

Do newly public technology INVs benefit from their pre-IPO internationalization?

Abstract

The strategic importance of early internationalization for international new ventures (INVs) is well acknowledged, but its financial impact remains unexplored. Building on dynamic capabilities literature, we propose that a broader scope of internationalization before initial public offerings (IPOs) positively impacts the valuation of the INVs. The results from a sample of 180 newly public new ventures indicate that firms' pre-IPO internationalization helps reduce IPO underpricing and increases post-IPO valuation. In addition, these effects are more salient for firms with a higher degree of technological innovations. Overall, this study offers fresh implications for the international entrepreneurship and finance literature, uncovering brand-new IPO-based explanations that early internationalization can help create shareholder value.

Keywords; international new venture; IPO; underpricing; value creation; high technology

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Introduction

International new ventures (INVs) often expand to global markets without building economies of scale in their domestic markets. They pursue internationalization with the goal to explore market opportunities and learn from such markets (Autio, Sapienza & Almeida, 2000; Oviatt & McDougall, 1994; 2005). International entrepreneurship literature provides explanations of how international expansion of INVs can lead to firm performance through dynamic capabilities, defined as firms' internal capabilities in creating and maintaining competitive advantages to achieve superior performance (Casillas, Moreno & Acedo, 2012; Mattew and Zander, 2007; Mudambi & Zahra, 2007; Rialp, Rialp & Knight, 2005; Weerawardena, Mort, Liesch & Knight, 2007; Zahra, Ireland, & Hitt, 2000). While internationalization increases the opportunities for growth, there is also great risk associated with developing the needed capabilities (Prashantham & Floyd, 2012; Sapienza, Autio, George, & Zahra 2006). In particular, Sapienza et al. (2006) argue that early internationalization may decrease the chance of firm survival in the short term because internationalization activities abate a firm's limited resources. LiPuma (2012) shows that young technology-based ventures with internationalization may not increase their values at the time of Initial Public Offering (IPO). What remains unclear is the role of early internationalization in both short-term and long-term value creation of new ventures (Certo, Holcomb & Holmes, 2009).

The IPO process represents a particularly viable context to understand the impact of early internationalization given the substantial uncertainty surrounding the survival of INVs. IPO provides important long-term capital that leads to further expansion of the issuing company. In

the capital market, investors reward the firms with high legitimacy by paying premium prices to acquire equities of the organizations (Zuckerman, 2000). However, information asymmetry regarding the value of the new venture and its future prospects may also lead to underpricing, which impedes short-term IPO valuation. Moreover, although firms prepare for an IPO to attract investors' attention, the attention doesn't necessarily lead to long-term investment for future growth. They also need to develop dynamic capabilities for long-term growth since IPO firms usually lack operating history, are riskier than establishments, and face the liability of market newness (Varshney & Robinson, 2004). Therefore, both the short term and long term success of IPO are critical to the INV growth (Carpenter, Pollock & Leary, 2003; LiPuma, 2012). In this study, we specifically focus on pre-IPO internationalization through the lens of dynamic capabilities of INVs. A broader scope of internationalization at an early stage creates learning opportunities for the growth of an INV. Furthermore, these opportunities can be captured and converted into value through technological innovations. Thus, we argue that the interaction of early internationalization and technological innovation contributes to the IPO success of INVs. Building on research of international entrepreneurship and dynamic capabilities, we argue that international capabilities along with technological capabilities developed at the early stage of a firm's growth leads to a long-term value creation. Drawing on signaling theory and IPO research, we argue that these capabilities can signal the quality of INVs, and further neutralize the threat of underpricing caused by information asymmetry between issuing firms and investors.

