



Paper to be presented at the
35th DRUID Celebration Conference 2013, Barcelona, Spain, June 17-19

THE INITIAL PUBLIC OFFERING OF HIGH-TECHNOLOGY FIRMS: FEMALE EXECUTIVE MANAGERS AND INNOVATION

Cristina Quintana-García

University of Málaga

Departamento de Economía y Administración de Empresas

cqg@uma.es

Carlos A. Benavides-Velasco

University of Málaga

Departamento de Economía y Administración de Empresas

cabv@uma.es

Abstract

The purpose of this article is to examine the influence of gender diversity in top management teams (TMTs) on the success of the initial public offering (IPO) of high-technology entrepreneurial firms, and how critical indicators of innovation capabilities for those types of firms can mediate the gender effect. We carried out a longitudinal study of a sample of dedicated biotechnology firms that went public in the United States. Results indicate that there is a negative and significant relationship between gender diversity in executive management and IPO success, although the effect of innovation capabilities attenuates and causes no significant influence of such type of demographic diversity in top management.

THE INITIAL PUBLIC OFFERING OF HIGH-TECHNOLOGY FIRMS: FEMALE EXECUTIVE MANAGERS AND INNOVATION

ABSTRACT

The purpose of this article is to examine the influence of gender diversity in top management teams (TMTs) on the success of the initial public offering (IPO) of high-technology entrepreneurial firms, and how critical indicators of innovation capabilities for those types of firms can mediate the gender effect. We carried out a longitudinal study of a sample of dedicated biotechnology firms that went public in the United States. Results indicate that there is a negative and significant relationship between gender diversity in executive management and IPO success, although the effect of innovation capabilities attenuates and causes no significant influence of such type of demographic diversity in top management.

Key words

Gender, top management team, patent, product innovation, capital market, biotechnology firms.

THE INITIAL PUBLIC OFFERING OF HIGH-TECHNOLOGY FIRMS: FEMALE EXECUTIVE MANAGERS AND INNOVATION

INTRODUCTION

The initial public offering is one of the most significant milestone in the life cycle of research-based and young startup 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, Pollock and Leary, 2003; Deeds, DeCarolis and Coombs, 1997; Filatotchev and Piesse, 2009).

This study addresses how female representation in top management teams (TMTs) and indicators of innovation capabilities can attract investment at the initial public offering (IPO) of high-technology entrepreneurial firms.

New entrants and science-based firms are more likely to encounter finance difficulties than large established firms. The financial rewards of innovation vary dramatically between dominant and nondominant companies. Incumbent firms are assumed to enjoy 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, Chandy and Prabhu, 2003). Although science-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 risk than larger and more established companies (Zimmerman, 2008).

To overcome the asymmetric information problems between investors and entrepreneurial innovative firms, these need to provide information in order to reduce the subjective uncertainty of outside constituencies regarding the productivity and viability of the company. There is little conclusive evidence as to how high-technology entrepreneurial firms

obtain informational advantages and how those advantages influence the economic value when they go public (Bach, Judge and Dean, 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 for the foreseeable future. Thus, accounting data in many of these cases is simply too unreliable a measure (Ritter and Welch, 2002). For those types of firms, the potential for raising capital in the IPO market is specially based on knowledge-based capital (Bach et al., 2008).

Gender diversity in TMTs is a useful non-financial signal to potential investors concerning the effectiveness of the top management team and the viability of the firm. Differences between male and female social behavior, management style, desired exposure to competition, investment strategies, etc. 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.

Nevertheless, gender diversity in top management has received insufficient attention in the research 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, Burton and O'Reilly, 2007; Cannella, Park and Lee, 2008; Zimmerman, 2008) the research examining the impact of TMT gender diversity on the critical stage of IPO is very limited. Mohan and Chen (2004) carry out a study focused on gender effect on IPOs but they only include firms with women CEOs and do 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 Parson (2007) investigate the impact of gender diversity in senior management on the stock returns after IPO using a sample of Fortune 500 companies. Welbourne, Cychota and Ferrante (2007)

examine the influence of the percentage of women on the top management on the short- and long-term financial performance of companies that belong to different industries that went public in a given year. Specific factors and indicators may provide valuable information to the market regarding organizational practices in each sector of activity.

By carrying out a longitudinal study of a particular high-technology sector, we seek to extend this research and make a contribution examining indicators that are particularly relevant for research-based firms and can mediate the perception of investors about the influence of gender diversity in the potential performance of those types of companies. Such indicators are related to significant patents (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 in high-technology industries (Hagedoorn and Cloudt, 2003) that can mediate, 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; Heely, Matusik and Jain, 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 work 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 secondly, by focusing on research-based firms that have particular features.

The structure of this paper is as follows: first, the next 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 discussion of the results and 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 their performance and base funding decisions on objective verifiable indicators of venture development (Eckhardt, Shane and Delmar, 2006). In the particular case of young or science-based companies, the potential for raising capital may not only be based on financial characteristics such as assets, earning, book value, etc., but also on intangible assets (Deeds et al., 1997; Zimmerman, 2008) and the dissemination of information about the development of a capability within the firm (Arikan and McGahan, 2010).

Dynamic capabilities are defined as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece, Pisano and Shuen, 1997; Teece, 2007). 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 refers to a "process" of dynamic capabilities (Makadok, 2001; Wang and Ahmed, 2007).

Gender diversity in a firm's TMT means that the team possesses diverse management and leadership styles that can promote the development of a unique "capability building" influencing the ability to obtain novel solutions, new products and identify new markets. Patent's value 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 influences the capacity of research-based firms to attract the attention and the funds of investors in the IPO process.

Female representation in the top management of high-technology firms

Top management team composition can serve as a signal to investors of the potential for future performance of a research-based firm. Expertise possessed by top managers is important as they play a relevant role in deploying resources and capabilities and determining technology and innovation strategy. A heterogeneous TMT includes diverse knowledge backgrounds that can lead to more original ideas and exploratory innovations (Alexiev et al., 2010). The influence of TMTs can be particularly relevant in young, entrepreneurial firms where their simplicity of the organizational structure allows top-level managers to interact with each other and with the firm's resources to influence R&D strategy. In entrepreneurial firms, top managers must constantly interact with those actors who are closer to the core technology so they can select the best alternatives, sponsor potentially productive initiatives, legitimize radical ideas, and identify and commercialize latent capabilities (Day, 1994).

