

# New Firm Performance and the Replacement of Founder-CEOs

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In this paper we study some causes and consequences of founder-CEO replacements among a sample of 4,172 Danish startups created by single founders in 1999 and 2000. In contrast to the extant literature on VC-financed firms, replacements among firms in our sample are more likely among the worst- and best-performing firms, and replacement is not unambiguously associated with better subsequent performance. Firms that replaced the founder as CEO were much more likely to fail, but the surviving firms among them grew considerably faster. We also analyze subsequent earnings and occupational choices of founders who rescinded operating control of their firms. Although subsequent founder income is increasing in the performance of their firms, those that left good firms were no more likely than others to found another business. Our results are consistent with the notion that founder-CEO replacement is driven in part by mismatches between business quality and founder ability.

JEL Classification Codes: D21, D22, J62, L26

*Keywords:* Entrepreneurship, business creation, founder turnover, CEO turnover.

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## 1. Introduction

How does firm performance influence the likelihood that founder-CEOs of new businesses cede operating control to a specialist manager? What implications does the departure of the founder have for subsequent business performance? And what happens to founders after they have left? This paper reports the results of an analysis of the causes and consequences of founder-CEO replacement among a cohort of new businesses founded in Denmark. Our empirical work uses the matched employer-employee database maintained by Statistics Denmark, and draws samples from the universe of new businesses created in Denmark during 1999 and 2000. These firms are generally small, they are almost invariably not financed by venture capital, and they are generally not at risk of an IPO event. We know surprisingly little about founder turnover<sup>1</sup> among such firms.

A growing literature has provided us with substantial insight into the causes and consequences of founder-CEO replacement in other types of firms. This literature, which has focused on high-growth and VC-backed firms<sup>2</sup>, finds that founder-CEO replacement is most likely to occur after a period of rapid expansion [e.g., Boecker and Karichalil (2002)], or upon attainment of critical milestones such as completion of product development or securing new rounds of outside funding [Waserman (2003)]. More important, perhaps, is that founder-CEO replacement is typically motivated by an expectation among stakeholders that the firm is likely in the near future to undergo an episode of transformational growth. Indeed, a significant portion of the literature explicitly samples on such expectations by studying only firms that are preparing for an IPO [e.g., Nelson (2003), Jain and Tabak (2008), Pollack, Fund and Baker (2009)].

The extant research lacks findings that we can confidently extrapolate to the firms that are the focus of the present paper. First, VC-financed firms appear to

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<sup>1</sup> We will use the terms founder-CEO replacement and founder turnover interchangeably to describe an event where the founder of a firm, who had been managing the firm as his or her primary occupation, rescinds operating control while maintaining ownership rights.

<sup>2</sup> Of course, executive turnover in established, typically public, firms has been extensively studied for many years [e.g., Hofer (1980), Chen and Hambrick (2012)]. There is also an active literature on succession in family-owned businesses, but the concerns of this literature are rather different from those in which executive control is passed outside the founder's family. See Handler (1994) for a review.

exhibit founder-CEO replacements at much higher rates than firms that are not subject to significant control by outside equity investors [Hellman and Puri (2002), Boeker and Wiltbank (2005)]. Second, few of the firms in our sample are ever likely to undergo transformations of the sort that appear to motivate many founder-CEO substitutions among VC-financed firms. Third, VC-financed firms are not random draws from the firm population. They are more likely to grow substantially, they are better financed, and their founders and employees on average have more human capital. Correlations between variables estimated from a sample drawn from the upper tail of the quality distribution may not hold in other segments of the population, especially when there are possibilities of non-monotonic relationships in the population as a whole.

It is well-known that VC-financed firms account for a tiny fraction of business launches<sup>3</sup> but they play a much larger role in economic growth, employment creation and innovation. As a result, academic effort to understand the dynamics of control in VC-financed firms is appropriately disproportionate to their numbers. Nonetheless, given their numerical importance, we should also be concerned with the control dynamics of the typical small business. Patterns of founder turnover among representative businesses also provide insight into the forces governing business transfers.<sup>4</sup> They are also key to understanding the expected opportunity costs of business creation, as well as the dual phenomena of serial and portfolio entrepreneurs.

In this paper we study founder-CEO replacements among a sample of 4,172 Danish startups created in 1999 and 2000. To ensure that the departure of the founder indicates a meaningful change in control, the sample consists only of firms that were created by a single founder, and where the founder worked as his primary job in the business. The firms and founders we study represent all firms founded in Denmark that meet these criteria. Only 18 percent of them are classi-

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<sup>3</sup> For example, in the United States, 626,771 new businesses were created in 2008, only 3,276 of which received VC financing (Bureau of labor Statistics at [http://www.bls.gov/bdm/entrepreneurship/bdm\\_chart1.htm](http://www.bls.gov/bdm/entrepreneurship/bdm_chart1.htm); and NCVA (2009).

<sup>4</sup> Founders may sell businesses because they are poorly matched to the needs of the business, or because they have reasons to cash out their equity position. Looking at founder-CEO replacements among businesses that are not transferred, allows us to gain insights about the first of these two motivations.

fied as high-tech, while wholesale, retail, construction and manufacturing are well-represented; this is a much broader sample than has previously been used to study founder-CEO replacement. Our data are drawn from Denmark's national matched employer-employee dataset, so we are also in a unique position to explore what happens to the founders after they have left the firm. We study instances of founder-CEO replacement and we track the firms and founder until 2005. The data allow us to distinguish business turnover from founder turnover and, in this paper, we focus on the causes and consequences of events in which the founder retires from active management but continues to retain controlling ownership. That is, our focus is on CEO succession in small firms, rather than business transfers.<sup>5</sup>

To guide our empirical work, we develop a simple model of firm creation, survival, and founder turnover. The goal of founder-CEO replacement among VC-backed firms is generally held to be resolving mismatches between the skills of the founder-CEO and the expected demands of the transforming enterprise. We also develop a framework based on mismatches between business and founder, although our model focuses on current rather than anticipated mismatches. We suppose that firm performance is a function of the ability of the founder and the quality of the business idea, both of which are draws from stable population distributions. Ability and quality are complements in production so that there can arise mismatches of sufficient magnitude to justify replacing the founder with an outside CEO who is better suited to the business.<sup>6</sup>

Our theoretical framework motivates us to consider the possibility that founder-CEO turnover is most likely in the tails of the initial performance distribution, and that, while good early performance is on average associated with good future performance, this effect is stronger in firms that had no turnover. What we find in the data is a little more complex than this. We do find that turnover is more likely in the tails of the firm performance distribution and, conditional on firm

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<sup>5</sup> The classic empirical study of small business transfers is Holmes and Schmitz (1995).

<sup>6</sup> Our theoretical framework is related to the models of business transfers developed by Holmes and Schmitz (1990, 1995), and to the model in Braguinsky *et al.* (2012), which explores the effect of the cost of evaluating ideas on founder turnover. We shall comment further on the relationship between our theoretical framework and these models in the next section.

survival, turnover is associated with higher rates of growth. However, turnover is also associated with higher firm exit rates. We also explore the earnings and occupational choices of founders who have relinquished day-to-day control of their firms. Our framework and our empirical results are both consistent with the intuitive notion that founders who were replaced in high-performing businesses subsequently earn more than those who left low-performing businesses but, less intuitively perhaps, they are no more likely to create another startup.

## 2. Theoretical Framework

There are two periods. In the first period, a founder with ability  $\theta$  has an idea of quality  $q_1$ . Ability is general and determines both the success with which the founder can manage a firm that implements the idea, and his earnings in alternative employment. We assume that founder ability is innate, fixed over time and known to the founder. Idea quality incorporates a variety of factors influencing performance, including the quality of the underlying idea or technology, its adaptation and fit to the market, and the public's state of knowledge about the firm's product. Some of these factors may be regarded as fixed, while others evolve over time as the business model is refined. Upon entry, the founder knows  $\theta$ , but he only knows that  $q_1$  is a random draw from the distribution  $F(q_1 | \theta)$ . The realization of  $q_1$  is observed after entry. The business idea is refined and adapted to the market, yielding a new quality  $q_2$  in the second period, which is drawn from  $G(q_2 | q_1)$ .

In each period,  $t = 1, 2$ , output is given by

$$y_t = q_t^{1-\alpha_t} \theta^{\alpha_t}, \tag{1}$$

for some  $\alpha_t \in [0, 1]$ . Although,  $\theta$  and  $q$  are assumed to be complements in both periods, we allow for the relative importance of ability and idea quality to vary from one period to the next.

Profit in period 1 is given by

$$\pi_1 = q_1^{1-\alpha_1} \theta^{\alpha_1} - w\theta. \tag{2}$$

The only cost is the opportunity cost of the founder's time, which is assumed to be linearly increasing in ability. For concreteness, we shall suppose this alterna-

tive use of the agent's time is in wage work.