We test our theoretical predictions on a sample of 180 high technology INVs that went public between 1998 and 2008. INVs are defined as those firms that have entered international markets by the age of eight or younger. The present paper makes several contributions to the research on international entrepreneurship. First, this paper examines the value creation of INVs

whereas previous studies have only focused on the growth and sales of international entrepreneurial firms (Jantunen, Nummela, Puumalainen & Saarenketo, 2008; Zhou, Barnes, & Lu, 2010). Although LiPuma (2012) employs a pre-money valuation measure which is the market valuation that a firm achieves immediately before the public offering, our study examines both IPO underpricing and long-run return. These two widely used market-based measures directly gauge the investors' perception and acceptance of INVs. While our study confirms the results from previous studies on the relationship between internationalization and firm performance, we advance the understanding by suggesting that INVs can build value creation on their dynamic capabilities --- early internationalization along with technological innovation. Secondly, we attempt to provide insights regarding internationalization for young IPO firms in high technology industries. Although the risk and false opportunities are not unusual in the internationalization process, there appears to be a source of learning, which helps new ventures better define their opportunities for further growth (Chandra, Styles & Wilkinson, 2012). Our research implies that INVs can signal a learning advantage through dynamic capabilities. Thirdly, our results are of particularly interest for those with specialized investment in both international markets and technological innovations. Meaningful implications are provided to international entrepreneurs who pursue an opportunity to obtain long-term capital from their ventures.

The rest of the paper is organized as follows. Section 2 presents the theoretical context of the study and develops the hypotheses. Section 3 describes the methodology and the data, followed by Section 4 presenting analysis of results. Discussion and conclusion in Section 5 concludes the paper.

Literature review

Value creation of INVs

Underpricing is defined as the selling of shares below their market value and is determined by the difference between the offer price and the closing price on the first day of trading, expressed as a percentage of the offer price. This represents one of the most prevalent measures of short-term IPO performance (Ritter, 1991; Ritter & Welch, 2002). Underpricing represents the money left on the table by the issuers at the time of IPO, a sizeable indirect cost of going public. The information asymmetry theory assumes that the IPO pricing is a product of information differences between potential investors and issuing firms. If no signal is sent to the market, asymmetric information will result in adverse selection in the IPO market (Leland & Pyle, 1977; Rock, 1986).

According to Spence's signaling theory (2002), firms with strong capabilities tend to invest in signaling to stand out in competition, especially when investors have limited information to differentiate high quality firms from lesser quality ones. Therefore, the success of an IPO is the result of transmitting favorable signals in uncertain markets. Specific signals can help reduce uncertainty about a firm's quality and give a better outlook to stakeholders. In this study, we argue that the dynamic capabilities, scope of international expansion and technological innovations, provide effective signals to potential stakeholders. In addition, the signaling theory implies that only good firms can afford to "leave money on the table" by underpricing (Allen & Faulhaber 1989; Chemmanur, 1993). To be credible, the signal must be too costly to be imitated by "bad companies".

The idea of certification or legitimacy is central to the signaling theory. Legitimacy of a new venture shows how well an organization is accepted by its investors. It demonstrates a firm's precondition to compete (Pfeffer & Salancik, 1978). In the capital market, price represents

the discounted present value of expected future cash flows and also reflects the value of intangible assets. Investors reward the firms with high legitimacy by paying premium prices to acquire the equities of the organization while they would pay a discount otherwise (Zuckerman, 2000). When investors contemplate the legitimacy of a firm, they use the behaviors and traits of the firm to form a mental model of a legitimate IPO. An IPO issuer not fitting this mental model may be under-valued by the potential investors. To new ventures, internationalization represents a search and experimentation process whereby firms explore a variety of strategies to find the right one for their competitive situation. The speed and scope of internationalization are considered as innovative, proactive, and risk-seeking behaviors, which provide the foundation to develop the concept of international growth opportunities for new ventures (Oviatt and McDougall, 2005). Investors would positively value the IPO if such internationalization would enhance firm performance.

