	**Mean survival$_t$†† (5-year-window)**	**Mean survival$_t$ (3-year-window)**
One top employee departs vs. no top employees depart				
Estimate	0.0064	-0.0400**	-2.6322**	-0.9526**
	(0.0058)	(0.009)	(0.1229)	0.1388)
# Observations	24,334	19,644	24,334	60,157
# Treatments	4,067	3,334	4,067	13,273
# Controls	20,267	16,310	20,267	46,884
A: Departure into spin-off entrepreneurship				
Estimate	-0.0614*	-0.1983**	-0.3637	-0.8323†
	(0.0275)	(0.0632)	(0.4956)	(0.4881)
# Observations	3,123	2,572	3,123	10,215
# Treatments	104	80	104	319
# Controls	3,019	2,492	3,019	9,896
B: Departure into spin-off entrepreneurship				
Estimate	-0.0519†	-0.1663**	-	-0.5513
	(0.0269)	(0.0609)	-	(0.4970)
# Observations	3,123	2,572	-	10,215
# Treatments	104	80	-	319
# Controls	3,019	2,492	-	9,896
A: Departure to a rival incumbent firm				
Estimate	-0.0256*	-0.0613**	-0.9707**	-0.9228**
	(0.0275)	(0.0195)	(0.1816)	(0.1821)
# Observations	3,963	3,254	3,963	12,954
# Treatments	944	762	944	3,058
# Controls	3,019	2,492	3,019	9,896
B: Departure to a rival incumbent firm				
Estimate	-0.028**	-0.0626**	-	-0.573**
	(0.0098)	(0.0184)	-	(0.1767)
# Observations	3,963	3,254	-	12,954
# Treatments	944	762	-	3,058
# Controls	3,019	2,492	-	9,896
A: Departure to spin-off entrepreneurship (vs. rival incumbent)				
Estimate	-0.018	-0.1037†	0.3566	0.2788
	(0.0287)	(0.0587)	(0.4379)	(0.4529)
# Observations	1,048	842	1,048	3,377
# Treatments	104	80	104	319
# Controls	944	762	944	3,058
B: Departure to spin-off entrepreneurship (vs. rival incumbent)				
Estimate	-0.0284	-0.0811	-	0.1159
	(0.0282)	(0.0623)	-	(0.4638)
# Observations	1,048	842	-	3,377
# Treatments	104	80	-	319
# Controls	944	762	-	3,058

A) Adjusting for firm heterogeneity. Matching variables include: Ln(size)$_{t-2}$ or survival$_{t-2}$ estimate, Size group (3 categories), Firm Age, Industry (2-digit, 41 categories) and Average gross salary$_{t-2}$ for blue collar workers, white collar workers and CEOs, respectively.
B) Adjusting for top employee heterogeneity. Matching variables include: Ln(size)$_{t-2}$, (3 categories), Size group Firm Age, Wage Score (1-10), Tenure (yrs), Education (yrs) and Employee Age.
††: Single matching variable is survival$_{t-2}$ estimate.
Significance levels: † : 10% * : 5% ** : 1%. Standard errors in parentheses.

be certain of the degree of selection of these unobservables, but Altonji et al. (2005) offers a method demonstrating the sensitivity of our results by assessing both the direction and magnitude of this bias. Combined with the estimated effects of our key-variables (the departure of top employees in general and to spin-offs and incumbent rivals), it establishes that the effect is within a defined range when controlling for bias (see Altonji et al. (2005) for details on the model and the underlying assumptions). Establishing whether our conclusions stands the test of whether our estimates remain negative when we correct for the bias was our primary concern followed by a desire to assess the magnitude of the bias and the endogeneity problem.[10] We found that the bias is positive for the three types of top-employee migration. We subtracted the estimated bias from the coefficient estimate to obtain the range, probably including the true effect. Numerically, the effect is larger than or equal to the coefficient estimate, confirming that the omitted variable bias underestimates the effects. Moreover, this approach estimates that the bias is relatively small and indicates that endogeneity is less of an issue. The negative effect will increase (the numerical value) with less than one percentage point in all cases. For the most exposed type, departure to an incumbent rival, this corresponds to an increase in the effect on parents' sales and employment of 6.9% and 14.3%, respectively.[11]

The previous tests indicate that omitted variable bias has a minor impact on our results. In the following section, we introduce a final control for the implications of endogeneity. If our previous findings are subject to severe endogeneity, applying a matching approach should significantly affect the magnitude of our estimates. To assess the implications of the matching approach, we re-estimated Model 5 to 7 and Model 9 to 11, but we only include firms from the corresponding matched model (recall that the matched models are biased toward the smaller firms in the population). The matching approach found no significant effect on employment growth from the departure of any

[10] We isolated the bias from our three key-variables (dummy variables for the departure of one or more top employees in general, to spin-offs and to incumbent rivals) in turn. This method did not allow us to estimate bias in the joint models (Model 8 and Model 12). We investigated the endogeneity in Model 5 to 7 and Model 9 to 11. To isolate the bias from the key-variable in question, the models exclude the clock-variable and wage score.

[11] Estimations are available upon request.

top employee. Nevertheless, the re-estimation of Model 5 illustrated a significant negative effect on employment. This indicated endogeneity in our reduced sample, as matching eliminated the effect, but this is an isolated case. For the remaining cases, the matched models depicted similar or even stronger effects, supporting previous findings.[12]

3.5 Discussion

We investigated how top employees' departures for spin-offs, incumbent rivals, and non-competitive destinations affect the survival, sales growth and employment growth of parent firms. When a top employee resigns, we expect a harmful reduction in the parent firm's stock of human capital, and the event might destabilize organizational routines and trigger organizational change. For these reasons, migration of top employees is expected to affect parent-firm performance negatively, independently of their reason for departure. Supporting this, we found a negative performance effect from departure in general, but we found additional effects on parent-firm performance from departure to spin-off and incumbent rivals after controlling for general departure of top employees. These findings support the argument that transfer of human capital and social capital from the parent to a competing firm is more harmful than top-employee migration in general because it increases competitive pressure on the parent firm.

We hypothesized that the competitive threat, and thus the negative performance effect, could be even greater for departure to spin-off. Unlike incumbent firms, spin-offs replicate the organizational structures of their parents, increasing similarity and competition between spin-offs and their parent firms. However, our results do not support this hypothesis; rather, they indicate that departure to rival incumbent firms might have larger negative effects on parent-firm survival than departure to spin-off entrepreneurship. However, our analysis shows no clear evidence of this result because the result differs across dependent variables. Our findings support the apparent resistance of

[12] Estimations are available upon request.

incumbent firms to the general departure of top employees, especially departures to competitive firms, but our findings do not support greater resistance toward spin-offs. Incumbent firms should focus on general strategies to retain employees and not specifically on preventing spin-off entrepreneurship by employees.

We used different methods to account for endogeneity associated with both firm and top-employee heterogeneity. Whether the endogeneity problem is associated with the sinking ship hypothesis or the opposite, it constitutes a potential risk that can never be completely eliminated, but the preceding tests indicate that endogeneity is associated with positive effects on firm performance in this study because better firms apparently have more spin-offs and higher migration of top-level employees. This result suggests that our findings are conservative. The magnitude of the negative effects from general top-employee migration and migration to spin-offs and incumbent rivals are probably underestimated, thereby supporting our conclusions. Moreover, we expect that stronger and healthier firms are less sensitive to negative impacts, such as loss of human capital and organizational disruptions and should be quicker to rebound and regain strength. This result scales down the overall economic implications of top employees' entry into, for example, spin-off entrepreneurship.

We have shown that top employees' departing for spin-offs or competitive incumbent firms have larger negative effects on parent-firm performance than other types of top-employee migration. Moreover, we have argued that the loss of social relations may drive this result, but these network effects do not apply equally to all industries. We expect the effect from the loss of relationships is especially strong within certain consultancy industries, for example, accounting or law firms, as investigated in Wezel et al. (2006) and Phillips (2002), respectively. These are industries in which decisions on business relations are more closely related to single individuals than to whole companies. Investigating this in more detail, we have estimated the matched models (adjusted for firm heterogeneity) excluding all but the consultancy industries.[13] We found

[13]Limited by the level of detail in the data, we only included industries in which we believe that network-effects play a significant role. This list could include industries in which the majority of activities match our definition of consultancy. We argue that this is the case

that the effect on survival from top-employee migration is larger within the consultancy industry, but no effects on employment and sales appeared within the industry.[14] The previous arguments suggest that top employees' departure to rival incumbent firms and spin-offs, in particular, are relatively more harmful within in the consultancy industry. Supporting this hypothesis, we determined that departures for spin-offs and incumbent rivals have an above-average adverse impact on parent-firm survival, but no significant effects with respect to employment and sales.[15]

Overall, our analysis depicts similar effects from departure to spin-offs and incumbent rivals. An equally harmful transfer of knowledge and loss of social relations might explain this finding. On the other hand, we found that spin-offs, conditional on mobility, are more likely to be in the upper percentile of top employees, indicating superior human capital. This suggests that the similar effects from top employees' departure to incumbent rivals and spin-offs might rely on different explanations. The latter might depend on a significant reduction in the stock of parents' human capital, while the transfer of knowledge and loss of social relations drives the negative effect for migration to rivals. Finding no answer, our investigation leaves that question for future research.

We do not distinguish between single and collective migration. Following Wezel et al. (2006), the replication of organizational routines is more likely to succeed and, thereby, compose a threat to the parenting firm when organizational members leave as a group. Furthermore, collective migration is more likely to trigger organizational change in the parent firm compared with departure of a single employee. Future research should address how the departure of teams and groups of employees to same destination might multiply these effects.

for law firms, accounting firms and technical consultancies. Alternatively, the definition might also include financial institutions and insurance companies, but we excluded these and questioned the degree to which customers' preferences relate to single individuals. We argue that customers, particularly large business clients, are less likely to respond to top-employee turnover by changing their bank connections, as compared with that in a technical consultancy for example.

[14] Matching departures from consultancy with departures from other industries, however, we found a strong effect on sales. In other words, departure from consultancy reduces parent firms' sales by 39% relative to migration within other industries and strongly supports the hypothesis.

[15] The estimations are available upon request.

As described previously, our study indicates that the departure of top employees to incumbent rivals and spin-offs has negative effects on parent-firm performance, but we do not investigate how other characteristics of the receiving firm (the firm to which the top employee departs) affect the parent firm's performance. We expect that greater similarity between the parent and the receiver will increase the competitive fallout, for example, if the two firms are established in the same environment (institutionally, geographically, socioeconomically and historically), thereby increasing the likelihood of competition for the same resources (Sørensen, 1999; Wezel et al., 2006). Greater similarity might also increase the receiving firm's absorptive capacity (Corredoira and Rosenkopf, 2010). Furthermore, because they have more resources, larger rival firms might be better at exploiting the inflow of human and social capital from the new employee and increase its market shares at the expense of the parent firm. This hypothesis might explain why we, as previously discussed, find indications that departures to rival incumbent firms could have larger negative effects on parent-firm survival than departures to spin-off entrepreneurship, as start-ups are generally smaller than incumbent firms. For these reasons, later studies should undertake a more exhaustive analysis and investigate under which circumstances top-employee migration is most harmful for parent firms.

As opposed to previous studies on spin-off and top-employee migration, which delimit themselves by industry and geography, we have investigated the phenomenon more generally. However, the question still remains of whether these findings apply equally to all industries. Although factors such as social and intellectual capital have significant parts to play within some industries, they are less crucial in others. We have already taken a first step by investigating consultancy industries, and future research should strive to outline in more detail which industries and under which circumstances spin-off contributes significantly to parent-firm performance. This includes an investigation of spin-off by lower ranked employees and investigation of small firms (fewer than ten employees).

We have illustrated a negative effect on firm performance from all types of top-employee migration. We partly explain this finding as a loss of human capital. This negative performance effect increases with greater human capital and might discourage firms from investing in their top employees' human

capital, especially if they expect high employee turnover. Moreover, we expect that idiosyncratic human capital will increase with the length of top employees' tenure, indicating a larger effect on parent-firm performance when employees leave after a longer period of employment. In many ways, the Danish labor market resembles that of the U.S. Compared with many other European countries, the employers costs of firing employees are low, and annual rates of job creation and turnover resemble the labor market in the U.S. (Dahl and Klepper, 2008; Sørensen and Sorenson, 2007). This suggests that the effects on parent-firm performance from top-employee turnover might be larger in other European countries but similar in the U.S.

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Chapter 4

Who loses a leader without losing ground?

Unexpected death in top management teams and firm performance

Abstract: *Executive migration might cause a detrimental human capital loss with great replacement costs or trigger a disruptive shock within an organization. Events such as top management turnover often reduce future performance. The question addressed in this paper is thus whether such potential disruptive change to the top management team is an inevitable risk that is equally harmful to all organizations or whether, and why, some organizations can better absorb the expected negative impact of this shock. I address these questions by exploiting the exogenous variation in firm performance from unexpected deaths in top management teams. I investigate which firm characteristics mitigate the negative effects of this exogenous shock by estimating firm survival and sales growth models. I find that greater organizational capabilities and increasing organizational stability and routinization through continuity in the top management team mitigate the negative effects, leading to higher post-death performance. Conversely, I find that increasing stability in the employee composition, reflected by higher employee tenure, increases organizational vulnerability to this disruptive shock.*

4.1 Introduction

Being at the head of firm strategy and being responsible for firm efficiency and employee achievements, top managers can be crucial to firm performance. The impact of top management turnover, especially CEO turnover, is thus *"critically important and yet unique and separate from turnover at other levels"* (Kesner and Sebora, 1994, p. 329). First, top management turnover is particularly detrimental because managers' organization-specific human capital is higher. The top management team (TMT) tasks are often non-routine and idiosyncratic, making potential replacements more difficult and costly (Kesner and Sebora, 1994). Second, top management turnover might trigger a disruptive shock for the firm, temporarily incapacitating organizational structures and routines (Carroll, 1984; Johnson et al., 1985; Haveman, 1993; Kesner and Sebora, 1994; Shen and Canella, 2002). This shock disrupts the internal functioning of the organization, as the departing top manager leaves gaps in the organizational structure. This alteration of organizational structures affects decision-making processes in the firm, and at best, involves implementing new and efficient organizational routines. This process takes time, during which organizational performance is less efficient. Moreover, the alternate top manager might differ from his/her predecessor in competencies, management style, strategic focus and prioritization (Shen and Canella, 2002). This difference might further complicate and prolong the process, as both routines and organizational norms are challenged. In addition, the indirect missed opportunity costs during this restructuring period might further enhance the negative effect of top management turnover (Hannan et al., 2007). All together, this leaves the post-shock organizations less efficient than before and thereby further hampering post-turnover performance.

Accepting the premise that top management turnover triggers a disruptive organizational shock and reduces the firm's human capital stock, we might expect firms to engage in TMT retention strategies when economically feasible. Nevertheless, provided a firm survives, TMT turnover eventually becomes inevitable. The question put forth in this paper is therefore whether potential disruptive TMT changes are risks that firms must simply (passively) accept or whether some firms cope better with such organizational shocks than others. The latter suggests that firms could perhaps equip themselves to reduce the

shock-effect of "losing a leader".

Intuitively, organizations that develop flexible routines and adaptive capacities are better prepared to cope with organizational disruptions such as top management turnover. Conversely, organizational inertia might circumscribe an organization's willingness and ability to act and adapt or limit its ability to perceive the need to do so, resulting in negative effects on the firm's post-turnover performance. Following the above arguments, if TMT continuity (i.e., lack of turnover) manifests organizational inertia, this inertia might imply a greater human capital loss during top management turnover, further hampering post-turnover performance. This suggests that older, highly routinized and inert organizations are more vulnerable to the organizational disruption of losing a leader. This paper, however, suggests an alternative hypothesis, arguing that firms characterized by organizational stability are, on average, more resistant to disruptive changes to the TMT and have a less negative shock to subsequent performance.

While more inert and routinized organizations might be slower or unable to adjust to changing environments, they might also have more efficient production than highly flexible organizations. This increased efficiency is partially due to their efficiently routinized behaviour, including better activity coordination and a more efficient resource exploitation (Nelson and Winter, 1982; Cohen and Bacdayan, 1994; Becker, 2004). Moreover, flexibility and adaptability imply that the firm employs excess resources and therefore has relatively higher production costs (Hannan and Freeman, 1977). For these reasons, stronger and more efficient organizations' might be better equipped to handle disruptive events. This further implies greater competitiveness and organizational capabilities (Le Mens et al., 2011). The latter might serve as a buffer for disruptive organizational shocks, preventing fatal outcomes. Another argument why organizational stability reduces the negative shock-effect builds on these organizations' presumed stronger structural inertias, i.e., greater resistance and less flexibility to organizational change. Because stronger inertial forces work against and hinder potentially detrimental organizational changes from occurring, the consequences of losing a top manager might be less severe with smaller organizational changes and performance effects.

The above portrays heterogeneous organizations, suggesting different responses to and different performance effects of losing a top manager. However, both organizational characteristics and the top management turnover type affect the performance outcome (Shen and Canella, 2002). The preceding points implicitly assumes that top management turnover implies an organizational loss with negative effects on performance. However, firms sometimes decide to terminate members of the TMT. Firms might initiate these TMT changes to improve performance or to signify change to external shareholders, often called the ritual scapegoating theory (Kesner and Sebora, 1994). This theory suggests that poor performance increases the likelihood of TMT turnover (He et al., 2011). Conversely, TMT turnover might not occur following a firm's initiative. Top managers might strive for new and exciting challenges and a higher salary, pursuing career-promoting opportunities outside the firm. Moreover, managers with extraordinary abilities, presumably employed in better performing firms, are more likely to be headhunted, indicating a positive correlation between TMT turnover and firm performance or perhaps post-turnover performance (Hayes and Schaefer, 1999). Nevertheless, whether a firm loses a top manager because he/she leaves for a new job, retires, falls ill, or is fired, there is a potential detrimental human capital loss[1], and it might trigger a disruptive organizational shock, which negatively affects organizational performance. The consequences to the firms' subsequent performance, however, differ. The evidence on the impact of top management turnover on firm performance is thus somewhat inconclusive (Carroll, 1984; Bonnier and Bruner, 1989; Haveman, 1993; Shen and Canella, 2002; Chang et al., 2010; He and Sommer, 2011; He et al., 2011).[2]

A general critique of the studies that investigate performance-effects from top management turnover is their inability to conclusively determine causality between the event and the firm's post-event performance. Top management turnovers rarely happen randomly. The endogeneity problem of a possible correlation with firm performance makes it increasingly difficult to separate these effects, predict the consequences of top management turnover, and investigate

[1] Though presumably higher, when a top manager is "raided" by another firm rather than fired.

[2] See Kesner and Sebora (1994) for a review of this literature.

which firms are better at overcoming this potential loss and organizational disruption. I address this problem by exploiting the exogenous variation in firm performance following 699 unexpected deaths in top management teams. Using a comprehensive dataset, containing yearly observations of all Danish firms from 1993 to 2006, I investigate which firm characteristics mitigate the disruptive organizational shock of losing a leader and increase post-death performance. These events, I argue, are randomly assigned and therefore uncorrelated with the firms' prior performance (Bennedsen et al., 2006). Moreover, as unexpected deaths draw randomly from the distribution of top managers, these top managers' abilities should reflect the population average (Hayes and Schaefer, 1999).