At the end of the first period,  $q_2$  is observed and a decision is then made whether to contract with an outside CEO to replace the founder, to continue without change of leadership, or to exit. If the outside CEO has ability  $\tilde{\theta}$ , she must be paid a wage  $w\tilde{\theta}$ . If a replacement CEO is hired, a transition cost,  $c$ , must be paid. This cost reflects both direct costs of any disruption associated with a change in leadership, as well as any premium necessary to resolve agency problems arising from the separation of ownership and control [Fama and Jensen (1983), Jensen and Meckling (1976)].<sup>7</sup> The rewards to recruiting an outside CEO are that the CEO's ability can be chosen optimally in light of the realization of  $q_2$ , and the founder is released to earn  $w\theta$  elsewhere while remaining as the residual claimant on the firm's earnings. The founder is replaced by an outsider if

$$\arg \max_{\tilde{\theta}} \left( q_2^{1-\alpha_2} \tilde{\theta}^{\alpha_2} - w\tilde{\theta} - c \right) > q_2^{1-\alpha_2} \theta^{\alpha_2} - w\theta, \quad (3)$$

and if the term on the left hand side of (3) is positive. The profit-maximizing ability of the external CEO is given by

$$\tilde{\theta} = \left( \alpha_2 / w \right)^{1/(1-\alpha_2)} q_2, \quad (4)$$

so maximized profits in period 2 are

$$\pi_2^* = \max \left( q_2^{1-\alpha_2} \theta^{\alpha_2} - w\theta, A q_2 - c \right), \quad (5)$$

where  $A = (1 - \alpha_2)(\alpha_2 / w)^{\alpha_2/(1-\alpha_2)}$ . If  $\pi_2^* < 0$ , the firm exits.

The two terms on the RHS of (5) are plotted separately in Figure 1 for different values of  $q_2$  while holding  $\theta$  constant. The concave function  $\pi_2(q_2, \theta)$  indicates profits when the founder continues, and the straight line  $\tilde{\pi}_2(q_2)$  depicts profits when the founder is replaced. In the case illustrated in the figure, there are four distinct regions defined by the boundary values  $0 < q_E \leq \underline{q} \leq \bar{q}$ : if  $q_2 \in [0, q_E]$ , the firm exits at the end of period 1; if  $q_2 \in [q_E, \underline{q}]$  or if  $q_2 \geq \bar{q}$ , the founder is replaced as CEO; and if  $q_2 \in (\underline{q}, \bar{q})$ , the founder continues to operate the firm.

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<sup>7</sup> He (2008), for example, documents that founder CEOs have lower incentive compensation and lower total compensation than professional CEOs.

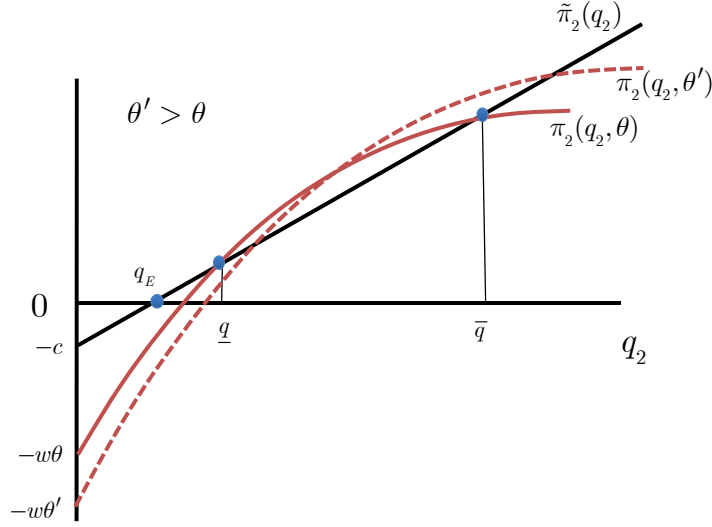
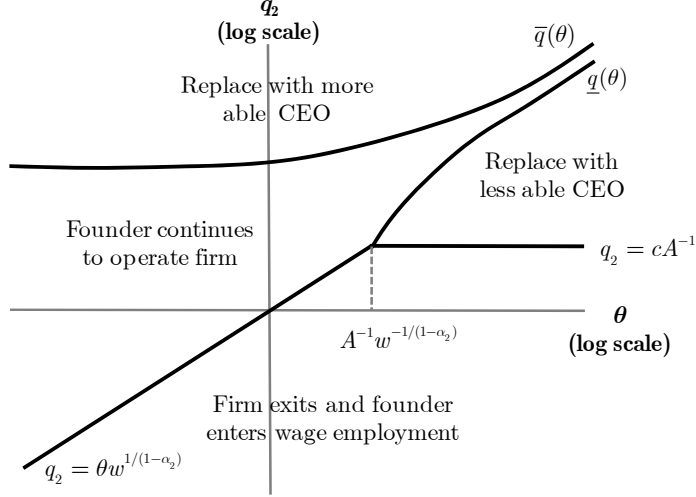


FIGURE 1. Second period payoffs;  $c > 0$ .

When  $q_2 \in [q_E, \underline{q}]$ , the founder is replaced because the opportunity cost of his time does not justify continued commitment to the business model; he is replaced by an external CEO who is less able than the founder. In contrast, when  $q_2 \geq \bar{q}$  the founder is replaced by an external CEO with higher ability.

Figure 1 also illustrates the effect of an increase in the founder's ability, from  $\theta$  to  $\theta'$ . This reduces the profitability of the founder continuing with the firm when the quality of the idea is low, and increases it when the idea is good. It is easy to verify that the intersection of  $\pi_2(q_2, \theta)$  and  $\pi_2(q_2, \theta')$  lies between  $\underline{q}$  and  $\bar{q}$ , and hence that the effect of an increase in  $\theta$  is to raise both  $\underline{q}$  and  $\bar{q}$ . The interval  $[q_E, \underline{q}]$  will vanish if the founder's ability declines sufficiently so that  $\underline{q} < q_E$ . There are, therefore, two distinct cases. In one case, when founders have limited ability, the period 2 outcomes fall into three distinct groups, with replacement of founders occurring only at higher values of  $q$ . In the second case, founders are replaced in firms with business models drawn from the tails of the quality distribution among all surviving firms. Which of these cases arises depends on the founder's ability, as well as other parameters of the model. For example, an increase in the transition cost,  $c$ , shifts  $\tilde{\pi}_2(q_2)$  down, which may eliminate the interval  $[q_E, \underline{q}]$ ; that is, if the increase in  $c$  is large enough, replacement of founders occurs only at high values of  $q_2$  and in each case the replacement has higher ability than the founder. Clearly, the minimum value of  $c$  that eliminates the interval



**FIGURE 2.** Ability, idea quality, and outcomes.

$[q_E, \underline{q}]$  depends on the founder's ability.<sup>8</sup>

Figure 2 provides a more complete depiction of the model's implications. Firms that are closed down are those with low-quality ideas. If the founder does not want to continue to operate the firm, continuation requires a new CEO. However, payment of the transition cost cannot be justified in low-quality firms. The boundary separating firms that are discontinued from those that are continued with the founder at the helm is given by the pairs  $\{q_2, \theta\}$  satisfying  $q_2 = \theta w^{1/(1-\alpha_2)}$ , showing that low-ability founders may continue to operate a business that a high-ability founder would close down. Founder turnover in continuing firms occurs in two distinct groups. First, there is a group of firms with high-quality ideas but that were founded by agents of sufficiently low ability to merit replacement with a more able CEO. The boundary between this group and the group of founders that continue to operate their own firm is defined by the func-

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<sup>8</sup> When  $c > 0$ , it is always the case that  $\underline{q} < \bar{q}$ . In the limiting case of  $c = 0$ , the function  $\tilde{\pi}_2(q_2)$  is then tangential to  $\pi_2(q_2, \theta)$  for any value of  $\theta$ , and  $\underline{q} \rightarrow \bar{q}$ . In this case, every founder is replaced, because it is always efficient to secure a perfect match between CEO ability and idea quality.



tion  $\bar{q}(\theta)$  that provides the larger of the solutions to the equation  $Aq_2 - c = q_2^{1-\alpha_2}\theta^{\alpha_2} - w\theta$ . As the transition cost rises,  $\bar{q}(\theta)$  unambiguously shifts upwards. The second group consists of firms with able founders but whose firms are of middling quality. The quality of the idea is high enough to prefer continuation over exit, but not high enough to merit continuation of the founder. The replacement CEO has lower ability than the founder. The boundary between this group and those that exit is a horizontal line at  $q_2 = cA^{-1}$ . The boundary between this group and the group of founders that continue to operate their own firm is given by the function  $\underline{q}(\theta)$  that provides the smaller of the solutions to  $Aq_2 - c = q_2^{1-\alpha_2}\theta^{\alpha_2} - w\theta$ . An increase in the transition cost shifts  $\underline{q}(\theta)$  downwards. Figure 2 shows that  $\bar{q}(\theta)$  and  $\underline{q}(\theta)$  are both positively sloped, which is consistent with the discussion around Figure 1.

