We interpret organizational imprinting as organizational learning processes and thereby explain theoretically why imprints develop during short periods of susceptibility and persistently affect organizations. At the same time, we reason that the persistency of imprints does not necessarily imply absence of organizational change because imprints weaken over time and, under certain conditions, imprints can even enhance capabilities for organizational change. Focusing on founder imprinting, we test inasmuch adding new educational backgrounds not already present in the founding team affect growth in the population of 486,679 start-ups in Sweden from 1997-2011. In line with imprinting theory, we indeed find that adding new educational backgrounds reduce firm growth over substantial periods. We also show that the susceptibility periods in which imprints form last about four years on average. At the same time we provide evidence that imprints taper off. First, the negative growth effects become insignificant after 10 years. Second, we find that educational diversity in the founding team facilitates the integration of new backgrounds, indicating that some types of imprints may enhance firms’ capabilities to learn from the environment.
The Growth Effects of Founder Imprinting in Start-up Firms: 
A Perspective from Learning Theory

Abstract:
We interpret organizational imprinting as organizational learning processes and thereby explain theoretically why imprints develop during short periods of susceptibility and persistently affect organizations. At the same time, we reason that the persistency of imprints does not necessarily imply absence of organizational change because imprints weaken over time and, under certain conditions, imprints can even enhance capabilities for organizational change. Focusing on founder imprinting, we test inasmuch adding new educational backgrounds not already present in the founding team affect growth in the population of 486,679 start-ups in Sweden from 1997-2011. In line with imprinting theory, we indeed find that adding new educational backgrounds reduce firm growth over substantial periods. We also show that the susceptibility periods in which imprints form last about four years on average. At the same time we provide evidence that imprints taper off. First, the negative growth effects become insignificant after 10 years. Second, we find that educational diversity in the founding team facilitates the integration of new backgrounds, indicating that some types of imprints may enhance firms’ capabilities to learn from the environment.

Keywords: imprinting, organizational learning, path-dependence, start-ups, firm performance
1 Introduction

Throughout a firm’s life-cycle its organization structure typically undergoes considerable change. Often, in start-ups employees are jacks-of-all-trades and are involved in a broad portfolio of tasks including production, sales, marketing, and management tasks. As firms mature, they experience an increasing need to professionalize (Boeker and Karichalil, 2002, 2009; Hellmann and Puri, 2002), e.g. by relegating managerial tasks from the founding team to professional managers (Flamholtz and Randle, 2016; Wasserman, 2003). Thus firms need to add and integrate novel competences as the need occurs (Jawahar and McLaughlin, 2001). Empirical accounts, however, show that professionalisation through integration new competences is often fraught with severe rigidities (Beckman, 2006; Beckman and Burton, 2008). One strand of the literature has resorted to explaining such rigidities with reference imprinting - a process in which specifics of the firms' early environment are imprinted into its organizational structure (Stinchcombe, 1965).

Although there is some consensus that imprinting can be a powerful explanation for organizational rigidities in general and difficulties of adding new competences in particular, the concept has been criticized for its fuzziness (Johnson, 2007). Recent research has made an attempt to define imprinting on its specific temporal pattern (Judge et al., 2015; Marquis and Tilesik, 2013). In specific it has been argued that imprinting refers to a process in which during short periods of organizational susceptibility elements of the firms’ environment become persistently imprinted on its organizational structure. Yet, while there is some agreement on this specific temporal pattern, the causal mechanisms bringing it forth are still not well-understood. In this article, we propose a framework which sees imprinting as a process of organizational learning. Focusing on founder imprinting, i.e. the imprinting of characteristics of founding team (Beckman and Burton, 2008; Kriauciunas and Shinkle, 2008; Leung et al., 2013; van Driel and Dolfsma, 2009), we argue in specific that the definitional temporality of imprinting is a result of processes of organizational learning taking place in start-up firms. Start-up, we posit, will usually lack strong organizational routines implying that the firm become more susceptible to skills located on the individual level, in particular the founding team. Over time, these individual level skills are transformed into persistent organizational routines and organizational knowledge sources. While the emergence of organizational routines allows for efficient repetition of tasks, it reduces the firms’ susceptibility to skills at the individual-level. Thus firms will become less able to learn through recruitment (Almeida and Kogut, 1999; Song et al., 2003) resulting in path-dependent competence-building.

It is worth noting, however, that our learning based perspective does not predispose organizational rigidities and inertia as most traditional accounts of imprinting do (Beckman and Burton, 2008; Hannan et al., 1996; Hannan and Freeman, 1984; Koch, 2011). During the start-up phase also learning-routines (dynamic capabilities) will be imprinted on the firm suggesting that im-
imprinting can be conducive to organizational adaptability. In particular, we argue that educational
diversity in the founding team will imprint strong knowledge integration capabilities on the
firm, which increases its ability to learn from recruitment and thereby withstand the coercive
power of organizational routines also in the long-run.

We test our theory based on a matched employer-employee dataset on the population of all
Swedish firms founded between 1997 and 2012. Employing panel data regression techniques,
which are robust to unobserved heterogeneity, we provide strong evidence of imprinting pro-
cesses by showing that recruiting employees with educational backgrounds absent in the found-
ing team strongly reduces the firms’ growth prospects. We show that these negative effects on
growth are long-lasting and do not seem to wear off over time. Furthermore, we show that im-
printing becomes stronger as the firm ages: in their first approximately four years after found-
ing, hiring employees with new educational backgrounds, in fact, leads to higher firm growth.
Only for firms older than four years we find the negative effects. On the positive side, this find-
ing suggest that imprinting processes need time to unfold endowing start-up firms with a win-
dow of opportunity to add the required competences. On the negative side, it suggests that im-
printing is cumulative implying that firms as they mature become increasingly unlikely to be
able to add new competences when needed. Finally, we show that indeed firms with more di-
verse founding teams are less susceptible to the negative growth effects of imprinting.