Scholars have examined the market valuation that a firm achieves in the years following the IPO as long-run market return (Chahine & Filatotchev, 2008). Holding period return captures stock price movement over time relative to the offer price. Aggarwal and Rivoli (1990) and Ritter (1991) document the underperformance of IPOs after three years. “Fads theory” explains that overoptimistic investors could sell the IPO shares if their higher expectations are not fulfilled in the long run. If firms with early internationalization experience tend to underperform, it possibly implies that their IPOs are subjects to fads in early post-IPO trading. Otherwise, early internationalization may serve as an even stronger signal to indicate firm’s long run viability.

Based on the signaling theory and dynamic capabilities research, we hypothesize that IPO underpricing and long-run market return are related to dynamic capabilities of INVs through a broader scope of internationalization and technological innovations.

Hypotheses development

INVs start internationalization at an early stage of development and overcome their newness liability to operate in other countries. These firms discover, evaluate and explore business opportunities in multiple countries (Oviatt & McDougall, 1994; Oviatt & McDougall, 2005). By doing so, they create capabilities in the markets where the resources lacked by new ventures are not required. Moreover, the dynamic environment decreases the likelihood that the INV's competitive advantages will be imitated by others (Efrat & Shoham, 2012). Therefore, dynamic capabilities, such as technology, international marketing as well as managerial expertise, have been considered as a firm's ability to address a rapidly changing environment to support a firm's long-term performance (Matthew & Zander, 2007; Mudambi & Zahra, 2007; Rialp et al., 2005; Weerawardena et al., 2007)

Dynamic capabilities also reflect a firm's ability to seek and create new learning opportunities (Teece, 2007). Some studies have found that young firms with a proactive activity to pursue internationalization tend to have greater entrepreneur orientation, which further leads to greater innovation for better performance (Kocak & Abimbola, 2009; Kropp, Lindsay, & Shoham, 2006; Ruokonen & Saarenketo, 2009). International entrepreneur orientation is demonstrated in dynamic capabilities including learning capabilities and growth capabilities, and positively related to the international performance (Jantunen et al., 2008; Zahra, 2005; Zhou et al. 2010). Some scholars refer to organizational learning literature and argue that INVs benefit from a learning advantage to achieve a superior performance (Autio et al. 2000). In this literature, internationalization at an early stage provides learning flexibilities. Such firms often face fewer home-based routines, less political power in home-based activities and fewer relationship obligations with domestic partners (Carr, Haggard, Hmleleski, & Zahra, 2010; De

Clerq, Sapienza, Yavuz, & Zhou, 2012). Younger firms with more resource limitations are more likely to attend carefully to their foreign operations, so they learn more from the process and build new international competencies (Sapienza et al. 2006).

While some scholars find that international expansion increase the growth prospect of INVs (Fernhaber & Li, 2010; Carr et al., 2010), others find such expansion may decrease the likelihood of survival (Sapienza et al. 2006) because of the greater risk associated with developing the capabilities needed to survive (Autio et al. 2000; Sapienza et al., 2006). In the early stage of internationalization, firms often lack the information and knowledge about foreign markets and practices of international activities, which accentuate the perception of risk and uncertainty (Liesch, Buckley, Simonin, & Knight, 2012). Although the risks and false opportunities are not unusual in internationalization process, there appear to be a source of learning, which helps new ventures better define their opportunities for further growth (Chandra et al., 2012).

While previous studies have been focused on discussing internationalization and INV performance, few studies have investigated how investors value the INVs through dynamic capabilities, except for the study by LiPuma (2012). Moen, Sorbeim & Erikson (2008) suggest that born global firms possess specific potentials to attract critical sources of capital to grow, such as the increasing globalization of markets, growing demand for specialized and customized products, and possible flexibility and adaptability of entrepreneurial firms.