Demographic diversity in the top management has a symbolic value for the organization and aims to create an inclusive culture that values and uses the talents of all would-be members (Herring, 2009). It may provide information to the market about the presence of positive organizational practices and more diverse social networks, which can aid firm

performance because of the benefits of embeddedness for linking firms to needed resources in the environment (Uzzi, 1996; Welbourne et al., 2007). Particularly, female executives in top management may have an effect on the capability building of a company. Women managers can enhance the firm's capabilities to be flexible and deal with ambiguity (Rosener, 1995). By better utilizing the contributions of women in management, firms can become more innovative and accepting of change. The creative conflict that may emerge leads to closer examination of assumptions, a more complex learning environment and better solutions (Herring, 2009). When creative organizations such as biotechnology firms with men and women from different backgrounds and life experiences can agree on common goals, diversity trumps individual ability in producing innovative outcomes (Smith-Doerr, 2004).

Research that analyzes the relationship between the presence of women in the upper echelons of management and firm performance is limited and evidence is mixed. Some contributions provide evidence that companies with more women in senior management are found to be more profitable (Catalyst, 2004; Cordeiro and Stites-Doe, 1997; Krishnan and Parson, 2007), whereas using a sample of large firms, Shradern Blackburn and Illes (1997) do not encounter a significant influence.

Studies that focus on the effect of the female representation in TMTs on market value, and particularly on IPO, are sparse. Lee and James (2007) find that the announcement of female top management appointments has no effect on stock market reactions. They do not include announcements of appointments in 'pink sheet' Nasdaq firms as they consider them to be very small companies. Welbourne et al. (2007), selecting a specific cohort of IPO firms that went public in a given year, find that the percentage of women on the TMT was positively related to initial pricing for the IPO (measured as Tobin's Q). Similarly, examining a sample of firms from the database of Fortune 500 companies, Krishnan and Parson (2007) obtain that firms with more women in senior management have higher stock returns after IPO

than those with fewer women in the management ranks. Analyzing a sample of large Canadian firms for a period of three years, Francoeur, Labelle and Sinclair-Desgagné (2008) reveal that firms operating in complex environments and which have a high proportion of women officers (maximum rate identified: 50%) do experiment positive and significant monthly abnormal returns. Taking into account the environment as a contingency factor, gender diversity in the TMT of research-based companies, which face high uncertainty, can be positively valued by investors. Team members with different sociocognitive perspectives and skill sets may be perceived as capable of stimulating debate, generating a greater range of strategic alternatives and improving the evaluation of the feasibility of such alternatives. Therefore, we suggest the following:

Hypothesis 1: Gender diversity in top management positively influences the success of the initial public offerings of high-technology firms.

Innovation capabilities

Innovation capabilities are an indicator of capability development specially relevant for research-based firms. Significant dimensions of innovation capabilities are patents and the development of products (products on the market and products under development) (Hagedoorn and Cloudt, 2003), which provide evidence of the value or effectiveness of a firm's R&D program to potential investors.

Patents represent the firm's capacity to transform research investment into new and potentially valuable knowledge. Although not indicating the development of a marketable product or process, patents demonstrate (Levitas and McFadyen, 2009; Stephan, 1996): the ability to perform knowledge recombination; the possession of potentially valuable technology; and the ability to go beyond basic understanding to produce technology that is not

obvious to a person having ordinary skills in the pertinent art. Some contributions examine the impact of the number of patents on different measures of IPO success (Chin et al., 2006; Deeds et al., 1997; Heely et al., 2007; Lee and Lee, 2008). Nevertheless, the superior knowledge is reflected not only in the number of patents that a firm has, but also in their usefulness that they reflect.

The extent to which a firm's invention resonates with other researchers is an important indicator of its capacity to generate ideas that have both clear utility and wide applicability (DeCarolis and Deeds, 1999; Makri, Lane and Gomez-Mejia, 2006). External citations provide evidence of the role of the cited patent in the development of successful technologies, and they may suggest that the firm will produce commercially valuable inventions in the future (Trajtenberg, 1990). Also, self-citation is relevant because firms citing their own patents may be a reflection of the cumulative nature of innovation and the increasing returns property of knowledge accumulation (Hall, Jafe and Trajtenberg, 2005); besides, it may imply that the firm is gaining a more competitive position in a particular field (Deng, 2007).

Empirical evidence shows that influential inventions create economic value for the firm, and that citations contain information above and beyond simple patent counts on the value of the firm's intangible assets. Several contributions find that the market value (usually measured through Tobin's q) is positively related to a firm's stock of patents adjusted by quality or weighted by citations (Lanjouw and Schankerman, 2004; Hall et al., 2005; Heiens, Leach and McGrath, 2007; Shane and Klock, 1997). By identifying the share of external citations and self-citations out of total citations, some works reveal that both components have a significant and positive effect on market value of firms (Deng, 2007; Hall et al., 2005).

The development of a new product innovation is essential to the continued existence of the research-based firms (Tidd, Bessant and Pavitt, 2001). A firm's ability to rapidly develop and commercialize new products serves to establish external visibility and legitimacy, gain

early entry into chosen markets, and increases the likelihood of survival (Schoonhoven, Eisenhardt and Lyman, 1990). Those types of firms, such as biotechnology companies, usually have no products on the market when they go public because their development processes are very long, specially the testing and regulatory approval stages. Hence, products in the pipeline may be considered an important indicator of a company's future performance. The amount of products under development reveals the future value of the firm's current capabilities to the financial markets. Moreover, those companies that have products on the market clearly reveal to potential investors that they have superior innovation capabilities that enhance their performance.