We contribute to the literature on imprinting in several ways. First, we provide a clear theoreti-
cal basis for the phenomenon of imprinting, which is able to derive the temporality as postulated
by Marquis and Tilcsik (2013) from typical processes of organizational learning in start-ups.
Second, we provide empirical evidence on the temporal pattern on imprinting and thereby pro-
vide support of temporal definition by Marquis and Tilcsik (2013). Third, by highlighting the
moderating role of diversity in the founding team, we extend the current theorizing by showing
that imprinting does not necessarily lead to organizational rigidities.
2 Theory

Imprinting in organizational theory is one of the major concepts invoked to explain persistence in the organizational structures of firms (Beckman and Burton, 2008; Dobrev and Gotsopoulos, 2010). Dating back to Stinchcombe (1965), imprinting originally refers to the observation that firms founded in the same cohort tend to preserve comparable characteristics over long periods of time even in the face of considerable change in the firms’ environment (Hannan et al., 1996; Hannan and Freeman, 1984). Several authors have therefore implied that imprinting leads to path-dependence and organizational rigidities (Dowell and Swaminathan, 2006; Koch, 2011). Despite the intuitiveness of the concept, other authors have increasingly questioned the concept because of a lack of precision as well as its metaphorical usage and have argued for the need to define more clearly its theoretical nature (Johnson, 2007; Simsek et al., 2015).

Important conceptual progress has been made by Marquis and Tilcsik (2013), who provide a three-tier definition clarifying in particular the specific temporality of imprinting. They argue that imprinting refers to i) the existence of short periods of time in which firms are particular susceptible to conditions in the environment, ii) strong influence of the environment making firms to reflect upon and respond to the environmental conditions, and iii) the persistence of the resulting imprints. While the definition from Marquis and Tilcsik (2013) provides an angle to distinguish imprinting from other processes of path-dependence by highlighting the specific time-structure, its basic nature and causal drivers remain nonetheless salient.

In the following, we will argue that imprinting can be viewed and analyzed as a process of organizational learning typically occurring in start-ups. We follow the literature and define organizational learning as a change in an organization's knowledge base which occurs as a function of its experience (Argote, 2011; Fiol and Lyles, 1985; March, 2010). A key implication of this definition is that, although organizational learning aims at the generation of new knowledge and capabilities, organizations always rely on source of experiential knowledge acquired in the past. In principle, such sources of knowledge can be located both at the level of individuals (Simon, 2013) or at the level of the organization (Grant, 1996b; Nelson and Sidney, 1982; Teece et al., 1997; Zollo and Winter, 2002). While there has been some dispute on how both levels interrelate with respect to organizational learning, several authors have argued that in particular, absent of strong dynamic organizational routines firms need to resort to knowledge residing in individuals (Bruneel et al., 2010; Clercq et al., 2012). Since, in particular start-ups will have only weak organizational routines, which could drive further organizational learning, we argue that individual-level competences are particularly relevant during the founding phase of the firm. Thus, we propose to understand imprinting as a process of organizational learning where firms short of strong organizational level routines become receptive to the knowledge in key individual knowledge (such as the founding team members) which is eventually transformed into organizational knowledge persistent over time.


2.1 Imprinting as organizational learning

While there is less of a dispute of the empirical relevance of imprinting, several authors claimed that a conceptual understanding of imprinting would require a much more detailed definition of the underlying causal mechanisms (Johnson, 2007; Simsek et al., 2015). An important task of the literature is therefore to clarify the concept so that the causal mechanisms governing processes of imprinting become apparent. The definition by Marquis and Tilcsik (2013) is useful in this respect because it precisely defines the characteristics of imprinting that any theoretical grounding should be able to explain. In advocating an understanding of imprinting as phenomenon engendered by processes of organizational learning, we need to explain why organizational learning implies that firms are more susceptible to the environment in some periods than in others, how reflection upon and responses to the environment lead to imprinted behaviors and capabilities, and finally why these imprints are persistent. In the following we will argue that the literature on organizational routines is a valuable conceptual background, which does not only explain the phenomenon of imprinting, but it also gives guidance on when processes of imprinting will lead to organizational rigidities and when imprinting rather engenders organizational change.

The central question is therefore when and how organizations learn. According to the traditional evolutionary economics literature, organizational knowledge is stored in routines (understood as the genes of a firm). While exhibiting a high degree of inertia, firm routines can also change due to experiential learning (Gavetti and Levinthal, 2000; Miner, 1994; Nelson and Sidney, 1982), where however the learning is again understood as a routinized task strongly depending on existing organizational-level routines (Teece et al., 1997; Teece, 2007; Zollo and Winter, 2002).

Despite delivering key-insights into organizational learning, the evolutionary perspective pays little attention to deliberate learning of and from individuals within firms and can therefore not explain how knowledge located at the individual level affects knowledge formation at the organization level (Simon, 2013). The neglect of knowledge and skills located at the individual level is particularly problematic in start-up firms, which due to their youngness, cannot be expected to have developed strong organizational level routines and knowledge bases. Several authors have therefore argued that firms lacking strong internal routines resort to vicarious processes of learning. For example, firms typically become more susceptible to knowledge held by external partners or key employees (Clercq et al., 2012; Huber, 1991). A particular important group of key employees are founders who draw on their own experiences as well as knowledge and resources in their networks to gradually create organizational routines. Hence, the absence of organizational routines in early phases makes new firms highly susceptibility to the environment (Marquis and Tilcsik, 2013). It should be noted however that susceptibility is not only found in start-up firms. More generally, when once established routines become obsolete, e.g. as a result of disruptive environmental change, firms will be more susceptible to a change in or-
ganization routines (Cope, 2003). In fact, a reflection on the effect of organizational routines only provides an incentive to change if a mismatch with the environment is observed (e.g. decreasing sales or profits).

The second part of the definition by Marquis and Tilcsik (2013) refers to processes of reflection that leads to a response of the organization to the environment. As argued before the absence of organizational routines in start-up firms requires firms to put more emphasis on the skills of individuals and particular of the founding team (Colombo and Piva, 2012; Leung et al., 2013). Nonetheless, while learning ultimately takes place inside individuals, in order to be stably accessible to the firm, individual knowledge must ultimately be stored in organizational level knowledge repositories such as routines (Argote, 2011). The transformation of individual into organizational knowledge necessitates that the individual employees articulate their knowledge and integrate it with the knowledge bases of other members of the organization (Grant, 1996b; Nickerson and Zenger, 2004; Zollo and Winter, 2002). Such integration endeavors are complex and involve a high-degree of cognitive reflection (Greenwood, 1993; Schön, 1987).