In the hypotheses below, we investigate the internationalization of INVs in the high technology industry, which have been shown to signal the quality of the firms and facilitate subsequent economic returns to investors (Zahra, 2005), conveys important information for the IPO valuation. Research has shown that both the speed and the scope of internationalization have

been incorporated into a combination of innovative, proactive, and risk-seeking behaviors, which provides the foundation to develop the concept of international entrepreneurship (Oviatt & McDougall, 2005). Moreover, the timing of internationalization has been studied as the key factor to impact firm performance (Jones & Coviello, 2005; Sapienza et al. 2006). Therefore, in this study, we specifically discuss the scope of internationalization in the pre-IPO stage of new venture development. Furthermore, the interactions between the two dynamic capabilities, the technological innovation and the scope of internationalization, conveys important signals that have implications for future valuation of IPO performance.

Scope of Pre-IPO internationalization.

Entrepreneurial firms pursue internationalization processes without initial resources and leverage their newness liability as an advantage to grow internationally. The process through which the new ventures upgrade their capabilities is built on exploring external sources of knowledge (Oviatt & McDougall, 2005; Presutti, Boari & Fratocchi, 2007). Investors can be concerned about potential misrepresentations by the new ventures since some attributes of resources and capabilities are difficult to judge. However, for INVs, internationalization can be observed and reflect their advantages resources and capabilities. Some firms may involve modest commitments and are narrow in the scope of international expansions. Higher-quality new ventures are willing to invest in the capabilities to differentiate themselves from others. In this study, we argue higher-quality new ventures have an interest in associating with the most prominent investment in international markets.

First, U.S. firms introduce their products and managements in both foreign and domestic markets, and such global IPOs increase firms' visibility and capabilities which lead to reduced information cost and uncertainty. Ripolles, Blesa and Monferrer (2012) argue that high

commitment entry leads to international performance of INVs with stronger capabilities (e.g. marketing capabilities). Li, Qian and Qian (2012) find that early internationalization impacts firm performance in high technology industries. The study supports the argument that self-reinforcing learning enhances a proactive culture for international growth and a firm's capabilities to seek and exploit opportunities in international markets at an early stage (Autio et al., 2000; Casillas et al., 2012; Sapienza et al., 2006; Zahra et al., 2000). Thus, the proactive attitude is fundamental to explain why new ventures initiate international learning across borders with greater speed than others (Kulvalainen, Sundqvist & Servais, 2007). Therefore, an IPO firm with international expansions at an early stage can ease investors' concerns about the firm's capabilities and prospects.

Second, a broader scope of international entries can be considered as a certification of the firm's ability to operate in multiple markets. Furthermore, a firm with limited international entries that focuses on explorative dynamic capabilities may rely on managers' prior experience for internationalization, and such experience is not sufficient to support a broad scope of internationalization. A firm may have greater difficulty to attain social acceptance from potential investors if it operates in a few markets. Although higher degree of internationalization associated with broader scope of international expansion may also raise the information asymmetry between ventures and investors (Shrader, McDougall & Oviatt, 2000), highly diversified firms may be perceived as more legitimate since risk and uncertainty decreases through the process of experiential learning in internationalization (Zuckerman, 2000). Scholars have suggested that the scope of international diversification is positively related to firm profitability given the market opportunities increases the market power of international firms (Delios & Beamish, 1999).

Third, internationalization increases the cost of IPOs for INVs (e.g. marketing expenses in both local and foreign markets), which is a very costly signal for lower quality firms to imitate. As INVs increase international entries, the gains are likely to increase. Meanwhile, on the other hand, the costs may increase at a fast pace as well. Extensive global operations may increase governance costs as well as the complexity of managerial information processing. Moreover, exploratory internationalization through a broader scope of new countries do not normally have the opportunity to immediately realize the profits from sustained revenues streams because both available financial resources and returns are invested in further international expansions and new adaptations (Prange & Verdier, 2011). Thus new ventures with a broader scope of international expansions can also signal the quality by differentiating themselves with lower quality firms with limited commitment to international market.

