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## Gender Diversity in Top Management Teams and Innovation Capabilities: The Initial Public Offerings of Biotechnology Firms



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The initial public offering (IPO) is an important stage in the life cycle of research-based firms. The purpose of this article is to examine the influence of gender diversity in top management teams (TMTs) on the success of the IPO of research-based firms. We also explore how critical indicators of innovation capabilities for those types of firms can mediate the gender effect. To test a set of hypotheses, we carried out a longitudinal study of a sample of dedicated biotechnology firms that went public in the United States. Results suggest there is a negative and significant relationship between gender diversity in executive management and IPO success in the specific context of the biotechnology industry. However, the effect of innovation capabilities reduces and causes no significant influence of such type of demographic diversity in TMTs.

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### Introduction

This study addresses how gender diversity in top management teams (TMTs) and indicators of innovation capabilities can attract investment at the initial public offering (IPO) of research-based firms.

An important problem in technology management is financing research and development (R&D) activities, due to the degree of uncertainty and risk associated with their outputs (Levitas and McFadyen, 2009). The initial public offering is one of the most significant milestones in the life cycle of research-based firms (Shane and Stuart, 2002). Capital raised in the IPO can be used for pursuing extensive R&D projects, and developing both existing and new capabilities to support growth and international expansion (Carpenter et al., 2003; Deeds et al., 1997; Filatotchev and Piesse, 2009).

Research-based firms are more likely to encounter financial difficulties than larger established firms. The financial rewards of innovation vary dramatically between large and small companies. Large firms are assumed to have experience, economies of scale and scope in both R&D and in marketing, and a high level of appropriability of the returns from innovations (Gambardella, 1995; Sorescu et al., 2003). Although research-based firms preparing for an IPO often attract investors' attention, this does not always result in investment, because those firms have short operating histories and have higher risks than larger and more established companies (Zimmerman, 2008).

To overcome the asymmetric information problems between investors and research-based firms, these firms need to provide information in order to reduce the subjective uncertainty regarding their productivity and viability. There is little conclusive evidence as to how research-based firms provide useful information to influence their economic value when they go public (Bach et al., 2008; Zahra and Filatotchev, 2004). Such companies are usually characterized by extremely long periods of product development (e.g., in the biotechnology sector) and the lack of revenues in the foreseeable future. Thus, accounting data do not represent useful information to attract investors (Ritter and Welch, 2002). For those types of firms, the potential for raising capital in the IPO market is linked to knowledge-based capital (Bach et al., 2008). Since investors have easy access to information regarding knowledge and experience possessed by TMTs and their demographic composition, these dimensions are regarded as very valuable market signals (Beckman et al., 2007; Cohen and Dean, 2005).

Regarding the TMT demographic composition, gender diversity in top management is a useful non-financial signal to potential investors concerning the effectiveness of the top management team and the viability of the firm (Krishnan and Parsons, 2008; Welbourne et al., 2007). Differences between male and female social behavior, management style, cognitive resources, desired exposure to competition, investment strategies, etc. (Dwyer et al., 2003; Francoeur et al., 2008) can have an effect on the valuation of potential investors regarding a TMT's competences to foster effective decision-making, exploit market opportunities and enhance performance.

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Nevertheless, gender diversity in TMTs has received insufficient attention in the literature compared to other aspects of diversity such as tenure, education and functional background. Moreover, despite the extensive literature on IPOs and evidence that TMT characteristics influence firm performance (Beckman et al., 2007; Cannella et al., 2008; Zimmerman, 2008) research that examines the impact of TMT gender diversity on the critical stage of IPO is very limited. The study by Mohan and Chen (2004) examines gender effect on IPOs, but it only includes firms with women CEOs and does not consider the entire management team. To date, only two papers have addressed the relationship between gender diversity in executive management and the performance of IPO firms. They focus on large companies or study short periods of time. Krishnan and Parsons (2008) investigate the impact of gender diversity in senior management on the stock returns after IPO using a sample of Fortune 500 companies. Welbourne et al. (2007) examine the influence of the percentage of women on the TMT on the short- and long-term financial performance of companies that went public in a given year and belong to different industries.