Few studies apply a similar methodology, exploiting the exogenous event of unexpected executive deaths to estimate the significance of top managers, CEOs, independent directors, and founders to firm performance (Johnson et al., 1985; Hayes and Schaefer, 1999; Bennedsen et al., 2006; Hvide, 2009; Nguyen and Nielsen, 2010). These studies generally confirm a negative relation between losing a top manager and post-death performance. While these studies focus on the value of differences in managerial ability and establishing the consequences of executive turnover, I apply an organizational theory perspective, investigating which firm characteristics influence post-death performance. I address the question of which firms are better prepared to handle the disruptive organizational shock of losing a leader and what can organizations do to better equip themselves to manage this shock with fewer effects on performance.

I find that organizations that increase organizational stability through TMT continuity (i.e., increasing TMT tenure), are better prepared to cope with top management turnover and the simultaneous organizational shock. Increasing TMT tenure results in a less disruptive effect on the organization and better post-shock performance. Moreover, matched models, controlling for endogeneity caused by the correlation between TMT tenure and firm performance, support this conclusion. I find evidence that higher ex ante death performance increases the organizations' organizational capability stock, leading to a smaller negative effect on post-death performance. Conversely, I find that longer employee tenure enhances the negative effects on firm performance

from losing a leader. I thus conclude that firms can, to some extent, build organizations that are better equipped to handle and resist the negative shock of top management unexpected death. Moreover, I argue that these results might also apply to other types of (internal) exogenous organizational disruptions. The results emphasize the important role of top management stability in establishing efficient and routinized organizations that are better equipped to handle disruptive organizational shocks. This finding suggests increasing focus on top management retention strategies, e.g., employee shares, terms of notice or non-competition agreements.

4.2 The effects of top managers' unexpected deaths

Extensive organizational changes punctuate and reset the process of establishing efficient organizational routines (Tushman and Rosenkopf, 1996). Altering established organizational action patterns destabilizes the organization and negatively affects organizational performance because of subsequent lower productivity. While this is not a permanent state, realigning the organization, re-establishing efficient patterns of activity, and adapting to the new context take time. This process is often called "resetting the liability of newness clock", comparing the post-disruption situation with the conditions and challenges that face new firms and increase their potential to fail. Conditional on survival, an organization can rebuild its internal processes (Amburgey et al., 1993). An unexpected death in the top management team might be an example of such a destabilizing activity. It alters the decision-making process and task division within the firm, incapacitating organizational structures and routines and leaving the organization in a state of perturbation.

Top management unexpected death also implies a human capital loss. The negative performance-effect of losing a leader increases with human capital, particularly firm-specific human capital (Johnson et al., 1985; Eriksen, 2011). Because top managers often perform non-routine and idiosyncratic tasks, their organization-specific human capital is higher than that of other employees. First, this implies a relative greater drop in the firm's human capital stock. Second, the idiosyncratic character of their work makes the process of finding a suitable replacement difficult and long-lasting. This difficulty implies

high recruiting and selection costs, especially those associated with training and learning organization-specific skills (Johnson et al., 1985; Eriksen, 2011). Top management unexpected death is thus particularly detrimental to firm performance. The alternate top manager might also have different competencies (e.g., technical, academic and managerial skills) than his/her predecessor. He/she might have a different managerial style, focus and prioritization, for example, different prioritization regarding fields of work and divisions due to personal commitment and areas of interests. These differences might further prolong and complicate the restructuring phase, thus reducing efficiency and performance. Moreover, a shift in focus, a lack of decision-making authority, and committing resources to the restructuring process might lead to missed business opportunities (Hannan et al., 2007).

After developing organization-specific skills, a potential successor might renew and strengthen the firm's competencies. He/she might bring new knowledge, perspectives, ideas, and social capital (networks) to the firm, potentially increasing firm efficiency and competitiveness (Tushman and Rosenkopf, 1996; McKendrick et al., 2009; Eriksen, 2011). These improvements suggest that the expected negative effect of top management death might reverse over time. While organizational changes might be disruptive and negatively affect firm performance, they are sometimes imperative. Baron and Hannan (2002) show that changing an organization's blueprint appears to be most disruptive when implemented by the original CEO. They further propose that this reflects the nature of the implicit contract between employees and management (Baron and Hannan (2002), p. 22). This suggests that top management turnover might sometimes provide an opportunity to change core organizational features with less disruptive effects. Supporting this theory, Tushman and Rosenkopf (1996) argue that firms might exploit top management changes as an adaption mechanism in turbulent environments.

Top management unexpected death causes a drop in the organization's firm-specific human capital stock and triggers a disruptive organizational shock. This shock leaves the post-shock organizations less efficient than before, and the organizational shock of losing a leader results in a (temporary) decline in firm performance. The question is not, I argue, whether this disruptive organizational shock has an immediate negative effect on performance. The relevant

question is instead the decline's size and duration. When do firms manage to escape this downturn, if ever, and how does this vary with different firm characteristics?

In the following sections, I develop hypotheses about which firm characteristics potentially enhance and mitigate the shock-effect. In addition to these internal factors, other external factors might affect the post-death performance. By asking whether firms can "prepare themselves for losing a leader", this paper solely examines internal factors and does not investigate the effect of the firms' environmental contexts on performance. However, I discuss the significance of external factors to the paper's conclusions in a later section.

Organizational stability

Unstable environments require that organizations develop the capacity to adapt by employing excess resources. In a more stable environment, however, this implies lower efficiency and thus lower competitiveness (Hannan and Freeman, 1977). Selection therefore favors organizational stability and reliability in a stable context (Carroll, 1983; Freeman et al., 1983; Hannan and Freeman, 1984; Baron et al., 2001; Hannan et al., 2007). Intuitively, however, flexibility and adaptability might better equip organizations for exogenous and sudden organizational disruptions. Moreover, organizational inertia might circumscribe the organization's willingness and ability to act and adapt or limit its ability to perceive the need for change, as phrased by Tushman and Rosenkopf: *"It (inertia) anchors the organization to its past, even in the face of turbulent contexts"* (Tushman and Rosenkopf (1996), p. 942). Contrary to this view, this paper hypothesizes that (past) organizational stability might reduce the expected negative shock-effect from top management unexpected death. Stable (i.e., inert) organizations are, on average, more resistant to top management unexpected death and show less negative shock to subsequent performance.

Assuming a stable context, the above paragraph argues that organizational stability and stronger inertia increase firm efficiency. This includes the formal organizational structure and routines, as well as organizational norms or culture (Hannan and Freeman, 1977). Efficiently routinizing activity patterns is essential, as it implies better coordination of organizational actions, i.e., more efficiently exploiting and integrating the organization's knowledge

and resources. Finally, organizational members in instable organizational environments who lack the willingness to try to engage themselves in acquiring organization-specific skills that are necessary to establish efficient routines might reinforce the previously described disadvantage of organizational instability (Hannan and Freeman, 1984). However, developing efficient routines takes time. The process of developing these routines includes developing social trust relationships among employees, management and external parties. Moreover, efficient routines evolve from learning-by-doing experience and stable repeated interactions among organizational members. Building on its experience, the organization establishes and continuously improves its organizational routines. Increasingly coherent and efficient routines thus evolve gradually over time (Stinchcombe, 1965; Nelson and Winter, 1982; Tushman and Rosenkopf, 1996; Sorenson and Sørensen, 2001; Hannan et al., 2006). These arguments suggest that organizational efficiency is higher in older firms, with all else being equal. Moreover, assuming that stronger firms with more efficient routines are less vulnerable to disruptive organizational shocks, the negative effect of top management unexpected death might decrease with firm age.

Organizational ecologists, studying the effects of fundamental organizational change, build on the premise that organizations are subject to strong inertial forces. Increasing inertia implies decreasing the speed at which organizational structures can change (Hannan and Freeman, 1984). Following the above arguments, continually enhancing organizational routines according to organizational stability reinforces organizational inertia. As a result, these organizations become inherently resistant to change. This suggests that organizations with stronger inertia are more resilient to disruptive organizational shocks, with less negative effects on subsequent performance. First, Baron and Hannan (2002) and Hannan et al. (2006) argue that CEO turnover tends to affect subsequent performance because top management turnover often coincides with changing the organizational blueprint. A negative effect of TMT turnover (or top management unexpected death) might be contingent on the event triggering substantial organizational change, thus altering established processes and organizational norms. However, if organizational inertia is strong, building on multiple periods of refining efficient and deeply rooted routines, these routines are not easily altered. When a changing context calling for reorientation

collides with strong internal forces that pull the organization in opposite directions, the prevailing outcome for strong inertia might be retaining the status qou. Stronger inertia may thus limit the expected negative effects from losing a leader. Because structural inertia increases with time, older firms might experiences a relatively smaller drop in post-death performance, with all else being equal. This smaller change in performance, however, is due to inertial forces working against and preventing potentially detrimental subsequent organizational changes from occurring, rather than a smaller disruptive shock to the organization per se. Supporting this, Amburgey et al. (1993) show that the net effect on firm performance from organizational disruptions decrease with age, though organizational vulnerability to disruptions increases with firm age, because organizational inertia decreases the likelihood of change (Amburgey et al., 1993).

H1: The negative shock-effect of top management unexpected death decreases with firm age.

In addition to the above arguments, firm age increases both employee tenure and the likelihood of insider turnover; the latter is replacement by an employee from within the firm. Because insider turnover is associated with less post-turnover organizational change and thus less disruptive effects on post-turnover performance, this adds further support to Hypothesis 1 (Kesner and Sebora, 1994; Shen and Canella, 2002). Moreover, because firms develop efficient routines and learn from experiences, older firms might be better equipped for top management unexpected death, as they are more likely to have previously experienced non-routine top management turnover.

Organizational capabilities and ex ante performance

Building on Le Mens et al. (2011)'s development of Levinthal (1991)'s organizational evolution model, this section argues that the organization's endowment of organizational capabilities determines its resistance to the disruptive shock of top management unexpected death. Organizational capabilities represent the firm's stock of financial (e.g., an ample cash reserve) and non-financial

(e.g., a good reputation) resources, which affects its potential to fail (Levinthal, 1991; Le Mens et al., 2011). Organizational capabilities may increase or decrease over time, depending on the organization's relative performance and a random component. The organization's initial endowment and previous resource inflows and outflows determine its current capability stock. The organization fails when its endowment is fully depleted. Hence, past evolution of capabilities, and not just the current flow, determines a firm's potential to fail and its resistance to disruptive organizational shocks (Le Mens et al., 2011).

It takes time to establish solid and efficient organizational routines, build a good reputation, and establish a network to external partners. In addition, the learning effect implies that productivity and knowledge of customer preferences increase over time. All else being equal, this suggests that organizational capabilities increase with time, adding further support to Hypothesis 1. Whether this actually implies that the focal organization's potential to fail decreases with age depends on its fitness (appeal) relative to other producers in the market. If organizational capabilities do not exceed the industry fitness threshold, the firm will experience a net resource outflow, decreasing the stock of organizational capabilities. When relative fitness is high, resources flow from the target audience to the organization, and vice versa (Le Mens et al., 2011).[3]

This organizational evolution model offers three hypotheses. First, it supports the main hypothesis of this paper. Punctuating established organizational routines implies a resource outflow. Hence, the current organizational capability stock is contingent on past performance and shocks. The latter might include events like executive turnover. Both past and current organizational stability might better equip organizations for disruptive shocks because their organizational capability endowments are higher. Second, all else being equal, organizational capabilities and immunity to disruptive organizational shocks increase with firm age, supporting Hypothesis 1. The expected negative shock from top management unexpected death is less likely to completely deplete the organizational capability endowment, making it less likely that this event leads to failure in older firms. Finally, following similar arguments, higher post-event performance might further diminish the shock-effect. I therefore hypothesize

[3]For simplicity, the model assumes that resources controlled by the target audience is constant over time.

the following:

H2: Higher ex ante-event performance reduces the negative shock-effect of top managers' unexpected deaths.

Continuity in the top management team

The above arguments univocally suggest that organizational stability is an important factor in determining how top management unexpected death affects firm performance. One argument is that stability might imply more routinized and potentially more efficient organizational action patterns. Moreover, it might increase organizational capabilities. In Hypothesis 1, I operationalize this as stability reflected by firm age. In addition, this section argues that this also includes stability in the top management team. An additional objective organizational stability measure in this paper, considering the data at hand, is TMT tenure or past TMT turnover. The potential significance of the TMT composition is especially interesting because it, as opposed to firm age, suggests that organizations may prepare themselves to handle the disruptive organizational shock from top management unexpected death.

The paper relies on the premise that top management unexpected death is detrimental to firm performance. This negative effect primarily occurs because the event disrupts organizational routines, leaving the post-shock organization less efficient. Other types of top management turnover might have similar destabilizing effects. Organizations with recent changes in the TMT are weakened, with all else being equal, and might therefore be ill-prepared to handle the disruptive shock of losing a leader. Supporting this, Meyer (1975) shows that management continuity is a concomitant of organizational stability and organizational structure predictability in finance departments. Therefore, we might expect that higher TMT tenure decreases the negative effect of losing a leader because it reflects past TMT stability. Furthermore, the above arguments indicate that organizational capability endowments are decisive for the performance-effect of top management unexpected death. Because past organizational shocks, including top management turnover, affects the current

organizational capability stock, TMT stability and continuity increase organizational capabilities. This argument again suggests that higher TMT tenure might mitigate the shock-effect, leading to higher performance.

Adding support to a potential mitigating effect of TMT tenure on post-death performance, I build on previous arguments, suggesting that higher TMT tenure might result in smaller subsequent organizational changes with fewer negative effects on subsequent firm performance. If the effect of top management unexpected death depends on whether the event triggers substantial organizational change (Baron and Hannan, 2002; Hannan et al., 2006), then his/her subsequent replacement is important (Shen and Canella, 2002). Potential disruptive effects triggered by organizational change initiated by the successor might depend on the power balance between the successor and the organization, particularly incumbent top managers. For now, I refrain from discussing other potentially counterbalancing effects from this aspect of TMT turnover (e.g., concurrent human capital inflow), though I return to this discussion below.

Developing this argument, at least two matters need consideration. First, the CEO and/or board of directors might use top management turnover to change core features of the organization. Second, potential successors differ in their desire to signal a change of track. As suggested above, top management turnover might facilitate the organizational change process (Shen and Canella, 2002). However, when an unexpected death triggers top management turnover, it is an unplanned and non-routine event. Such an opportunity for strategic reorientation happens by accident and is not easily considered. Moreover, one might argue that when there is a strong desire for facilitating reorientation through top management turnover, it would have been initiated earlier, i.e., before top management unexpected death. Considering a potential successor's incentive to engage in or signal a new direction (e.g., management style or strategic focus), previous studies show that the type of successor matters (Shen and Canella, 2002; Perry et al., 2011; Quigley and Hambrick, 2012). *"New leaders are under some pressure to demonstrate their efficacy and worthiness, and they typically cannot do this by simply maintaining the status quo"* (Quigley and Hambrick (2012), p. 836-837). Internal contenders and outsiders are likely to chart different courses than followers, who have less cause to demonstrate

their worth through a shift in management style or by restructuring the organization or introducing new strategies or markets (Shen and Canella, 2002). In this context, it is interesting to see which organizations allow for such greater strategic and organizational change. Quigley and Hambrick (2012) find that CEO succession leads to smaller post-succession performance changes when the predecessor stays with the company as chairman of the board. They argue that this occurs because the predecessor directly or indirectly restricts the actions of his/her successor. This restricts the successors opportunities to influence firm performance (Quigley and Hambrick, 2012). Following similar arguments, incumbent top managers may play a similar role following top management unexpected death. When more and stronger (i.e., longer tenure) top managers comprise the incumbent TMT, there may be a greater capacity to withstand the pressure from a potential successor's eagerness to shake-up the organization. Moreover, such a TMT constitution might further reinforce the internal reluctance to organizational change, and it might reduce the likelihood that the organization chooses to bring new members into the TMT who intend to challenge established routines. This possibility further supports the proposition that organizational stability, especially when affected through a strong and continuous TMT, diminishes the negative shock-effect from losing a leader. I therefore hypothesize the following:

H3: Higher TMT tenure reduces the negative shock-effect of top managers' unexpected deaths, leading to higher post-death performance.

Employee vulnerability to change

Building on Hypothesis 3, one might extend the above arguments to include other employees. Employee outflow implies a human capital loss, and excessive employee turnover potentially destabilizes organizational structures and routines (Baron et al. (2001), Eriksen (2011), Eriksen (2012)). Moreover, high-tenured employees increase the organization's ability to efficiently integrate new members, passing on organizational norms and routines (see Chapter 2). Employee turnover might therefore decrease performance. Because employees with higher tenure are less likely to leave the firm, higher employee tenure might add to organizational stability and reduce the negative effect of top

management death. However, I suggest an alternative hypothesis.

While increasing TMT tenure might increase post-death stability (Hypothesis 3), I argue that increasing employee tenure has the opposite effect. Following the structural inertia argument, employees who have been with the organization for years might be more negatively affected by the organizational shock than new employees (Baron et al., 2001). As explained above, top management unexpected death might lead to changes in organizational structures and routines. The event might alter the political base or power status within the organization, thus reallocating tasks and responsibilities. This implies that employees might interpret the organizational shock of top management unexpected death and the subsequent structural changes as a violation of their psychological contract with the firm. The psychological contract refers to employees' *"beliefs or perceptions regarding promises and acceptance"* (Robinson and Rousseau (1994), p. 246). It is the implicit or explicit contract between the employer and employee regarding mutual obligations and future returns, for example, loyalty in return for job security or hard work in return for a high potential for promotion (Robinson and Rousseau, 1994). Robinson and Rousseau (1994) find that psychological contract violations are negatively associated with job satisfaction and increase the likelihood of employee turnover. They further argue that contract violations impact employees differently, depending on the employees' career motives. High-tenured employees are more likely to aim for a long-term commitment and value the employment relationship itself more than employees who consider their current jobs stepping stones to better jobs at other firms. Contract violations thus impact the former employee category more negatively (Robinson and Rousseau, 1994). Even when contract violations are unintentionally or spurred by unanticipated events, employees might still perceive them as breaches of faith (Morrison and Robinson, 1997). Moreover, turbulent situations might lead to greater vigilance and uncertainty about the firms ability or willingness to fulfill the psychological contract (Morrison and Robinson, 1997). These situations likely reveal contract violations that would otherwise not have invoked employees' attention. I thus expect that increasing employee tenure leads to a greater drop in employee productivity and/or higher employee outflow following top management unexpected death. I therefore hypothesize the following:

H4: Employee tenure increases the negative performance effect of top management unexpected death.

Conversely, average employee tenure reflects the organization's past performance. Recent employment growth implies an inflow of new employees, reducing the average employee tenure. While a drop in the average employee tenure might decrease performance due to less organizational stability and efficiency, high growth, however, suggests accumulating organizational capabilities. Following the arguments of Hypothesis 2, low or negative growth might further explain a potential negative effect on post-death performance from higher employee tenure. To supplement Hypothesis 4, separating the employee tenure effect from the previous performance and organizational capabilities, I also hypothesize the following:

H5: A greater number of high-tenured employees increase the negative effect of top management unexpected death.

Increasing employee tenure may enhance the negative effect of top management unexpected deaths, independent of the firms' previous growth rates, i.e., recent employee inflow. The intuition of Hypothesis 5 continues with the previous argument. The "old guards", with more organization-specific human capital and stronger organizational commitment, might be more reluctant to accept organizational change. These "old guards" are more vulnerable to organizational shocks, and potentially more likely to leave the company in response to top management unexpected death. A greater number of high-tenured employees should thus increase the negative effect of top management unexpected death.