### 2.1 Baseline simulations

The empirical implications of our theoretical framework depend critically on the joint distribution of  $q_2$  and  $\theta$  (and, by virtue of the correlation between  $q_1$  and  $q_2$ , on the joint distribution of initial idea quality and founder ability). For example, the implication that founder turnover occurs both when  $q_2$  is high (relative to  $\theta$ ) and when it is low requires that we observe in any sample instances where contrasting values of  $q_2$  and  $\theta$  coexist. Similarly, the transition cost cannot be so high that it eliminates the interval  $[q_E, \underline{q}]$ . Because this may not be the case, and despite the simplicity of the theoretical framework, there are no general empirical predictions about the relationships between performance in the two periods, founder ability and turnover. We will therefore make use of some numerical simulations to explore the *possibilities* of the model.

However, it is useful to consider some reasonable ways in which we can limit the varied possibilities. We do so in two ways. The first imposes a constraint on the transition cost,  $c$ , such that the model predicts an aggregate rate of turnover that approximates the rate (about 12 percent) that we observe in our data. The second makes use of a simple free-entry condition to help us constrain the relationship between ability and the quality of the idea. We want to admit entrepreneurs of all abilities. This will be the case if all agents, regardless of ability, are indifferent between entrepreneurship and wage work in period 1. If the quality of ideas and agent ability are independent of each other, then high-ability agents, who bear a higher opportunity cost of becoming an entrepreneur, will find busi-

ness creation less attractive than low-ability agents. We will therefore assume that idea quality and agent ability are positively correlated. For our purposes, it suffices to suppose that ability and agents care only about expected first-period returns. In the simulations to follow we therefore impose the constraint<sup>9</sup>

$$E\left[q_1^{1-\alpha_1}\right] = w\theta^{1-\alpha_1}, \quad (6)$$

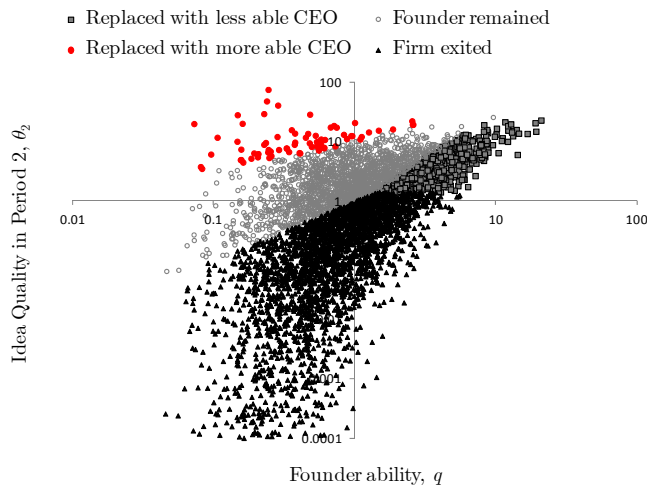
which ensures that all agents, regardless of ability, are indifferent between creating a business and wage employment.

In our baseline model, we assume that in both periods ability and the quality of the ideas are equally important. That is, we set  $\alpha_1 = \alpha_2 = 0.5$ . We assume that  $\theta^{1-\alpha_1}$  has a lognormal distribution, with unit mean and standard deviation of 0.5. Consistent with (6), we then assume that, for agent  $i$ ,  $q_{1i}^{1-\alpha_1}$  is a draw from a lognormal distribution with mean  $w\theta_i^{1-\alpha_1}$ . Finally, consistent with the assumption that  $G(q_2 | q_1)$  is decreasing in  $q_1$ , we assume that  $q_{2i}^{1-\alpha_2}$  is a draw from a lognormal distribution with mean  $q_{1i}^{1-\alpha_1}$ . The wage,  $w$ , is normalized to 1. Finally, we set  $c = 0.35$ , so that our baseline produces an aggregate rate of founder turnover of about 12 percent, consistent with evidence we shall show later.

Figure 3, which plots 5,000 random draws using the baseline parameters, depicts outcomes that confirm the boundaries already given in Figure 2. Although founders of exiting firms on average have relatively low ability, this is incidental and driven by the correlation between idea quality and founder ability. Indeed, once one conditions on idea quality, low-ability founders are *less* likely to close down the firm. The simulations yield observations in the two sets of firms with sufficiently good ideas but poor matches between idea and founder ability to merit replacement with a more able CEO. Although founder CEO's of all abilities may suffer a mismatch sufficient to induce their replacement with an outside CEO, it is clear that the likelihood of replacement is greater in the tails of the ability distribution.

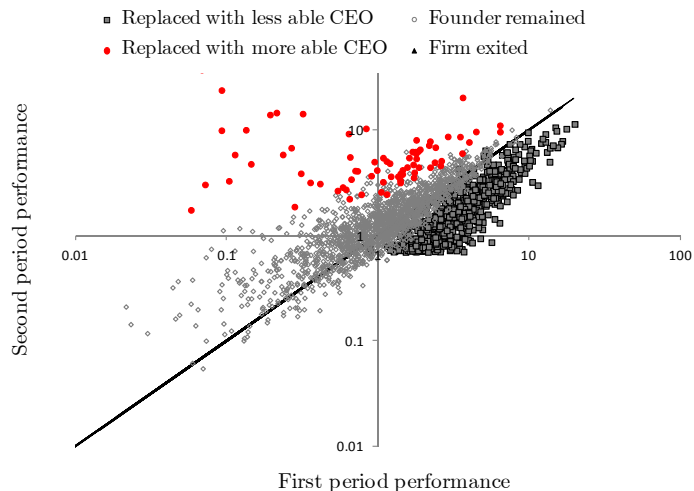
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<sup>9</sup> A forward-looking agent will also consider the option value that entering gives by providing choices in the second period. In period 2, the founder may choose to remain in control of the business, replace a new CEO if doing so increases profits, or exit. Even if expected second-period earnings from continuation are the same as expected first-period earnings, the replacement and exit options imply for a forward looking agent that  $E\left[q_1^{1-\alpha_1}\right] < w\theta^{1-\alpha_1}$ .



**FIGURE 3.** *Baseline simulations Founder ability versus second-period idea quality, by outcome.* 5000 observations. Parameters:  $\alpha_1=\alpha_2=0.5$ ,  $w=1$ ,  $c=0.35$ . Each  $\theta^{1-\alpha_1}$  is a draw from the lognormal with mean one,  $q_1^{1-\alpha_1}$  is lognormal with mean  $\theta^{1-\alpha_1}$ , and each  $q_2^{1-\alpha_2}$  is lognormal with mean  $q_1^{1-\alpha_1}$ ; all three distributions have a standard deviation of 0.5. Founder turnover occurs in about 12% of the observations.

However, we do not get to observe  $q$  and  $\theta$  separately. In the data, we observe only their combined contribution to revenues, and it is not obvious that we should also expect to see more frequent founder-CEO replacements in the tails of the firm performance distribution. Figure 4 therefore plots simulated first- and second-period revenues of surviving firms by founder status for our baseline simulations. The two distinct groups of founders that experience turnover are also clearly evident when we look at first-period performance, and they are indeed drawn more frequently from the tails of the performance distribution. There is a group with above-average performance in the first-period whose founders are replaced with less able CEOs. There is also a group of firms whose founders are replaced with more able CEOs. This group consists of firms with low-ability founders, but their poor ability is offset by ideas that in the second-period are sufficiently high quality to justify payment of the transition cost (firms with the worst ideas in the second period are closed down). Although these firms have a mean first-period performance that is not much different from the population av-