Therefore, we suggest

H1a: The scope of pre-IPO internationalization is negatively associated with IPO underpricing of INVs.

H1b: The scope of pre-IPO internationalization is positively associated with IPO long-run market return of INVs.

The contingent factor of technological innovation.

Technological innovations are related to firm's ability to acquire, aspire and integrate knowledge from external environments. Previous research argues that increased innovative activities negatively impact the short-term performance of an IPO (Aboody & Lev, 2000; Heeley, Matusik, & Jain, 2007). Aboody and Lev (2000) find that insider gains are substantially larger for R&D intensive firms. Heeley et al (2007) directly test the relationship between innovation and IPO underpricing. They conclude that firm's innovation activities help to reduce IPO underpricing only in the transparent industries. Others find that investment in innovation with prospects of developing innovative products and services lead to increased performance (Deeds, DeCarolis, &

Coombs, 1997). Gassmann & Keupp (2007) suggest that the early and rapid internationalization is integrated with firm's scope and volume of advantages on intellectual property rights. In this study, we follow previous studies to evaluate the influence of the extent and scope of technological innovation (Zahra et al. 2000).

We argue that along with firms' other dynamic capabilities, such as, internationalization, the effect of innovation activities help to explain the value creation of INVs. Previous studies have found that a higher degree of internationalization promotes firm's ability to improve performance through technological innovation. Zahra et al. (2000) claim that international performance is driven by firm's capability to create new knowledge to suit the requirements of the international market. More studies have found that technological resources can influence the internationalization of the firm (Tsang, Yip, & Toh, 2008; Zahra et al. 2000). New ventures with internationalization may increase the returns on their innovations, reduce the risk of competing in a single domestic market, and protect themselves from the mature R&D intensive firms (Hitt, Hoskisson, & Ireland, 1994; Zahra, 2005). Therefore, we argue that a combination of international and technological knowledge may give a firm the opportunity to learn new capabilities, update existing products and develop new ones (Kylaheiko, Jantunenm Puumalainen, Saarenketo, & Tupoura. 2011) to enhance value creation.

First, we suggest that technological innovations can help INVs to increase performance prestige as a consequence of selling new version of technological offering and reputation in the international markets. The early success of new ventures often depends on the enterprise routines that fit the pursuit of appropriate external opportunities. The emergence of new opportunities in the technology development presents managers with challenges while some of the managers may be more willing to take reasonable risks to exploit such opportunities. Given our previous

discussion, as opposed to large established firms, INVs face more acute resource limitations and liabilities. With managers' sufficient understanding of technological development and effective innovation activities, the technological innovation is another influential signal to attain legitimacy of new ventures (Powers & McDougall, 2005). Gassmann & Keupp (2007) find that not only the specialized knowledge but the uniqueness of technological products and processes serve as the foundations of INVs' competitive advantages. Therefore, a firm with more technological innovations will be more likely to benefit from the expansion in international markets (Knight & Cavusgil, 2004; Mumtaz & Zahra, 2007; Zahra et al. 2000).

Second, Gleason & Wiggenhorn (2007) argue that intangibility is an important determinant of abnormal returns (value creation) of INVs, and their results imply that investment in proprietary technologies and processes is essential to the success of international expansions. Thus, high technological capabilities may have a stronger effect in reducing the uncertainty inherent in the international entrepreneurial IPOs, and lending an improved legitimacy. INVs from high technology industries are more likely to build strong relationships in foreign countries because the focus of innovative searches is more likely to reside within the external network. As search-oriented firms, new ventures pursuing early internationalization may seek opportunities in new countries in order to generate new products and technologies. Thus, new ventures with strong technological innovation can compete on a faster speed of identifying business opportunities in other countries.

