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# Top management team tenure and technological inventions at post-IPO biotechnology firms

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## ABSTRACT

We examine how top management teams (TMTs) facilitate invention performance. We test our hypotheses with a sample of 185 biotech firms that issued initial public offerings (IPOs) between 1980 and 1997. We predict that the percentage of founders on TMT has an inverted U-shaped relationship with invention performance. Average intrafirm tenure will be negatively associated with invention performance and average TMT member experiences from competitors or outside the industry will be positively associated with invention performance. Finally, contextual factors such as firm size and firm age moderate the impact of TMT experiences on invention performance.

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## 1. Introduction

Top management teams have attracted research attention as an antecedent of organizational outcomes. Researchers using the upper echelons perspective (Hambrick & Mason, 1984) have shown top managers have a significant impact on a variety of organizational outcomes, such as strategic change (Barker & Barr, 2002; Musteen, Barker, & Baeten, 2006), firm growth (Kor, 2003; Stam & Elfring, 2008), search (Papenhausen, 2010), acquisition performance (Walters, Kroll, & Wright, 2007), and innovation (Alexiev, Jansen, Van Den Bosch, & Volberda, 2010; Elenkov, Judge, & Wright, 2005; Smith & Tushman, 2005; Vaccaro, Jansen, Van Den Bosch, and Volberda, forthcoming; Wu, Levitas, & Priem, 2005).

While much research has focused on established public firms, less research has examined the unique context of a newly public firm. The initial public offering (IPO) is an important milestone in an entrepreneurial firm's life cycle (Carpenter, Pollock, & Leary, 2003; Filatotchev & Piesse, 2009). The post-IPO firm is unique because it has already laid foundations for further development, unlike the early-stage firm that prioritizes on survival amid high uncertainties. At the same time, its legitimacy is lacking and its technological and market base are yet to grow (Filatotchev & Piesse, 2009). The post-IPO firm faces transitional challenges such as liability of adolescence (Hannan, 1998).

The post-IPO TMT is in a unique position relative to their peers at either an early-stage firm or a well-established public firm. The TMT often continues to be influenced by a sizable presence of founders, rarely seen in a mature public firm; it has also included external managers who established their career paths elsewhere to enrich the experiences of the TMT, which does not happen to the early-stage firm that primarily relies on founders. The TMT in the post-IPO firm becomes the locus where external and internal managerial experiences are brought together, with far-reaching implications.

We examine the role of TMT using an organizational life cycle perspective (Kazanjian, 1988; Smith & Miner, 1983). We focus on multiple aspects of top managers' experiences such as founder percentage, intrafirm tenure, competitor tenure and outside industry tenure that may better respond to the stage-specific organizational challenges. First, we propose founders' presence has an inverted U-shaped relationship with the firm's patented inventions. Second, we predict that shorter intrafirm tenure, more experiences at competitors (i.e., other firms in the same industry), and more experiences from outside the industry would enhance invention performance. Finally, we highlight organizational contexts and predict that firm age and firm size moderate the relationship between external experiences and invention performance. We test our hypotheses with a sample of 185 biotechnology firms that undertook IPOs between 1980 and 1995. We conclude the paper by discussing the implications of our results.

## 2. Theoretical background and research hypotheses

The upper echelons research suggests that top managers' personal characteristics have an important impact on firm performance

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(Hambrick & Mason, 1984). The knowledge and prior experiences of senior executives affect decisions about internal resource allocations (Burgelman, 1991; Noda & Bower, 1996). The influence of TMT knowledge and experiences is likely to be strong in the post-IPO firm. The post-IPO firm differs from both a mature public firm and an early-stage firm in three ways. First, the post-IPO firm faces a bigger community of stakeholders whose demands may influence its strategies because it now has a more dispersed owner group (Ritter & Welch, 2002). The post-IPO firm needs to report financial data on a quarterly basis as well as follow strict regulations from the Stock Exchange Commission (Levesque, Joglekar, & Davies, forthcoming). In contrast, an early-stage firm is relatively free from external pressures while a mature public firm is more experienced with stakeholders.

Second, the stricter scrutiny of stakeholders affects some internal changes at the post-IPO firm. R&D activities at the post-IPO firm are more result-oriented and need to deliver tangible products within a shorter timeframe (Hine & Kapeleris, 2006). The post-IPO firm can no longer focus on pursuing blue-sky research that emphasizes scientific merits over commercial value, like in an early-stage firm (Hine & Kapeleris, 2006). The post-IPO firm can utilize the capital gained from IPO and start to grow its technological and marketing capabilities whereas the early-stage firm has to prioritize on survival and has no room for strategic maneuvering. The post-IPO firm can be more effective than a mature public firm in utilizing resources towards R&D and marketing (Levesque et al., forthcoming).