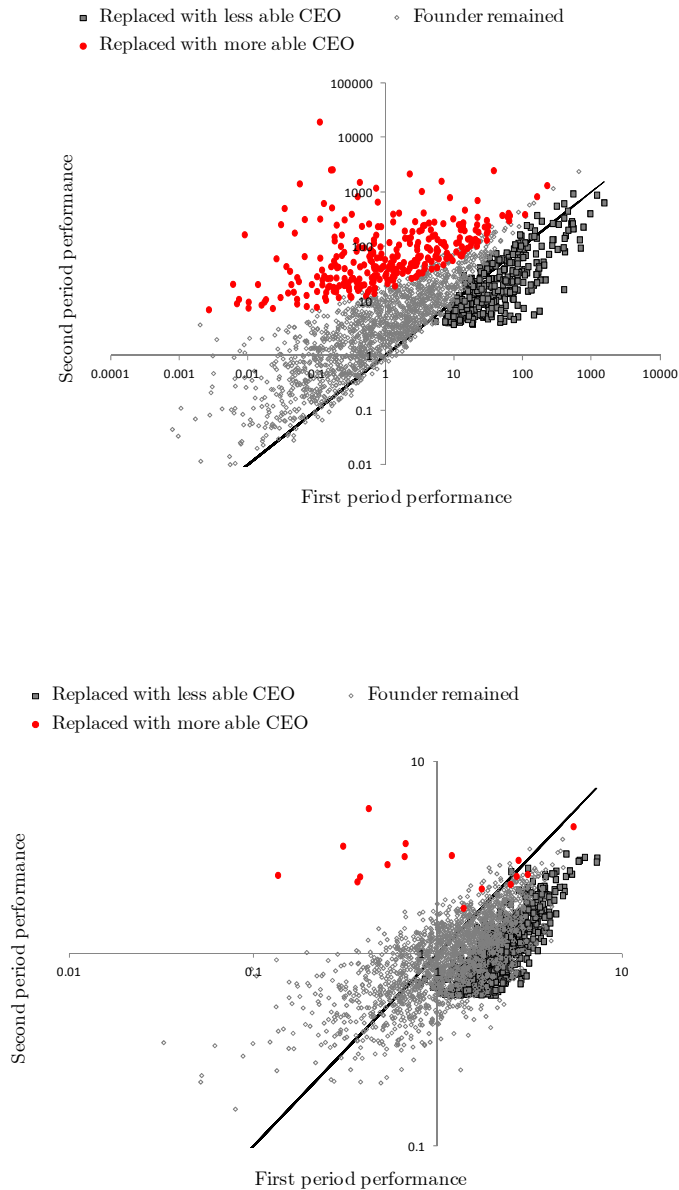
**FIGURE 4.** *Baseline simulations: First-period versus second-period performance among surviving firms, by outcome. 5,000 observations. Solid line indicates equal performance in both periods.*

erage, they are overrepresented in the lower tail of the first-period performance distribution.

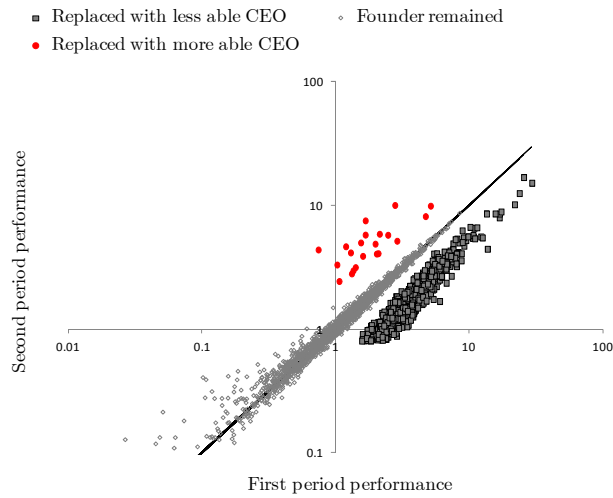
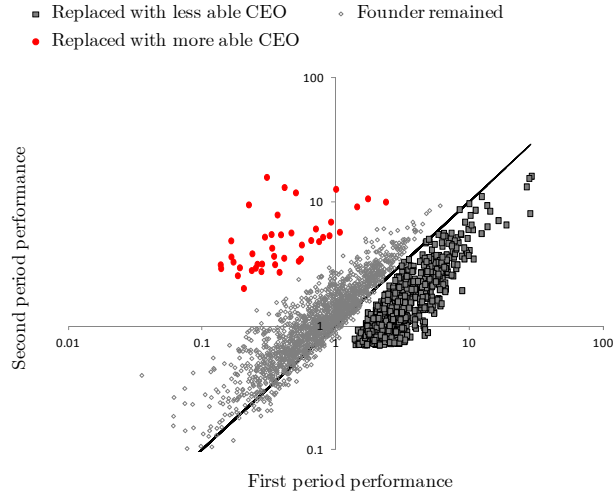
A distinctive feature of Figure 4 concerns the effect that CEO turnover has on the relationship between first-period performance and second-period performance. Performance among the group of surviving firms with no turnover tends to be more consistent from one period to the next than in the case of firms that experienced turnover. Firms in which founders are replaced by less-able CEOs see on average a decline in their performance, while the arrival of a more capable CEO induces on average an improvement in performance. Among surviving firms with no turnover, therefore, the relationship between first- and second-period performance is strongly positive. In contrast, the marginal ‘effect’ of first-period performance on second-period performance among firms that experienced turnover is much weaker in absolute value, and may even be negative.

## 2.2 Alternative Scenarios

Do these implications of the model persist in the face of significant changes in parameter values? Figures 5 through 7, which replicate Figure 4 for five alternative scenarios, suggest that the possibilities depicted so far are, in fact, quite



**FIGURE 5.** *Alternative scenarios I. First-period versus second-period performance among surviving firms, by outcome. Upper panel:* Ability matters more (less) than idea quality in the first (second) period;  $\alpha_1=0.8$ ,  $\alpha_2=0.2$ . **Lower panel:** Idea quality matters more (less) than ability in the first (second) period;  $\alpha_1=0.2$ ,  $\alpha_2=0.3$ . In each case  $c$  is adjusted to maintain turnover rate of about 12%.



**FIGURE 6.** *Alternative scenarios II. First-period versus second-period performance among surviving firms, by outcome. Upper panel:* First- and second-period idea qualities more highly correlated (standard deviation of distribution of  $q_2$  reduced to 0.1). **Lower panel:** First-period idea quality and founder ability more highly correlated (standard deviation of distribution of  $q_1$  reduced to 0.1). In each case  $c$  is adjusted to maintain turnover rate of about 12%.



**FIGURE 7.** *Alternative scenarios III. First-period versus second-period performance among surviving firms, by outcome.* Transition cost reduced to  $c=0.1$ , increasing founder turnover rate to about 35%.

robust. In Figure 5, the relative importance of idea quality and ability is altered across the two periods. In the upper panel, ability is most important in the first period ( $\alpha_1 = 0.8, \alpha_2 = 0.2$ ), while in the lower panel it is more important in the second ( $\alpha_1 = 0.2, \alpha_2 = 0.8$ ). The results reported in the baseline are not sensitive to these significant changes in the production technology. Figure 6 sharply alters the correlations between idea quality and ability. In the upper panel, the standard deviation of the distribution of  $q_2$  is reduced by 80 percent, to 0.1, while maintaining its mean equal to the realized value of  $q_1$ ; the lower panel similarly increases the correlation between  $\theta$  and  $q_1$  by reducing the variance of the distribution of  $q_1$ . The three groups of surviving firms become even more distinct than in the baseline, but the original pattern is preserved. Finally, in Figure 7 the cost of transitioning to a new CEO is reduced sharply, so that the fraction of firms that experience turnover is increased from about 12 percent to 35 percent. Again, the baseline results are robust to this change.<sup>10</sup>

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<sup>10</sup> Our data do not afford us an opportunity to explore the effects of changes in the transition cost. However, Braguinsky et al. (2012) explore the effects of a likely decline in the

### 2.3 Related models

There are, of course, different ways one may specify a model of mismatching. In this subsection we briefly compare our theoretical framework with three related models. The best known of these is Holmes and Schmitz (1995), in which agents vary in their ability to produce ideas, although all are equally gifted at managing. Agents with low innovative ability prefer to buy and manage existing businesses, while agents with high ability prefer to specialize in business creation (selling or closing each business they create). The outcomes for founders with intermediate ability depend on the quality of the business idea: they will close the worst businesses and manage the best. A key determinant of the boundaries between the choices is the cost of transferring a business. Figure 8 illustrates. Clearly, only the better ideas produced by the more able innovators experience founder turnover.

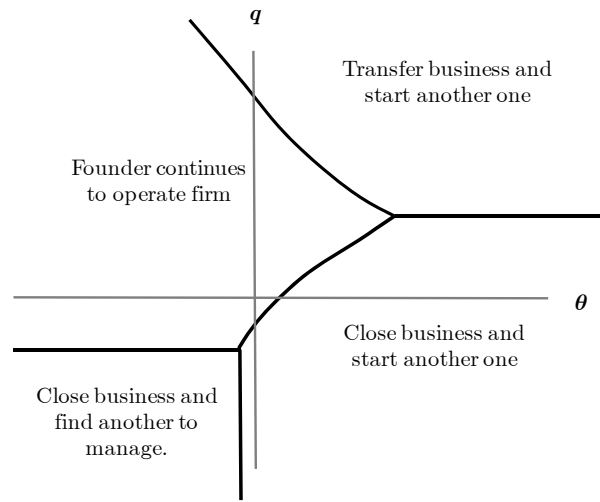


FIGURE 8. *Holmes and Schmitz (1990)*

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cost of evaluating ideas in Japanese biotech firms, brought about by institutional reform. They find that a reduction in evaluation cost was associated with a large increase in the rate of founder turnover.



As managerial ability is fixed, the model predicts that business turnover is associated with high initial and subsequent firm performance, but it does not predict any change in performance after turnover.