Some research explores the relationship between innovative competence and the performance or value of a firm. Contributions that examine the effects of innovation indicate a positive relationship between product innovativeness and profit or growth performance (Kleinschmidt and Cooper, 1991; Subramanian and Nilakanta, 1996). Chaney, Devinney and Winer (1991) find that the number of new products announced has a positive impact on a company's market value and the effect is higher for firms in more technologically based industries. There is also evidence that the number of total products (the sum of products under development and those that have reached de market) has a significant positive impact on the value of high-technology companies' IPO (Deeds et al., 1997).

Both patent citation and the development of products are indicators of the outcomes of innovation capabilities that are closest to firm success and performance (Coombs and Bierly, 2006; Stalk and Hout, 1990). Therefore, they can mediate, in this case reduce, the influence gender diversity in top management on the success of IPOs.

Accordingly, the following hypotheses are suggested:

Hypothesis 2: Innovation capabilities have a positive impact on the success of the initial public offerings of high-technology firms.

Hypothesis 3: Innovation capabilities mediate the effect of gender diversity in top management on the success of the initial public offerings of high-technology firms.

METHODOLOGY

Research setting, sample and data

The research setting of this paper is provided by dedicated biotechnology firms (DBFs) that completed an initial public offering in the United States during 1983-2009. The youth, size and the entrepreneurial and scientific nature of biotechnology companies make them an excellent venue in which to study the effect of the top management team composition and innovation capabilities on the perception of potential investors about the effectiveness of R&D strategy. The research sample was drawn from the Thomson Financial/Venture Economics VentureXpert data set. We used this database to identify biotechnology firms undergoing their IPO of stock and IPO value of each firm during the time period of January 1, 1983 through December 31, 2009. In 1983, the first IPO undergone by a DBF was identified in VentureXpert database. Searches in this database yielded a list of 308 firms. Data availability constraint (i.e., missing data for one or more of the variables and unavailability of IPO prospectus) limited the sample to 229 companies.

Information related to gender diversity, other features of TMTs, and products on the market and under development was obtained from the IPO prospectus of each firm. The prospectus is the document provided to the Securities and Exchange Commission (SEC) prior to the public offering, and it is also the document circulated by the underwriter to assess demand for the firm's stock. The SEC requires that firms follow strict guidelines in the format. This fact allows a high level of consistency. We obtained the information of patents from the United States Patent and Trademark Office (USPTO). A company may have patents granted by other international patent offices; however, the likelihood of this fact is low due to

the youth and size of the sample of firms. Nevertheless, using a single patent office as the information source helps to maintain a certain level of consistency and comparability. In our study, the USPTO is found to be suitable in order to be consistent with the financial market analyzed (IPOs in the United States). Among the data available in patents, we used the citation received by each patent to estimate the value of the stock of patents.

Measures

Dependent variable

“IPO value per share” is the dependent variable of the model regarding the success of the initial public offerings. We defined this variable as the amount of capital from the offering that is actually transferred to the firm and its owners divided by the number of shares issued at the time of the IPO. The numerator (the amount of capital from the IPO) was calculated by subtracting the underwriter's fees from the total value of the capital raised through the IPO (Deeds et al., 1997) and it is expressed in millions of 2009 constant dollars. IPO value per share was measured using data drawn from the Thomson Financial/Venture Economics VentureXpert data set and the IPO prospectus.

Independent variables

The first independent variable is “Gender diversity in top management”. The top management team is defined as all inside top-level executives. This definition includes all of the C-level positions, e.g., CEO, chief financial officer, chief operating officer, as well as all executives above the rank of vice presidents and senior vice presidents (Cohen and Dean, 2005). Data on the gender of top managers were obtained from the management section presented in the IPO prospectus. Companies are required by the SEC to list the names. The name of the executives was examined to indicate whether the individual was male or female;

when in doubt, we read the description of the managers' biographies and searched for a reference to he/his or her/him. Gender diversity in top management was calculated using Blau's (1977) heterogeneity index $(1 - \sum S_i^2)$, where S_i is the proportion of a TMT in the i th category. Since there are only two categories (male and female), the maximum diversity will occur when the index takes the value 0.5; values close to 0 indicate that a TMT is dominated by a single gender.

We included three independent variables regarding innovation capabilities: patent stock's value, products under development and product on the market.

The "patent stock's value" at the moment of IPO represents another independent variable. A patent's citations contain information on a patent's value. Citations typically keep coming over the long run, giving plenty of time to dissipate the original uncertainty regarding both the technological viability and the commercial worth of the cited innovation. Therefore, if we still observe citations years after the grant of the cited patent, it must be that the latter had indeed proven to be valuable (Hall et al., 2005). We measured the value of a patented invention by counting the number of received citations that come from any subsequent patent, including self-citations by the firm and external citations. We include the number of subsequent citations a patent receives until the date in which the firm undergoes the IPO. Then, to calculate the patent stock's value, we use the index of weighted patent countsⁱ $WPC = \sum(I+C_i)$ where C_i is the number of citations that the patent i has subsequently received (Trajtenberg, 1990; Wong and Singh, 2010). Data on "products under development" and "products on the market" were obtained from the business section of each IPO prospectus. Multiple applications of the same product were counted as a single product (Deeds et al., 1997).

Control variables

We included several control variables to capture differences in the ability of companies to obtain financing. Such variables are related to additional characteristics of TMTs and the firm.

In order to control for other differences regarding TMTs, we included the following variables: female CEO, TMT functional diversity, TMT firm tenure and TMT prior experience in related industries.