The last part of the three-tier definition refers to the persistence of imprinting mechanisms. High levels of reflective behavior are per se inconsistent with rigidities because reflection allows firms to adapt and modify organizational routines whenever necessary. However, reflection is a costly and effortful process. Organizations can economize their every-day activities by transforming individual-level capabilities into organizational routines (Schreyögg and Sydow, 2011; Zollo and Winter, 2002). Transforming past experience by individuals into routines has considerable advantages. First, individuals executing a certain task do not have to reflect on the task each time. They just have to execute the routine, which in the absence of strong environmental change will yield an acceptable outcome (Levitt and March, 1988). Second, by transforming insights from higher-level learning into routines, efficient behaviors become independent from the individual, who engaged in the original learning activity. That implies that efficient behaviors can be replicated across the members of the organization (Kogut and Zander, 1992; Zollo and Winter, 2002). The execution of tasks becomes less dependent on skills and experience resting in individuals while those resting in organizational routines become more important. Organizational routines, irrespective of whether they refer to executing a repetitive task or whether they refer to dynamic capabilities, display a high degree of stability and tend to persist over extended periods. Thus, from a learning perspective, the persistence of imprints can be understood as a process of routinization (Bryant, 2014; Dimov et al., 2012). Consistent with the temporal anatomy defined by Marquis and Tilcsik (2013) we can conclude with the following learning based definition of imprinting:

*Imprinting is learning process initiated by the absence or inadequacy of organizational routines in which firms move from initially vicarious learning strategies to internal and routinized learning strategies.*
2.2 The Hypotheses

The literature has typically focused on the inertia caused by imprinting leading to maladaptation in the longer run, in particular when environments change fast (Beer and Nohria, 2000; Hannan and Freeman, 1984; Judge et al., 2015). This view is consistent with the notion that imprints refer to the existence of stable and persistent organizational routines (Koch, 2011). As argued, the development of organizational routines bears considerable advantages they allow to execute certain tasks without necessitating individual employees to understand fully the causal mechanisms underlying the functioning of the routine. In addition, because routines can be thought of as a sort organizational memory, they can serve as a buffer against employment turnover (Levitt and March, 1988).

However, the buffering function also works in the other way, because it immunizes the knowledge stored in the routines against knowledge resting e.g. at the level of individuals (Verbeke, 2013). Furthermore, the existence of routines does not only block the use of knowledge from individuals, it also leads to the destruction of this knowledge through coercive mechanisms forcing individuals to adapt to the dominant routines (March, 1991). In other words, the stronger the routines are, the less likely it is that individual level knowledge and skills will be used by the firm. Therefore, one of the major implications of imprinting is that firms with strong routines become less able to learn from individual-level sources of learning based on for instance hiring (Almeida and Kogut, 1999; Song et al., 2003).

Furthermore, the ability to make effective use of new skills and backgrounds resting in individuals in presence of strong routines requires that parts of the routines are unlearnt (Gabriel Cegarra-Navarro et al., 2011; Levitt and March, 1988; Tsang and Zahra, 2008). This is a major reason for why integrating new knowledge is costly, especially when the new knowledge is distant from the existing knowledge stored in organizational routines (Grant, 1996b; Tortoriello and Krackhardt, 2010). It follows that unlearning is unlikely to occur as long as existing routines and capabilities are valuable. Unless discontinuous events like crises create an incentive for unlearning and a cycle of new higher-order learning at the individual level (Cope, 2003), existing routines are likely to persist. Processes of imprinting as defined by us will therefore create learning inertia, which will manifest in a structural inability to make effective use of new individual-level skills introduced to the firm by recruitment. We follow amongst others McEvily et al. (2012) and Roberts et al. (2011) and measure the impact by imprinting with respect to changes in the growth rates.

*H1: Recruiting an educational background to the firm not present in the founding team reduces firm growth.*
H1 is based on the notion that imprints can be thought of organizational level repositories of knowledge, which were acquired through learning from vicarious sources of experiential knowledge. The acquired imprints on the one hand allow the firms to access stably knowledge which was once located at the level of the individuals. On the other hand, it immunizes firms against external knowledge making it less susceptible to changes in the environment. In particular, when firms are faced by large changes in their environment, changing or even unlearning organizational routines becomes crucial (Benner and Tripsas, 2012; Boeker, 1989). Unlearning or adaption of routines thus suggest that imprints decay over time as a reaction to poor performance or mismatches between the imprint and the environment (Boeker, 1989; Kimberly, 1979), distant organizational search (Kriauciuunas and Kale, 2006), or competitive pressures to meet best practices (Cockburn et al., 2000). Nonetheless, there are also forces maintaining or even amplifying imprints including vested interests or institutionalization (Greve and Rao, 2012) and isomorphism (Benner and Tripsas, 2012). Thus, an important question is how long the effects of imprinting persist. While in particular the population ecology approach postulated the complete invariability of once formed imprints (Hannan and Freeman, 1984) such an extreme view cannot be easily reconciled with a learning view of imprinting, because it denies the possibility that firms can change their imprints and routines even over longer periods of time. In addition, over the life cycle, the influence of founders will become smaller because of professionalization and the inflow of new employees. In fact, integration of new knowledge is typically a process of knowledge interactions located very much at the individual-level, where self-interested individuals determine which knowledge is used, which is advanced and which is abandoned (Felin and Zenger, 2009; Nickerson and Zenger, 2004). Thus, when the firm grows over its life cycle or when new key employees (such as professional managers) enter the firm the founders’ control over the firm decreases. It can therefore be expected that the inertia produced by imprinting do not persist over infinitely extended periods.

H2: The negative effects of recruiting employees with novel educational backgrounds taper off over time.

H1 and H2 refer to a situation where a stable founder imprint already has developed. We have argued that the paucity of organizational routines in the very early start-up phase forces the firm to specifically rely on vicarious sources of experience. Furthermore, the coercive power of organizational routines are much lower, thereby prolonging the period under which conflicting knowledge held by employees can survive (Adler and Borys, 1996; March, 1991). The higher susceptibility to knowledge located at the individual level in conjunction with the lower coercive power of routines should therefore be associated with a higher ability to integrate effectively novel knowledge accessed by recruitment. In fact, some authors suggest that firms are able to professionalize through the replacement of the founding personnel e.g. by professional managers (Boeker and Karichalil, 2002; Hellmann and Puri, 2002). Our learning perspective however also makes clear that this learning during the start-up phase is not a general ability, which per-
sists over time. Rather it is a window of opportunity due to the absence of strong organizational routines in the start-up phase. That suggests that firm age is an important moderator of the ability to learn from novel skills through recruitment, where younger firms are more able to do so while more mature firms are less able. In fact, this expectation is fully consistent with the notion of early susceptibility periods. Yet, rather than by axiomatic definition of the temporality of imprinting (Marquis and Tilcsik, 2013) our learning approach explicitly derives the temporality from the characteristics of the learning process as such. We conclude:

**H3: For young firms recruiting new educational backgrounds increases firm growth.**

A further qualification of the inertia perspective on imprinting results from the specific types of organizational routines. Several authors have made a distinction between operational routines which allow firms to execute a repetitive task and higher order dynamic routines that determine the firms’ ability to change the operational routines (Grant, 1996a, 1996b). The latter type of dynamic routines has also been labeled dynamic capabilities (Eisenhardt and Martin, 2000; Teece et al., 1997; Teece, 2007). Operational routines thus determine how a firm executes static and repetitive tasks that are geared towards the generation of sales and profits while dynamic capabilities refer to a capability that allows a firm to adapt the operational routines systematically (Zollo and Winter, 2002). The dynamical capabilities approach puts a somewhat ambiguous perspective on the rigidities produced by organizational routines. On the one hand, dynamic capabilities themselves are stable path-dependent routines. On the other hand, they bring forth organizational change and can thereby prevent organizational inertia. The firms’ ability to implement organizational change and to adapt to changing environments will therefore depend on its dynamic capabilities. The concept of imprinting suggests that the type of dynamic capabilities which emerge inside the firm depend also on the characteristics of founding team. A particularly powerful source of learning is the diversity in the skills and backgrounds because of an increased potential to recombine existing knowledge and skills to generate novel knowledge (Belderbos, 2003; Fleming, 2001; Nooteboom, 2009). A large literature has shown that more diverse management teams are more effective in making productive use of new knowledge sources (Bower and Hilgard, 1981; Dahlin et al., 2005). Homogenous teams instead will be sensitive mainly to those facets of the underlying problem they are most familiar. This focus on well-known facets will then typically lead to oversimplification and narrowly formulated problems (Baer et al., 2013; Volkema, 1997). However, integrating diverse knowledge stocks is also costly (Dahlin et al., 2005; Hobman et al., 2003; Tortoriello and Krackhardt, 2010) and therefore requires specific capabilities to emerge that relate for instance to effective communication routines, ability to handle uncertainty, or a high level of tolerance to new ideas. Firms with diverse founder teams are already early on forced to integrate diverse knowledge bases and should thereby develop the dynamic capabilities to integrate new knowledge at a later stage. In fact, the literature emphasizes that founder imprinting does not only affect which kinds of operational tasks a firm can execute efficiently. It also affects the types of communication processes and the
overall organizational culture (Baron and Kreps, 1999; Leung et al., 2013), which are highly influential as concerns learning.

H4: Greater educational diversity in the founding team mitigates the negative growth-effect of adding a novel educational background.

3 Data and methodology

3.1 Data sources

We base our empirical analysis on a linked employer-employee dataset on the population of Swedish start-ups from 1997-2012. The data is regularly collected and provided for research purposes by the statistical office of Sweden (SCB). SCB provides various types of firm and individual-level information in separated databases, which, however, can be flexibly merged through the use of common firm and individual identifiers. In this paper we make use of the firms and establishment dynamics database (FAD) allowing to identify new firms, the business statistics database (FEK) and business group register providing basic firm-level information, and the integrated longitudinal database for health insurance and labor market studies (LISA) providing detailed information on each firm’s employees on the individual level.

3.2 Identifying new firms

Since we focus on start-ups, a particularly important task is to develop a clear definition of what a start-up is. Practical obstacles are for example that merely legal or ownership changes (e.g. name changes, changes of the legal form, mergers and acquisitions) can imply that a firm receives a new identifier and thus may appear as new. In our definition legal changes, however, do not qualify as new. The FAD data is particularly central in our study because it provides additional information on the circumstances under which the firm was founded, which allows identifying new firms without confounding them with legal changes in principally existing firms. We identify a new firm if all of the following conditions are met:

- Firm is identified as new according to the FAD data (except new firms resulting from a merger);
- The firm’s organization number did not exist in the previous year;
- The firm has only one establishment; and
- The firm is not part of a corporate group
New firms are identified in the period from 1997 to 2011 and followed until the end of the observation period (2012) or their exit. To this data, we match firm business statistics (FEK) as well as employment data based on LISA, which allows us to construct the complete workforce of firms from the date of establishment until the end of the observation period. As a further limitation, we excluded firms with a founding team size of larger than 10 and firms that increase their labor force by a factor of more than 30 in a given year. This is to exclude organizational reorganizations where new firms are established and workforce moved in large quantities to the new entity. It may be noted that the results also hold without this restriction.

### 3.3 Variables

Our explained variable is firm growth. In the literature, many variables of growth were proposed but the most frequent measurements of firm growth are based on sales and employment (Delmar, 2006; Rodriguez and Nieto, 2016; Stuart, 2000). Even though sales and employment growth are often correlated, this is not necessarily the case. Firms can meet increasing demand by hiring staff but also through other means such as subcontracting (Delmar, 2006). A further disadvantage of employment is that it neglects varying capital-intensities. Sales data provides therefore a more direct measure of market success than employment, which is especially important when measuring the performance of new firms. We consequently decided to use sales growth as dependent variable and calculate the growth factor for each firm $i$ in year $t$ as follows:

$$\text{growth}_{i,t} = \log \left( \frac{\text{sales}_{i,t}}{\text{sales}_{i,t-1}} \right)$$

(1)

According to H1, we expect that adding an educational background to the firm, which is not present in the founding team, reduces firm growth. The main explanatory variable thus captures the introduction of new educational backgrounds through recruitment. An educational background ($\text{EB}_m$, where $m = 1, \ldots, M$) relates to the field of study, e.g. humanities, social science, or natural science. The Swedish system for classifying education (SUN 2000), which is aligned with the International Standard Classification of Education 1997 (ISCED 1997), captures 10 major educational fields. We register for each firm $i$ in year $t$, which of the educational backgrounds are represented through the employees. Educational backgrounds that are represented receive a value of 1, the others 0.