In Braguinsky *et al.* (2012), entrepreneurs with known ability found businesses with unknown quality. As in our model, business quality and founder ability are complements in production. The quality remains unknown unless the founder chooses to pay an evaluation cost,  $c$ . High-ability agents know that they are at risk of wasting their time with a poor idea, so they choose to evaluate the idea, closing down business that are not good enough. Low-ability agents know that they may not be good enough managers if their business quality is good; they also pay the evaluation cost and either close their business or transfer control to a professional manager. Agents with intermediate ability do not pay the evaluation cost; they continue to manage a business of unknown quality (see Figure 9). The model unambiguously predicts that only the better businesses founded by low-ability managers are at risk of founder turnover, and that turnover elicits an improvement in performance. Auxiliary assumptions of the model associate better initial firm performance (i.e., the combination of business quality and founder ability) with turnover.

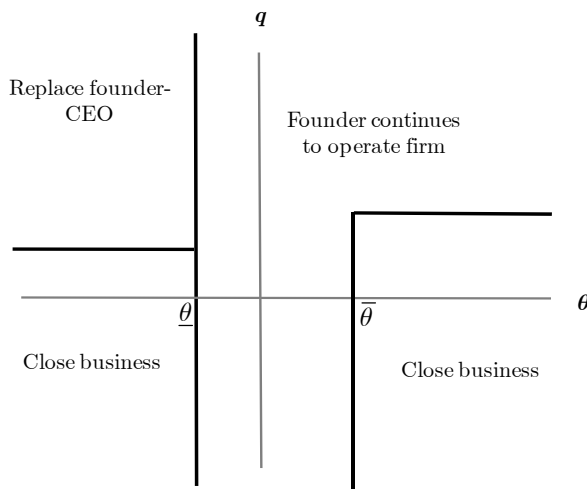
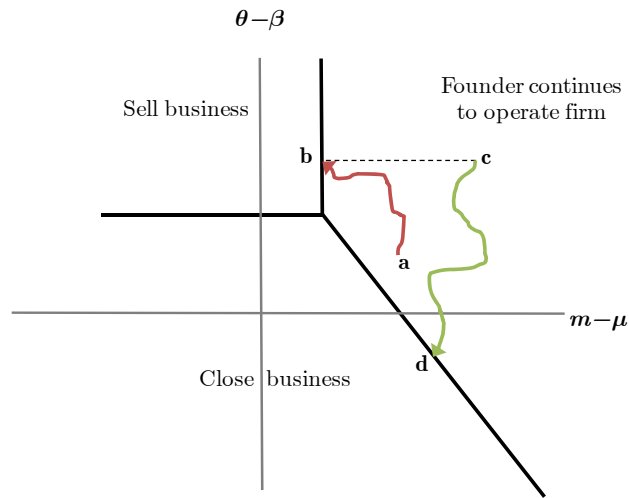


FIGURE 9. Braguinsky *et al.* (2012)

Finally, Holmes and Schmitz (1995) do not have explicit variations in skill. In this model, output is given by  $y_t = q_t + m_t$ , where  $q$  is business quality and  $m$  is match quality. Both  $q$  and  $m$  evolve over time, each consisting of permanent and transitory components. The permanent component of business quality,  $\beta$ , is fixed when a business is first founded, while the permanent component of match quality,  $\mu$ , is fixed each time a new manager takes control of the business. Founders (and subsequent managers) who experience a sufficient decline in match dispose of their business, either by closing it (if the business quality is sufficiently low) or by selling it to a new manager (if the quality is sufficiently high). Figure 10 illustrates, with a sample path depicting the evolution of business and match qualities. A business begins at point **a**, and suffers a steady decline in match quality. At **b** the business quality is sufficiently high to enable a sale. The new manager begins with the same business quality but a better match quality, at **c**, but then suffers a decline in both business quality and match quality until exit at **d**. Holmes and Schmitz show that the boundary between closing and selling a business shifts down when the permanent business quality,  $\beta$ , increases. Hence, better quality businesses are more likely to be sold. However the match quality may



**FIGURE 10.** *Holmes and Schmitz (1995)*

be little better after a sale, so despite better average performance after business turnover, there can be an increased risk of quick failure.<sup>11</sup> It is not possible to relate founder ability to the likelihood of business turnover in this model unless we impose some functional relationship between ability and the pair  $\{m, q\}$ . Doing so, however, would be unfair to the Holmes and Schmitz model, although it strikes us that their model could be made consistent with turnover occurring in the tails of the firm performance distribution.

### 3. Data and Sample Construction

Our empirical analysis focuses on all new business founded in Denmark in 1999 and 2000. We construct our samples out of three databases maintained by Statistics Denmark: the Entrepreneur Database, the Firm Database, and the Integrated Database for Labor Market Research (IDA).

The Entrepreneur Database is the primary source for identifying new businesses (partnerships or sole proprietorships) registered in Denmark each year, and provides unique identifiers for each firm, each plant, and one individual identified in the registration documents. The Entrepreneur Database spans the period 1996 to 2006. However, accounting information is not collected for all industries until 1999, so this is the earliest cohort we study.

There are several limitations to the Entrepreneur Database. First, since only one person associated with the new business is recorded, the database provides no information for identifying possible co-founders. Second, some of those who appear in the database may not be the “real” founder. For example, there are cases in which founders used their spouse’s name to register a business. Third, it is unclear from the Entrepreneur Database whether or not the identified entrepreneur actually works at their startup. Although it is possible that entrepreneurs do not operate businesses themselves, this study focuses on those who were actually working for their own businesses. In order to identify these entrepreneurs and possible co-founders, the data obtained from the Entrepreneur Database are combined with information provided in the Firm Database.

The Firm Database consists of annual employment information on all workers

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<sup>11</sup> Figure 5 depicts the case where the  $\mu$  is common across matches. If  $\mu$  is lower after business transfer, the boundaries shift to the right, increasing the risk of business failure.

(full-time and part-time) at all firms operating in Denmark. The variable of particular interest is their position in the firm, through which founders of each new business are identified in the following way. First, founders are those whose positions are classified as self-employed, employers, or business tax payers. Second, for businesses with fewer than four employees, people whose positions are top managers are also defined as founders.<sup>12</sup> Third, if nobody in a business with fewer than four employees is identified as a founder based on the previous two criteria, all employees are considered as cofounders. The fourth group of founders consists of those who registered the business, were working for the business, but did not meet the first three criteria for being a founder. Lastly, we identify individuals who registered the business, but did not appear to be working for the new firms (we will exclude this last category from the sample).

We link these businesses to the IDA, where more detailed information such as industry classification and employee demographics is available. The IDA is an employer-employee matched database, which provides mainly employment information at firm, establishment, and employee levels. The IDA enables us to track over time the turnover of founders, changes in firm status, and occupational choices of individuals each year until 2008. However, because of incomplete accounting and earnings data in the most recent years, we will follow firms only through 2004 and individuals through 2005.

Firm identifiers in the IDA are attached to a specific owner, so they change whenever there is a change of ownership. This design makes it possible to distinguish three firm-level events in each year. Survival is assumed if the same firm identifier from the previous year appears in the current period. An ownership change occurs if the same establishments of the firm from the previous year are identified in the current period except that they are associated with a different firm identifier. A business exit is identified if all the establishments of the firm can no longer be found in the data.

In our analysis, the original founder of a startup must meet the following criteria: (1) He or she formed a startup in 1999 or 2000 as a sole proprietor; (2) The person was currently working at the new venture; and (3) The new business could be identified in the Firm Database and the IDA database, indicating that at least

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<sup>12</sup> This way to identify founders was first used by Sørensen (2007).

one person was working in the business as his or her primary job.<sup>13</sup> Using the unique person and firm identifiers, we can track these founders' employment in the following year to identify whether or not the founder was still working at the startup, and whether he was still an employer. A founder was staying at the startup if he could be identified in the firm in the following year, whether as an employee or as an employer. Otherwise, the founder is assumed to have left the original firm because of turnover, business exit, or ownership change. In a few cases, the founder might stay at the startup after a change of ownership, but in each of these cases a new firm identifier is assigned to the startup.

Table 1 provides tabulations of changes in the status of startups and their founders from the founding year to 2005. Four outcomes are possible in each year: the firm exits, the firm is acquired or the firm continues, either with or without the founder remaining in operational control. Of 4,172 firms in the sample, a total of 533 (12.8 percent) of them eventually experienced founder turnover. Turnover was twice as common as ownership change (6.5 percent), but much less common than firm exit (50.6 percent). The hazard of turnover declines with firm age, declining from 5.11 percent in the first year, to 2.61 percent at age five.<sup>14</sup>

## 4. Firm Performance and Founder-CEO Replacement

In this section, we evaluate the relationships between startup performance and subsequent rates of founder turnover, and between founder turnover and subsequent firm performance.