“Female CEOs” can have an effect on the investor’s valuation. This variable is coded as 1 when the CEO is a woman and 0 when is a man. Greater heterogeneity of functional backgrounds may foster effective strategic decision making, lead to innovation and creativity and positively influence a firm’s performance and market value (Cannella et al., 2008; Zimmerman, 2008). In order to measure “TMT functional diversity”, we first classified each executive’s function into one of the eleven tracks: management and business development, research (including scientific affairs), development, clinical and medical affairs, production and operations, sales and marketing, finance and accounting, legal, human resource management, quality management, and other. The functions selected for inclusion in this study are based on previous contributions on functional diversity (Michel and Hambrick, 1992; Yap, Chai and Lemaire, 2005) and adapted to the nature of TMTs of the sector analyzed in this research. TMT functional diversity was calculated using Blau’s heterogeneity index. In this case, the index can vary between 0 and 1, with values close to 1 indicating higher diversity and values close to 0 indicating that a TMT is dominated by a single category. TMT firm tenure can be a signal of the ability to manage the firm; TMT prior experience in related industries implies a familiarity with the external environment of the firm and therefore the ability to lead the firm through complex managerial decisions (Cohen and Dean, 2005). To estimate both variables we used the average of firm tenure and prior experience in related industries owned by the TMT’s members.

Regarding features of the company, we control for firm size, firm age and net income.

“Firm size” at IPO was estimated through the number of employees. “Firm age” at IPO was computed from the date of incorporation to the date of IPO. Firm size and age may increase the market valuation as they are associated with experience, process efficiency and potential higher returns. We included “net income” as a financial control variable. Biotechnology firms usually report net loss for the fiscal years prior to the IPO date (90.83% of our sample) that are attributable to high R&D expenses. Therefore, the fact that a biotechnology firm reports to have net income can be a more informative indicator to influence an investor’s decision than to rely on the total amount of net income or net loss. Accordingly, we coded net income as a dummy variable that takes value 1 when the firm reports net income for the previous year to the IPO date and 0 when it reports net loss.

Factors that vary over time but affect all firms in the industry, such as financial market conditions, were also controlled with dummy variables for each year.

RESULTS

Table 1 shows the mean, standard deviations, and correlations of the variables used in the analyses.

Insert Table 1 about here

Regarding gender diversity, 83 companies (36.24% of the sample) have at least one woman in their TMTs. In that subsample, the mean of gender diversity in top management is 32.73 per cent, and the maximum diversity is 0.5.

Insert Table 2 about here

Table 2 provides the regression results. To test the significance in predicting the IPO success of the independent variables over the control variables, we used a hierarchical regression analysis. We entered the control variables in the first step (model 1), except the variable female CEO so as not to take into account any gender effect at this phase. In the second step, gender diversity in top management and female CEO were added to the equation (model 2) providing the variance accounted for the variables related to gender. Next, in model 3, we entered the independent variables concerning innovation capabilities (patent stock's value, products under development and products on the market).

We tested our data for multicollinearity. The variance inflation factor (VIF) is a measure of the reciprocal of the complement of the intercorrelation among the predictor variables: $VIF = 1/(1 - r^2)$ where r^2 is the multiple correlation between the predictor variable and the other predictors. VIF values greater than 10 indicate possible problems (Cohen et al., 2003). In the regression models (models 1, 2 and 3), the highest VIF score was 3.15, which was within acceptable parameters. The mean of VIF was 1.37.

Model 1 representing only the control variables was significant with a $R^2 = 0.175$ ($p < 0.01$). In examining the effect of control variables related to the firm, we found that TMT functional heterogeneity was positively and significantly related to IPO value per share. This evidence is consistent with previous research that demonstrates that investors positively value breadth in the functional backgrounds of TMTs as an indicator of quality (Beckman et al., 2007; Zimmerman, 2008). Our data showed a positive and significant effect of both TMT firm tenure and TMT prior experience in related industries in their relationship with IPO success. This result indicates a positive contribution of the TMT's superior knowledge that is important in gaining an understanding into team dynamics and strategic decision-making (Bach et al., 2008). The effect of firm size was positive and significant on IPO value per

share, suggesting that perception of investors about a firm's value or viability increases with firm size. As a counterintuitive result, the effect of firm age at IPO was not significant; nevertheless, it can be considered that part of the effect of age will be incorporated into the effect of firm size, as older firms tend to be larger (Heeley, Matusik and Jain, 2007). The effect of net income was not significant. This result may validate the assumption that for research-intensive firms, the potential for raising capital in an IPO is mostly based on non-financial metrics such as those related to competences and intangible assets.

The variables gender diversity in top management and female CEO were entered as a block into model 2. The addition of these variables to the equation with the control variables resulted in a significant improvement in the model. The R^2 was 0.203 ($p < 0.001$) and the change in R^2 was 0.027 ($p < 0.05$). Model 3 includes the patents stock's value, the number of products under development and on the market. The inclusion of this block of variables related to innovation capabilities leads to a significant improvement of the model. The R^2 of model 3 was 0.3352 ($p < 0.001$) and the change in R^2 was 0.131 ($p < 0.001$).

Model 2 tests H1. We do not find support for this hypothesis. Contrary to our expectations, gender diversity in the top management was significantly and negatively related to the success of the IPOs of research-based firms. The fact that the CEO of the TMT is a woman has no a significant effect on the IPO value per share. The lack of significance may simply be related to the extremely low number of female CEOs in our sample (only 5 cases), and this fact can explain that the variable has no explanatory power. Findings support hypotheses 2 and 3. Hypothesis 2 predicted that innovation capabilities are positively related to IPO success. Model 3 shows that the effect of the "patent stock's value" in terms of citations received was positive and significant. Products under development and products on the market also have a significant and positive influence on IPO success. These results indicate that products in both stages of their life cycle denote superior scientific and

innovation capabilities. We also find evidence that indicators of innovation capabilities mediates gender diversity in top management, the coefficient of this variable changes from $b = -6.988$ in model 2 to -4.553 in model 3. Moreover, as a result of this mediation, gender diversity in top management is not significant. The Sobel statistic for mediation is significant at $p < 0.05$ for products under development and for products on the market; such statistic is found not significant for the patent stock's value. It seems that innovation capabilities and, in particular, information about product development, are perceived by investors to be a closer indicator to firm performance than the heterogeneity of knowledge and sociocognitive perspectives in the TMT inherent to gender diversity. Nevertheless, variety of knowledge and competences associated to TMT functional diversity is highly valued by investors even after including the effect of innovation capabilities.