One might oppose to Hypothesis 5 (and 4), arguing that high-tenured employees increase organizational stability and performance. First, however, I expect that these "old guards" are more vulnerable to organizational shocks and potentially more likely to leave the company in response to the unexpected death of a top manager. Moreover, because TMT stability largely carries/determines stability in organizational structures, the negative effect of

employee tenure, I argue, is stronger. I suggest that TMT tenure, rather than higher employee tenure, equips the organization for the disruptive organizational shock of losing a leader.

4.3 Method

Data

I investigate the effect on firm performance from top managers' unexpected deaths using the Danish Database for Labor Market Research (IDA). Statistics Denmark maintains the IDA. It is constructed for research purposes and combines official registers from the Danish government. It contains detailed information on all Danish firms (e.g., accounting figures and industry) and their employees (e.g., salary and education). The IDA is a longitudinal database and has annual information from 1980 to 2007. Moreover, Statistics Denmark provides information on the date of death for all individuals. This information can be linked to the IDA. Due to gradual changes in key variables until 1993, 1993 is the first year of my investigation period. Moreover, accounting variables are not introduced until 1995, further restricting the investigation period for the sales growth analysis.[4] Previous studies using the IDA include Sørensen (2007), Nanda and Sørensen (2010) and Dahl (2011).

Investigating firm performance, I only include privately held firms with 10 or more full-time equivalents in most years from 1993 to 2007. Moreover, I exclude public firms and the heavily regulated primary sector. To determine firm exit, I accept a single year without activity[5]. If a firm is not active for two successive years, I consider the firm closed. I do not accept re-entry, thus dropping subsequent observations from the data. I determine firm age, counting from the first year of activity in the database. I do not observe the firms before 1980. I thus cannot predict the exact age of firms that were already active in 1980. I control for this issue in the survival models.

The IDA provides identification codes for both the plant and the employer

[4]Chapter 1 provides a detailed description of this database, its applications, strengths, and weaknesses.

[5]Less than one full-time equivalent.

levels (ownership). I base my definition on the latter to investigate firm performance. A single firm (employer/owner) may contain multiple plants. One implication related to firm exit and top managers' unexpected deaths is that an organization's activities may continue after the event under a different owner and, technically, under a different firm. To control for this, I impose an additional restriction of zero activity in the largest firm in the subsequent year, i.e., less than one full-time equivalent. If the largest plant is still active one year after its exit, I censor the firm failure observation. This censoring prevents changes in ownership from overestimating the effect of top managers' unexpected deaths on firm survival.

Statistics Denmark provides information on the date of death for all deaths in the labor force. I identify top managers using their occupational codes in the IDA.[6] Table 4.1 shows that the average number of top managers in firms without top management unexpected death is 1.77, corresponding to approximately one top manager per 24 employees. Firms that experience top management unexpected death are generally larger and have, on average, 9.54 top managers, corresponding to approximately 28 employees per top manager. I expect the significance of single individuals, and thus the effect of top management unexpected death, to differ with firm size, including the number of employees and top managers in each firm. I control for this in the empirical analysis.

I use a very restrictive definition to identify unexpected deaths. First, I only include individuals younger than 70 (but older than 18). Second, I exclude individuals who have received any sickness benefits during their final year. Third, to control for a top manager being affiliated with the most recently observed employer at the time of death, I only include individuals with "death" stated as their employment status for the following year. The latter is not possible for 2007, as employment status for 2008 is not available. This restricts the observation period to 2006. Finally, I only allow for a single event (top management unexpected death) per firm. Multiple unexpected deaths within a single year are, however, possible and treated as one event. If a second unexpected death occurs in the TMT, subsequent observations are dropped.

[6] In the database, the occupational code for "top manager" and "CEO" is the same and both are included in my definition.

This leaves a sample of 699 unexpected deaths in TMTs from 1993 to 2006.

Estimations

I estimate the performance of firms where a TMT member dies and compare it with the performance of firms that do not experience unexpected TMT deaths. I interpret differences in performance after controlling for firm heterogeneity as being due to the disruptive organizational event of losing a leader. First, I investigate the effect on firm survival, using the piece-wise exponential duration model (Equation 4.1), which handles left- and right-censored observations. I estimate the exponential model for accelerating failure time form. The model predicts the time to failure, assuming that the baseline hazard, τ_i, follows an exponential distribution with mean e^{β_0} (Cleves et al., 2004).

$$ln(t_i|x_{k,i}) = \beta_0 + \beta_g ln(g_{i,2}) + \beta_1 x_{1i,t} + ... + \beta_k x_{ki,t} + \epsilon_{i,t}, \qquad (4.1)$$

From an organizational ecology perspective, survival is the favored firm performance measure (Haveman, 1993; Barnett and Carroll, 1995). The above arguments add further support to this performance measure, suggesting that a shock to the organization might make a crucial dent in its organizational capability endowment, reducing it below the critical threshold, after which the firm's organizational capability stock continues to gradually decline. Eventually, the firm's endowment is completely depleted and it exits. However, considering the average size of the firms in the event-group (see Tables 4.1 and 4.2) and the suggested close relation between organizational capabilities and firm size, the likelihood of firms actually exiting due to top managers' unexpected deaths might be low. While I argue that this shock, on average, negatively affects performance, I do not argue that the event of a top manager's unexpected death has profound fatal consequences for most firms. I also do not argue that these effects are persistent over time. On the contrary, I expect that while the negative effects of this shock might be long-lasting and some firms might never recover, most firms will eventually bounce back. If this prediction is correct, the key question becomes which firm characteristics can increase the likelihood and speed of the latter? While survival might be

the preferred performance measure, it might not be possible to capture the firm characteristics that help absorb the shock-effect within a survival model framework. This might be due to the relatively low number of events or limited observation period or because the expected negative effect is only transient and most firms eventually bounce back.

For the above reasons, I use sales growth as the primary performance variable when investigating the effect of top managers' unexpected deaths on firm performance. One advantage of sales growth over survival time is that it can capture transient performance shocks that may not necessarily result in firm exit. Even if this shock eventually leads to failure, one would expect a continuing sales decline to come before a complete withdrawal from the market (Almus, 2004). A negative effect on firm survival from this shock should be reflected in sales growth and expected survival time estimations. However, sales growth estimations are less restricted by a short observation period.

I estimate sales growth models using the approach from Sørensen (1999). Growth is a function of firm size (sales), S, and covariates, x (Equation 4.2). I estimate the model using firm fixed effects, as I assume that unobserved but fixed firm characteristics affect firm performance (Angrist and Pischke, 2009).

$$ln(S_{i,t+1}) = \alpha \ln(S_{i,t}) + \beta_1 x_{1i,t} + ... + \beta_k x_{ki,t} + \epsilon_{i,t+1} \tag{4.2}$$

Explanatory variables

I include a dummy variable for top managers' unexpected deaths, *TM death*. This variable takes a value of one in all years after the event. I also include a clock variable, *Time since TM death*$_t$, to analyze how the shock-effect evolves over time. This clock variable counts the number of years since the event. Initially, it takes the value zero in year t, the value one in year $t+1$, the value two in year $t+2$, and it continues to grow similarly. While I only have annual observations on firm performance (e.g., sales, employment and survival), I know the exact date of death. Depending on how quickly the firms' respond to and recover from the shock, the effect on firm performance might be sensitive to the accuracy with which the event is dated. Controlling for this, I add $(1-(month\ of\ death/12))$ to *Time since TM death*$_t$. If the top manager dies in January

(month 1), *Time since TM death* is 1.92 in year $t + 1$. Equivalently, if he/she dies in December, the clock variable is 1 in year $t + 1$. For surviving firms, I expect the effect on sales growth from a top manager's unexpected death to decrease over time. However, if the shock eventually leads to firm failure, the expected negative effect on sales growth should be persistent and increase over time.

I include interactions terms with *TM death* to estimate the significance of different firm characteristics (see e.g., Brambor et al. (2006)). All interaction terms correspond to firm and employee characteristics in the year of the event. This approach thus identifies factors that might better equip firms for such unanticipated events and reduce the shock-effect. First, I include the interaction term between *TM death* and *Firm age, logged* to test Hypothesis 1. Similarly, I investigate the significance of the focal firm's ex ante performance, including the interaction term between *TM death* and ex ante-event performance (Hypothesis 2). While I cannot observe sales before 1995, I observe employment from 1993 and onwards. I therefore include the firm's average employment growth rate for the three years before the event, *Emp growth, t-3 to t*, to reflect previous performance. If observations about a firm's previous three-year employment level are not available (e.g., if the company is under three years old), I include the employment growth rate for the previous one or two years.

To test Hypothesis 3, I estimate the interaction effects between *TM death* and *TMT tenure*. The latter is the number of years that the top manager has been employed at the firm. If I observe more than one top manger in the firm, *TMT tenure* is the average for the top management team. If I do not identify any top managers, *TMT tenure* is zero. Finally, I investigate the significance of the employee composition at the time of death, including interactions terms between *TM death* and *Employee tenure* and *High-ten emp* (Hypotheses 4 and 5). The latter is the number of employees in each firm with tenure equal to or greater than the industry mean.

Table 4.1: Descriptive statistics (1995-2006)

	No TM dies		**Before TM death**		**After TM death**	
	Mean Number	Std. Dev.	Mean Number	Std. Dev.	Mean Number	Std. Dev.
Employees, t	42.24	(152.11)	271.21	(1074.04)	199.62	(624.58)
Ln(employees), t	3.10	(0.92)	4.05	(1.45)	4.00	(1.43)
No. TMs, t	1.77	(6.57)	9.54	(39.43)	8.03	(24.54)
Ln(no. TMs), t	0.39	(0.68)	1.20	(1.20)	1.10	(1.20)
No. workplaces, t	1.59	(4.54)	4.95	(22.80)	3.24	(7.55)
Ln(workplaces), t	0.19	(0.50)	0.55	(0.99)	0.54	(0.85)
Firm age, t	10.69	(7.40)	12.54	(6.66)	16.55	(6.56)
Ln(firm age), t	2.00	(1.01)	2.29	(0.84)	2.69	(0.57)
Ln(TMT salary), t	13.23	(0.38)	13.24	(0.39)	13.25	(0.37)
TMT tenure, t (yrs)	5.00	(6.32)	7.26	(5.66)	6.51	(6.04)
Emp growth, t-3 to t	8.75	(26.38)	5.26	(16.77)	-0.34	(13.37)
Employee tenure, t	4.43	(2.71)	4.72	(2.45)	5.41	(2.63)
Ln(High-ten emp), t	1.82	(1.20)	2.88	(1.63)	2.93	(1.52)

4.4 Results

Table 4.2 compares firm size and growth rates before and after top management (TM) unexpected death, only including the observations used in the sales growth models, as in Table 4.4. I divide the firms into three categories: 1) firms that do not experience TM unexpected death, 2) firms that have not yet experienced TM death but will do so, and 3) firms that have experienced TM death. I shall refer to the latter two as the treatment group.

The number of top managers increases with firm size, and the number of top managers proportionally increases the likelihood of TM unexpected death. The firms in the treatment group are thus, on average, expected to be significantly larger than firms in the control group. However, the TM unexpected death event is random, and TM unexpected death is *not* correlated with firm performance.[7] Supporting this, Table 4.2 shows that sales growth does not differ significantly between the treatment and control groups before the event. However, post-event sales growth is significantly lower than ex ante-event sales

[7] I test this calculating the correlations between TM death and employment growth$_t$, employment growth$_{t-3-t}$, and sales growth$_t$. Correlations are not significantly different from zero.

Table 4.2: Comparison of treatment and control groups (1995-2006)

	No TM dies		**Before TM death**		**After TM death**	
	Mean Number	Std. Dev.	Mean Number	Std. Dev.	Mean Number	Std. Dev.
Sales growth, %	**3.94**	(35.69)	**3.29**	(29.95)	**-0.92****	(33.34)
Sales, deflated	65,939**	(284,391)	467,076	(1,958,411)	505,250	(3,555,999)
No. of TMs	1.77**	(6.57)	9.54	(39.43)	8.03†	(24.54)
Observations	138,277		2,695		2,431	
Firms	26,269		671		623	

Column 1 + 2: T-test of H0: Mean(No death) - Mean(Before death)=0, Ha: diff < 0
Column 2 + 3: T-test of H0: Mean(Before death) - Mean(After death)=0, Ha: diff > 0
Significance levels: † : 10% * : 5% ** : 1%

growth, indicating a negative effect on firm performance from this shock.

Survival

Table 4.3 investigates the effect of top management unexpected death on firm survival. Estimations are based on 205,429 firm-year observations from 1994 to 2006 for 27,825 unique incumbent firms. As suggested above, the disruptive shock of losing a leader potentially increases the hazard of exit, for example, if the shock pushes organizational capabilities below the industry threshold and thereafter gradually depletes the endowment. However, considering the limited observation period and relatively large firms in the treatment group, we might not observe this effect. Moreover, it is not evident that the shock has fatal consequences for firms. I instead argue that the shock is temporary and that most firms eventually bounce back.

The models in Table 4.3 confirm that top management unexpected death decreases the expected time to failure. This negative effect tends to decrease over time. Furthermore, the models indicate that *TMT tenure* and past performance, *Emp growth*$_{t-3\ to\ t}$, increase current performance (Models 1 and 3 in Table 4.3).

In the treatment group, only 110 firms exit within the observation period. While the models estimate a negative effect on firm survival from top management unexpected death, the number of events is apparently insufficient to investigate how these firms differ from others in the treatment group. Hence,

Table 4.3: Firm survival, 1994-2006

	(1)	(2)	(3)	(4)	(5)	(6)
TM death	-0.439*	-0.807**	-0.419**	-0.577**	-0.515†	-0.476*
	(0.171)	(0.279)	(0.161)	(0.217)	(0.271)	(0.216)
Time after death, t	0.083*	0.081†	0.059	0.070†	0.065†	0.069
	(0.042)	(0.042)	(0.039)	(0.039)	(0.039)	(0.044)
TMT tenure, t (yrs)	0.047**	0.047**	0.049**	0.049**	0.049**	0.022**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Emp tenure, t (yrs)	-0.004	-0.003	0.014**	0.014**	0.014**	-0.089**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
TM d_Ln(firm age)		0.167				
		(0.107)				
Emp growth, t-3 to t			0.010**	0.010**	0.010**	
			(0.000)	(0.000)	(0.000)	
TM d_pre growth			0.009			
			(0.008)			
TM death_TMT ten				0.019		
				(0.018)		
TM death_Emp ten					0.020	
					(0.042)	
Ln(high-ten emp), t						0.805**
						(0.020)
TM d_Ln(high-ten)						0.024
						(0.072)
Constant	1.164**	1.164**	1.411**	1.418**	1.418**	2.669**
	(0.443)	(0.443)	(0.454)	(0.454)	(0.454)	(0.446)
Log-likelihood	-14881	-14880	-14467	-14467	-14468	-13789
Observations	205,429	205,429	205,429	205,429	205,429	205,429
Firms	27,825	27,825	27,825	27,825	27,825	27,825
Failures	6,979	6,979	6,979	6,979	6,979	6,979

Notes. All regressions are piece-wise exponential survival models in accelerated failure-time form, predicting the number of years until failure, logged. All regressions include unreported controls for firm age (25 dummies), TMT salary$_t$ (logged), and firm size (size group (2 dummies), employees$_t$ (logged), top managers$_t$ (logged), and work places$_t$ (logged)). Full tables are available upon request. Clustered standard errors are reported in parentheses.
† $p< 0.10$; * $p< 0.05$; ** 0.01

the models do not confirm (or reject) any of the hypotheses. All interaction effects are thus insignificant.

Sales growth

To investigate how the shock-effect of top management unexpected death differs with firm characteristics, I estimate firm fixed effects models of Ln(sales)_{t+1} (see Equation 4.2). Estimations are based on 143,403 firm-year observations from 1995 to 2006 for 23,538 unique incumbent firms. Table 4.4 presents the results.

Overall, the models indicate that firm age and TMT tenure positively affects sales, while employee tenure has a negative effect. Model 1 confirms a negative effect from top management unexpected death on firm performance. This effect increases with time. At first, the latter might seem unexpected; however, considering the negative effect on survival from top management unexpected death, it is not. While some firms do bounce back from this shock, others do not. The effect on survival is not expected to be immediate. As argued above, we should expect to see declining sales during the years between the event and failure. These firms with declining sales due to top management unexpected death might exit after 2006.[8] It was therefore somewhat expected that the effect on sales growth from top management unexpected death increases over time. However, this finding does not necessarily imply that most firms never recover from this shock.

Model 2, presented in Table 4.4, tests Hypothesis 1, suggesting that the effect of top management unexpected death decreases with firm age. The model does not support the hypothesis, as the coefficient estimate of the interaction term with firm age is insignificant. There is no mitigating effect from firm age at the time of death. However, estimates may be subject to a selection bias, as firms exit the population. The above survival analysis showed that top management unexpected death is associated with an increasing hazard of failure. Moreover, Model 2 in Table 4.3, indicates that firm age mitigates the negative effect on survival from top management unexpected death. However, the significance of this estimate is weak ($p<0.12$), exceeding the maximum significance

[8] Recall that only 110 firms from the treatment group exit within the observation period.

Table 4.4: Sales growth, 1995-2006

	(1)	(2)	(3)	(4)	(5)	(6)
TM death	-0.038*	0.030	-0.051**	-0.091**	0.082*	0.184**
	(0.019)	(0.057)	(0.019)	(0.032)	(0.038)	(0.037)
Time after death, t	-0.012**	-0.012**	-0.014**	-0.013**	-0.014**	-0.011**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Ln(firm age), t	0.027**	0.027**	0.066**	0.066**	0.066**	0.016**
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)
TMT tenure, t (yrs)	0.001†	0.001†	0.001†	0.001†	0.001†	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Employee ten, t (yrs)	-0.008**	-0.008**	-0.006**	-0.006**	-0.006**	-0.017**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
TM d_Ln(firm age)		-0.028				
		(0.022)				
Emp growth, t-3 to t			0.002**	0.002**	0.002**	
			(0.000)	(0.000)	(0.000)	
TM d_pre growth			0.003*			
			(0.001)			
TM death_TMT ten				0.006†		
				(0.003)		
TM death_Emp ten					-0.025**	
					(0.007)	
Ln(high-ten emp), t						0.071**
						(0.003)
TM d_Ln(high-ten)						-0.071**
						(0.010)
Constant	6.493**	6.494**	6.388**	6.384**	6.388**	6.619**
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Log-likelihood	-65506	-65505	-65147	-65149	-65143	-65090
Observations	143,403	143,403	143,403	143,403	143,403	143,403
Firms	23,538	23,538	23,538	23,538	23,538	23,538

Notes. All regressions are fixed effects models. The dependent variable is $\ln(\text{sales})_{t+1}$, and I estimate sales growth, controlling for $\ln(\text{sales})_t$. All regressions include unreported controls for firm size (sales_t (logged), employees_t (logged), top managers_t (logged), work places_t (logged)) and TMT salary_t (logged). Full tables are available upon request.
† $p< 0.10$; * $p< 0.05$; ** 0.01. Standard errors are reported in parentheses.

level accepted in this paper ($p<0.10$). Nevertheless, if younger firms are more likely to exit the population, potentially due to top management unexpected death, this might explain the lacking significance of the interaction term in Model 2 in table 4.4. One way to account for this potential selection bias is to estimate selection-corrected sales growth models. However, as I have previously discussed in Chapter 3, the database does not provide any appropriate instrument variables for this task. I thus cannot account for potential selection bias in the sales growth model.