By carrying out a longitudinal study of a particular sector (biotechnology), we seek to extend this research and make a contribution examining indicators that are particularly relevant for research-based firms and can mediate investors' perception of the influence of gender diversity in the potential performance of those types of firms. Such indicators are related to patents' value (measured by received cites) and the development of products (products on the market and products under development). They are important signals of research and learning skills and innovation capabilities (Hagedoorn and Cloudt, 2003) that can mediate and in this case reduce the influence of gender diversity in TMTs on IPO success.

Prior literature that examines the association of innovation competence and IPOs usually measures such a competence by proxies of R&D and the number of granted patents (Chin et al., 2006; Heeley et al., 2007; Lee and Lee, 2008). We make a contribution in this study by taking into account the patents' usefulness and significance that reflect the economically valuable knowledge accumulation (Trajtenberg, 1990). A previous study by Miller and Triana (2009) examine innovation (in the form of R&D expenditures) as a mediator between board gender diversity and firm performance using data on Fortune 500 firms. We contribute to the literature in two ways; first, by using patents and the development of marketable products that are indicators of innovation capabilities that more closely reflect the potential economic and financial performance; and second, by focusing on research-based firms that have particular features.

The structure of this paper is as follows: the first section presents the theoretical framework and hypotheses regarding the effects of gender diversity in the TMT and innovation capabilities on IPO success. This is followed by a description of the research methodology employed and the empirical analysis to test the hypotheses. The final section includes a discussion of the results and the conclusions.

## Theoretical framework and hypotheses

An initial public offering can be considered successful when it accumulates maximum possible net proceeds to the issuing firm (Ragupathy, 2011). The amount of capital that flows into the firm depends upon the favorable evaluation of the firm by the financial market. The amount of capital the firm can raise through an IPO involves negotiations between the lead underwriter and the firm. To overcome problems that may arise due to asymmetry of information and interests between investors and firms, investors seek observable sources of information about the firms' performance and base funding decisions on objective verifiable indicators of venture development. In the particular case of young or research-based companies, the potential for raising capital may not only be based on financial characteristics such as assets, earnings, book value, etc., but also on intangible assets (Deeds et al., 1997; Zimmerman, 2008) and the dissemination of information about the development of capabilities within the firm (Arikan and McGahan, 2010). A capability can be conceptualized as a distinctive and superior way of allocating resources embedded in activities and routines for addressing complex, practical and repeated problems (Schreyögg and Kiesch-Eberl, 2007). A capability can be considered dynamic when it promotes the continuous renewal of organizational capabilities and focuses on rapidly creating situation-specific new knowledge, matching the demands of high-velocity markets (Eisenhardt and Martin, 2000; Wang and Ahmed, 2007).

Dynamic capabilities are defined as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece, 2007; Teece et al., 1997). Dynamic capabilities are likely to result in improved performance, when firms demonstrate the ability to deploy resources to attain a desired goal. It is possible to distinguish "capability development" from "capability building". Capability development is the "outcome" of a firm's dynamic capabilities over time. Capability building is referred to as a "process" of dynamic capabilities (Makadok, 2001; Wang and Ahmed, 2007).

In the following sections we argue that gender diversity in a firm's TMT means the team possesses diverse management and leadership styles that can promote the development of unique "capability building", influencing the ability to obtain novel solutions, new products and identify new markets. We also suggest that the value of patent and product development can be considered an indicator of "capability development" related to the outcome from a firm's learning and research processes. There is little empirical evidence to show how gender diversity and relevant outcomes with potential economic value influence the capacity of research-based firms to attract the attention and the funds of investors in the IPO process.

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