The sensitivity of the results was tested in several ways. We modified the models replacing IPO value per share with IPO value as the dependent variable. The IPO value was also expressed in millions of 2009 constant dollars. This test consistently supported the main results. Gender diversity in top management had a significant and negative impact on IPO value in model 2 with the alternative dependent variable ($b = -7.242$, $p < 0.05$), and its influence was smaller and not significant when the indicators of innovation capabilities were added to the equation ($b = -5.334$, $p > 0.05$). To examine the effect of the presence of women in executive management, we also ran additional analyses by including alternative measures of gender diversity in the TMT: a) the percentage of women on the TMT; b) a dummy variable called women in the TMT that takes the value 1 when the TMT has at least one woman and 0 otherwise. The results from this sensitivity test consistently supported the main findings of the study. The coefficient of the percentage of women on the TMT in modified model 2 was $b = -9.235$ ($p < 0.05$) and in modified model 3 was $b = -7.318$ ($p > 0.05$). The

coefficient of women in the TMT in modified model 2 was $b = -2.000$ ($p < 0.05$) and in modified model 3 was $b = -1.666$ ($p > 0.05$).

DISCUSSION AND CONCLUSIONS

Given the relatively short operating history of the high-technology entrepreneurial firms and the asymmetric nature of the knowledge involved, it is usually difficult to guarantee the desired economic value as they go public. For those types of companies, IPO investment is specially based on intangible assets that may support R&D activities and innovation.

The main aim of this study was to investigate if the potential investors are sensitive to information regarding the representation of women in the top management team of high-technology companies that go public. Moreover, we explored how critical indicators of innovation capabilities for those firms can mediate the gender effect.

The pool of knowledge, behaviors and different leadership styles embedded in gender diverse TMTs may influence the perception of investors concerning the firm's organizational outcomes and viability. Our study of a sample of dedicated biotechnology firms that went public in the United States during 1983-2009 found no support for the prediction that gender diversity in TMT positively influences IPO success. On the contrary, the results show a negative and significant effect of that type of demographic diversity. Examining gender diversity in top management as the main independent variable, we obtained that investors do not perceive that woman managers can enhance the firm's capabilities to be more profitable. This evidence is not consistent with previous studies that find that the presence of women in executive management was positively related to IPO returns when analyzing large firms or no considering specific significant signals for each sector of activity, (Krishnan and Parson, 2007; Welbourne et al., 2007). Compared to the Fortune 500 companies and other industries, the percentage of women in executive teams and boards of technology intensive firms are the

lowest (Terjesen, Sealy and Singh, 2009). The selected sector in this study is male-dominated (36.24% of the sample have at least one woman in their TMTs and the mean percentage of women in TMT is 8.05%). The result obtained in this predominantly male sector is coherent with those works based on social identity theory and organizational demography theories of diversity research that suggest that women in male-dominated groups receive more negative evaluations than men in those groups, at least until they prove themselves to be competent (Nieva and Gutek, 1980; Swim et al., 1989). For instance, Sackett, Dubois and Noe (1991) found that in groups where women were less than 20 per cent of the group, they received lower performance ratings than men did, but when they were greater than 50 per cent they were rated even higher than men. However, these proportionality effects were not found for men. Konrad, Winter and Gutek (1992) found that sexist stereotyping was higher in male-dominated groups, while it was lower in female-dominated groups.

Nevertheless, relevant indicators to high-technology firms, particularly those related to innovation capabilities, may reduce the potential gender stereotyping that influence their valuation. Our results demonstrated that the significance of the firm's stock of patent (in terms of patent citation), and the number of products under development and on the market are relevant factors that shape the ability of high-technology firms to attract investment in their IPOs. This result is consistent with previous research that shows that those dimensions of innovation capabilities contain significant information that is positively associated with the stock market value of firms (Chaney et al., 1991; Deeds et al., 1997; Hall et al., 2005; Heiens, Leach and McGrath, 2007; Lanjouw and Schankerman, 2004; Shane and Klock, 1997). Furthermore, we found that the influence of gender diversity in TMT on the IPO success is not significant as a result of the mediating role of innovation capabilities. These results suggest that indicators of innovation capabilities, specially those regarding products under development and products on the market, are considered more direct proxies for future returns

and may remove the negative effects of gender stereotypes in male-dominated sectors. This evidence is coherent with those contributions that claim and take a contingency approach to investigate the relationship between some types of demographic diversity in TMT and different measures of firm performance (e.g. Carpenter, 2002; Dwyer, Richard and Chadwick, 2003).

We also found that designing functionally heterogeneous TMTs is strongly and positively associated with raising funds through an IPO. In addition, the explanatory power of that specific type of diversity remains significant when relevant information regarding innovation is considered. This suggests that a functionally diverse TMT makes a firm more attractive to external investors who may perceive that the management team has the requisite competences to make the firm successful. Particularly, in high-technology sectors, functionally heterogeneous top management teams can be observed as a combinative capability that impacts on the exchange and integration of distributed knowledge required to develop and commercialize valuable innovations (Beckman and Burton, 2008). Innovation requires competences in both idea generation and idea implementation. Designing a heterogeneous TMT in terms of functions can affect how the team performs at all stages of the innovation process (Fang and Bednar, 2009). Effective innovation development routines typically involve the participation of cross-functional teams that bring together different sources of expertise. These sources of expertise are essential for superior products because each addresses a unique aspect of product quality or related production (Eisenhardt and Martin, 2000). Since the team includes research, development, manufacturing and marketing representatives, innovation process is facilitated.

This is the first study as far as we are aware that examines the relationship between gender diversity in the TMT and IPOs of high-technology entrepreneurial firms characterized by a risky and uncertain context. This study has theoretical and managerial implications.