Model 3 tests Hypothesis 2, including the average employment growth rate from time t to $t-3$ and the interaction term between *TM death* and the average employment growth rate from the three years before top management unexpected death. The model finds that past employment growth at time t has a positive effect on firm sales. It also finds a positive effect from the interaction term, suggesting that higher ex ante performance reduces the negative effect of top management unexpected death. This finding supports the hypothesis that organizations with greater organizational capabilities are better prepared to handle disruptive organizational shocks.

Models 4 and 5 in Table 4.4 investigate the effects of TMT and employee tenure, respectively. Because TMT tenure is potentially associated with the firm's previous performance and employee tenure is negatively correlated with recent employment growth, the models control for past performance, including the three-year moving employment growth average. Controlling for past performance, the models suggests that both the employee and TMT composition significantly affect how firm performance responds to the disruptive shock of top management unexpected death. In Model 4, I test Hypothesis 3, suggesting that TMT tenure reduces the shock-effect. The model supports the hypothesis, showing positive effects on sales from the interaction term between top management death and TMT tenure in the death-year; however, its significance is weak. I further estimate the effect of the TMT's top management experience with the firm.[9] The model (not reported here) shows a much stronger

[9]Recall that the key variable *TMT tenure* is tenure with the firm and not tenure with the TMT.

effect from this variable than *TMT tenure*, significantly increasing the magnitude of the effect.[10] Moreover, the model shows stronger significance for this interaction term ($p<0.05$), supporting the mitigating effects of TMT tenure.

Second, Model 5 finds that employee tenure in the death-year enhances the negative effect of top management unexpected death. This finding suggests that the shock has a greater (negative) impact on tenured employees than on new employees. One explanation is that the former are more reluctant to accept radical organizational changes, potentially leading to higher post-event employee turnover. This explanation supports Hypothesis 4. Following similar arguments, Hypothesis 5 suggests that more high-tenured employees increase the negative top management unexpected death effect. While a greater number of high-tenured employees generally have a positive impact on firm sales (Model 6), increasing the number of high-tenured employees exacerbates the negative effect of top management unexpected death, thus supporting Hypothesis 5. The coefficient estimates of *TM death* in Models 5 and 6 change and indicate a positive effect from top management unexpected death. However, including interaction terms in the models changes the interpretation of the included variables. The TM death estimate is the effect of TM death when employee tenure is zero (Brambor et al., 2006). The aggregated effect of employee tenure and top management unexpected death is thus actually negative if employee tenure equals the population average of 4.72 years. This finding also illustrates a strong interdependency between the employee composition and the performance effect of top management unexpected death.

Finally, recall that Model 4 in Table 4.4 controls for past performance, including the three-year moving employment growth average. For the treatment group, however, this might imply an endogeneity problem, as post-death employment growth is potentially correlated with top management unexpected death. I thus re-estimated Model 4 to include the three-year employment growth rate from the death-year.[11] This growth rate corresponds to the interaction term between top management unexpected death and past performance, i.e., the interaction term from model 3. Controlling for death-year employment

[10] Results are available upon request.
[11] Results are available upon request.

growth does not alter previous conclusions. The model also shows stronger significance for the interaction term ($p<0.01$), emphasizing the important role of TMT stability in overcoming disruptive organizational shocks.

Separate analysis for the treatment group

The above analysis successfully identified several factors that might help absorb the shock-effect of top management unexpected death, indicating that these firms will experience a relatively smaller negative effect on their post-event performance. One interesting conclusion from the above analysis is that TMT stability reduces the effect of losing a leader, as reflected by a mitigating effect from TMT tenure. However, one might argue that the potential stabilizing effect of this factor is contingent on the context, for example, the industry and firm's past performance. The latter is particularly interesting because of the potential correlation between TMT tenure and past performance. TMT tenure apparently increases performance, though performance may increase TMT tenure.[12] The above analysis shows that the shock-effect differs according to the firms' performance before the event (Model 3, Table 4.4). The conclusion that TMT tenure and stability both increase performance and allow the firms to better handle disruptive shocks might not apply equally to all firms regardless of their past performance. Investigating this further, I estimate additional firm-fixed effects models of Ln(sales)$_{t+1}$ excluding all firms but the treatment group.

I divide the treatment group into three categories using their performance until the event (three-year employment growth rate). Categorizing the firms, I base the cut-off points on the employment growth distribution for the treatment group. The first category, "Negative growth", has an average growth rate equal to or lower than -2.67% per year, corresponding to the 25th percentile. The second category, "Low growth", ranges from -2.67% to 6.67%, and the third category, "High growth", has growth rates equal to or exceeding 6.67%, corresponding to the 75th percentile. This approach allows for direct testing of how top management unexpected death affects firm performance contingent

[12]The above estimations partly account for this, controlling for past performance, including both the three-year moving average, and performance up until the event. In addition, I use firm fixed effects and additional controls for firm heterogeneity.

on the firms' performance level until the event. I also test how the hypotheses vary with different performance levels at the time of death. Estimations are based on 1,280 firm year-observations for categories 1 and 3 and 2,566 firm-year observations for category 2. The reduced number of observations restricts me from including the previous controls. Table 4.5 and 4.6 show the results.

Table 4.6 investigates the effect of TMT and employee tenure. The models in Part 1 confirm the mitigating effect of TMT tenure, but only for "High-growth" companies. The models in Part 2 find that employee tenure in the death year reduces the shock-effect for firms in the third category. The above results suggest that retaining organizational stability when growing is important, as it reduces the vulnerability to exogenous shocks.

Part 1 in Table 4.5 indicates that top management unexpected death significantly affects firm performance in only the two end categories. This effect increases with time, supporting previous results. Part 2 in Table 4.5, which controls for firm age at the event time, shows negative effects from the shock in all three categories. The models show a mitigating effect from firm age, but only for stronger firms (the second and third categories), partly supporting Hypothesis 1.

Finally, the lower number of degrees of freedom in this analysis makes it subject to greater uncertainty. In particular, one should exercise caution when making conclusions based on a lack of significance. Nevertheless, the models paint an interesting picture, indicating that while top management unexpected death might have (lasting) negative effects on post-event performance in all categories, increased stability only benefit stronger firms, assuming that stability increases with age. Moreover, only the strongest firms can equip themselves for such exogenous disruptive events through increased organizational stability. Conversely, most models indicate a greater negative effect of top management unexpected death for the strongest firms. This finding suggests that exogenous organizational shocks might be more disruptive to successful and well-run firms. However, the potential limited effect of this exogenous shock in less successful firms might illustrate that, while organizational stability may increase performance and strengthen the firms so that they can better handle disruptive shock, changes are sometimes imperative. Organizational inertia, conversely, might hamper progress and adjustment, thus preventing organizations from

Table 4.5: Sales growth, 1995-2006

Part 1	**Negative growth**	**Low growth**	**High growth**
Ln(sales), t	0.678**	0.481**	0.502**
	(0.024)	(0.018)	(0.023)
TM Death	-0.151†	-0.035	-0.083*
	(0.085)	(0.031)	(0.040)
Time since TM death, t	-0.037†	-0.002	-0.025**
	(0.020)	(0.007)	(0.008)
Ln(firm age), t	0.091	0.014	0.253**
	(0.094)	(0.039)	(0.049)
TMT tenure, t (yrs)	0.000	0.003	0.003
	(0.007)	(0.002)	(0.004)
Constant	3.435**	5.715**	5.156**
	(0.329)	(0.209)	(0.251)
Observations	1,280	2,566	1,280
Log-likelihood	-1478	-1458	-599
Part 2	**Negative growth**	**Low growth**	**High growth**
Ln(sales), t	0.677**	0.481**	0.495**
	(0.024)	(0.018)	(0.023)
TM Death	0.081	-0.232†	-0.337**
	(0.234)	(0.119)	(0.116)
Time since TM death, t	-0.034†	-0.004	-0.029**
	(0.020)	(0.007)	(0.008)
Ln(firm age), t	0.051	0.043	0.315**
	(0.101)	(0.043)	(0.056)
TMT tenure, t (yrs)	0.001	0.003	0.003
	(0.007)	(0.002)	(0.004)
TM death_Ln(firm age), d-year	-0.092	0.074†	0.104*
	(0.087)	(0.043)	(0.044)
Constant	3.531**	5.660**	5.117**
	(0.341)	(0.211)	(0.251)
Observations	1,280	2,566	1,280
Log-likelihood	-1477	-1456	-596

Notes. All regressions are fixed effects models. The dependent variable is $\ln(\text{sales})_{t+1}$. Firms are categorized by the their yearly employment growth rate three years prior to the event. The cut-off points -2.67 and 6.67 correspond to the 25th and 75th percentile, respectively.
Negative growth $\leq$ -2.67 %; Low growth -2.67 % to 6.67 %; High growth $\geq$ 6.67 %.
† $p< 0.10$; * $p< 0.05$; ** 0.01. Standard errors are reported in parentheses.

Table 4.6: Sales growth, 1995-2006

Part 1	**Negative growth**	**Low growth**	**High growth**
Ln(sales), t	0.678**	0.481**	0.503**
	(0.024)	(0.018)	(0.023)
TM Death	-0.239	-0.085	-0.190**
	(0.148)	(0.055)	(0.059)
Time since TM death, t	-0.037†	-0.002	-0.026**
	(0.020)	(0.007)	(0.008)
Ln(firm age), t	0.095	0.017	0.267**
	(0.094)	(0.040)	(0.050)
TMT tenure, t (yrs)	0.001	0.004	0.004
	(0.007)	(0.002)	(0.004)
TM death_TMT ten, d-year	0.010	0.005	0.017*
	(0.013)	(0.005)	(0.007)
Constant	3.422**	5.707**	5.117**
	(0.330)	(0.209)	(0.251)
Observations	1,280	2,566	1,280
Log-likelihood	-1478	-1457	-596
Part 2	**Negative growth**	**Low growth**	**High growth**
Ln(sales), t	0.676**	0.480**	0.453**
	(0.024)	(0.018)	(0.024)
TM Death	0.081	-0.018	-0.220**
	(0.188)	(0.065)	(0.076)
Time since TM death, t	-0.037†	-0.001	-0.004
	(0.020)	(0.007)	(0.009)
Ln(firm age), t	0.069	0.026	0.303**
	(0.098)	(0.041)	(0.049)
TMT tenure, t (yrs)	-0.000	0.003	0.004
	(0.007)	(0.002)	(0.004)
Employee tenure, t (yrs)	0.005	-0.012	-0.097**
	(0.021)	(0.009)	(0.013)
TM death_Emp ten, d-year	-0.040	-0.002	0.049*
	(0.029)	(0.011)	(0.020)
Constant	3.490**	5.752**	5.924**
	(0.340)	(0.211)	(0.267)
Observations	1280	2566	1280
Log-likelihood	-1477	-1457	-565

Notes. All regressions are fixed effects models. The dependent variable is $\ln(\text{sales})_{t+1}$. Firms are categorized by the their yearly employment growth rate three years prior to the event. The cut-off points -2.67 and 6.67 correspond to the 25th and 75th percentile, respectively.
Negative growth $\leq$ -2.67 %; Low growth -2.67 % to 6.67 %; High growth $\geq$ 6.67 %.
† $p< 0.10$; * $p< 0.05$; ** 0.01. Standard errors are reported in parentheses.

taking the necessary steps toward change.

Endogeneity

The empirical analysis exploits exogenous variation in firm performance to investigate which firm characteristics influence post-shock performance. However, as noted above, the conclusions might still be subject to endogeneity issues due to the potential correlation between TMT tenure and firm performance. TMT tenure might increase performance, but performance might also increase TMT tenure. To test the conclusions' sensitivity to this potential endogeneity, I supplement the above analysis with a matching approach. I estimate the average effect on Ln(sales)$_{t+1}$ from different TMT tenure levels at time $t-1$ (i.e., the final observation before death), using nearest neighbor matching with bias adjustment (Abadie et al., 2004). I match firms using two different previous performance variables (*Ln(sales)*$_{t-2}$ and employment growth up until top management death, three-year average) and industry. Table 4.7 illustrates the matching approach, and Table 4.8 presents the results. Estimations are based on 336 observations, including 23 to 297 treatments (TMT tenure levels) and 39 to 313 controls. Individual observations can be used more than once (Abadie et al., 2004).

Table 4.7: Matching approach

Time	**Firm ID**	**Year**$_t$	**ln(sales)**$_t$	**ln(sales)**$_{t+1}$	**ln(sales)**$_{t-2}$	**TM death**	**Yrs after TM death**
$t-5$	5	1995	10.2	10.4		0	0
$t-4$	5	1996	10.4	10.5		0	0
$t-3$	5	1997	10.5	11.2	10.2	0	0
$t-2$	5	1998	11.2	10.8	10.4	0	0
$t-1$	5	1999	10.8	10.0	10.5	1	0
t	**5**	**2001**	**10.0**	**10.2**	**10.8**	**1**	**1**
$t+1$	5	2002	10.2		10.0	0	2

Table 4.8 shows the average effect of TMT tenure ≤ 1 year, ≤ 2 years, and values up to 15 years.[13] All models in Table 4.8 support the above conclusions, indicating a negative effect on post-event performance from lower TMT tenure

[13]Maximum TMT tenure in the population is 21 years. However, due to the low number of observations at the end levels of the TMT tenure distribution, I restrict the set of estimations to TMT tenure ≤ 15 years.

Table 4.8: Average treatment effects for Ln(sales)$_{t+1}$, nearest neighbor matching

Treatment: TMT ten$_{t-1}$	**$\leq$ 1**	**$\leq$ 2**	**$\leq$ 3**	**$\leq$ 4**	**$\leq$ 5**	**$\leq$ 6**	**$\leq$ 7**	**$\leq$ 8**
Estimate	-0.155	-0.519	-0.577†	-0.429†	-0.259	-0.195	-0.167	-0.128
	(0.257)	(0.433)	(0.348)	(0.249)	(0.171)	(0.149)	(0.147)	(0.137)
# Obs	336	336	336	336	336	336	336	336
# Treatments	23	46	65	86	105	135	156	186
# Controls	313	290	271	254	231	201	180	150
# Matches	2	2	2	2	2	2	2	2

Treatment: TMT ten$_{t-1}$	**$\leq$ 9**	**$\leq$ 10**	**$\leq$ 11**	**$\leq$ 12**	**$\leq$ 13**	**$\leq$ 14**	**$\leq$ 15**
Estimate	-0.064	-0.043	-0.039	-0.031	-0.009	-0.018	-0.005
	(0.125)	(0.126)	(0.132)	(0.138)	(0.146)	(0.166)	(0.180)
# Obs	336	336	336	336	336	336	336
# Treatments	204	223	238	255	272	287	297
# Controls	132	113	98	81	64	49	39
# Matches	2	2	2	2	2	2	2

Matching variables: Ln(sales)$_{t-2}$, Pre emp growth$_{t-1}$, Industry (41 categories).
Bias-adjusted variables: Ln(sales)$_{t-2}$, Pre emp growth$_{t-1}$, Industry (41 categories).
† $p< 0.10$; * $p< 0.05$; ** 0.01. Standard errors are reported in parentheses.

levels. However, the negative effect is only significant in two models (TMT tenures ≤ 3 and ≤ 4). Accounting for endogeneity, this analysis nevertheless supports the above conclusion that TMT tenure and organizational stability improve post-event performance over lower TMT tenure levels.

4.5 Discussion

Unexpected death in the top management team triggers a disruptive shock in a firm. This event implies a sudden drop in the firm's human capital stock, and it temporarily incapacitates organizational structures and routines. This study confirms a negative effect on firms' post-shock performance. The questions examined in this paper are, first, whether firms' can prepare for such disruptive events and which firm characteristics reduce or eliminate this shock-effect. An immediate answer to the latter might be flexibility and adaptability; organizations that develop flexible routines and an adaptive capacity and have experience with organizational change might be better equipped for unexpected organizational disruptions. The opposites are thus highly routinized and inert organizations. Because organizational inertias might circumscribe the firms' willingness and ability to act and adapt to the new situation, there may be greater and potentially fatal effects on the organizations' post-shock

performance. However, my findings support an alternative hypothesis.

First, I find that TMT tenure reduces the negative effect of top management unexpected death, thus increasing post-event performance. Applying an organization ecology theory perspective, I explain this finding, arguing that increasing TMT tenure reflects greater organizational stability. I argue that the mitigating effect of TMT tenure on top management unexpected death is due to the following: i) stronger organizational routines and increased efficiency, and/or ii) greater organizational inertia, thus decreasing post-event organizational changes. These findings suggest that top management stability plays a great role for efficient and routinized organizational behaviour, highly influencing overall organizational stability and thus the ability to resist disruptive organizational shocks. However, the data does not allow me to conclusively determine which of the above mechanisms play the greater role in driving this effect.

Second, the analysis reveals that both TMT and employee composition affect post-shock performance. I hypothesize that tenured employees are more vulnerable to organizational disruptions, leading to greater frustrations and uncertainty among this employee group. Long-tenured employees are thus more negatively affected by top management unexpected death than new employees, leading to a greater drop in their post-shock productivity. I also hypothesize that this might lead to increasing employee turnover. In support of these hypotheses, I find that increasing the average employee tenure or the number of long-tenured employees enhances the negative effect on post-shock performance. This finding illustrates that the organizational members, particularly employees, drive the disruptive effect on organizational routines and smooth-functioning of the organization. This finding also suggests that organizational stability through TMT continuity, rather than increasing stability within the employee composition, may better equip organizations for exogenous organizational disruptions. Finally, the analysis supports the hypothesis that a greater organizational capability stock decreases the negative performance effect of top management unexpected death.

The above results indicate that firms, to some extent, can build organizations that are better prepared to handle and resist the negative shock-effect of top management unexpected death. First, I find that TMT tenure reduces the

shock-effect. However, striving to increase TMT tenure might be a two-edged strategy. If TMT stability and continuity strengthen the organizational ability to resist the disruptive organizational shock, it might seem a reasonable assumption that increasing TMT tenure exposes the company to organizational disruptions, including executive migration, succession or death. Supporting this argument, recall that top management human capital is increasingly firm-specific. Moreover, human capital, particularly firm-specific human capital, increases with tenure, potentially enhancing the expected negative effect of top management turnover (Hannan and Freeman, 1984; Kesner and Sebora, 1994; Eriksen, 2011). If organizations prepare themselves for losing a leader by increasing TMT tenure, they might actually put themselves at greater risk. This hypothesis is crucial, as it questions TMT stability as an appropriate method for preparing the organization for disruptive organizational shocks. However, I argue that increasing top management tenure is not necessarily associated with greater vulnerability to disruptive shocks from the TMT, building on the organizational ecology and institutionalization (or routinization) literature (Hannan and Freeman, 1984; Conger, 1999). The top managers' values and strategic decisions might transfer to organizational culture and routines concurrent with his/her increasing tenure. When efficiently embedded in organizational routines, the organization might be able to continue the same activity pattern and strive for the same goals, independent of individual actors. Following similar lines of reasoning, TMT stability might transfer to the organization. In addition to the above regressions (which focus on the top management *team*), I investigate this hypothesis, estimating the significance of the deceased top manager's characteristics. I find that the negative effect of the unexpected death decreases with the deceased top manager's tenure with the firm, thus supporting this argument.[14]

Above, I make the perhaps counterintuitive proposition that the disruptive effect of top management tenure might decrease with the deceased top manager's tenure at the firm. The previous discussion on top management turnover might offer another explanation to support this. New top managers might have greater incentives to initiate organizational changes, for example,

[14]Results are available upon request.

a different management style, introducing new strategies and markets, and restructuring the organization, thus signaling a different and improved course. As argued above, establishing new efficient organizational routines takes time. However, if the initiator leaves the organization (e.g., migrates, retires, dies) before such routines are efficiently integrated or a new culture is truly embedded into the organization, he/she might leave the organization in transition at a somewhat chaotic state, potentially leaving the organization with no clear guidelines for the collective purpose, organizational structures or norms to use. Furthermore, the disruptive effect of top management unexpected death might be smaller if the deceased top manager has longer tenure, despite potentially greater firm-specific human capital.