Third, as technological innovations increase, so does the firm-specific information necessary to evaluate the growth opportunities. Investors need to know firm-specific information to assess whether an INV will be able to capitalize its investments in international expansions. Firms create and secure inventions, then demonstrate the ability to recoup the cost and make a

profit during further growth in international markets. Foreign market entry and growth also increase managerial complexity, and firms may need to take time to deal with the complexity of international activities. However, technological development and product innovation provide additional benefits, and makes other firms less likely to compete since international entrepreneurs and technology-based ventures have very different organizational traits.

Therefore, we suggest:

H2a: pre-IPO technological innovations positively moderate the relationship between the scope of pre-IPO internationalization and IPO underpricing of INVs.

H2b: pre-IPO technological innovations positively moderate the relationship between the scope of pre-IPO internationalization and IPO long-term performance of INVs.

Methodology

Data Collection

Data used to test the hypotheses in this study were obtained from several sources. First, we use the VentureXpert database from Thomson Financial. We collect our data for all firms initiating an IPO in U. S. between 1998 and 2008. This period was chosen because these years yielded the highest number of new ventures in high technology industries. We only include IPOs in high technology industries that went public at the age of eight or younger, therefore satisfying the notion of new ventures with a high growth focus. By the age of eight, firms have developed well in their operations, as they grow from being start-ups to become mature enterprises (Baum, Locke and Smith, 2001). Second, *Mergent Online* provides additional information about firms' subsidiaries; in this way we can identify internationalized firms as those who have at least one subsidiary located a country other than the United States. Third, we rely on *Hoover's Handbook of Emerging Companies*, *Mergent Online*, *Compustat*, *Edgar SEC filings* and company websites in order to get other information. Financial information, including assets, sales, R&D expenditures and firm size were obtained from *Compustat* and supplemented by *Hoover's*

Handbook of Emerging Companies. The U.S. Patent and Trademark Office (USPTO) provided archival data about patents. We used the USPTO and NBER databases to aggregate the data on the firm level. After applying these screens, we have a dataset of 180 IPOs.

Measurements

We measure our main variables (e.g. underpricing, long-run market return, scope of internationalization, and technological innovation) at the level of each IPO firm.

Dependent variables.

In our study, the two key dependent variables are IPO underpricing and long-run market returns respectively. First-day trading information and stock return data for the sample of IPOs are obtained from Security Data Company (SDC) and the Center for Research in Security Prices (CRSP).

IPO underpricing is measured as the percentage return in stock price from offer price (SDC) to the first day close (CRSP), i.e., $(\text{closing price} - \text{offer price}) / \text{offer price}$. Underpricing occurs when the first day closing price is higher than the offer price, meaning the firm is selling its shares at a price lower than the market value, “leaving money on the table”. We try to investigate whether signals, such as, the scope of internationalization and technology innovation, are positively interpreted by the investment community at the time of IPOs.

Long-run market returns are measured as the buy-and-hold returns for 3 years after IPO. The underpricing of IPO stocks appears to be a short-run phenomenon. It is commonly known that IPOs underperform the market 3 to 5 years after they become public, consistent with the notion that investors may be overoptimistic towards young growth firms, and firms take advantage of “windows of opportunity” (Ritter 1991). Again we try to understand whether these

two dependent variables will also signal the firm's long-run competitiveness, and have the potential to provide reliable information on the firm's long-run prospect.

Independent variables

As mentioned earlier, *Mergent Online* is the major source to get data to measure international activities on both the time and the scope dimensions.