Applying dynamic capabilities perspective, this research suggest that, for research-intensive firms, relevant dimensions of innovation outcomes are indicators of capability development that were found useful to alleviate some information asymmetry in the IPOs. Such dimensions provide evidence of superior research competence and have a positive influence on the investors' expectation of higher performance in firms reducing the stereotype that considers women to be less qualified for executive positions. Moreover, a functionally heterogeneous top management team ensures the full range of capabilities needed to manage the organization and innovation process. Thus, TMT functional diversity can be observed as a combinative capability, which appears to be an important determinant of IPO success. On the other hand, this study has managerial implications. Managers in research-based firms should pay particular attention to the mechanisms by which they can reduce information asymmetries. Successful mechanisms for reducing these information asymmetries may translate into more capital raised through IPO. Firms will need to be aware of the potential negative reaction to gender diversity in the TMT and to develop appropriate communication strategies for informed and, specially, uninformed investors as to the firm's technological performance that is positively related to market valuation. Moreover, top management teams seem to be critical signals to outside investors. In preparing for an IPO, firms should properly design their TMT so as to indicate to investors the breadth of knowledge possessed by the team.

This study has a number of limitations. The primary contribution of this study can be also considered a limitation. Studying a single sector of activity makes it possible to research contextual factors. However, findings may not be generalized to other industries and competitive settings. It would be of interest to extend this research to other sectors, and thus to identify differences in the importance of TMT gender diversity and other strategic and organizational contingent factors to attract investors' attention when firms go public. Another limitation comes from using exclusively secondary sources of information. Combining these

sources with information collected through questionnaires, to study the aforementioned question would be interesting. In particular, we have no direct information on the basis of investor decisions. Further research incorporating interviews to investors and other techniques for assessing intentions and methods for valuating intangible assets is needed to fully understand the relationships that we study. Another extension of this research could be broadening our definition of diversity to include racial and ethnic diversity and analyzing other relevant groups such as the founding team, middle managers or outside directors. Future research could also take into account other measures of performance regarding the value given by the capital market and include external quality signals in highly uncertain contexts such as underwriter reputation.

References

- Alexiev, A.S., Jansen, J.J.P., Van den Bosh, F.A.J. and Volberda, H.W. (2010). 'Top management team advice seeking and exploratory innovation: The moderating role of TMT heterogeneity'. *Journal of Management Studies*, **47**, 1343–1364.
- Arikan, A.M. and McGahan, A.M. (2010). 'The development of capabilities in new firms'. *Strategic Management Journal*, **31**, 1–18.
- Bach, S.B., Judge, W.Q. and Dean, T.J. (2008). 'A knowledge-based view of IPO success: superior knowledge, isolating mechanisms, and the creation of market value'. *Journal of Managerial Issues*, **20**, 507–525.
- Beckman, C.M., Burton, M.D. and O'Reilly, C. (2007). 'Early teams: The impact of team demography on VC financing and going public'. *Journal of Business Venturing*, **22**, 147–173.

- Beckman, C.M. and Burton, M.D. (2008). 'Founding the future: Path dependence in the evolution of top management teams from founding to IPO'. *Organization Science*, **19**, 3–24.
- Blau, P. (1977). *Inequality and heterogeneity: A primitive theory of social structure*. New York: The Free Press.
- Cannella, A.A., Park, J.H. and Lee, H.U. (2008). 'Top management team functional background diversity and firm performance: Examining the roles of team member collocation and environmental uncertainty'. *Academy of Management Journal*, **51**, 768–784.
- Carpenter, M.A. (2002). 'The implications of strategy and social context for the relationship between top management team heterogeneity and firm performance'. *Strategic Management Journal*, **23**, 275–284.
- Carpenter, M. A., Pollock, T. G. and Leary, M. M. (2003). 'Testing a model of reasoned risk-taking: Governance, the experience of principals and agents, and global strategy in high-technology IPO firms'. *Strategic Management Journal*, **24**, 803–820.
- Catalyst (2004). *The Bottom Line: Connecting Corporate Performance and Gender Diversity*. New York: Catalyst Publication Code D58.
- Chaney, P.K., Devinney, Y.M. and Winer, R.S. (1991). 'The impact of new product introductions on the market value of firms'. *The Journal of Business*, **64**, 573–610.
- Chin, C-L., Lee, P., Kleinman, G. and Chen, P.Y. (2006). 'IPO anomalies and innovation capital'. *Review of Quantitative Finance & Accounting*, **27**, 67–91.
- Cohen, B.D. and Dean, T.J. (2005). 'Information asymmetry and investor valuation of IPOs: Top management team legitimacy as a capital market signal'. *Strategic Management Journal*, **26**, 683–690.

- Cohen, J., Cohen, P., West, S.G. and Aiken, L.S. (2003). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Coombs, J.E. and Bierly, P.E. (2006). 'Measuring technological capability and performance'. *R&D Management*, **36**, 421–438.
- Cordeiro, J. J. and Stites-Doe, S. (1997). 'The impact of women managers on firm performance: Evidence from large U.S. firm'. *International Review of Women and Leadership*, **3**, 1–20.
- Day, D.L. (1994). 'Raising radicals: different processes for championing innovative corporate ventures'. *Organization Science*, **5**, 148–172.
- DeCarolis, D.M. and Deeds, D. (1999). 'The impact of stock and flows of organizational knowledge on firm performance: an empirical investigation of the biotechnology industry'. *Strategic Management Journal*, **20**, 953–968.
- Deeds, D., DeCarolis, D. and Coombs, J. (1997). 'The impact of firm-specific capabilities on the amount of capital raised in an initial public offering: Evidence from the biotechnology industry'. *Journal of Business Venturing*, **12**, 31–46.
- Deng, Y. (2007). 'The value of the knowledge spillovers in the U.S. semiconductor industry'. *International Journal of Industrial Organization*, **26**, 1044–1058.
- Dwyer, S., Richard, O.C. and Chadwick, K. (2003). 'Gender diversity in management and firm performance: the influence of growth orientation and organizational culture'. *Journal of Business Research*, **56**, 1009–1019.
- Eisenhardt, K.M. and Martin, J.A. (2000). 'Dynamic capabilities: What are they?' *Strategic Management Journal*, **21**, 1105–1121.