The above discussion also links to the literature on charismatic leaders (e.g., Nadler and Tushman (1990) and Conger (1999)). This paper does not question that personal charisma is associated with a greater effect on firm performance from top management unexpected death. With the loss of a charismatic leader, successful (smooth and trouble-free) turnover is often not feasible and is potentially worsened when the charismatic leader has not appointed a successor. However, following the above argument, this negative effect might be mitigated if the organization is imbued with the deceased top manager's charisma (Bryman, 1993). Furthermore, I recognize that the effect of top managers' unexpected deaths differ with their firm-specific values. I partly account for this by controlling for TMT salary and tenure. However, other managerial characteristics, including charisma, brand value and networking skills, are non-observable. Similarly, while occupational codes allow me to identify the TMT, I do not know the division for which each manager is responsible. Furthermore, I do not know the broader role each manager has in the organization, for example, if he/she is a role model to other managers and whether he/she dictates the management style or is the main innovator in the organization. The significance of different managerial styles, capabilities, and personal attributes might have different effects within heterogeneous organizations; the performance-effects of losing a leader are likely to differ with firm characteristics such as size and the number of top managers in the TMT. However, performance might also differ with other non-observable characteristics. The data at hand restricts me from investigating this possibility empirically

and in more detail; thus, I shall leave these questions for further research. Because top management unexpected death draws randomly from the population of top managers and firms, I argue that these unobservable factors do not affect the empirical results.

While this study focuses on observable firm characteristics at the time of the exogenous event, I emphasize that the subsequent actions of heterogeneous firms also play an important role. Firms have different capabilities and strategies for handling this organizational disruption, including different replacement strategies. Moreover, these differences influence the performance effects of top management unexpected death. As argued above, a potential successor might apply a reversing effect on post-shock performance. He/she might renew and strengthen the firm's competences, potentially increasing the long-term post-shock performance. Conversely, as illustrated above, top management turnover is a potentially long and troublesome process. Furthermore, different successors have different incentives to initiate (potential disruptive) organizational change, so the type of successor matters to post-shock performance (Shen and Canella, 2002; Perry et al., 2011; Quigley and Hambrick, 2012). For example, Shen and Canella (2002) argue that outsiders and internal contenders are more likely to make significant organizational changes, while followers would continue the course of his/her predecessor. The replacement choice might be influenced by the number of qualified candidates in the labor market, particularly within the firm. This strategy is influenced by the firms' previous performance, and the board of directors', the CEO's, and other parties' willingness to adopt and request new ways. Firms might use follower succession to reduce organizational disruptions after top management succession. However, the situation sometimes calls for different perspectives and strategic changes. When performance is low, the replacement strategy might aim for someone to chart a different course (Shen and Canella, 2002). While acknowledging the potential reversing effects of a subsequent replacement and the significance of different firms' actions and strategies after top management unexpected death, I leave this topic for future research.[15]

[15]The IDA database provides some variables that might shed light on some of these questions. However, as this discussion illustrates, investigating a potential replacement effect with the data at hand, is subject to potential endogeneity problems, even when it is triggered by

A key issue concerning *whether* or *when* the above results apply is the question of how industry differences come into play, for example, stable vs. instable industries and market concentration. Recall that organizational ecologists argue that selection favors stable and more efficient organizations when the context is stable, while more flexible and adaptive organizations perform better in unstable environments. Operating in an instable environment, i.e, placing demands on organizational adaptability and flexibility by employing excess resources, might improve organizational ability to adapt to sudden changes in TMT composition. The proposition that TMT tenure increases stability and reduces the negative shock-effect and appertaining response time might not apply to instable environments. This might occur if inertia, as Tushman and Rosenkopf (1996) phrase it, *"anchors the organization to its past"* (Tushman and Rosenkopf (1996), p. 942), restricting it from initiating or even perceiving the necessary course of action to adapt to the new context. Similarly, Le Mens et al. (2011) suggest that companies with stronger inertia might experience a gradual organizational capability depletion, lacking behind competitors in the market, because inertia stands in the way of crucial organizational change and improvement. The population of competing firms (against which relative performance is evaluated), however, is not subject to similar problems, as other organizations with strong inertia are leaving the industry, i.e., failing, and are being replaced by new and more flexible organizations (Le Mens et al., 2011). Conversely, if environmental instability prevails for long periods of time, one might argue that companies adjust accordingly and develop organizational routines suitable for this context, for example, developing procedures for handling increased competition, shifting technologies and markets (Nelson and Winter, 1982). I see no obvious reasons why TMT continuity should prevent such routinized adaptability from continuing after top management unexpected death. Contradicting the above arguments, stable organizations might also be better prepared to handle top management unexpected death in both instable and highly competitive industries. Based on this discussion, it is not obvious how external factors such as industry stability and competition affect and potentially negate the results. It is not evident whether increasing TMT stability and

an exogenous event.

continuity prepare firms to better deal with disruptive organizational shocks or whether this only applies to some subpopulations, for example, within stable industries.

This study investigates the significance of different firm characteristics on the performance effect of one specific organizational shock, top management unexpected death. However, I argue that the firm characteristics, which this study identifies as those that help firms prepare for this disruptive event, also apply to other organizational shocks. I suspect that this is particularly true for other internal shocks, such as executive or top employee migration. Some external shocks (e.g., demand shocks), conversely, might call for reorganization and focus shift. Stable efficient organizational routines, particularly inertia, might stand in the way of accomplishing such necessary organizational changes or perceiving the need to do so. Similarly, the paper's conclusions are not directly transferable to deliberate organizational changes, for example, changes initiated to improve performance. This is especially true if greater resistance to change, i.e., stronger inertia, drives the above results. These propositions might even lead to reverse effects on post-change performance. I leave this question for future research to investigate.

Finally, the main conclusion from this study implies that organizations can benefit from increasing their focus on top management retention strategies. These strategies might include the terms of notice, non-competition agreements or employee shares. This study also has political implications, as the law restricts using some of these strategies. If top management retention increases efficiency and strengthens organizations' resilience to unexpected disruptive shocks, it could be politically desirable to expand the use of, for example, non-competition agreements.

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Part II

Background paper and summary

Chapter 5

Spin-off growth and job creation: Evidence on Denmark[1]

Published in:
EMAEE Conference Volume 2009: *Applied Evolutionary Economics, Behavior and Organizations.* Edited by Guido Buenstorf

Abstract: *Employment growth is often the primary motivation behind entrepreneurial and industrial policy. But, new firms are known to differ greatly in performance. Not all firms survive for long and fewer achieve high growth rates. Numerous studies have found that spin-offs, which are firms that are founded by employees from incumbent firms in the same industry, outlive other entrants. Survival of new firms is a requisite for a long-term contribution to employment. But does longer survival also mean increased employment growth for spin-offs as well? Or does a trade-off between growth and survival exist, as found for older firms? Exploring a comprehensive dataset covering all entrants in the Danish economy from 1995 to 2004, this paper investigates how spin-off job creation differs from that of other entrants in terms of growth rates, variation and sustainability. We find that spin-offs are not only surviving longer, as the existing literature suggests, they are also a more homogeneous group, show increased stability in growth patterns and they are relatively more important for job creation in the economy.*

[1] Co-authored with Michael S. Dahl, Aalborg University.

5.1 Introduction

It is well established that entrepreneurial spin-offs are distinct performers in several industries. Firms founded by former employees from incumbent firms in the same industry tend to outperform other new entrants and sometimes even incumbent firms as well (see Klepper (2001a; 2009) for reviews of this literature). This fact has sparked considerable interest among politicians and civil servants, since future industrial and entrepreneurial policy might gain by looking more closely at this. Most of the existing studies focus on the life cycle of single industries and on survival as a key performance indicator. Spin-offs have been found to be key entrants at specific stages of the life cycles, but are spin-offs universally the best entrants? To answer this question, we need to add studies of firms from a variety of industries, across different stages of the life cycle and with other performance measures as well. Dahl and Reichstein (2007a) and Dahl et al. (2009) have established that spin-offs are relatively more successful entrants across industries in terms of survival. The question is more open when it comes to other performance measures.

This paper adds to this discussion by studying in greater detail the performance differences between spin-offs and other entrants in terms of employment growth and job creation. We use a comprehensive dataset covering all entrants in the Danish economy from 1995 to 2004. We find that spin-offs are not only surviving longer, as the existing literature suggests, but they are also relatively more important for job creation in the economy.

One of the reasons for the increasing attention to entrepreneurship is the expectation that new and younger firms are the driving force behind economic growth and job creation. Policy makers promote them to provide future employment and prosperity, and their industrial policy is often focused on increasing the number of start-ups. If spin-offs are a particularly successful type of entrant in terms of job creation and generation of prosperity, it might be a particularly interesting type of entry to promote in industrial policy.

The paper is structured as follows. First, we discuss the relative performance of spin-offs presenting selected literature from organizational ecology and human and social capital theory. Based on this discussion, we develop our hypotheses on spin-off employment growth. In the next section, we describe the dataset and selection of firms. We introduce notation and measures of

growth rates, job creation and job destruction. In the following section, we test our hypotheses and present the results, and also illustrate the impact of spin-off entrepreneurship on overall employment. Finally, we summarize major results and discuss implications of our findings.

5.2 Employment growth of *de novo* entrants

A great number of studies have illustrated how spin-offs are more likely to survive compared to other *de novo* entrants. This has been demonstrated for a number of different industries from Silicon Valley law firms to the Detroit automobile industry (Klepper, 2001b; Phillips, 2002; Agarwal et al., 2004; Klepper and Sleeper, 2005; Klepper, 2007). Assuming identical rates of employee turnover, increased likelihood of survival implies a proportional increase in job security for spin-off employees. Furthermore, it indicates more homogeneous growth rates for firms that survive longer. These characteristics also describe the job creation among relatively older firms (Davis et al., 1997). In this paper, we argue that stability and homogeneity are also features of the job creation of spin-offs. However, there is not the same trade-off between growth and stability that these studies observe with older firms.

We build our hypotheses departing from the liability of newness argument presented by Stinchcombe (1965). He explains the liability of newness based on three central factors. First, there must be internal distribution of roles among the employees. The roles need to be not only distributed but also defined. A vague distribution of roles might give rise to problems and inefficiencies as division of tasks and responsibility might be unclear. Distribution of roles is partly based on history and experiences. It takes time and might require some trial-and-error which can be costly.

Second, new firms have not yet established a social structure for communication. Thus, the communication in new firms might resemble communication among strangers. It takes time to establish social relations and relationships of trust among the employees and the employees and management when there is no basis of communication; this also complicates knowledge sharing. In sum, communication might be more complicated in younger firms compared to older firms.

Finally, lack of reliance is not only a potential internal problem regarding employees, it also includes customers, investors and suppliers. As was the case internally in the organization, it also takes time to establish stable relations to these external parties. In opposition to older firms, new and young firms do not yet have a reputation for reliability. Older firms potentially have a number of regular customers who are familiar with the products and services of the firms and, perhaps, not willing to substitute what they are already conversant with, in order to win minor cost savings which, possibly, could be achieved by changing to a new but unknown supplier. Likewise, the investors are interested in the firms' ability to produce, service customers and run a cost-effective business, but new firms have not yet had the opportunity to prove their worth (Hager et al., 2004).

Along similar lines, Brüderl and Schüssler (1990) develop the theory of liability of smallness by introducing the term "liability of adolescence", suggesting that the hazard of exit is not necessarily at its highest at the time of start-up. Instead, the likelihood of exit increases in the first period, peaks in the middle, and then gradually decreases with firm age. The argument for this U-shaped hazard rate, as opposed to the monotonously decreasing risk suggested by the liability of newness, is that new firms often have an initial capital to draw on and the firm does not exit until it has exhausted its initial resources. The more initial resources, the longer the firm is capable of surviving (Brüderl and Schüssler, 1990).

Several studies have demonstrated a positive correlation between start-up size and new firm survival (see e.g., Freeman et al. (1983); Brüderl et al. (1992); Dahl and Reichstein (2007a)). Economies of scale, systematic research and development and access to capital and qualified labor are explanations of the liability of smallness (Audretsch and Mahmood, 1995; Agarwal et al., 2002; Dahl and Reichstein, 2007a). However, while the likelihood of survival on the one hand is increasing with firm size, the above arguments further point to an inverse relationship between employment growth and firm size. As the number of employees increases, growth rates tend to subside. This indicates a trade-off between growth and survival (Dunne et al., 1989).

The above arguments suggest that differences in survival rates might be explained by the liability of smallness. If so, the higher survival of spin-offs

can be explained by them being larger at entry. Industry experience tends to improve productivity. Greater technological knowledge of the spin-off entrepreneurs might allow spin-offs to produce at lower unit costs, giving them a competitive advantage over other entrants. For that reason, spin-offs are expected to enter more markets, leading to an increased start-up size (Roberts et al., 2006). Moreover, Audretsch and Mahmood (1995) point out the potential reverse causality that start-up size is an indicator of the founders' expectations. Supporting this, Roberts et al. (2006) suggest that spin-off entrepreneurs found initially larger businesses than others, as they are aware of the (competitive) advantages arising from superior qualifications. Apart from technological knowledge regarding production processes, prior industry experience also includes knowledge concerning relevant organizational structures and routines, customers, suppliers, markets, products etc., giving spin-off entrepreneurs a superior endowment of knowledge and helping them to identify unexplored business opportunities, thereby giving them a head start over their peers (see e.g., Burton et al. (2001); Helfat and Lieberman (2002); Shane (2003); Chatterji (2009)). Brüderl et al. (1992) show that industry-specific experience has a positive effect on start-up size. They argue that greater human capital increases founders' productivity by managing and organizing the production process more efficiently and attracting more customers and investors. This reflects on production efficiency and results in higher profits. Therefore, despite possibly greater initial size, the risk spin-off entrepreneurs take is relatively smaller due to greater competency at the time of entry.

Hypothesis 1: Spin-offs have more employees at the time of entry.

Yet another explanation to the spin-offs' relatively higher likelihood of survival relies on the theory of liability of newness. As presented above, the liability of newness is triggered by a lack of organizational routines which are not yet fully incorporated in younger firms. New firms are founded on the routines implemented by the founders. These routines are often based on founders' prior experience as they will lean on routines already familiar to them. One might expect founders to differentiate their organization from their prior employer depending on the estimated quality of the organizational structures of

the latter. Immediately, this is rarely the case (Baron and Hannan, 2002). But, Baron and Hannan (2002) argue further that the founders are actually better off sticking to a model familiar to them independently of how good it might be objectively (see also Hannan and Carroll (1992)). Prior experience is important as organizational culture and structures already start to take shape in the early years, making the priorities and choices made during this initial period crucial, as they might have long-lasting and permanent effects on the organization's routines and through that the firm's performance (Stinchcombe, 1965; Schein, 1983). In other words, the performance of new firms is determined by the founders' experiences prior to the start-up (Klepper, 2001b; Helfat and Lieberman, 2002).

Klepper (2001b) explains the superior performance of spin-offs over other entrants based on the notion of routines from Nelson and Winter (1982). As spin-offs are established in industries where the founder has prior experience, their routines are more likely to fit the challenges characteristic of that particular industry. The spin-off entrepreneur has more experience of how to run a business in that industry and how to make that business profitable (Agarwal et al., 2004).

Returning to the core of liability of newness, Stinchcombe (1965) emphasizes the three central factors described above. First, the division of tasks and responsibility in new and young firms is unclear as internal roles among the employees are not yet distributed; a distribution that is partly based on history and experience. Additionally, new firms lack a social structure of communication. Potentially, spin-off entrepreneurs already have a network within the industry helping them in the early recruitment phase. They might recruit former colleagues as well as others who are already part of their network. It is possible that this could limit the liability of newness as a number of employees as well as managers already share a history of experiences and organizational culture. Thus, relationships and a basis of trust might already be established among members of the organization and this could ease communication and knowledge sharing, limit the degree of misunderstandings and, taken together, result in increased efficiency compared to other start-ups.

Relationships of trust are not only a relevant internal matter. The above arguments point to lack of reputation and relationships to external partners

as other significant factors. Following the argument of Dahl and Reichstein (2007a), a spin-off might inherit something other than technological knowledge and organizational routines from its prior employer. In the case that the prior employer (the parent firm) has a good reputation, this blueprint might be transferred from the parent firm to the spin-off, giving the spin-off entrepreneur a great advantage, for example, help the entrepreneur to raise finance and attract the most talented employees. In other words, external parties (e.g., investors) cannot observe the new firm's potential directly and therefore need to rely on *signals* of legitimacy, credibility and profitability – even if the effect on performance is only symbolic. The founders' career history and network are examples of indicators that might affect outsiders' perception of the new firm (Brüderl et al., 1992; Stuart et al., 1999; Higgins and Gulati, 2003). Following similar lines of argument, Chatterji (2009) shows that new firms, within the US medical device industry, secure funding more quickly than other entrants do, when spawned by incumbent firms in the industry. Finally, as I discussed in Chapter 3, studies on the role of parent firms suggest that spin-offs from better parent firms survive longer, and better parent firms have higher spawning rates (see, e.g., Phillips (2002); Agarwal et al. (2004); Gompers et al. (2005); Dahl and Reichstein (2007b); Klepper (2007)).

Taken together, the above arguments explain how stronger skills or competences embedded in the spin-offs help them cope with the barriers that lie in the liability of newness. In addition to increased survival, this also makes the spin-offs a more homogeneous group with less performance variation. As previously discussed, the great heterogeneity observed among new and younger firms is partly explained by differences in the skills acquired by the founders prior to the time of entry. Different initial endowments of knowledge make the entrepreneurs differ in ability to identify and explore opportunities. As the less-skilled, -gifted or -experienced entrepreneurs exit during the selection process, the remaining (older) firms make up a more homogeneous group of viable firms. But spin-offs already constitute a group of higher-skilled entrepreneurs at the time of entry. For that reason, we expect spin-offs to reflect the homogeneity and stability in job creation otherwise characteristic of relatively older firms:

Hypothesis 2: Spin-offs constitute a more homogeneous group with more stable growth patterns than other young firms.

If spin-offs have a higher likelihood of survival, are a more homogeneous group and show greater stability in overall job creation compared to other entrants, it might seem a natural conclusion that they, like older firms, should experience a trade-off, as discussed above, between growth and survival. In other words, they might contribute less to the overall (net) job creation in comparison to other young firms despite improved survival. Moreover, a common default assumption in economics is the positive correlation between risk and return. When entering, spin-off entrepreneurs might lower their risk by imitating the business model, products, organizational structures etc. of their parents. In a related model, Jovanovic (2004) shows how firms, switching from new product development to safer returns, gain initial higher earnings at the expense of long-run profits. Spin-offs might have a higher likelihood of survival because they take less risk, indicating a similar trade-off between risk and return. Other entrants, in contrast, might be more explorative and innovative which, in turn, will lower survival but increase overall growth, for example, job creation. In contrast to this, we argue that spin-offs' net job creation exceeds that of other young firms.