We choose the number of new countries entered as the final measure for the scope of international expansion. The total number of new countries entered by new ventures is created to measure the *Scope of Pre-IPO Internationalization*, therefore, new ventures with more new countries entered are considered as having a higher degree of international exploration. We also create the additional measures to run the robustness test (e.g. the number of new foreign entries before IPO and the number of continents firms have operations on before the IPO year).¹

Moderating variables

A key problem in empirical research related to technological knowledge is how to measure innovation. A large body of work in management relies on patents to capture the firm knowledge base (Hall, Jaff and Trajtenberg, 2005). Although the use of patents involves some limitations, such as, patents may not fully represent the technological knowledge of a company. Nevertheless, this drawback is less of a concern in high technology industries, especially patenting is routinely practiced by new ventures. We measure *the volume of a firm's technological innovation* as the number of new patents over the years before IPO and *the scope of technological innovation* as the number of sub-classification of the firm patent knowledge

¹ Scope of international expansion has three different measures: number of new countries entered, number of continents where international new venture operates, and institutional distance of all countries entered. And these measures provide high correlation among each other, which support the evidence that three measures are along with the same variable.

base. We use the natural logarithm values for these two contingent variables to avoid the impact of outliers.

Control variables

In order to account for exogenous influences on IPO performance, our study includes relevant control variables: firm age, firm size, hot IPO indicator, prestigious underwriter indicator, venture capitalist backing indicator, R&D expenses, industry and year dummies. Firm age and size can affect the IPO performance as larger and older firms typically have more resources (Carr et al. 2010). We control for firm size by including the natural logarithm of an IPO firm's total assets in millions of dollars, and firm age as the new venture's age at the year of IPO since inception. Various firm characteristics have been related to the cross-sectional variations in IPO valuation. For example, Booth and Smith (1986), Carter and Manaster (1990), Carter, Dark, and Singh (1998) show that prestigious underwriters are associated with IPOs that have smaller underpricing because top ranked investment banks have their reputational capital at stake when they underwrite IPOs. Thus, we use the Carter and Manaster's metric of investment bank "pecking order" from 1992 to 2007. Prestigious Underwriter is a dummy variable that equals to 1 if the underwriter has a ranking of 9.0 or higher, and 0 otherwise. IPOs backed by venture capitalists also appear to be rewarded with lower underpricing since venture capitalists are commonly recognized as a better advising and monitoring device (Barry, Muscarella, Peavy, & Vetsuypens, 1990; Megginson & Weiss, 1991). Thus, VC dummy is an indicator variable that equals to 1 if the new venture is backed by venture capitalists and 0 otherwise. Previous literatures have documented that IPOs tend to come in waves, and IPOs may be strategically timed to take advantage of favorable market conditions (Ritter 1984, Lowry 2000). HotIPO is a dummy variable that equals 1 if the IPO's final offer price is greater than or equal to the original

mid filing price, and 0 otherwise. To control for industry effects as industries differ in the social expectations of internationalization, we create five dummy variables based on Standard Industry Classification (SIC) codes: Computer related industry, Communication related industry, Semiconductor, Medical and Health sector and Biotechnology sector. The time period between 1999 and 2000 is known as the economic bubble. Thus, we also include one dummy variable to indicate the year of IPO. Furthermore, this study measures R&D expenses as a percentage of the revenues during the time of IPO.

Analysis and results

Ordinary least squares (OLS) is used to analyze the differences in performance. Table 1 presents the descriptive statistics and correlation matrix.

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The average IPO underpricing in our sample is 75%, while their 3-year long-run market return is -4%. Most of the IPO firms have prestigious underwriters and VC backing. Half of the new ventures in our sample (51%) already have international expansion before IPO. On average they have about 2 new country entries.

Table 2 and Table 3 present the Ordinary Least Squares (OLS) regression results for testing Hypothesis 1 and Hypothesis 2. The baseline model Model 1 is augmented by adding the scope of Pre-IPO internationalization (Model 2), the scope of pre-IPO internationalization squared (Model 3), the volume of technological knowledge (Model 4), the interaction between scope of Pre-IPO internationalization and volume of technological knowledge (Model 5), the scope of technological knowledge (Model 6), and the interaction between scope of Pre-IPO internationalization and scope of technological knowledge (Model 7) respectively. In order to minimize possible multicollinearity between the main and interaction effects, we mean center all

independent variables and create the interaction terms accordingly. The result from VIF test shows that multicollinearity is not an issue in our analysis.