Adding a new educational background ($\text{newedu}_{i,t,m}$) to a firm $i$ in year $t$ implies that an individual is hired who has an education in a field that was not represented among the founding team or the year before the hiring takes place ($t-1$). The new educational backgrounds are coded 1 and the others 0. Given that there are 10 major educational fields and that the founding team mem-
bers need to be educated in at least one of them, the highest number of new educational backgrounds in a given year is 9. The dependent variable is a relative measure capturing the number of new educational backgrounds divided by the number of major educational fields, thus ranging from 0 to 0.9:

\[
sh_{\text{newedu},i,t} = \frac{\sum_{m=1}^{M} \text{newedu}_{i,t,m}}{M}
\]  

As discussed in section 2, we expect the effect of introducing new educational backgrounds to be mediated by the age of the firm (H3) and the educational diversity of the founding team (H4). Age is simply the observation year minus the year of firm establishment. Given that we need to observe a firm at least in two years in order to be able to measure firm growth, the minimum firm age in the sample is 1 and the maximum 15. Diversity is conceptualized as variety in terms of complementary types of knowledge, expertise or background, which is typically measured with the Blau index (Harrison and Klein 2007):

\[
div_{\text{found},i} = 1 - \sum_{m=1}^{M} \left( \frac{\text{edu}_{\text{found}_{m,i}}}{\text{found}_{size,i}} \right)^2
\]  

d_{edu_{\text{found}_{m,i}}} captures the number of individuals in the founding year of firm \( i \) with educational background \( m \) and \( \text{found}_{size}, \) stands for the size of the founding team of firm \( i \). If all individuals in the founding team have the same educational background, this variable is zero. The highest possible value is 0.9, which is achieved if all 10 educational fields are equally represented in the founding team. In our sample, the highest value is 0.86.

A key control variable is the yearly change in the team size:

\[
hiring_{i,t} = \frac{\text{team size}_{i,t}}{\text{team size}_{i,t-1}}
\]  

team size\(_{i,t} \) is the total number of employees of firm \( i \) in year \( t \). If we did not control for the change in the team size, the effects of introducing new competences would be conflated with the effects of hiring. The maximum value of this variable is 30 due to the restriction in the sample that we have applied.

Furthermore, we control for firm size (logarithm of sales), which accounts for the long debate on the relationship between firm size and firm growth going back to Gibrat (1931). Furthermore, we include other time variant firm-level variables in the model that relate to the strength and value of a firm’s routines and capabilities, namely labor productivity (sales by number of employees), profitability (earnings before depreciations by total assets), and the general level of skills of the work force (share of employees with tertiary education in total employment). Furthermore, we account for changes in industry and national economic dynamics by introducing industry and year fixed effects. Descriptive statistics of all variables can be found in Annex 1.
3.4 Identification strategy

In order to test H1-H4, we can resort to regression approaches. The baseline model, which is also used to test H1, is formulated as follows:

\[ \text{growth}_{i,t} = \alpha + \beta_{\text{sh}_{\text{newedu}}_{i,t}} + \gamma x_{i,t} + \delta_{\text{industry}}_{i} + \varphi z_{t} + \mu_{i} + \varepsilon_{i,t} \]  

(5)

where firm growth is explained by the share of new educational backgrounds (\(sh_{\text{newedu}}_{i,t}\)); a vector \(x_{i,t}\) of firm characteristics including hiring, labor productivity, profitability, firm size, share of employees with tertiary education; vectors for industry (\(\text{industry}_{i}\)) and time (\(z_{t}\)) fixed effects, as well as random errors (\(\varepsilon_{i,t}\)). We capture unobserved heterogeneity by the firm-specific effects (\(\mu_{i}\)). If \(\mu_{i}\) was uncorrelated with any the included main explanatory variables or the control variables, we had estimated Eq. (5) by pooled OLS or random effects (RE). The zero-correlation assumption is however quite restrictive and typically fails as firms differ in many respects which cannot easily be controlled because of unobservability. In our case, the data is for example largely silent about management practices and organization differences. We therefore decided to apply a fixed effects (FE) estimator, which is able to control at least for time-constant unobserved heterogeneity. Indeed, Hausman tests strongly rejected the zero correlation assumption. Nonetheless, we present pooled OLS models with panel-robust variances as a point of reference.

We expect that the effect of introducing new competencies tapers off over time (H2). This is investigated by including lagged variables for the share of new educational backgrounds and the corresponding yearly changes in team size.

\[ \text{growth}_{i,t} = \alpha + \beta_{1}\text{sh}_{\text{newedu}}_{i,t} + \beta_{2,\ldots,12}\text{sh}_{\text{newedu}}_{i,t-1,\ldots,t-11} + \gamma x_{i,t} + \omega_{\text{hiring}}_{i,t-1,\ldots,t-11} + \delta_{\text{industry}}_{i} + \varphi z_{t} + \mu_{i} + \varepsilon_{i,t} \]  

(6)

H3 stipulates further that firm foundation can be interpreted as a period of susceptibility to the environment when firms, in the absence of strong routines, may benefit from new competencies. We test this hypothesis through introducing firm age as explanatory variable and interacting it with the share of new educational backgrounds.

\[ \text{growth}_{i,t} = \alpha + \beta_{1}\text{sh}_{\text{newedu}}_{i,t} + \beta_{2}\text{age}_{i,t} + \beta_{3}\text{sh}_{\text{newedu}}_{i,t}\times\text{age}_{i,t} + \gamma x_{i,t} + \delta_{\text{industry}}_{i} + \varphi z_{t} + \mu_{i} + \varepsilon_{i,t} \]  

(7)
Also, we expect that greater educational diversity in the founding team mitigates the negative growth effect of adding a novel educational background (H4). In order to test this hypothesis, we introduce the diversity of the founding team in the model and interact it with the share of new educational backgrounds.

\[
growth_{i,t} = \alpha + \beta_1\text{sh}_\text{newedu}_{i,t} + \beta_2\text{div}_\text{found}_i + \beta_3\text{sh}_\text{newedu}_{i,t} \times \text{div}_\text{found}_i + \gamma x_{i,t} + \delta_\text{industry}_i + \phi z_t + \mu_i + \epsilon_{i,t}\]  

(8)

4 Results

As a point of reference, we present the main descriptive statistics of the variables used throughout the paper including a correlation matrix in Table 4 in the appendix. The starting point for our investigation is the inertia in firm routines and capabilities resulting from the imprints created when the firm was established. Unlearning existing competencies and integration new ones is difficult and costly. H1 therefore stipulates that adding a new competence to the firm should negatively affect firm performance. This relationship is captured in the baseline models reported in Table 1.