Third, the post-IPO firm is at a stage to deliver reliable organizational outcomes. The demands from external stakeholders require a more stable organization that can maintain a reliable track record (Hannan & Freeman, 1984), with more routines and clearer internal divisions of labor. Although the firm is already more professionalized than the early-stage firm, its internal organization and external legitimacy are still yet to be developed relative to mature, public corporations (Filatotchev and Piesse, 2009). These unique characteristics of stakeholders, tasks, and internal organization require managers at the post-IPO firm to possess appropriate experiences.

An entrepreneurial firm's initial knowledge can no longer satisfy the fast-growing demands at the post-IPO stage and new knowledge and skills are needed (Nelson, 2003). With the changes of the firm's dominant problems (Kazanjan, 1988) such as the lack of legitimacy and internal specialization, adding new knowledge and experiences at the TMT provides an important solution. We next unpack the broad concept of TMT tenure into founder-based, intrafirm, competitor-based and outside industry tenure and consider the impact of different dimensions of TMT characteristics on invention performance.

### 2.1. Founders

Founders are those executives who have been with the firm since its inception and some founders may remain in the post-IPO TMT. In science-based industries such as the biotechnology industry, founders often come from the academia and start the entrepreneurial firm with their knowledge of fundamental science, which is often tacit and resides only in the minds of founders (Hine & Kapeleris, 2006). These founders are usually successful in their scientific career first and then seek to commercialize inventions in the entrepreneurial firm (Knockaert, Ucbasaran, Wright, & Clarysse, 2010). The entrepreneurial firm gradually consolidates the tacit science-based knowledge of founders into intellectual capital and later intellectual properties such as patents (Hine & Kapeleris, 2006). Founders are critical to getting the firm to a competitive start in terms of invention performance. Their knowledge continues to be important and their presence on the TMT would be helpful to preserve the scientific edge.

Too high a percentage of founders on the TMT can also cause problems. In the increasingly complex task and stakeholder environments of the post-IPO firm, founders' original skill sets are inadequate and an overly strong presence of founders does not help to address

new challenges (Nelson, 2003). A higher percentage of founders on the TMT will tilt the power balance towards founders, and in turn the post-IPO TMT may continue to direct the firm's limited resources toward fundamental research. At the post-IPO stage, however, the emphasis of research should be on moving existing research to the next step and reaping benefits from prior blue-sky research. Therefore, we expect that the percentage of founders on the TMT would be helpful but when the percentage gets too high, it could be detrimental to invention performance.

**H1.** The percentage of founders on the TMT will have an inverted U-shaped (curvilinear) relationship with post-IPO invention performance.

### 2.2. Intrafirm tenure

Longer tenured executives have developed their experiences in the early-stage firm and those experiences may become an impediment when the post-IPO firm is experiencing fundamental changes (Hambrick & Fukutomi, 1991; Musteen et al., 2006). Longer tenured executives are often more committed to existing projects and practices (Katz, 1982). They may be more committed to the status quo and less adaptable to changes (Boeker, 1997; Hambrick, Geletkanycz, & Frederickson, 1993). The experiences needed for growing the post-IPO firm's research pipeline and delivering the results regularly differ greatly from those of helping an early-stage firm to survive (Smith & Miner, 1983). An early-stage biotechnology venture, for example, may survive on winning a few research grants that cover the initial exploration for a short time, which is very different from moving the drug design through experiments and regulation (Robbins-Roth, 1999). Longer tenured executives often lack the knowledge for further development and commercialization, especially when the firm is experiencing radical changes regarding stakeholders, task, and internal organization. Therefore,

**H2.** The average of TMT members' tenure within the focal firm will be negatively related to post-IPO invention performance.

### 2.3. Competitor tenure

Managers with external experiences can often enrich the knowledge sets of the TMT, particularly under the post-IPO context. Managers may have worked for competitors who faced the similar supply and demand conditions of the same industry. Some competitors may have already experienced the same challenges as the post-IPO firm, such as the stakeholder, task, and organizational challenges. Managers with prior experiences at competitors can be particularly helpful for transferring directly relevant knowledge in those regards (Kor & Misangyi, 2008). For example, in biotechnology industry, managers with competitor experiences may be more knowledgeable about balancing blue-sky research with development-oriented projects and they can help the firm become more strategic in R&D (Hine & Kapeleris, 2006).

**H3.** The average of TMT members' tenure with competitors will be positively related to post-IPO invention performance.

### 2.4. Outside industry tenure

Managers who have work experience from outside industries can also enrich the post-IPO TMT. They are often functional specialists with significant administrative skills and knowledge. While their knowledge may not be directly related to specific R&D issues, they add to the depths of organizational knowledge and free founders and other technologically oriented executives from those administrative tasks that can be time-consuming and even distracting. For example, Knockaert et al. (2010) found that commercial expertise and mindsets

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