First, the above arguments on greater spin-off performance mention suitable (and quickly established) organizational routines, structures and culture. While older firms might find themselves locked into existing routines, spin-offs are better able to change their organization and routines, if it is required by the market, thereby making them more flexible (Klepper, 2001b). This higher flexibility enables them to challenge incumbent firms, whereas other young (and equally flexible) firms lack experience and routines to compete with both incumbents and spin-offs. Second, as described above, the spin-off entrepreneur's prior industry experience includes knowledge regarding the market and competitors helping him/her identify *unexplored* business opportunities (see, e.g., Burton et al. (2001)). In contrast to the above discussion, this speaks against the perception of spin-offs as less innovative and less willing to explore new markets. Supporting this, Chatterji (2009) finds that non-technological

rather than technological knowledge is important for spin-off performance. Finally, Roberts et al. (2006) show that spin-offs do not experience higher (or lower) growth rates than other young firms. On the other hand, we argue that if spin-offs experience the same (gross) job creation as others, but are less likely to exit or have negative growth, their net job creation should be greater.

Hypothesis 3: Spin-offs have higher net job creation than other young firms.

This suggests that the relative net contribution to job creation by spin-offs exceeds that of other new firms. If supported empirically, this stresses not only the importance of spin-offs to continuous job creation, but also the economic and political potential of promoting spin-off entry rates.

5.3 Method

Data

We exploit two databases: the Danish Entrepreneurship Database and the Danish Integrated Database for Labor Market Research (referred to by its Danish acronym, IDA). Both databases are maintained by Statistics Denmark. IDA is a linked employer-employee database containing all incorporated companies in Denmark and their employees from 1980 to 2006, which allow us to follow the year-on-year employment flow of Danish firms. The Danish Entrepreneurship Database identifies the primary founder of all new limited liability and privately owned firms in Denmark from 1994 to 2004.[2]

Following Dahl et al. (2009) our sample consists of all (active) start-ups in Denmark from 1995 to 2006. We only include start-ups from the private sector. Additionally, due to regulation and reduced competition, we exclude start-ups from the primary and the energy sectors. As we are investigating job creation, our interest is confined to those start-ups that are (or become) actual active businesses. We define this as start-ups with a minimum employment of

[2]IDA is merged with the Entrepreneurship Database through a third dataset, which connects the firm-level data from the Entrepreneurship Database to the establishment-level data from IDA. This implies, however, that the period of investigation must be reduced to 1995-2006, as this third dataset only includes observations from 1995 onward.

one full-time equivalent in addition to the founder. Using this definition (minimum one full-time equivalent), we determine firm age from the first observed activity. Similarly, we consider the firm closed after two successive years without activity. Thus, we allow for a single year without activity (less than one full-time equivalent).[3] If the firm is later observed in the dataset we consider it to be re-entered and we reset the age variable. We use information on activity to determine the start-up year even though the year of official registration is in the database. The reason for this is that in many cases, no (or very limited) activity is observed in the start-up until several years later. We argue that the level of experience within these firms - and thus expected growth and likelihood of exit - does not mirror that of established firms. In other words, using business registration as a measure of start-up year would impose uncertainty regarding job creation within different age groups.

We identify a total of 142,278 start-ups from 1994 to 2004. From this population, approximately only one in three has any employees (in addition to the founder) at any point and even fewer ever employ as many as one full-time equivalent. This reduces our population to 37,080 start-ups from 1994 to 2004. All the start-ups in our sample are registered in the Danish Entrepreneurship Database. Using the IDA database we run a series of additional controls to verify that these start-ups are new businesses in compliance with the above definition. This reduces the population further by approximately 7,500 start-ups. Finally we exclude founders younger than 18 or older than 65 years of age (this has only very little effect on the population size). The final population consists of 29,583 start-ups, including 6,645 spin-offs. Spin-offs are businesses founded by previous employees from incumbent firms in the same industry. Following the approach of Chapter 3, we define this as the same four-digit SIC-code.

We cannot track individual positions, but only make yearly observations of the employment level in each firm. The implication of this is that we are not able to capture whether a firm, within the same year, both creates and cuts one

[3]One deviation from this definition is firms which are active in 2005 but not in 2006. Since 2006 is the last year of our observation period we cannot determine whether this is a single year without activity. In these cases we consider the firms closed. As is clarified in the following section, this deviation does not affect the overall calculation of job creation and job destruction. It can only affect the ratio of job destruction due to exit.

or more position, for example expands its research department and outsource cleaning. Instead we observe the year-to-year net employment changes for each firm.[4] Thus, the disadvantage of this time frame is that the actual job flow within our population is underestimated. If two employees are laid off in August and two employees are hired in October, then it is not revealed in the statistics. The advantage, on the other hand, is that an annual statement does not include every temporary and provisional change. We assume that annual counts will provide a more accurate picture of the more permanent job flow (Davis et al., 1997).

Job creation

In order to confirm (or reject) Hypotheses 2 and 3, we need a detailed investigation of employment growth by spin-offs and other entrants. As in Chapter 2, we follow Davis and Haltiwanger (1992) and compute employment growth for a particular firm, j, as:

$$g_{j,t} = \frac{E_{j,t} - E_{j,t-1}}{X_{j,t}} \tag{5.1}$$

$$X_{j,t} = \frac{E_{j,t} + E_{j,t-1}}{2}, \tag{5.2}$$

The growth rate, $g_{j,t}$, is the difference between the number of employees in firm j at time t, $E_{j,t}$, and the number of employees the previous year, $E_{j,t-1}$, in proportion to the *average* number of employees within the two-year period, $X_{j,t}$. The advantage of using the average employment level, $X_{j,t}$, over the initial employment level, $E_{j,t-1}$, is that it allows for job creation and job destruction by entry and exit, respectively, and it is symmetric around zero for job creation and job destruction. Using $E_{j,t-1}$ instead would overestimate the growth rate for job creation ($g_{j,t} > 0$) and underestimate the growth rate in the case of job destruction, i.e., lead to a numerically smaller $g_{j,t}$ (Davis and Haltiwanger, 1992). Equation 5.1 also takes into account the intuitive correlation between size and growth. We expect more small than large businesses to double employment within a year. A business with only one employee, which recruits

[4] All information is generated ultimo November each year.

additionally two employees, would have a growth rate of 200% using $E_{j,t-1}$ and just 100% using $X_{j,t}$ (Equation 5.1). By comparison, a business with an initial employment level of 50 employees and an equivalent increase in its staff by two employees would have a growth rate of 4 and 3.92%, respectively.

To investigate Hypothesis 3 and evaluate the potential differences in economic contribution in terms of employment further, we are interested in the overall net job creation from the two categories of start-ups (net job creation is explained in Equation 5.6). The net job creation is divided into the two components, gross job creation (JC) and gross job destruction (JD). The gross job creation in subpopulation s at time t is the sum of employment increases in all firms which either start-up or expand in the period between $t-1$ and t:

$$JC_{GROSS_{s,t}} = \sum_{g_{j,t}>0, j\in s} \frac{X_{j,t}}{X_{s,t}} \cdot g_{j,t} \tag{5.3}$$

$$X_{s,t} = \sum_{j\in s} X_{j,t} \tag{5.4}$$

The employment growth for each firm, $g_{j,t}$, is weighted by the firm's size (the average number of employees, $X_{j,t}$) relatively to the size of the entire subpopulation, $X_{s,t}$, which is the overall employment within firms characterized by s, which represents different age ranges. Finally, the weighted growth rates are added up. Likewise, the gross job destruction at time t is the sum of all jobs that are lost among all firms, which either reduce their staff or exit over the period from $t-1$ to t:

$$JD_{GROSS_{s,t}} = \sum_{g_{j,t}<0, j\in s} \frac{X_{j,t}}{X_{s,t}} \cdot |g_{j,t}| \tag{5.5}$$

Firms with an unchanged employment enter neither job creation nor job destruction. We point out that the job creation, $JC_{GROSS_{s,t}}$, also includes start-ups, in which case employment will increase from zero to a positive number, generating a net growth rate, $g_{j,t}$, of 200%. Similarly, job destruction, $JD_{GROSS_{s,t}}$, includes firms which exit, in which case employment declines from positive to zero generating a net growth rate of -200%. The overall employment net change is computed as the difference between employment at

year t and $t-1$:

$$JC_{NET_{s,t}} = JC_{GROSS,t} - JD_{GROSS,t} \tag{5.6}$$

Thus, the net growth rate is total employment growth[5] in percentages of the average employment level within firms characterized by s, for example total employment growth of spin-offs aged one to three.

The overall reallocation accounts for the number of jobs that are created and destroyed:

$$Reallocation_{s,t} = JC_{GROSS,t} + JD_{GROSS,t} \tag{5.7}$$

Job reallocation at time t is the sum of the total job creation and job destruction, which has taken place within the period $t-1$ to t. Job creation captures the opportunities of employment within different locations, industries, age groups etc. depending on the classification, s. An increase in job creation improves the chances of finding employment, all things being equal. Likewise, an increase in job destruction increases uncertainty among those already employed. These opposite trends are summarized in the job reallocation. Thus, job creation and job destruction are indicators of the heterogeneity of employment growth within different age groups or within spin-offs and other entrants, and we shall interpret a higher job reallocation as an indicator of greater heterogeneity within the group of firms in question. Additionally, we include the standard deviation of the individual firms' growth rates ($g_{j,t}$, Equation 5.1) as an indicator of heterogeneity in the firms' growth patterns.

5.4 Results

Size differences at start-up

Table 5.1 presents the average number of full-time equivalents employed at spin-offs and other entrants each year from age zero to nine. Comparing the average start-up size, we find that the average spin-off employs 1.84 full-time

[5]The overall employment level net change in proportion to the *average* overall employment level in year t and t-1.

Table 5.1: Average firm size for spin-offs and other entrants, classified by age

	Average size (95% confidence interval)			
Age	**Others**		**Spin-offs**	
0	1.64	(1.62–1.67)	1.83	(1.78–1.89)
1	2.59	(2.53–2.66)	2.88	(2.78–2.98)
2	3.18	(3.09–3.28)	3.47	(3.30–3.63)
3	3.70	(3.56–3.85)	3.90	(3.64–4.12)
4	4.15	(3.94–4.36)	4.21	(3.88–4.53)
5	4.66	(4.41–4.91)	4.59	(4.15–5.03)
6	5.29	(4.91–5.67)	5.13	(4.56–5.69)
7	5.53	(5.08–5.98)	5.82	(4.96–6.68)
8	5.70	(5.09–6.31)	6.31	(4.97–7.65)
9	6.52	(5.54–7.50)	6.52	(5.36–7.67)

equivalents at the time of entry, whereas other new firms, on average, only employ 1.64. This provides support to Hypothesis 1, that spin-offs are larger than other start-ups at the time of entry. This is also true for the two subsequent years. However, one problem arises, as firms can never be reduced to fewer than zero employees, whereas there is no upper limit. This should result in a right-skewed distribution where the mean employment level might give an inaccurate impression of the employment level in Danish start-ups.[6] For this reason, we further investigate the median and 75th percentile of employees at different ages for spin-offs and other start-ups, respectively. These are illustrated in Figure 5.1. We no longer find size differences between the typical spin-off and other entrants at start-up and the following year. Comparing Table 5.1 and Figure 5.1, we reconfirm that outliers increase the mean value, as the median at all ages is well below the mean. Investigating the median for different points in time, we find that the typical spin-off is larger than the typical start-up in the third, fourth and ninth years. For the remaining years, the 50th percentiles are equal in the two groups. Looking at the 75th percentile we observe even more differences, as the 75th percentile for spin-offs exceeds that of other young firms in the second, third, fourth and sixth years. These results indicate that within some age ranges, the typical spin-off is larger than

[6]When we investigate the actual distributions our suspicion is confirmed and we find high positive values for skewness (not reported, but available upon request). Furthermore, we see a tendency toward lower skewness for spin-offs, indicating greater homogeneity in firm size.

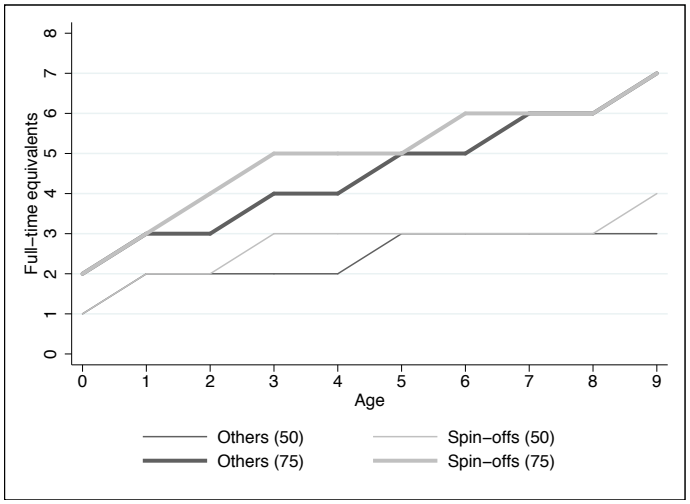

Figure 5.1: Median and 75th percentile of number of full-time equivalents of spin-offs and other entrants, classified by age

the typical start-up. This supports the argument that spin-offs might experience a higher likelihood of survival as they are less exposed to the liability of smallness.[7]

Job creation and stability in growth

Investigating Hypotheses 2 and 3, Table 5.2 shows the job creation and job destruction at younger firms from zero to nine years of age, categorized as spin-offs and others. As job creation for firms of the age range zero to three also includes jobs created by entry (as opposed to growth in established firms) we also include the age range one to three. Furthermore, the main results are summarized in Figure 5.2.

The subject of Hypothesis 2 is homogeneity and stability in growth. For all age ranges, we find that job creation as well as job destruction is higher for non-spin-offs, which results in similarly higher rates of reallocation for these firms, corresponding to a higher variation in job creation compared to spin-offs. Substantiated with a relatively lower standard deviation for spin-off growth

[7]Figure 5.4, which shows Kaplan-Meier survival rates for spin-offs and other entrants, confirms a higher likelihood of survival for spin-offs.

Table 5.2: Job creation and job destruction of spin-offs and other entrants, classified by age

	0-3 years:		**1-3 years:**		**4-9 years:**	
	Others	**Spin-offs**	**Others**	**Spin-offs**	**Others**	**Spin-offs**
JC (%)	55.11	52.46	29.42	28.49	14.17	13.48
JD (%)	22.12	18.72	26.04	21.77	17.53	16.56
Net growth rate (%)	32.99	33.73	3.38	6.72	-3.36	-3.07
Standard deviation	139.42	130.20	106.19	98.11	83.70	78.06
Reallocation rate	77.23	71.19	55.47	50.26	31.70	30.04

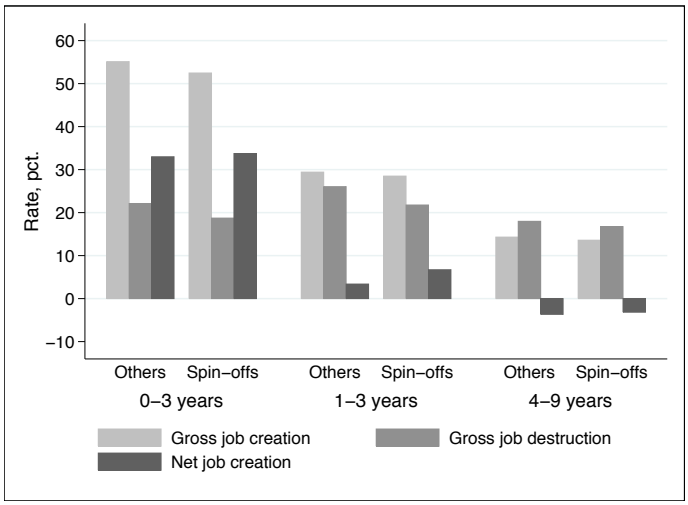

Figure 5.2: Job creation and job destruction of spin-offs and other entrants, classified by age

rate we can confirm the notion of overall smaller variation in spin-off growth rates. This smaller variation is further illustrated by Figure 5.3, which shows a boxplot of employment growth for spin-offs and other entrants from age one to nine. Job creation by entry is excluded, as it is always a growth rate of 200% with zero standard deviation. Figure 5.3 shows that the observations of spin-off employment growth are more clustered around the mean (in both cases zero), indicating a smaller degree of dispersion in the distribution compared to other young firms.[8]

[8]As a consequence of the enormous number of observations, outliers are not depicted in Figure 5.3. In both cases the outliers, if included, would have appeared as straight lines

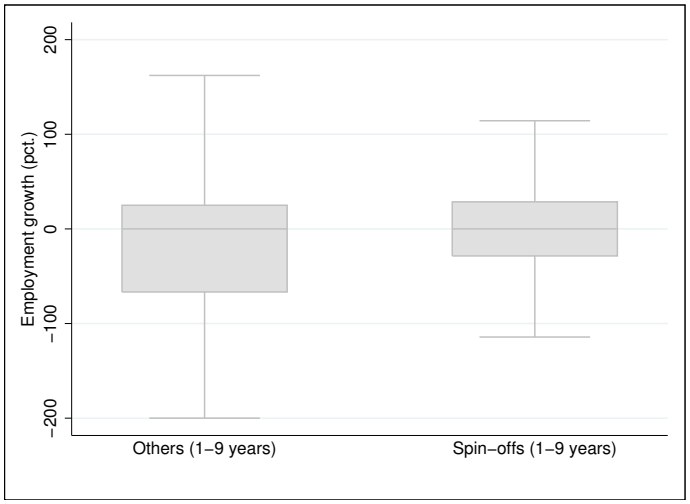

Figure 5.3: Boxplox of employment growth, classified as spin-offs and others

In Table 5.3, we group the firms according to their growth. We find that a relatively larger share of spin-offs have positive growth rates each year. This result applies to most age groups, supporting the argument that spin-offs are able to convert initial better endowments of human and social capital into larger and more rapidly growing businesses. Moreover, it is indicated that a relatively smaller share of spin-offs have negative growth rates during the first years. After the sixth year, however, we find no systematic pattern.

In Table 5.2, gross job creation and gross job destruction give us the net job creation, which was the focal point of Hypothesis 3. The net job creation for firms of age range zero to three is 33.73% and 32.99% for spin-offs and non-spin-offs, respectively. This results in only a small difference in net job creation of 0.74 percentage points. The difference in net job creation is more pronounced for firms of age range one to three and with a net rate of 6.72%, spin-offs' net job creation is almost twice the magnitude of that in other young firms. For firms older than four years, the difference in net job creation decreases once again. Net growth is negative for both spin-offs and others but it is less negative for spin-offs. For the three age groups investigated, we can confirm

going to 200 and -200, respectively.