Table 1 unveils the interrelationship between hiring and introducing new educational backgrounds to the firm. Without controlling for the change in team size the introduction of new educational backgrounds has a positive effect (Models 1 and 2). The effect turns negative when hiring is introduced as a control variable (Models 3 and 4). This pattern is due to the fact that new educational backgrounds are added through recruitment. If hiring is not included in the model, the share of new educational backgrounds mainly captures the effect of a change in team size. The latter is positively related to sales growth. The inclusion of hiring as control variable therefore allows distinguishing between the effects of adding new competencies as opposed to increasing the team size in general.
Table 1: Baseline model: Effect of introducing new educational backgrounds on firm growth

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POLS (clus)</td>
<td>FE</td>
<td>POLS (clus)</td>
<td>FE</td>
</tr>
<tr>
<td>Log turnover growth</td>
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<td></td>
</tr>
<tr>
<td>Share of new educational</td>
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<tr>
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<td></td>
<td></td>
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<td>(0.0011)</td>
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<tr>
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<td>0.1480***</td>
<td>0.6758***</td>
</tr>
<tr>
<td></td>
<td>(0.0009)</td>
<td>(0.0008)</td>
<td>(0.0009)</td>
<td>(0.0008)</td>
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<tr>
<td>Labor productivity</td>
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<td>-0.0009***</td>
<td>-0.0009***</td>
<td>-0.0006***</td>
</tr>
<tr>
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<td>(0.0004)</td>
<td>(0.0001)</td>
<td>(0.0003)</td>
<td>(0.0001)</td>
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<tr>
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<td>0.1006</td>
<td>-1.5112***</td>
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<tr>
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<td>(0.7074)</td>
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<td>(0.0672)</td>
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<tr>
<td>Share of employees w. tertiary</td>
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<tr>
<td>education</td>
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<td>0.0099**</td>
<td>0.0241***</td>
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<td>(0.0045)</td>
<td>(0.0013)</td>
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</tr>
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<td>-1.7905***</td>
<td>-8.6036***</td>
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<td>(0.0119)</td>
<td>(0.0129)</td>
<td>(0.0119)</td>
</tr>
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<td>Industry dummies</td>
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<td>No</td>
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<td>No</td>
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<td>486679</td>
<td>486679</td>
<td>486679</td>
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<tr>
<td>$R^2$</td>
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<td>0.336</td>
<td>0.102</td>
<td>0.344</td>
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<td>$AIC$</td>
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<td>2845589</td>
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<td>$BIC$</td>
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<td>2820450</td>
</tr>
<tr>
<td>$F$</td>
<td>1845.7***</td>
<td>39386***</td>
<td>1858.4***</td>
<td>38865***</td>
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</table>

Note: standard errors in parentheses; standard errors of OLS regressions are clustered at the level of the firm; ***, **, * indicate significance at the 10%, 5%, and 1% levels.

The results suggest that the introduction of a new educational background indeed reduces firm growth (H1). The coefficients are substantial with values of -0.7111 (POLS) and -0.2436 (FE). This means that the introduction of one new educational field, which corresponds to 0.1 (10 percentage points) increase in the share, reduces firm growth by 7.1 percentage points according
to the POLS regression and 2.4 percentage points according to the FE estimator. The effects are relatively large as compared to average firm growth in the sample of 7%. As the FE estimator controls for unobserved heterogeneity at the level of the firm, the respective values are more reliable and we limit our presentation below to the FE models.

By corroborating H1, we show that the imprints created at the time of firm formation have a lasting impact but we know little about how long they last. Following an organizational learning perspective existing competences and routines can be unlearned and new ones integrated over time. The organizational learning perspective is therefore more in favor of a tapering off as suggested by H2. To investigate these dynamics, Table 2 reports the long-term effects of adding new competencies to the firm. Considering the lag structure, we find that adding new competencies affects firm growth for a relatively long period of time but becomes weaker and finally disappears. Using 5 lags the negative effect of introducing new educational backgrounds peaks after 2 years reaching a coefficient of -0.7631 (Figure 1). This means that a new competence that was introduced to the firm two years ago reduces current firm growth on average by 7.6 percentage points. After the second year, the negative effect becomes smaller but remains significant.
<table>
<thead>
<tr>
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<td>POLS (clus)</td>
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<td>POLS (clus)</td>
<td>FE</td>
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<td></td>
<td>Log turnover</td>
<td>Log turnover</td>
<td>Log turnover</td>
<td>Log turnover</td>
</tr>
<tr>
<td>growth</td>
<td>growth</td>
<td>growth</td>
<td>growth</td>
<td>growth</td>
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<tr>
<td>Share of new educational backgrounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>t0</td>
<td>-0.5305***</td>
<td>-0.5409***</td>
<td>-0.3681***</td>
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<td>(0.0665)</td>
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<tr>
<td>t-1</td>
<td>-0.4697***</td>
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<td>-0.2231***</td>
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<td>(0.0239)</td>
<td>(0.0212)</td>
<td>(0.0910)</td>
<td>(0.0753)</td>
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<td>t-2</td>
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<td>-0.7631***</td>
<td>-0.2841***</td>
<td>-0.5325***</td>
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<tr>
<td>t-3</td>
<td>-0.6667***</td>
<td>-0.6104***</td>
<td>-0.2974***</td>
<td>-0.5817***</td>
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<td></td>
<td>(0.0218)</td>
<td>(0.0202)</td>
<td>(0.0482)</td>
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<tr>
<td>t-4</td>
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<td>-0.4732***</td>
<td>-0.2997***</td>
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<td>(0.0200)</td>
<td>(0.0197)</td>
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<td>(0.0876)</td>
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<td>t-5</td>
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<td>(0.0181)</td>
<td>(0.0181)</td>
<td>(0.0468)</td>
<td>(0.0877)</td>
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<td>t-6</td>
<td>-0.4152***</td>
<td>-0.6408***</td>
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<td></td>
<td>(0.0531)</td>
<td>(0.0875)</td>
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<tr>
<td>t-7</td>
<td>-0.3824***</td>
<td>-0.5222***</td>
<td></td>
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<tr>
<td></td>
<td>(0.0518)</td>
<td>(0.0842)</td>
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<td>t-8</td>
<td>-0.4088***</td>
<td>-0.4505***</td>
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<td></td>
<td>(0.0501)</td>
<td>(0.0777)</td>
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<td>t-9</td>
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<td>-0.2564***</td>
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<tr>
<td></td>
<td>(0.0479)</td>
<td>(0.0695)</td>
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<td>t-10</td>
<td>-0.4466***</td>
<td>-0.1921***</td>
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<td></td>
<td>(0.0465)</td>
<td>(0.0604)</td>
<td></td>
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<tr>
<td>t-11</td>
<td>-0.4041***</td>
<td>-0.0623</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0414)</td>
<td>(0.0502)</td>
<td></td>
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</tr>
</tbody>
</table>