### 4.1 *Startup performance and founder-CEO replacement*

To assess the effect of initial performance on subsequent rates of founder-CEO replacement, we remove from the baseline sample 2,388 startups (918 from the 1999 cohort, and 1,470 from the 2000 cohort) that exited or were acquired before

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<sup>13</sup> This person may be the founder, so our sample includes single-person firms. We have, however, repeated our analyses after restricting the sample to including firms with at least two individuals. The results, available from the authors, are very similar to those reported here.

<sup>14</sup> The declining hazard of turnover is consistent with gradual *learning* about match quality [Jovanovic (1979)], which we have not attempted to model.

**TABLE 1**  
*Status Change of Startups by Year*

	Years after Founding					
	1	2	3	4	5	6*
<b>Count</b>						
Surviving: founder stays	2,996	2,247	1,829	1,535	1,321	
Surviving: founder turnover	213	127	82	54	40	
Firm exit	898	550	291	193	140	
Firm acquired	65	72	45	47	34	
Total	4,172	2,996	2,247	1,829	1,535	
<b>Hazards (percentage)</b>						
Surviving: founder stay	71.81	75.00	81.40	83.93	86.06	87.16
Surviving: founder turnover	5.11	4.24	3.65	2.95	2.61	3.12
Firm exit	21.52	18.36	12.95	10.55	9.12	7.71
Firm acquired	1.56	2.40	2.00	2.57	2.21	2.02
Total	100	100	100	100	100	100

\* Percentages for 1999 cohort only.

any occurrence of a founder turnover during the observation window between the founding year and 2005. Table 2 provides descriptive summary statistics for the remaining 1,784 startups and their founders. There are no large differences in means between founders that continued and founders who were replaced. However, the latter group are somewhat younger and less likely to have had vocational training; they are also more likely to come from the tails of the earning distribution (either less than high school or at least college); they are also somewhat less likely to have founded businesses in construction, and more likely to be engaged in high-tech activities.

We first estimate the following logit model,

$$\ln\left(\frac{p_t}{1-p_t}\right) = \alpha + \beta_1 \text{logsale}_{t-1} + \beta_2 (\text{logsale}_{t-1})^2 + \gamma X_i + \delta Z_{i,t-1} + \varepsilon_{i,t} \quad (7)$$

where  $p_t$  is the probability that the founder leaves a continuing firm in period  $t$ ,  $X_i$  is a vector of time-invariant variables related to founder demographics (gender, marital status, age, and education) and startup founding conditions (founding year and industry), and  $Z_{i,t-1}$  is a vector of potentially time-varying variables, such as firm age, founder age, marital status, and highest completed education.

**Table 2**  
*Descriptive Summary of Subsample 1*

	All	No Turnover	Turnover
Age (mean years)	40.07	40.23	37.91
Male (%)	0.76	0.76	0.77
Married (%)	0.64	0.64	0.54
Education (%)			
less than high school	16.84	16.55	21.01
exact high school	6.66	6.34	11.07
vocational training	50.91	51.75	39.21
some college	14.72	14.66	15.57
bachelor	1.13	1.02	2.63
Master	7.66	7.66	7.69
Phd	0.69	0.69	0.75
others	1.38	1.33	2.06
Founded in 1999 (%)	42.28	42.69	36.59
Initial sales (1,000 DKK)	2,149	2,135	2,347
Initial no. of full-time employees	1.87	1.85	2.09
Industry (%)			
Agriculture	0.29	0.28	0.38
Manufacturing	7.25	7.34	6.00
Construction	17.57	17.86	13.51
Wholesale and retail	37.57	37.55	37.9
Transport, post, telecom	4.89	4.90	4.69
Low-tech businesses	6.93	6.93	6.94
Public Services	0.43	0.42	0.56
Personal Services	6.05	6.26	3.19
Kibs	0.44	0.34	1.88
High-tech	18.24	17.77	24.77
Others	0.34	0.35	0.19
Obs.	7,961	7,428	533

The key independent variable is the logarithm of sales in the previous period, along with its quadratic to allow for the possibility of a non-monotonic effect as predicted in Section 2.<sup>15</sup> Columns (1) and (2) of Table 3 present the results. In column (1), we include controls only for firm age and founding year. The negative coefficient on firm age reflects the declining hazard of founder-CEO replacement already noted in the summary statistics, while the cohort dummy is insignificant. In column (2) we add some founder characteristics. The probability of founder-CEO replacement declines with founder age, it is lower for founders with college education, and it is lower for men and married founders. Both columns show a U-shaped relationship between the log of sales in the previous period and the likelihood of founder turnover in the current period, indicating that a founder is more likely to rescind operating control of the firm if it is located the tails of the performance distribution among all surviving firms. Columns (3) and (4) replace sales in the previous period with sales in the startups' first year of operation. The results continue to show the U-shaped relationship, and the same effects of founder characteristics and firm age on the likelihood of founder-CEO replacement. The minimum of the U-shaped relationship between prior performance and the probability of turnover occurs at revenue levels of DKK580,000 to DKK800,000, equal to 15 to 37 percent of the sample mean. This is also well within the sample range. Consistent with the predictions of our simple mismatching model, therefore, we find that turnover is more common in the tails of the observed earnings distribution than in the middle.

#### 4.2 *Founder-CEO replacement and the subsequent performance of startups*

To examine the relationship between founder-CEO replacement and subsequent firm performance, we use a subset of startups in the baseline sample and limit the observation window to the interval between the founding year and 2004. The startups included in this subsample meet two criteria. First, we eliminate firms in which the founder was replaced after 2002. That is, firms included in the sample either experienced founder turnover by 2002, or never had founder turnover during the observation period. Second, we remove startups that failed or were acquired between the initial founding year and 2002 but prior to any observed

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<sup>15</sup> For six observations with zero sales, we added one DKK to sales prior to taking the logarithm.



**TABLE 3***The Effect of Startup Performance on the Probability of Founder-CEO Replacement*

	Dept Var: = 1 if founder replaced in year $t$			
	<i>Logit Reegression</i>			
	Using sales in year $t-1$	Using sales in year $t-1$	Using sales in founding year	Using sales in founding year
	(1)	(2)	(3)	(4)
Log of sales	-0.940*** (-5.08)	-0.966*** (-5.10)	-1.159*** (-3.30)	-1.270*** (-3.43)
(Log of sales) <sup>2</sup>	0.072*** (5.71)	0.076*** (5.87)	0.084*** (3.36)	0.095*** (3.61)
<b>Founder characteristics</b>				
Founder age	--	-0.017*** (-3.05)	--	-0.019*** (-3.40)
College educated = 1	--	-0.235* (-1.38)	--	-0.090 (-0.54)
Male = 1	--	-0.154 (-1.28)	--	-0.104 (-0.86)
Married = 1	--	-0.331*** (-3.25)	--	-0.303*** (-2.98)
<b>Firm characteristics</b>				
Firm age	-0.366*** (-10.39)	-0.340*** (-9.47)	-0.324*** (-9.68)	-0.288*** (-8.46)
Cohort dummy (= 1 if founding year = 2000)	0.130 (1.34)	0.103 (1.04)	0.095 (0.96)	0.069 (0.69)
Controls for industry	No	Yes	No	Yes
Ave Log Likelihood	-0.239	-0.235	-0.241	-0.237
No. of observations	7,357	7,348	7,305	7,305

Sales in thousand DKK.  $z$ -scores are in parentheses. Significance levels: \*\*\* 0.01, \*\* 0.05, \* 0.1.

founder turnover event. However, we retain in the subsample startups that experienced founder turnover and then exited or were acquired. Table 4 illustrates how we construct the subsample.

Starting with the 1,588 startups in the 1999 cohort, we removed 709 firms that exited or went through ownership change by the end of 2002 and before any occurrence of founder turnover, and 36 firms that experienced founder turnover in 2003 or 2004. For the 2,584 startups of the 2000 cohort, we removed 995 and then 83 of them for the same reasons. We are left with a sample of 2,349 startups, 843 of which come from the 1999 cohort, and 1,506 from the 2000 cohort.

**Table 4**  
*Firms Included in Subsample 2*

	Turnover by 2002	Turnover after 2002	No Turnover
Exited or acquired by 2002	✓	×	×
Exited or acquired after 2002	✓	×	✓
Survived to 2004	✓	×	✓

Table 5 summarizes the number of startups in our sample that survived, exited, or experienced ownership change during the observation period. Among the 843 startups founded in 1999, 142 of them had founder turnover before 2002. Among them, 50 survived to 2004, 56 exited or changed owners before 2002 but after founder turnover, and 36 exited after 2002. Among the 1,506 startups founded in 2000, 232 had founder turnover before 2002. Of these, 82 survived the entire observation period, 70 exited or changed owners before 2002, and 80 exited after 2002.