Table 5.3: Share of firms with positive, negative and zero growth, respectively, of spin-offs and other entrants, classified by age

Age	Growth rate < 0		Growth rate $= 0$		Growth rate > 0	
	Spin-offs (%)	**Others** (%)	**Spin-offs** (%)	**Others** (%)	**Spin-offs** (%)	**Others** (%)
0	0	0	0	0	100	100
1	25.93	32.81**	36.38	35.90	37.69	31.30**
2	29.50	33.25**	38.30	37.86	32.20	28.89**
3	29.09	32.23**	39.18	39.76	31.74	28.02**
4	29.36	32.17**	39.03	39.94	31.60	27.89**
5	31.28	31.92	41.36	41.69	27.36	26.40
6	27.28	31.84**	42.22	40.44	30.50	27.72*
7	31.40	30.90	41.79	42.54	26.81	26.56
8	30.31	29.12	41.12	44.21	28.57	26.67
9	26.43	26.17	42.68	46.05	30.89	27.78
10	25.79	28.54	42.63	44.32	31.58	27.15†
11	34.78	32.16	30.43	40.70	34.78	27.14*

Significance levels: † : 10% * : 5% ** : 1% indicates differences between spin-offs and other entrants using a chi-square test (not calculated for "Growth rate = 0").

Hypothesis 3 that spin-offs have higher net job creation than other new firms. An obvious explanation of this result is a proportional higher gross job creation in spin-offs. Table 5.2, however, tells a different story. Within each age group, gross job creation is actually relatively smaller for spin-offs but at the same time, they also show a relatively smaller job destruction, which more than offsets this. Thus, despite a lower rate of gross job creation, spin-offs actually achieve a higher net job creation. Higher likelihood of survival for spin-offs (Figure 5.4) drives this higher net growth, indicating that employment growth does not necessarily have to happen at the expense of job security.

The importance of survival to net job creation becomes more obvious when we investigate the job flow excluding job creation by entry. For both spin-offs and others the main job creation happens in firms within age group zero to three. This was expected as this category includes job creation by entry, which always equals a growth rate of 200%. The importance of entry to employment growth is evident from the large difference in job creation between the two categories of younger firms (0-3 years and 1-3 years). Because of their relatively low hazard rate and thereby fewer exits, growth by entry accounts for a smaller share of employment growth for spin-offs compared to other entrants. For

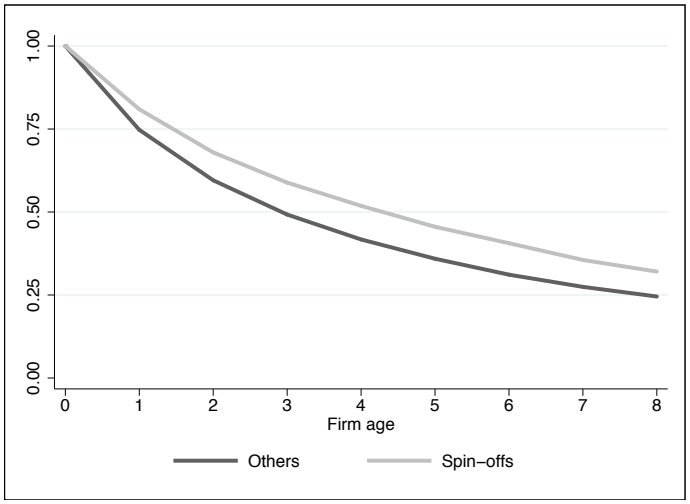

Figure 5.4: Kaplan-Meier survival rates for spin-offs and other entrants

that reason, the spin-offs experience a relative smaller decrease in net job creation when moving from age range zero to three and up. Similarly, exit has a significant effect on job destruction in both categories. We find that the average number of employees in spin-offs in the year of exit exceeds that of other young firms. This makes exit more crucial to the destruction rate. However, because of their smaller hazard of exit, job destruction by exit actually accounts for a smaller share of spin-off job destruction.

Overall, Table 5.2 and the additional results give strong evidence to support Hypothesis 3. This superiority in (net) job creation emphasizes the spin-offs' great economic significance. But, exactly *how* important are spin-offs to employment in Denmark? Moreover, what might the policy implications of these results be? We shall explore these questions in the next subsections.

Relative importance of spin-offs to employment growth in Denmark

High survival rates, increased stability and high net growth are indicators that spin-offs are important to employment growth. In order to verify this, we need to consider the spin-offs' effect on *total* employment in the economy. However, using the population of this paper makes such an analysis very difficult and at

best imprecise. Our population includes only Danish start-ups satisfying certain criteria. As previously discussed, we take a rather conservative approach when selecting our population in order to ensure that all firms are in fact real entrants and only true spin-offs are included. This is likely to underestimate the actual job creation, as we leave out some potential entrants. Therefore, proving the importance of new firms to job creation will not be the aim of this paper. Instead, we shall continue to focus on spin-offs' performance relative to other entrants, when investigating their significance to employment. However, references to the literature on job creation by new and young firms are considered. As described above, the crucial role played by job creation in new and young firms to overall employment, is well established (Davis et al., 1997; Westergård-Nielsen and Ibsen, 2005; Dahl et al., 2009; Haltiwanger, 2009). We shall rely on these studies when we evaluate the importance of spin-offs to employment based on their relative performance. Investigating employment and job creation in Denmark, Westergård-Nielsen and Ibsen (2005) find that new establishments account for approximately one-third of job creation (excluding the public sector). This is supported by Dahl et al. (2009) who show that new and young firms (0-3 years) account for 61% of the gross job creation.[9] Moreover, 69.1% of the jobs created by new and young firms arise from entry, corresponding to 43% of total job creation. As stated above, we add to this literature by investigating the spin-offs' significance to employment compared to other entrants. We illustrate the impact of spin-offs' increased stability and high net growth on overall job creation by new and young firms.

For each category - gross job creation, gross job destruction, and net job creation - we divide the total number of jobs created (or destroyed) into spin-offs and other entrants, respectively. Then the spin-offs' share of job creation is compared to their share of firms and share of employment. As previously discussed, we include two categories of young firms: 0-3 and 1-3 years, the latter being exclusive of entry. Results are shown in Table 5.4.

In their first years, spin-offs account for approximately 23% of the population but, as a result of their higher survival rates, this share increases with the age of the spin-offs. Similarly, the spin-offs' share of employment rises from

[9]Dahl et al. (2009) investigate the yearly average job creation in Denmark from 1995 to 2006, excluding job creation in the public, primary and energy sectors.

Table 5.4: Share of job creation and job destruction of spin-offs and other entrants, classified by age

	0-3 years:		**1-3 years:**		**4-9 years:**	
	Others	**Spin-offs**	**Others**	**Spin-offs**	**Others**	**Spin-offs**
Share of firms (%)	76.83	23.17	76.47	23.53	72.63	27.17
Share of employment (%)	74.08	25.92	73.59	26.41	72.02	27.98
Share of JC (%)	75.08	24.92	74.52	25.48	73.10	26.90
Share of JD (%)	77.21	22.79	77.21	22.79	73.47	26.53
Share of net JC (%)	73.71	26.29	58.74	**41.26**	74.94*	25.06*

*Share of negative value

25.92 to 27.98%. As clarified in the following subsection, this is the result of both superior survival and net job creation. As expected, based on Table 5.2, the spin-offs' share of job destruction is less than their share of firms and share of employment. For example, spin-offs accounts for 26.41% of the employment, but only 22.79% of the job destruction within firms of age group one to three. This result applies to all age groups. On the other hand, spin-offs create fewer jobs (gross) than one would expect based on their employment share. Nevertheless, they still outperform others regarding net job creation.[10]

The object of Table 5.4 is to examine the magnitude of the spin-offs' job creation and their impact on total employment compared to other new and young firms. When investigating the spin-offs' significance to employment, our interest concentrates on *net* job creation. As already stated above, spin-offs have higher rates of net job creation and they are slightly larger at start-up. The effect is that spin-offs account for 26.3% of net job creation for age range zero to three, while only accounting for 23.2% of the population. Moreover, spin-offs are responsible for an impressive 41.3% of the net job creation within age range one to three, while only making up a quarter of the population. Recalling the magnitude of job creation in new and young firms, this strongly underlines the significance of spin-offs to overall employment and job creation.

[10]Note that the net job creation is negative for both categories of firms within age group four to nine, but smaller for spin-offs.

Do spin-offs matter in the long run?

So far, we have investigated performance differences for different age groups separately. Generally, the tendency seems to be a superior performance by spin-offs in terms of job creation. However, what is the overall effect of increased survival, higher net job creation and greater average firm size in the long run? Overall, do spin-offs rather than non-spin-offs result in a marked improvement in employment or is the difference barely perceptible in the long run? We explore this question in the following, as our focus shifts from growth rates to absolute employment.

Investigating long-term effects on job creation, the scale of data bounds us. Our population includes start-ups from 1995 to 2006. This implies that we can observe some entrants for 11 years and others for just one. This makes comparisons difficult and investigation of long-term effects is only possible for a part of the population. As a solution to the latter, we only include start-ups for the period from 1995 to 1998 in the following analysis. Thus, we are able to track the total net job flow from four generations of entrants (1995-1998) during their first eight years. The total net job flow is the total year-to-year development in employment by one generation. We measure it as the number of jobs created by entry, adding and subtracting the yearly job creation and job destruction, respectively. The latter includes both negative growth and job destruction by exit. Table 5.5 shows the total net job flow provided by the four generations of entrants.

Table 5.5: Yearly average of total employment for spin-offs and other entrants, classified by age (year of start-up: 1995-1998)

	Others			Spin-offs		
Age	**Firms**	**Jobs**	**Share of total jobs (%)**	**Firms**	**Jobs**	**Share of total jobs (%)**
0	4,970	8,446	75.59	1,397	2,728	24.41
1	3,662	9,207	73.27	1,146	3,359	26.73
2	2,886	8,967	71.41	988	3,590	28.59
3	2,409	8,636	70.69	859	3,580	29.31
4	2,028	8,324	71.04	746	3,393	28.96
5	1,731	7,823	71.19	651	3,166	28.81
6	1,484	7,302	69.80	580	3,159	30.20
7	1,305	6,875	68.72	518	3,129	31.28
8	1,167	6,651	69.31	467	2,945	30.69

In total, 4,970 non-spin-offs and 1,397 spin-offs start up between 1995 and 1998. At the time of entry they employ 8,446 and 2,728 full-time equivalents, respectively.[11] In other words, in their first year, spin-offs account for 24.41% of a generation's employment. In the second year (corresponding to age one), the number of total employees rises for both spin-offs and other entrants, whereas the number of firms is reduced. The total number of employees depends on the effect from two opposing factors. The first factor (the negative effect) is the continuous reduction in the number of firms and the second factor (the positive effect) is a yearly increase in the average firm size (the number of employees). For both spin-offs and others, total employment peaks in the third year, after which total employment gradually declines as the negative effect of firm exit becomes stronger. After eight years, only 1,167 of the other start-ups still exist, whereas 467 of the spin-offs remain. The important conclusion of this analysis, however, is not the higher survival rate for spin-offs, which is already an established fact, but the spin-offs' relatively large share of a generation's employment. During the first nine years the spin-offs' share of total employment has increased from 24.41% in the start-up year to 30.69% of the employment eight years later. Recall that both survival and average firm size have previously been illustrated for the entire population in Figure 5.4 and Table 5.1. We find a similar survival rate and average firm size for the 1995-1998 cohort. This suggests that the increase in share of employment is the result of not only a higher survival rate, but also a relatively larger firm size on average.

Finally, to make a clear illustration of what these differences in job creation mean to new firms' long-term contribution to employment, we estimate the total employment-effect after eight years. Based on the data presented in Table 5.5, we find the expected returns on employment for spin-offs compared to other entrants. In other words, we obtain an estimate of spin-offs' relative contribution to absolute employment, all things considered. Results are presented in Table 5.6. In order to make a comparison of the two groups and expose the performance difference, we report the absolute job creation per 100 firms.

[11] This is the sum of employees in start-ups in 1995, 1996, 1997 and 1998.

Table 5.6: Total employment per 100 start-ups (year of start-up: 1995-1998)

Years since start-up	Average (1995-1998)	Others only	Spin-offs only
0	175	170	195
1	197	185	240
2	197	180	257
3	192	174	256
4	184	167	243
5	173	157	227
6	164	147	226
7	157	138	224
8	151	134	211

For each 100 non-spin-offs that enter the economy, there is an immediate contribution to employment of 170 full-time equivalents, corresponding to an average firm size of 1.7 employees. After eight years, however, this number diminishes to only 134 employees. In contrast, 100 spin-offs employ 195 employees in the start-up year, and eight years later this number has increased to 211 as the positive effect from increases in firm size offsets the negative effect from exit. We find this to be the case only for spin-offs. Of course, it is not realistic (or desirable) that spin-offs would ever account for 100 percent of the start-up rate in Denmark. Furthermore, we must emphasize that the difference in return on employment applies only to this ratio of spin-offs and non-spin-offs, even though we have no reason to suspect that the results would change dramatically by an increase in the share of spin-offs. This being said, it is food for thought that while today's[12] ratio of spin-offs to other entrants gives an expected return on employment after eight years of 151 employees for each 100 new firms established, it is likely that there is a potentially much higher return if we were to increase the spin-offs to non-spin-offs ratio. Table 5.6 indicates that an increase in spin-offs' share of start-ups by 10 percentage points from approximately 22% today to 32%, would result in an increase in the return to employment of 0.077 employee per start-up or, in terms of Table 5.6, an increase from 151 to 159 employees after eight years for each 100 start-ups. In other words, spin-offs *do* matter to employment - especially in the long run.

[12] This refers to the average ratio from 1995 to 1998.

5.5 Conclusion

If spin-offs survive longer, are a more homogeneous group and show greater stability in overall job creation compared to other entrants, it would imply a relatively higher job security for spin-off employees. Moreover, if spin-offs' job creation has no trade-off between growth on the one hand and size and stability on the other, then spin-offs would be relatively more significant to job creation in the economy compared to other start-ups. This has been the basis of the present paper, and if proven, it could make promotion of this type of entry an interesting target for industrial policy.

By detailed investigation of younger firms' growth patterns we are able to confirm that spin-offs are a more homogeneous group showing greater stability with potential to offer higher job security to their employees compared to other entrants. In comparison to other young firms, they not only survive longer (which in itself indicates increased stability in growth patterns), but their standard deviation in growth rates is smaller and they have a lower reallocation of jobs, meaning that relatively fewer spin-offs cut jobs within the same period as many others create jobs. We argue that this increased stability, homogeneity and higher likelihood of survival is the result of spin-offs being relatively less vulnerable to the liability of newness.

Despite a lower gross job creation, spin-offs actually achieve a higher net job creation, as their gross job destruction is also below that of other entrants. The difference in the net job creation is most pronounced for firms within the age range one to three. Resulting from fewer exits, the spin-offs' job destruction is significantly lower for this age group, contributing to an increased net job creation over other entrants. Furthermore, this result reveals that the entry of new firms is responsible for the majority of job creation accounted for by other entrants. Comparing the spin-offs' share of new firms to their share of the net job creation, their superiority becomes obvious. While spin-offs within the age range one to three only make up a quarter of the population, their net job creation accounts for more than 40%. These results illustrate how spin-offs play an important role to the employment in Denmark. An examination of the longer-term effects to the economy emphasizes this. The tendency seems to be that the gain of spin-off entry over other start-ups is greater the further ahead we look. Overall, the results suggest that changing the composition of today's

start-ups by promoting spin-offs over other entrants, could lead to substantial gains in terms of job creation.

Finally, we do not claim that our study captures the complexity of the Danish economy. Our study does not consider the overall economic effects of spin-offs. For example, as investigated in Chapter 3, if spin-offs are founded on intellectual capital accumulated at the parent firms, they could be potentially harmful to those firms. Chapter 3 confirmed a negative effect on parent firms' performance from top employees who migrate into spin-off entrepreneurship. This result means that there might be an equivalent (or larger) decrease in employment at the incumbent firms once parenting and now, perhaps, competing against these spin-offs. In other words, we cannot rule out the possibility that the overall economic effect of spin-offs is in fact negative because the negative effect on the parent firms' performance might outweigh the advantages of spin-offs over other entrants. Conversely, in opposition to this, the results provided in this chapter might fuel the discussion on non-competition clauses as a potential barrier to promote this type of entry.

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Summary

In three papers, this thesis addresses the overall research question: *"What are the effects of organizational disruptions on firm performance?"* These papers investigate three different types of organizational disruptions and their effects on firms' subsequent performance. These disruptive events include top-employee migration, an unexpected death among top management teams, and the rapid employment growth of start-ups. While the thesis also embraces other fields of research, the process of organizational disruptions and their effects on an organization's performance are the common denominator of the three leading papers contained in this thesis. I investigate these examples of organizational disruptions empirically, using a comprehensive Danish panel dataset. In addition, this thesis also includes a background paper.

Organizational disruptions are any events that alter organizational routines or key features of an organization in a way that disrupts the internal organizational processes. These disruptive events have the potential to push the prevailing organizational "equilibrium" out of balance, destabilizing the system and creating something new. Even if this eventually leads to positive performance outcomes, and even despite the overall approval of the organizational members, the transition from "well known" to "chartered territory" is not bound to be smooth. While some studies argue that organizations are generally flexible and adaptive at baseline, organizational ecologists argue that organizations are generally inert and hence vulnerable to organizational disruptions. In other words, shocks to key organizational features are disruptive to internal organizational processes with negative consequences for employees and firm performance. At the same time, organizational inertia implies the presence of routinized organizational activities, which require fewer resources and enhance the efficient coordination of tasks and resources. Overall, organizational inertia implies increasingly efficient organizations.

Routines are built on experience, and this experience may include insight on how to adapt to changing environments. However, because they rely on previous experience, routines may not provide appropriate responses to new situations and they may, in fact, legitimize inefficient behavior. At the same time, organizational inertia can restrict an organization to a suboptimal position. Disruptions can be beneficial to firm performance in this case by providing

an opportunity to identify the need for and to initiate imperative organizational change. In this sense, organizational disruptions can sometimes facilitate necessary organizational change and lead to positive performance outcomes. However, these disruptions are also potentially troublesome events with net negative effects on a firm's performance. Although a number of previous studies support the hypothesis that organizational changes and disruptions exert a net negative effect on a firm's subsequent performance, these studies tend to focus on a limited number of disruptive and often endogenous events. For these reasons, I argue that it is still largely an open question of *when* (i.e., what type of disruptions and what kind of firms) and with *what magnitude*, organizational disruptions will affect a firm's performance. In other words, *"What are the effects of organizational disruptions on firm performance?"*

Chapter 1 is a synopsis that introduces the overall research question, method and findings. In this synopsis, I illuminate what I understand of "Organizational disruptions and firm performance". I do so by presenting a model of three key mechanisms that illustrate the process from the onset of an organizational disruption to its effects on firm performance. The key concepts of this model and my thesis are structural inertia, organizational routines and organizational members. In the three focal papers, I focus on different aspects of these key mechanisms, investigating and explaining the effects of organizational disruptions on firm performance. This approach places the thesis within the organizational ecology literature, and the thesis, itself, adds to the stream of studies on inert organizations and argues that radical organizational changes are, overall, disruptive to organizations, with detrimental effects on a firm's subsequent performance. The latter is the overall hypothesis of my thesis. Chapter 1 also introduces the comprehensive Danish database, the Integrated Database for Labor Market Research. This longitudinal database is the empirical foundation for all four papers. This database provides annual data on all Danish firms and their employees from 1980 to 2008. I discuss the strengths and weaknesses of this database and its various applications. Finally, Chapter 1 provides the overall conclusion of my thesis. It further emphasizes the individual and collective contributions of the four papers and addresses the limitations of the research.