Industry dummies | Yes | No | Yes | No |
Year dummies      | Yes | Yes | Yes | Yes |
Observations      | 488232 | 488232 | 53870 | 53870 |
Number of firms   | 122979 | 0.435 | 129 | 23521 |
$R^2$             | 0.119 | 0.435 | 0.130 | 0.556 |
$AIC$             | 718434 | 360004 | 67126 | 2060.13 |
$BIC$             | 718867 | 360293 | 67517 | 2344.75 |
F                 | 367.04*** | 11260*** | 39.46*** | 1226.4*** |

Note: control variables, lagged variables for hiring, and constant are included but not displayed in the table; standard errors in parentheses; standard errors of OLS regressions are clustered at the level of the firm; ***, **, * indicate significance at the 10%, 5%, and 1% levels.
In order to analyze if and when the effects eventually disappear we introduce even more time lags and see that after 11 years the effect of adding a new competence becomes insignificant (Column 4 in table 2). Figure 2 illustrates the lag structure showing that the effect of introducing...
new educational backgrounds only peaks after 5 years when the average negative effect amounts to -0.6871. Hence, our results provide important qualifications: Firms need a very long time to integrate new competencies so that negative consequences on performance vanish. Also, the negative effect increases on average for 5 years following the introduction of a new educational background. Only then, the effect starts to fade.

Besides the persistence, a defining feature of imprints is that they are created in short periods when firms are susceptible to external influences (Marquis and Tilesik, 2013). The formation of a new firm is such a time window when firms – in the absence of strong organizational routines – may experience a positive effect from adding new competencies. In H3 we have therefore suggested that the positive effects of adding new competences dominate the negative ones in short periods after the founding of the company. In order to test H3, we have introduced the age of the company as an interaction term (Table 3, Column 1 and 2). If susceptibility periods exist, we would expect that the coefficient on the interaction term is negative and the overall effect of adding new competences is positive for very young firms. It should only turn negative as the firm matures. The average marginal effects of adding new competencies conditional to firm age are represented in Figure 3. The results show that young firms (less than 4 years) benefit in terms of sales growth from recruiting new educational backgrounds to the team (H2). Adding a new competence in year 1 contributes on average 8.2 percentage points to firm growth. It becomes increasingly difficult and costly to add new competencies as firms mature. The window of susceptibility closes on average three years following the establishment of the firm.
Table 3: Effect of introducing new educational backgrounds on firm growth, mediated by firm age and the diversity of the founding team

<table>
<thead>
<tr>
<th></th>
<th>(1) POLS (clus)</th>
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<tbody>
<tr>
<td></td>
<td>Log turnover growth</td>
<td>Log turnover growth</td>
<td>Log turnover growth</td>
<td>Log turnover growth</td>
</tr>
<tr>
<td>Share of new educational backgrounds</td>
<td>-0.3205*** (0.0258)</td>
<td>1.1080*** (0.0208)</td>
<td>-1.1486*** (0.0217)</td>
<td>-0.6329*** (0.0176)</td>
</tr>
<tr>
<td>Age of firm</td>
<td>-0.0284*** (0.0002)</td>
<td>-0.0669*** (0.0004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of new educational backgrounds # Age of company</td>
<td>-0.1121*** (0.0038)</td>
<td>-0.2915*** (0.0035)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diversity of founding team</td>
<td></td>
<td>-0.4585*** (0.0036)</td>
<td>0.0000 (.)</td>
<td></td>
</tr>
<tr>
<td>Share of new educ. backgrounds # Diversity of founding team</td>
<td></td>
<td>2.7411*** (0.0487)</td>
<td>1.5798*** (0.0439)</td>
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<td>Hiring</td>
<td>0.1485*** (0.0022)</td>
<td>0.1335*** (0.0011)</td>
<td>0.1621*** (0.0022)</td>
<td>0.1574*** (0.0011)</td>
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<tr>
<td>Log turnover</td>
<td>0.1564*** (0.0010)</td>
<td>0.6945*** (0.0008)</td>
<td>0.1712*** (0.0011)</td>
<td>0.6764*** (0.0008)</td>
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<tr>
<td>Labor productivity</td>
<td>-0.0013** (0.0006)</td>
<td>0.0008*** (0.0001)</td>
<td>-0.0014** (0.0006)</td>
<td>-0.0006*** (0.0001)</td>
</tr>
<tr>
<td>Profitability</td>
<td>-0.0748 (0.7656)</td>
<td>-1.9400*** (0.0753)</td>
<td>0.0102 (0.6920)</td>
<td>-1.5105*** (0.0672)</td>
</tr>
<tr>
<td>Share of employees w. tertiary education</td>
<td>0.0122*** (0.0014)</td>
<td>0.0334*** (0.0046)</td>
<td>0.0190*** (0.0014)</td>
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<td>-2.0619*** (0.0146)</td>
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</tr>
<tr>
<td>Industry dummies</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
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<td>Year dummies</td>
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<td>36044***</td>
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</table>

Note: standard errors in parentheses; standard errors of OLS regressions are clustered at the level of the firm; ***, **, * indicate significance at the 10%, 5%, and 1% levels.
Finally, by conceptualizing imprinting as organizational learning, we have argued in H4 that firms may also imprint dynamic capabilities (Teece et al. 1997, Eisenhardt and Martin 2000, Teece 2007) allowing to integrate new educational backgrounds. We link this dynamic capability to the competence diversity in the founding team, which captures the experience that founding teams have with integrating different educational backgrounds. Models 3 and 4 of Table 3 introduce competence diversity of the founding team and interacts this variable with the share of new educational backgrounds. As expected, the interaction variable has a highly significant and positive value, which suggests that competence diversity of the founding team mitigates the negative growth effects of adding a novel educational background (H4). Figure 4 plots the average marginal effects of recruiting new educational backgrounds conditional to the diversity of the founding team. It shows that the effects turn positive at diversity values of approximately 0.7. However, it may be noted that only 1.4% of all firms exhibit competence diversity of 0.7 or above implying that the number of firms, which show this extremely high level of competence diversity, is limited. While diversity in the founding team can therefore mitigate for the negative growth effect, for most firms it remains a burden to integrate new competences.
Figure 4: Effect of introducing new educational backgrounds on firm growth conditional to the competence diversity of the founding team.
5 Discussion and conclusion

We have proposed a learning-based perspective on imprinting, which heavily draws on the definition recently put forth by Marquis and Tilcsik (2013). The explicit incorporation of organizational learning processes, in particular experiential learning, extends the pure definition of the phenomenon of imprinting to a structural theoretical approach. This extension contributes to the literature in several ways.