Table 6 provides the descriptive summary of this subsample (the distributions of firms in each column across industries is very similar to those shown in Table 2, and are not reported). The summary statistics show two interesting contrasts between firms that experienced turnover and those that did not. Turnover by 2002 is strongly associated with lower odds of survival to 2004. Only 35 percent of firms with turnover survived, compared with 74 percent of firms with no turnover. However, conditional on survival, the growth rate of sales and of employment is much greater among firm that experienced turnover. For example al-

though there is little difference between the two groups in initial sales revenue, average 2004 sales are 55 percent higher among the turnover group.

**Table 5**  
*Survival, Exit, and Ownership Change after Founder Turnover*

	1999 Cohort		2000 Cohort	
	Turnover	No Turnover	Turnover	No Turnover
<b>Total</b>	<b>142</b>	<b>701</b>	<b>232</b>	<b>1,274</b>
Survived	50	545	82	912
Exited before 2002	56	0	70	0
Exited after 2002	36	156	80	362

**Table 6**  
*Descriptive Summary of Subsample 2*

	All	No Turnover	Turnover
<b>Obs.</b>	<b>2,349</b>	<b>1,975</b>	<b>374</b>
Survival in 2004 (%)	67.65	73.77	35.29
Founded in 1999 (%)	35.89	35.49	37.97
Initial sales (1,000 DKK)	2,008	1,962	2,253
Sales in 2004 (1,000 DKK)	5,168	4,929	7,639
Initial no. of full-time employees	1.68	1.62	2.00
No. of full-time employees in 2004	4.08	3.86	6.39

We estimate the following model

$$\ln(\text{sales})_{i,2004} = \alpha + \beta_1 \ln(\text{sales})_{i,0} + \beta_2 \text{turn}_i + \beta_3 \ln(\text{sales})_{i,0} \times \text{turn}_i + \gamma X_i + \varepsilon_{i,2004}, \quad (8)$$

where  $\text{turn}_i$  equals one if the startup experienced founder turnover between its founding year and 2002, and zero otherwise, and the vector  $X_i$  includes controls for cohort and industry.

Table 7 presents OLS estimates of (8). In the first three columns, we focus on

startups that survived until 2004. Column (1) shows that both initial sales and founder turnover have a positive impact on startups' sales in 2004. Interacting the two factors in column (2), we further find that the marginal effect of founder turnover on future sales is decreasing with the initial performance of startups (or, equivalently, that the marginal effect of initial performance is lower for firms that had turnover). This is consistent with the model in Section 2. However, this

**Table 7**  
*Founder-CEO Replacement and Future Performance of Startups*

	Dept Var: log of sales in 2004					
	Surviving Firms			All Firms		
	OLS			Tobit		
	(1)	(2)	(3)	(4)	(5)	(6)
Log.sale <sub>0</sub>	0.437*** (18.8)	0.453*** (18.6)	---	0.724*** (5.92)	0.817*** (6.12)	---
Turnover	0.336*** (4.15)	1.524*** (2.80)	---	-5.00*** (-14.4)	-1.032 (-0.45)	---
Log.sale <sub>0</sub> *turnover	---	-0.165** (-2.21)	---	---	-0.552* (-1.73)	---
log.sale <sub>0</sub> percentile: <25 <sup>th</sup> (D1)	---	---	-1.108*** (-16.6)	---	---	-1.817*** (-5.04)
log.sale <sub>0</sub> percentile: 25 <sup>th</sup> -75 <sup>th</sup> (D2)	---	---	-0.700*** (-12.5)	---	---	-1.666*** (-5.48)
D1 × turnover	---	---	0.441*** (2.60)	---	---	-5.879*** (-8.83)
D2 × turnover	---	---	0.483*** (4.19)	---	---	-3.605*** (-7.12)
D3 × turnover	---	---	-0.046 (-0.29)	---	---	-6.427** (-9.67)
2000 cohort	0.072 (1.56)	0.068 (1.49)	-0.081* (-1.76)	-0.441* (-1.80)	-0.452* (-1.85)	-0.666*** (-2.76)
Adj R-sq	0.214	0.216	0.188	--	--	--
Obs.	1,440	1,440	1,440	2,142	2,142	2,142

Columns (1) - (3): *t* statistics in parentheses. Columns (4) - (6): *z* scores in parentheses. The omitted category in columns (3) and (6) is the top quartile of the log of initial sales. All regressions include controls for industry. Significance levels: \*\*\* 0.01, \*\* 0.05, \* 0.1.

positive effect of turnover is reduced to zero only at about the 95<sup>th</sup> percentile in the distribution of initial sales. In column (3), we replace the log of initial sales with three categorical variables that indicate membership in the bottom quartile, the upper quartile, or the middle of the distribution of the log of initial sales. The result confirms a positive correlation between initial and future performance. Meanwhile, founder turnover has a positive association with a startup's future performance for the first two categories, but no association for the third category. In columns (4) to (6), we estimate Tobit regressions including all firms in the subsample. For startups that exited or went through ownership change before 2004, we recode the logarithm of their sales as zero [cf. Dunne, Roberts and Samuelson (1989)], and make zero our threshold for inclusion in the linear portion of the model. The inclusion of exiting firms changes the results. Turnover is now associated with lower future performance for *all* firms, although as in the first three columns, the effect of turnover is worse for firms with good initial performance.

**Table 8**  
*Survival and Founder-CEO Replacement*

	Logit Model	
	Dept Var: =1 if firm survived to 2004	
	(1)	(2)
log.sale <sub>0</sub> percentile: <25th (D1)	-0.458*** (-2.80)	-0.450*** (-2.75)
log.sale <sub>0</sub> percentile: 25th -75th (D2)	-0.540*** (-3.83)	-0.537*** (-3.81)
D1 × turnover	-2.002*** (-8.01)	-1.446*** (-5.36)
D2 × turnover	-1.276*** (-6.90)	-0.368 (-1.62)
D3 × turnover	-2.178*** (-8.61)	-1.337*** (-4.59)
2000 cohort	-0.270*** (-2.61)	-0.319*** (-2.97)
Ave. Log Likelihood	-0.580	-0.579
Obs.	2,153	2,035

*z* scores in parentheses. All regressions include controls for industry. Significance levels: \*\*\* 0.01, \*\* 0.05, \* 0.1.

The contrast between the OLS regressions for surviving firms and the Tobit estimates for the full sample suggests that founder-CEO replacements have disparate effects on survival and performance conditional on survival. To confirm this, in Table 8 we report the result of logit regressions where the dependent variable equals one if the firm survived to 2004 and zero otherwise. Column (1), which include all firms in our sample, clearly indicates lower survival rates for firms that experienced founder-CEO replacement, regardless of initial size. There is, however, a potential endogeneity problem in these two columns. It is possible the founders leave firms because they are already in the process of exiting, but our data do not record exits until after they have left. In column (2), we therefore remove from the sample 100 firms that had failed after founder departure but by 2002; these firms must have failed very soon after the founder left. Doing so does not alter the evidence that founder-CEO replacements are associated with higher failure rates.

This section has generated three central findings. First, founder-CEO replacement is more likely when firm performance is in the tails of the revenue distribution. Second, replacement is associated with higher future sales among surviving firms. Third, replacement is associated with higher failure rates. We will draw some conclusions from these findings in Section 6.

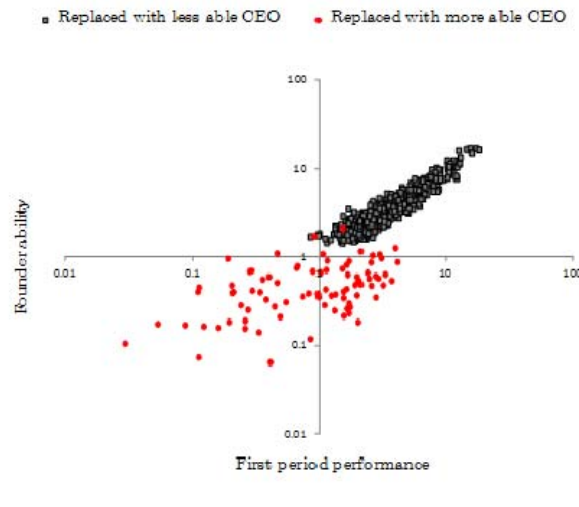
## 5. What Happens to Replaced Founder-CEOs?

What happens to the founder-CEOs that are replaced? Among all founders, first-period performance is positively correlated with ability. However, some founders are replaced because they have low ability but good ideas, so it is not clear that the positive correlation between firm performance and ability survives among the subset of founders that are replaced. Because future earnings depend on ability, the relationship between first-period performance and future earnings is also *a priori* unclear. However, as Figure 11 indicates, the positive relationship survives in our baseline analysis among founders selected for replacement.<sup>16</sup> As future

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<sup>16</sup> In scatter plots not shown, we find this relationship holds also for the parameter values used in Figures 5 through 7. In several cases the effect is, as in Figure 5, much weaker among founders that are replaced with more able CEOs.

earnings are expected to increase in ability (the model assumes a linear relationship), Figure 11 also suggests a positive relationship between the firm’s pre-turnover revenues and post-turnover founder earnings.