Chapter 2 is a co-authored paper with Christina Guenther. The title of

this paper is *"Heroes today - but what about tomorrow? Gazelles and their long-term performance"*. In contrast to previous studies, which mainly focused on the outstanding short-term performance of young, high-growth firms, this paper analyzed the long-term performance of these companies. We investigate this empirically, using the comprehensive Danish panel dataset, the Integrated Database for Labor Market Research. We argue that rapid initial growth rates impede the emergence of stable and efficient routinized structures in newly founded ventures, especially if the expansion is undertaken too hastily. This, in turn, negatively affects the long-term performance of these companies because the initial composite of organizational structures and routines, or the lack thereof, has a long-lasting effect on an organization's development. Supporting this hypothesis, we find that rapid initial employment growth negatively affects the long-term survival and employment growth rates for these companies and ultimately increases employee turnover. We also find that this trade-off between an initial high growth rate and a firm's long-term performance is partly explained by the higher initial employee turnover in these high-growth firms, which hinders the efficient integration of new members into the organization and hampers the development of a shared organizational culture and norms and of efficient organizational routines. This finding illustrates the significance of imprinting and inertia in the creation of organizational structures. Moreover, it emphasizes the time aspect in establishing efficient routines and the importance of organizational foresight when choosing an organizational model at the time of founding. Firms have a limited capacity to integrate new members efficiently into the organization, which significantly restricts the pace at which firms can successfully expand. These results raise the question of whether industrial policy should aim to promote potential high-growth start-ups over other entrants, even if this promotion comes at the cost of forgoing the creation of more sustainable jobs.

Chapter 3 is a co-authored paper with Michael S. Dahl. The title of this paper is *"The effect of top-employee migration and spin-offs on incumbent firms"*. In this paper, we investigate the performance effects of top-employee migration with a special focus on top employees who depart to spin-off entrepreneurship. Spin-off entrepreneurs are employees who leave incumbent firms to found their

own firms in the same industry. Previous studies have found that these entrepreneurs are significantly more likely to succeed compared with other, de novo entrants. However, if spin-offs are founded on the intellectual capital that was accumulated at their parent firms, they may be potentially harmful to the latter. One might expect that top-employee migration to rival incumbent firms would have similar effects on the parent firm's performance. We argue that top-employee migration is largely detrimental to firm performance because it results in a loss of human capital, and because this event is disruptive to organizational routines. Moreover, we expect increasing competitive pressure to result when key employees resign to work for spin-offs or incumbent rivals. We investigated the effects of top-employee migration on parent firm performance, exploiting the comprehensive Danish panel dataset. We found negative performance effects from top-employee migration, regardless of where the migrating employees end up working once they leave the parent firm, including non-competitive destinations. This effect is greater for top employees who leave to found spin-offs and top employees who resign to work with competing incumbent firms. The effect is not significantly different between these two categories of top employees. We also found that the negative effects on the parent firm's performance lessen over time. Overall, this study emphasizes the importance of top employees to firm performance. The decrease in post-departure performance explains and, to some degree, incites the extensive focus on employee retention through, for example, non-competition clauses.

Chapter 4 includes the last of the three major papers of this thesis. The title of this paper is *"Who loses a leader without losing ground: Unexpected death in top management teams and firm performance"*. In this paper, I exploit the exogenous variation in firm performance caused by sudden deaths among top management personnel to investigate the consequences of a disruptive organizational shock. At the same time, this paper studies which firms are better and faster at absorbing the impact from this shock with fewer negative effects on their subsequent performance. Organizational characteristics, such as flexible routines, an excess capacity to adapt, and previous experience with top management turnover events, can equip organizations to deal with unexpected organizational disruptions. The opposite of this flexible ideal might be a highly routinized and inert organization. Because organizational inertia can

circumscribe a firm's willingness and ability to act and adapt to a new situation, significant organizational disruptions can exert greater and potentially fatal effects on an inert firm's post-shock performance. Nonetheless, I hypothesize that inertia is a feature of more routinized, more efficient and stronger organizations, with a greater capacity to resist disruptive organizational shocks. I also hypothesize that a greater internal opposition to organizational change can lead to fewer potentially disruptive post-event changes in the organization. Supporting this hypothesis, I found that a longer tenure of the top management team mitigates the negative shock-effect of a team member's death, leading to a higher post-event performance than might otherwise be expected. I argue that continuity in the top management team increases organizational stability and routinization. Conversely, I find that employee tenure enhances the negative effect on post-shock performance. In keeping with the previous paper, this conclusion suggests that organizations might benefit from efforts to retain the individuals in their top management positions.

Chapter 5 is the final paper of this thesis. This chapter is a background paper that was co-authored with Michael S. Dahl. It is entitled *"Spin-off growth and job creation: Evidence on Denmark"*. This paper focuses on the superior performance of spin-offs in comparison with other start-ups. As such, this study supplements Chapter 3, which also addresses the question of the economic effects of employee migration and spin-off entrepreneurship. Previous studies have nearly exclusively investigated the comparative performance of spin-offs' in terms of their survival. We added to this body of literature by conducting a detailed empirical study of the performance differences between spin-offs and other entrants in terms of employment growth and job creation. We found that spin-offs are not only surviving longer, as the existing literature suggests, but that they are also relatively more important for the economy as a source of job creation. This finding has implications for industrial policy, particularly by suggesting that substantial gains may accrue from targeted entrepreneurial policies that promote spin-offs over other entrants.

Resume på dansk

Igennem tre artikler undersøger denne Ph.d afhandling det overordnede forskningsspørgsmål: "Hvad er effekterne af organisatoriske forstyrrelser på virksomheders performance?" Artiklerne undersøger tre forskellige typer af organisatoriske forstyrrelser og disses effekt på virksomheders performance. Disse organisatoriske forstyrrelser er henholdsvis nøglemedarbejdere, der forlader virksomheden, toplederes uventede dødsfald og høj beskæftigelsesvækst i nystartede virksomheder. De enkelte artikler trækker på flere forskellige forskningsområder. Fællesnævneren er dog, at de alle beskæftiger sig med processen omkring organisatoriske forstyrrelser, og hvorledes denne proces har indflydelse på, hvordan virksomhederne efterfølgende klarer sig. Derudover indeholder afhandlingen også et baggrundspapir. De fire artikler er alle empiriske studier, der er baseret på et meget omfattende dansk paneldatasæt.

Organisatoriske forstyrrelser er begivenheder, der påvirker og forandrer virksomhedens organisatoriske rutiner eller væsentlige karakteristika hos virksomhederne. Dette forstyrrer og ødelægger interne processer i virksomheden. Disse destruktive begivenheder bringer ubalance i den interne organisatoriske orden ved at erstatte velkendte og stabile mønstrer og hierarkier med noget nyt. Selvom dette med tiden kan medføre en positiv effekt på virksomhedens performance, og på trods af medarbejdernes eventuelle opbakning til den pågældende forandring, så kan overgangen fra en velkendt situation til noget ukendt være en problematisk proces. Nogen studier argumenterer for, at organisationer generelt er fleksible og omstillingsparate. I modsætning hertil argumenterer "organizational ecologists" for, at organisationer generelt er mindre fleksible og har en indbygget modstand mod forandring, der således besværliggøres og tager længere tid. Dette gør samtidigt organisationerne mere sårbare overfor organisatoriske forstyrrelser og større forandringer, der kan have negative effekter på medarbejderne og være skadelige for virksomhedens performance. På den anden side så medfører organisationers manglende evne og villighed til forandring også, at deres aktiviteter er mere rutiniserede og dermed mere effektive. Dette skyldes, at rutiniserede handlinger og aktiviteter kræver færre ressourcer, ligesom det muliggør en mere efficient koordinering og fordeling af opgaver og ressourcer i virksomheden.

Organisatoriske rutiner bygger på erfaringer, herunder mulige erfaringer

med, hvorledes organisationen bedst tilpasser sig skiftende omgivelser. Det er dog ikke givet, at rutiner, der er baseret på erfaringer, vil være velegnet til at håndtere nye og ukendte situationer. Dertil kommer, at fastholdelse i bestemte organisatoriske rutiner kan medvirke til at legitimisere en potentielt inefficient adfærd og dermed fastholde organisationen i et ikke optimalt adfærdsmønster. Hvis dette er tilfældet, kan organisatoriske forstyrrelser måske være positive for virksomhederne i den forstand, at de kan hjælpe med at identificere og efterfølgende bryde med potentielt inefficiente rutiner. Dette peger på, at organisatoriske forstyrrelser også kan have positive konsekvenser for virksomhederne og deres performance, i det de kan hjælpe med at facilitere nødvendige organisatoriske forandringer. Omvendt kan dette også være en vanskelig og destruktiv proces, der kan skade virksomhedens performance i større eller mindre grad. En række tidligere studier støtter hypotesen om, at organisatoriske forstyrrelser og forandringer kan have negative konsekvenser for virksomhedernes efterfølgende performance. Størstedelen af disse studier fokuserer dog på et begrænset antal af organisatoriske forstyrrelser, ligesom mange studier lider under endogenitetsproblemer. Jeg argumenterer således for, at det fortsat er et åbent spørgsmål *hvornår* (dvs. hvilke typer af forstyrrelser og virksomheder) og *med hvilken effekt*, organisatoriske forstyrrelser påvirker virksomheders performance. Med andre ord, *"hvad er effekterne af organisatoriske forstyrrelser på virksomheders performance?"*.

Kapitel 1 er en synopsis, der introducerer det overordnede forskningsspørgsmål, metode og resultater. I synopsen klargøres det, hvad jeg forstår ved afhandlingens titel "Organizational disruptions and firm performance". I den forbindelse præsenteres en model indeholdende tre hovedmekanismer til at forklare processen fra organisatorisk forstyrrelse til en effekt på virksomhedens performance. Disse hovedmekanismer, eller nøglebegreber, er "structural inertia", organisatoriske rutiner og organisatoriske medlemmer. I afhandlingens tre hovedartikler undersøger og forklarer jeg effekterne af organisatoriske forstyrrelser på virksomheders performance ved at fokusere på forskellige aspekter af de tre hovedmekanismer. På baggrund heraf positionerer synopsen afhandlingen inden for "organizational ecology" litteraturen. Her bidrager afhandlingen til litteraturen om "inert organizations" ved at advokere for, at radikale

organisatoriske forandringer og forstyrrelser generelt er destruktive for organisationer og dermed skadelige for virksomhedernes efterfølgende performance. Dette er endvidere afhandlingens overordnede hypotese. Deruodver introducerer synopsen også det omfattende danske register data, Integreret Database for Arbejdsmarkedsforskning (IDA). Dette omfattende paneldatasæt danner det empiriske grundlag for alle fire artikler i denne afhandling. Databasen indeholder detaljerede variable og har årlige observationer på alle danske virksomheder og deres medarbejdere fra 1980 til 2008. I Synopsen diskuterer jeg styrker og svagheder ved databasen og dens anvendelsesmuligheder. Synopsen indeholder også en samlet konklusion for afhandlingen og en diskussion af mulige svagheder og begrænsninger. Derudover fremhæver synopsen de konkrete bidrag fra de enkelte papirer og fra afhandlingen som helhed og diskuterer i den forbindelse også konsekvenserne af afhandlingens resultater.

Kapitel 2 er en artikel, der er skrevet i fællesskab med Christina Guenther. Titlen på dette papir er *"Heroes today - but what about tomorrow? Gazelles and their long-term performance"*. I modsætning til tidligere studier, der hovedsageligt fokuserer på unge vækstvirksomheders imponerende kortsigtede performance, så undersøger vi, hvordan disse højvækstsvirksomheder klarer sig på længere sigt. Vi undersøger dette empirisk ved hjælp af det omfattende danske registerdata, IDA, der er beskrevet ovenfor. I artiklen argumenterer vi for, at høj beskæftigelsesvækst i de første år af en virksomheds levetid kan hæmme udviklingen af stabile og efficiente rutinestrukturer i nyetablerede virksomheder, hvis ekspansionen sker for hurtigt. Dette har konsekvenser for virksomhedens langsigtede performance, fordi de initiale organisationsstrukturer og rutiner, eller mangel på samme, har en langvarig indvirkning på, hvordan virksomheden udvikler sig. Vores empiriske resultater understøtter denne hypotese. Vi finder, at høj beskæftigelsesvækst i de første år har negative effekter på virksomhedens langsigtede beskæftigelsesvækst og overlevelseschancer samt øger medarbejderudskiftningen. Vi finder også, at dette trade-off mellem virksomhedens initiale beskæftigelsesvækst og langsigtede performance delvist kan forklares med en højere medarbejderudskiftning hos disse vækstvirksomheder i de tidlige år. Dette skyldes til dels, at en for høj udskiftning blandt medarbejderne vanskeliggør en efficient integration af nye medarbejdere. Derudover

kan en høj medarbejderudskiftning forhindre, at der etableres en fælles organisationskultur, et fælles normsæt og efficiente organisatoriske rutiner. Dette understøtter hypoteserne om "imprinting" og "inertia" i organisatoriske strukturer. Det understreger også tidshensynet i forhold til at etablere efficiente rutiner samt betydningen af en vis fremsynethed i nystarte virksomheder, når de vælger en organisatorisk model, i det organisatorisk træghed og modvilje gør det vanskeligt at ændre den eksisterende model på et senere tidspunkt. Artiklen viser også, at virksomheder har en begræsnet kapacitet til efficient at integrere nye medlemmer, hvilket lægger en væsentlig begrænsning på, hvor hurtigt virksomheder kan ekspandere. Konklusionerne i denne artikel sætter spørgsmålstegn ved, om det er hensigtsmæssigt at målrette erhvervspolitikken mod vækstiværksættere og forsøge at fremme opstarten af disse frem for opstart af andre iværksættervirksomheder. Artiklen påpeger, at en sådan politik risikerer at fremme beskæftigelsen på kort sigt på bekostning af en mere vedvarende jobskabelse.

Kapitel 3 er en artikel, der er skrevet i fællesskab med Michael S. Dahl. Titlen på denne artikel er *"The effect of top-employee migration and spin-offs on incumbent firms"*. I artiklen undersøger vi, hvordan det påvirker virksomheders performance, når de mister en nøglemedarbejder. Vi fokuserer især på nøglemedarbejdere, der forlader virksomheden for selv at starte en virksomhed inden for samme branche. Denne gruppe af iværksættere betegnes "spin-offs". Tidligere studier har vist, at spin-off iværksættere klarer sig markant bedre end andre nystartede virksomheder. Men hvis disse spin-off virksomheder etableres på baggrund af viden, som iværksætteren har med fra sin tidligere arbejdsplads (modervirksomheden), så er der en risiko for, at spin-offs er skadelige for modervirksomhederne. På den anden side, så kan man også argumentere for, at lignende negative effekter bør forventes, i det tilfælde virksomheden mister en nøglemedarbejder til en anden konkurrerende virksomhed. I artiklen argumenterer vi for, at tabet af en nøglemedarbejder har negative konsekvenser for virksomhedernes performance, fordi det medfører et tab af humankapital, og fordi det har karakter af en organisatorisk forstyrrelse, der negativt påvirker organisatoriske rutiner. Vi forventer endvidere et øget konkurrencemæssigt pres, når nøglemedarbejdere forlader modervirksomheden for efterfølgende enten at blive ansat hos en etableret konkurrent eller starter en spin-off virksomhed.

Igen anvender vi IDA til at undersøge, hvorledes nøglemedarbejderes afgang påvirker virksomhedernes performance. Vi finder, at dette har negative effekter på virksomhedernes performance uanset nøglemedarbejderens efterfølgende beskæftigelsessituation. Denne negative effekt er dog større, når nøglemedarbejderen efterfølgende bliver ansat hos en eksisterende konkurrent eller bliver spin-off iværksætter. Der er dog ikke signifikant forskel på effektens størrelse i de to tilfælde. Vi finder yderligere, at den negative effekt på modervirksomhedens performance aftager over tid. Resultaterne i dette studie understreger først og fremmest nøglemedarbejdernes betydning for virksomhedernes performance. Derudover så understøtter og forklarer dette et større fokus på fastholdelse af de vigtigste medarbejdere, eksempelvis gennem konkurrenceklausuler.

Kapitel 4 indeholder den sidste af de tre nøgleartikler, der direkte behandler afhandlingens overordnede forskningsspørgsmål. Denne artikel har titlen *"Who loses a leader without losing ground: Unexpected death in top management teams and firm performance"*. Dette papir udnytter den eksogent bestemte variation i virksomheders performance fra uventede dødsfald i topledelsen til at undersøge konsekvenserne af et negativt organisatorisk chok. Artiklen studerer også hvilke virksomheder, der er bedre og hurtigere til at absorbere de negative effekter af et sådan organisatorisk chok. Det vil sige, hvilke virksomhedskarakteristika kan medvirke til at begrænse de negative konsekvenser for virksomhedens efterfølgende performance. På den ene side kan der argumenteres for, at karakteristika såsom fleksible rutiner, ekstra ressourcer til at imødekomme hurtig tilpasning og omstilling samt tidligere erfaringer med udskiftning i topledelsen vil ruste virksomhederne til bedre at håndtere dette chok. Omvendt vil dette betyde, at mindre omstillingsparate og meget rutiniserede organisationer vil være mere sårbare overfor sådanne organisatoriske chok og derfor må forventes at opleve en større performancenedgang som følge heraf. I modsætning hertil foreslår jeg, at netop disse mindre fleksible virksomheder, som følge af deres mere rutiniserede aktiviteter, også vil være relativt mere efficiente og stærke virksomheder med bedre forudsætninger for at modstå eller overkomme et organisatorisk chok. Jeg argumenterer yderligere for, at en generelt større intern modstand overfor organisatoriske forandringer kan medføre færre potentielt skadelige forandringer i kølvandet på chokket. Mine empiriske resultater understøtter denne hypotese. Jeg finder, at jo længere

tid virksomhedens team af topledere har været i virksomheden, jo mindre bliver den negative effekt på virksomhedens performance fra et uventet dødsfald blandt toplederne. Jeg argumenterer for, at dette skyldes, at kontinuitet i topledelsen medfører øget organisatorisk stabilitet og rutinisering. Dette gør virksomhederne stærkere og mere modstandsdygtige overfor uventede organisatoriske forstyrrelser. Som det også var tilfældet i ovenstående kapitel, så peger dette resultat i retning af, at organisationer har en fordel i at fokusere på fastholdelse af nøglemedarbejdere. Dette gælder ikke mindst i topledelsen.

Kapitel 5 er afhandlingens sidste artikel. Dette er et baggrundspapir, der er skrevet i fællesskab med Michael S. Dahl. Denne artikel har fokus på spin-off iværksætteres overlegne performance sammenlignet med andre iværksættervirksomheder. Denne artikel supplerer således kapitel 3, der også undersøger økonomiske konsekvenser i forbindelse med spin-off iværksætteri. Tidligere studier har næsten udelukket fokuseret på spin-off iværksætternes overlegne performance i form af øgede overlevelseschancer. Vi bidrager til denne litteratur gennem et detaljeret empirisk studie af spin-off virksomhedernes jobskabelse sammenlignet med andre iværksættervirksomheder. Vi finder, at spin-offs ikke blot overlever længere, de tegner sig også for et relativt stort bidrag til jobskabelsen. Dette studie har især konsekvenser for erhvervspolitikken. Vores resultater peger på, at der kan være betydelige økonomiske gevinster ved en målrettet indsats for at øge opstartsraten for spin-offs relativt til andre iværksættere.