- Fang, E. and Bednar, M.K. (2009). 'An examination of what, how and when TMT experience matters for firm innovativeness'. *2009 Academy of Management Annual Meeting*, Chicago, IL.
- Filatotchev, I. and Piesse, J. (2009). 'R&D, internationalization and growth of newly listed firms: European evidence'. *Journal of International Business Studies*, **40**, 1260–1276.
- Francoeur, C., Labelle, R. and Sinclair-Desgagné, B. (2008). 'Gender diversity in corporate governance and top management'. *Journal of Business Ethics*, **81**, 83–95.
- Gambardella, A. (1995). *Science and Innovation: The U.S. Pharmaceutical Industry During the 1980s*. Cambridge, UK: Cambridge University Press.
- Hagedoorn, J. and Cloudt, M. (2003). 'Measuring innovative performance: is there an advantage in using multiple indicators?' *Research Policy*, **32**, 1365–1379.
- Hall, B.H., Jafe, A. and Trajtenberg, M. (2005). 'Market value and patent citation'. *Rand Journal of Economics*, **36**, 16–38.
- Heeley, M.B., Matusik, S.F. and Jain, N. (2007). 'Innovation, appropriability, and the underpricing of initial public offerings'. *Academy of Management Journal*, **50**, 209–225.
- Heiens, R.A., Leach, R.T. and McGrath, L.C. (2007). 'The contribution of intangible assets and expenditures to shareholder value'. *Journal of Strategic Marketing*, **15**, 149–159.
- Herring, C. (2009). 'Does diversity pay? Race, gender, and the business case for diversity'. *American Sociological Review*, **74**, 208–224.
- Kleinschmidt, E.J. and Cooper, R.G. (1991). 'The impact of product innovativeness on performance'. *Journal of Product Innovation Management*, **8**, 240–251.
- Konrad, A., Winter, S. and Gutek, B. (1992). 'Diversity in work group sex composition'. *Research in the Sociology of Organizations*, **10**, 115–140.
- Krishnan, G.V., Parsons, L.M. (2007). 'Getting to the bottom line: An exploration of gender and earnings quality'. *Journal of Business Ethics*, **78**, 65–76.

- Lanjouw, J. and Schankerman, M. (2004). 'Patent quality and research productivity: measuring innovation with multiple indicators'. *Economic Journal*, **114**, 441–465.
- Lee, P.M. and James, E.H. (2007). 'She'-e-os: Gender effects and investor reactions to the announcements of top executive appointments'. *Strategic Management Journal*, **28**, 227–241.
- Lee, Y-J. and Lee, J.D. (2008). 'Strategy of start-ups for IPO timing across high technology industries'. *Applied Economics Letters*, **15**, 869–877.
- Levitas, E. and McFadyen, M.A. (2009). 'Managing liquidity in research-intensive firms: signaling and cash flow effects of patents and Alliance activities'. *Strategic Management Journal*, **30**, 659–678.
- Makadok, R. (2001). 'Toward a synthesis of the resource-based and dynamic-capability views of rent creation'. *Strategic Management Journal*, **22**, 387–401
- Makri, M., Lane, P.J. and Gomez-Mejia, L.R. (2006). 'CEO incentives, innovation, and performance in technology-intensive firms: A reconciliation of outcome and behavior-based incentive schemes'. *Strategic Management Journal*, **27**, 1057–1080.
- Michel, JG. and Hambrick, D.C. (1992). 'Diversification posture and top management team characteristics'. *Academy of Management Journal*, **35**, 9–37.
- Miller, T. and Triana, M.C. (2009). 'Demographic diversity in the boardroom: Mediators of the board diversity-firm performance relationship'. *Journal of Management Studies*, **46**, 755–786.
- Mohan, N.J. and Chen, C.R. (2004). 'Are IPOs priced differently based upon gender'. *The Journal of Behavioral Finance*, **5**, 57–65.
- Nieva, V. and Gutek, B. (1980). 'Sex effects on evaluation'. *Academy of Management Review*, **5**, 267–276.

- Ragupathy, M.B. (2011). 'Initial public offering: A critical review of literature'. *The IUP Journal of Behavioral Finance*, **8**, 41–50.
- Ritter, J.R. and Welch, I. (2002). 'A review of IPO activity, pricing, and allocations'. *Journal of Financial Economics*, **57**, 1795–1828.
- Rosener, J.B. (1995). *America's Competitive Secret: Utilizing Women As A Management Strategy*. New York: Oxford University Press.
- Sackett, P., DuBois, C. and Noe, A. (1991). 'Tokenism in performance evaluation: The effects of work representation on male-female and black-white differences in performance ratings'. *Journal of Applied Psychology*, **76**, 263–267.
- Shane, H. and Klock, M. (1997). 'The relation between patent citations and Tobin's Q in the semiconductor industry'. *Review of Quantitative Finance and Accounting*, **9**, 131–146.
- Shane, S. and Stuart, T. (2002). 'Organizational endowments and the performance of university start-ups'. *Management Science*, **48**, 154–170.
- Schoonhoven, C.B., Eisenhardt, K.M. and Lyman, K. (1990). 'Speeding products to market: Waiting time to first product introduction in new firms'. *Administrative Science Quarterly*, **35**, 177–207.
- Shrader, C. B., Blackburn V. B. and Iles, P. (1997). 'Women in management and firm financial performance: An exploratory study'. *Journal of Managerial Issues*, **9**, 355–372.
- Smith-Doerr, L. (2004). *Women's Work. Gender Equality vs. Hierarchy in the Life Sciences*. Boulder (CO): Lynne Rienner Publishers.
- Sorescu, A.B., Chandy, R.K. and Prabhu, J.C. (2003). 'Sources and Financial Consequences of Radical Innovation: Insights from Pharmaceuticals'. *Journal of Marketing*, **67**, 82–102.
- Stalk, G. and Hout, T.M. (1990). *Competing against time*. New York: Free Press.
- Stephan, P.E. (1996). 'The economics of science'. *Journal of Economic Literature*, **34**, 1199–1235.