First, it provides theoretical explanations for the specific anatomy of imprinting as defined by Marquis and Tilcsik (2013). In that respect, while Marquis and Tilcsik (2013) explain what imprinting is, we explain why it looks the way it does. In particular, we argue that the three definitional characteristics of imprinting - i) short periods of susceptibility ii) during which organizations reflect on their environment iii) leading to persistent imprints - can be understood as the result of typical learning processes following specific learning events. We follow Cope (2003) and argue that the foundation of a company constitutes such a learning event, where firms are susceptible to influences from the environment. Their newness deprives them from alternative sources for learning (Bruneel et al., 2010; Clercq et al., 2012). Thus, new firms reflect on their environment and begin to learn from it. Over time, firms accumulate an internal knowledge stock and develop routines. This implies that the knowledge once learnt from the environment during the susceptibility period becomes persistent. Established routines and the existence of an internal knowledge stock make firms less reliant on external knowledge sources. This leads to a decrease of the firms’ susceptibility towards the environment. Our emphasis on the learning event triggered by a scarcity/inadequacy of internal knowledge is also in line with the notion that formation of imprints is typically caused by events in the firms external environment (Hsu and Kenney, 2005; Powell and Sandholtz, 2012; Simsek et al., 2015).

Furthermore, our learning-based perspective on imprinting essentially posits that processes of routinization drive the transition from susceptibility periods to periods when the imprints dominate organizational behavior. Although sometimes treated as if (Dowell and Swaminathan, 2006; Koch, 2011), our understanding of imprinting is not identical to the claim that firms transform their knowledge to organizational routines leading to rigidities (Dosi and Nelson, 2010; Nelson and Sidney, 1982). Rigidities resulting from increasing routinization tend to predict that firms over time become increasingly self-reliant and closed towards its environment, whereby eventually even learning processes become routinized (Dosi and Nelson, 2010; Zollo and Winter, 2002). We conceptualize susceptibility periods as learning events that occur when internal knowledge is scarce or inappropriate. While high level of susceptibility typically characterize the foundation phase of a company, which over time fades out, it may well be possible that even in mature companies inappropriateness of the accumulated knowledge stocks leads to a renewed period of susceptibility. Therefore, our approach is compatible with alternating phases of closure and openness towards learning from the environment.
Second, by applying our theory to the case of learning-by-hiring (Almeida and Kogut, 1999; Palomeras and Melero, 2010; Song et al., 2003) in new firms, we provided first empirical evidence of the definition of imprinting by Marquis and Telsik (2013). Firms tend to be able to reap growth-potentials resulting from adding new competences to the firm only in a short period - up to four years in our sample - after the foundation of the company. After this window-of-opportunity closes, adding new competences not already represented by the founding team reduces firm growth. Following a learning-based theory of imprinting, new firms are susceptible for new competencies because they lack adequate routines and knowledge internally. Over time, firms accumulate knowledge internally and therefore become less reliant on and susceptible to knowledge accessible in its environment, e.g. through hiring. While we did not investigate the firm-internal processes leading to the increasing inability to profit from adding new competences, recent research shows that the ability to learn from recruitment is contingent on the firms capabilities to organize internal knowledge flows between incumbent and new employees (Tzabbar et al., 2015). As strong imprints emerge firms may become less able to change existing routines and incorporate new competencies, implying that new employees rather adapt to existing routines than changing them (March, 1991).

Third, we highlighted not only that firms may move between susceptibility periods and periods characterized by routinization, we also showed that imprints, typically understood as causing organizational inertia (Hannan et al., 1996; Hannan and Freeman, 1984; Judge et al., 2015), can be more flexible than commonly thought. Rather than merely restricting organizational behavior and learning, the effects of imprints depend on their specific content. In particular, we provided evidence that firms, which were very diverse already at the time of their foundation, are more able to add new competences also in later periods. Our results can be interpreted as evidence that integration capabilities (Zollo and Singh, 2004) can be imprinted on the firm. If the very ability to learn and integrate new knowledge can be imprinted on the firm, specific types of imprints may also improve organizational adaptability rather than producing inertia.

Finally, in contrast to Geroski et al. (2010) we provided evidence that, although long-lived, imprints caused by educational backgrounds of the founding team are not infinite. In our sample, the negative growth-effects of adding new competences to the firm peaked after five years but then tapered off until they became insignificant after a period of about 10 years. Also, this result is more consistent with a learning perspective which postulates that imprints - to the degree that they cause inertia - can be adapted even if it is costly and takes time.

In summary, our approach emphasizes persistence caused by imprints but departs from both the population ecology approach (Hannan et al., 1996; Hannan and Freeman, 1984) and a deterministic view on path-dependence, which regards lock-in as the natural outcome of routinization (Koch, 2011). In contrast, our theoretical perspective suggests that imprints are persistent but learning events can cause firms to become susceptible to the environment for example in times
of crises (Baker and Collins, 2010; Narayanan et al., 2009) or discontinuities in the markets or competition (Benner and Tripsas, 2012). Such learning events open up when internal knowledge and routines (the imprints) become inadequate and thus increase the incentives for firms to open up for learning from the environment. In that respect, our understanding of imprints is consistent with a view of path-dependence, which is neither inevitable nor irrevocable. In particular, Garud et al. (2010) emphasize the role of agency in interrupting lock-in. Likewise, Vergne and Durand (2010) highlight that although path-dependence is likely to lead to lock-in, exogenous shocks can create the opportunity to escape it. In summary, our learning-based perspective describes imprinting as a weak type of path-dependence process comprising coercive path-creating but also disruptive path-breaking forces. The theory thus provides guidance for the somewhat paradoxical coexistence of path-irreversibility and managerial intentionality as highlighted by Vergne and Durand (2011). It suggests both may occur, however, in distinct alternating periods.

The argument about the dynamics of alternating periods hints at a major limitation of our study. Since we focus on the foundation phase of firms, we only provide direct evidence of how and when the susceptibility periods phase out. Thus, our proposition that firms may reenter such susceptibility periods and may repeatedly cycle through different periods remains untested. We regard this question, however, as a central one in strategic management, as it can shed light on the question of how adaptable firms are in the long-run. Thus, highly relevant future research could focus on the question whether firms manage to reenter susceptibility periods, and if yes, under which conditions.
6 References


Table 4: Descriptive Statistics

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<th>Variables</th>
<th>Observations</th>
<th>mean</th>
<th>st. dev.</th>
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<th>5</th>
<th>6</th>
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<tr>
<td>Log turnover growth</td>
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<td>16.59</td>
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<td>Share of new educational backgrounds</td>
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