**FIGURE 11.** *Ability versus first-period performance among founders that are replaced.*

The pattern observed in Figure 11 is also evident in the data. We constructed a subsample that consists of all the founders that rescinded operational control of their businesses, and tracked their income for three years after turnover occurred. We estimate a linear model, where the dependent variable is the log of gross income averaged over three years after the founder left his startup at time  $t$ , and the key independent variable is the log of the startup’s sales before turnover. In column (1) of Table 9, we use the firm’s initial sales, while in column (2) we use sales in the year prior to turnover. Clearly, after controlling for their characteristics, founders who achieved higher sales in the first year of their startups also have higher average gross income in the three years after CEO turnover. There is, however also strong evidence of mean reversion: each ten percent increase in previous firm revenues is associated with only about a one percent increase in subsequent founder earnings.

**Table 9**  
*Founder's Performance after Turnover*

	OLS Regressions	
	Dept Var: Log of ave. gross income	
	(1)	(2)
Log sale <sub>0</sub>	0.123*** (3.93)	--
Log sale <sub>t-1</sub>	--	0.087*** (3.12)
Age <sub>t-1</sub>	0.004 (0.93)	0.004 (1.14)
Married <sub>t-1</sub>	0.139* (1.85)	0.129* (1.72)
Male	0.279*** (3.34)	0.296*** (3.56)
College <sub>t-1</sub>	0.441*** (5.73)	0.408*** (5.26)
Adj. $R^2$	0.154	0.138
Obs.	427	431

$t$  statistics in parentheses. Significance levels: \*\*\* 0.01, \*\* 0.05, \* 0.1.

We also explore whether success in the firm prior to turnover is associated with the likelihood of creating another business. Recall that our model assumes a correlation between idea quality and founder ability such that all agents are indifferent between founding a business and working as an employee; this is not a central assumption for the model but, if correct, it implies that good performance in one business does not raise the probability of new business creation. We estimate a logit model where the dependent variable equals one if the founder was an employer in the year after he left his startup, and the key regressor is pre-turnover sales. Columns (1) and (2) of Table 10 reveal no significant relationship between a startup's initial performance and the likelihood of the founder being an employer again in the period after turnover. Adding a quadratic term in column (2) shows a non-linear relationship, suggesting that founders from both the highest and lowest-performing businesses are more likely to be self-employed again after turnover.<sup>17</sup> However, as shown in column (4) this relationship disappears if we

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<sup>17</sup> This is consistent with the model of labor-market mismatching in Astebro, Chen and



look at a startup's performance immediately before founder turnover.<sup>18</sup>

**Table 10**  
*Founder's Occupational Choice after Turnover*

	Logit Regressions			
	Dept Var: =1 if being an employer at $t+1$			
	(1)	(2)	(3)	(4)
Log sale <sub>0</sub>	-0.047 (-0.38)	-1.759* (-1.92)	--	--
Log sale <sub>0</sub> <sup>2</sup>	--	0.124* (1.88)	--	--
Log sale <sub>t-1</sub>	--	--	-0.014 (-0.12)	0.294 (0.35)
Log sale <sub>t-1</sub> <sup>2</sup>	--	--	--	-0.021 (-0.38)
Age <sub>t-1</sub>	-0.007 (-0.52)	-0.009 (-0.64)	-0.004 (-0.32)	-0.004 (-0.32)
Married <sub>t-1</sub>	0.634** (2.08)	0.607** (1.96)	0.575* (1.92)	0.580* (1.94)
Male	-0.093 (-0.30)	-0.092 (-0.29)	-0.064 (-0.21)	-0.053 (-0.17)
College <sub>t-1</sub>	-1.147*** (-2.91)	-1.230*** (-3.08)	-1.030*** (-2.73)	-0.996*** (-2.59)
Ave. Loglikelihood	-0.376	-0.373	-0.384	-0.384
Obs.	498	498	502	502

*z* scores are in parentheses. Significance levels: \*\*\* 0.01, \*\* 0.05, \* 0.1.

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Thompson (2011), in which entrants into entrepreneurship are more likely to come from the tails of the ability and earnings distributions.

<sup>18</sup> We also examined occupational choice for three years after founders rescinded control of their businesses. OLS regressions in which the dependent variable is the total number of years that founders were an employer during this three year period also yielded no significant relationship between the dependent variable and startups' performance in the initial year or in the year immediately prior to founder turnover.

## 6. Conclusions

In this paper we analyzed the relationships between founder-CEO replacement, firm performance, and founder earnings and occupational choices in a sample of 4,172 firms drawn from the Danish matched employer-employee dataset. Our interest was in studying the causes and consequences of changing operating control of young firms, so we restricted our attention to firms that had a single founder. Our sample comprises the universe of Danish firms founded in 1999 or 2000 that met this criterion.

Our key findings were as follows. First, founder-CEO replacements among the firms in our sample were more likely among the worst- and best-performing firms as measured by sales revenue, with the lowest likelihood occurring around the 25<sup>th</sup> percentile. Second, replacement was not unambiguously associated with better subsequent performance. On the one hand, firms that replaced the founder as CEO were more likely to fail, while on the other hand the surviving firms among them grew faster. We also found that the marginal ‘effect’ of initial sales on future sales among surviving firms was much stronger among firms that did not experience founder-CEO replacement. Differences between the subsequent performance of turnover and non-turnover firms were numerically important. The likelihood of firms that experienced turnover by 2002 surviving to 2004 was only 35 percent, compared with 74 percent among firms with no turnover. Among the surviving firms, however, average 2004 sales are 55 percent higher among the turnover group, despite similar revenues in both groups prior to turnover.

We also analyzed subsequent earnings and occupational choices of founders who rescinded operating control of their firms. Although subsequent founder income was found to be increasing in the performance of their firms, those that left good firms were no more likely than others to found another business.

Our results are consistent with the notion that mismatches between business quality and founder ability matter, although not necessarily in the precise form of the theoretical framework we developed in this paper. Åstebro, Chen and Thompson (2011) assumed that mismatches between an agent’s ability and the quality of the firm that employed him might drive him into self-employment or entrepreneurship. That model, like the theoretical framework developed in this paper, predicted that mismatches were most likely in the tails of the ability distribution. However, it assumed that business creation serves the purpose of *re-*

*solving* mismatches. The present paper suggests that mismatches may be important also after business creation.

Our model predicts that turnover occurs more frequently in the tails of the initial performance distribution, that the marginal ‘effect’ of initial performance on future performance is greater among non-turnover firms, and it also predicts the empirical results about the future earnings and occupational choices of departing founders. However, the model has no uncertainty at the time of founder-CEO replacement, and hence has nothing to say about the much higher failure rates of firms that experienced turnover.

The disparate empirical results about firm failure and the growth of surviving firms recall Holmes and Schmitz’ (1995) model of business turnover. In their model, firm performance depends on the sum of business quality and match quality. In contrast to the present paper, there is no variation in ability so all agents have the same outside option, and new CEOs only observe the quality of their match with a business after they have purchased the firm. Their model predicts that the best business ideas are most likely to be transferred to new owners, so among surviving firms business transfers are on average associated with good performance. However, because transfers may create a poor match, businesses that are sold are at greater risk of subsequent exit.<sup>19</sup> Our results on growth and survival of firms resonate with these predictions of their model.

Of course, mismatching need not be the only mechanism at work. One alternative interpretation of our findings is based on the distinction between necessity and opportunity entrepreneurs [see, for example, Block and Wagner (2006) and references therein]. Suppose that some agents found businesses because they have suffered negative employment shocks, either because of a mismatch in wage work or a failure to find wage employment at all. These founders may be unusually likely to return to wage work as soon as the opportunity presents itself. If, as in Åstebro, Chen and Thompson (2011), such shocks are more common in the tails of the ability distribution, they can explain higher rates of founder turnover in the

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<sup>19</sup> Pollock, Fund and Baker (2009) find that VC-financed firms that are preparing for an IPO are more likely to experience founder turnover if their firm operates in an uncertain industry environment. This could also explain our results on survival, although our regressions do have industry fixed effects.

tails of the performance distribution.<sup>20</sup>

Both our theoretical framework and our empirical analysis have focused on the turnover of operating control while the founder retains ownership. In our sample, turnover of operating control is more common than business turnover, but both are important features of the data. Our paper leaves unanswered the interesting question of how owners decide between selling a business and hiring a CEO. The Danish matched employer-employee dataset may also be rich enough to allow us to compare some characteristics of outgoing founders and incoming CEOs, and assess whether founder-CEO pairs differ from each other in ways consistent with mismatching models. These are questions we intend to address in future work.

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<sup>20</sup> However, whether such shocks can also explain the observed relationships between founder turnover and subsequent firm performance depends on how departing founders select their replacements. It is likely that skill matching continues to play a role here.

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