- Subramanian, A. and Nilakanta, S. (1996). 'Organizational innovativeness: exploring the relationship between organizational determinants of innovation, types of innovations, and measures of organizational performance'. *Omega*, **24**, 631–647.
- Swim, J., Borgida, E., Maruyama, G. and Myers, D. (1989). 'Joan MacKay versus John McKay: Do gender stereotypes bias evaluations?' *Psychological Bulletin*, **105**, 409–429.
- Teece, D.J., Pisano, G. and Shuen, A. (1997). 'Dynamic capabilities and strategic management'. *Strategic Management Journal*, **18**, 509–533.
- Teece, D.J. (2007). 'Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance'. *Strategic Management Journal*, **18**, 1319–1350.
- Terjesen, S., Sealy, R. and Singh, V. (2009). 'Women directors on corporate boards: A review and research agenda'. *Corporate Governance: An International Review*, **17**, 320–337.
- Tidd, J., Bessant, J. and Pavitt, K. (2001). *Managing innovation. Integrating technological, market and organizational change*. Chichester: Wiley.
- Trajtenberg, M. (1990). 'A penny for your quotes: patent citations and the value of innovations'. *RAND Journal of Economics*, **21**, 172–187.
- Uzzi, B. (1996). 'The sources and consequences of embeddedness for economic performance of organizations: The network effect'. *Academy Sociological Review*, **61**, 674–698.
- Wang, C.L. and Ahmed, P.K. (2007). 'Dynamic capabilities: A review and research agenda'. *International Journal of Management Reviews*, **9**, 31–51.
- Welbourne, T.M., Cychota, C.S. and Ferrante, C.J. (2007). 'Wall Street reaction to women in IPOs. An examination of gender diversity in top management teams', *Group & Organization Management*, **32**, 524–547.
- Wong, P.K. and Singh, A. (2010). 'University patenting activities and their link to the quantity and quality of scientific publications'. *Scientometrics*, **83**, 271–294.

- Yap, C.M., Chai, K.H. and Lemaire, P. (2005). 'An empirical study of functional diversity and innovation in SMEs'. *Creativity and Innovation Management*, **14**, 176–190.
- Zahra, S. and Filatotchev, I. (2004). 'Governance of the entrepreneurial threshold firm: A knowledge-based perspective'. *Journal of Management Studies*, **41**, 885–897.
- Zimmerman, M.A. (2008). 'The influence of top management team heterogeneity on the capital raised through an initial public offering'. *Entrepreneurship Theory and Practice*, **32**, 391–414.

ⁱ Using patent citations to measure the value of a patent stock may have a potential truncation bias (Trajtenberg, 1990), since citations to a given patent typically keep coming over long periods of time, but citations are observed until a specific moment (in this case, the date of the IPO). This problem specially influences the most recent patents. Patents applied for in 2002, for example, will be cited less than patents applied for in 1998. Nevertheless, it is not clear to what extent the market anticipates future citations to evaluate a firm. Moreover, Hall et al. (2005) state that past citations can be used to forecast future ones, and empirically demonstrate that past citations clearly help in forecasting the value of knowledge assets and future returns. Additionally, observing the behavior of citation lags and the number of citations that the patent stocks of the sample have received, the absolute expected number of missing citations is small.

Table 1
Means, standard deviations, and correlations

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. IPO value per share	13.79	7.05	1.00											
2. Gender diversity in top management	0.11	0.16	-0.15*	1.00										
3. Patent stock's value	14.17	67.00	0.14*	0.12	1.00									
4. Products under development	4.67	3.59	0.22*	0.09	0.09	1.00								
5. Products on the market	1.46	5.21	0.16*	0.04	0.06	0.22*	1.00							
6. Female CEO	0.01	0.13	0.03	0.21*	0.00	-0.14*	-0.05	1.00						
7. TMT functional diversity	0.73	0.11	0.15*	0.13*	0.22*	-0.02	0.06	0.02	1.00					
8. TMT firm tenure	2.86	1.60	0.13*	0.04	0.07	0.15*	0.36*	0.01	0.00	1.00				
9. TMT prior experience in related industries	6.96	3.39	0.14*	0.06	0.09	0.16*	0.18*	-0.01	0.11	0.05	1.00			
10. Firm size	81.60	114.81	0.16*	-0.05	0.27*	0.19*	0.21*	-0.02	0.07	0.12	0.03	1.00		
11. Firm age	6.19	4.66	0.08	0.07	0.15*	0.16*	0.18*	0.00	0.01	0.30*	0.11	0.53*	1.00	
12. Net income	0.09	0.29	-0.01	0.01	0.02	0.04	0.24*	-0.04	-0.03	0.32*	0.14*	0.18*	0.30*	1.00

* $p < 0.05$

Table 2
Results of regression analysis for IPO value per share

	Model 1		Model 2		Model 3	
<i>Independent variables</i>						
Gender diversity in top management			-6.988*	(2.936)	-4.553	(2.786)
Patent stock's value					0.145*	(0.005)
Products under development					0.385**	(0.131)
Products on the market					0.217*	(0.085)
<i>Control variables</i>						
Female CEO			5.454	(3.565)	5.654	(3.325)
TMT functional diversity	8.018*	(3.709)	9.091*	(4.181)	9.762**	(3.352)
TMT firm tenure	0.064*	(0.029)	0.065*	(0.027)	0.048*	(0.018)
TMT prior experience in related industries	0.385**	(0.114)	0.372**	(0.102)	0.296*	(0.141)
Firm size	0.013**	(0.005)	0.011*	(0.005)	0.011*	(0.005)
Firm age	-0.196	(0.160)	-0.157	(0.159)	-0.238	(0.157)
Net income	-1.164	(1.802)	-1.304	(1.786)	-0.637	(1.693)
Annual dummies (25 years)	5 years*		5 years*		4 years*	
Constant	11.502**	(3.418)	11.210**	(3.381)	7.443*	(3.394)
N (number of firms)	229		229		229	
R^2	0.175**		0.203***		0.3352***	
Adjusted R^2	0.099		0.120		0.2382	
ΔR^2			0.027*		0.131***	
F	2.30**		3.32**		4.56**	

^a Standard errors are in parentheses

*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$ (two-tailed test)