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Insert Table 2 and Table 3 about here
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Table 2 presents the regression results with the underpricing of IPO firms as the dependent variable. Hypothesis 1a predicts that higher scope of pre-IPO internationalization leads to a lower IPO underpricing. Model 2 shows a significantly negative relationship between scope of internationalization and IPO underpricing ($b=-0.05$, $p<0.01$), which suggests that firms with a larger scope of internationalization are more likely to receive smaller underpricing. The result is also economically significant. Model 4 and Model 5 test the effect of volume of technological knowledge on underpricing. We didn't find the significant relationship between the volume of technological knowledge and IPO underpricing ($b=-0.02$, $p>0.1$), but the volume of technological knowledge moderates the relationship between the scope of internationalization and IPO underpricing ($b=-0.02$, $p<0.1$). Model 6 and Model 7 test the effect of the scope of technological knowledge on underpricing. We didn't find the significant relationship between the scope of technological knowledge and IPO underpricing ($b=-0.07$, $p>0.1$), but the volume of technological knowledge moderates the relationship between scope of internationalization and IPO underpricing ($b=-0.07$, $p<0.001$), confirming Hypothesis.

Table 3 presents the regression results with the 3-year long-run performance of the IPO firms as the dependent variable. Hypothesis 1b predicts that a higher scope of pre-IPO internationalization leads to a higher long-term IPO return. Model 2 shows a significantly positive relationship between the scope of pre-IPO internationalization and post- IPO 3-year returns ($b=0.07$, $p<0.05$), which suggests that firms with a larger scope of pre-IPO internationalization are more likely to outperform by 7% in the longer time horizon. This result is

consistent with the prediction under Hypothesis 1b. No significant relationship is found in Model 4 and Model 6 when the effect of the volume or the scope of technological knowledge is tested alone. However, the volume of technological knowledge in Model 5 moderates the relationship between the scope of pre-IPO internationalization and IPO long-run returns ($b=0.05$, $p<0.05$), and so does the volume of technological knowledge in Model 7 ($b=0.09$, $p<0.05$). These results confirm Hypothesis 2b.

Additional Analysis

We conduct several additional analyses to ensure that our findings are robust. First, we test our hypotheses on IPO long run market return by using returns of 180 days, 360 days and 720 days, respectively. Overall, the results are robust across all models without significant differences. Second, we also graph the contingent effects of the volume and the scope of technological knowledge. The levels of moderating variables were categorized as “high” if they are above the mean value and “low” if below the mean value. Figure 1a and 1b shows their effects on IPO underpricing. Figure 1a illustrates that international IPO firms with a broader scope of pre-IPO internationalization, together with a higher volume of technological innovation, are likely to receive less underpricing. Figure 1b shows that a broader scope of pre-IPO internationalization, bundled with a broader scope of technological innovation will help international IPO firms to reduce underpricing. The similarity of two graphs shows the volume and the scope of technological innovation lead similar effect on the relationship between the pre-IPO internationalization and IPO performance. Our graphical results are consistent with our empirical results.

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Insert Figure 1a and Figure 1b about here
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Figure 2a and 2b shows the effects on IPO long run market return. Figure 2a illustrates that international IPO firms with a broader scope of pre-IPO internationalization are more likely to create higher value when they are having high volume of technological innovation. Figure 2b shows that international IPO firms with a broader scope of pre-IPO internationalization are more likely to receive higher value when they are having broader scope of technological innovation. Our graphical results are consistent with our expectation about the positive effect of scope of pre-IPO internationalization on IPO performance. Moreover, we find that the effect of volume of technological innovation has smaller marginal effect than the scope of technological innovation.

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Insert Figure2a and Figure 2b about here
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Third, we are well aware of the possibility that when the degree of internationalization intensifies, the agency problem will be exacerbated. A high level of internationalization may raise the transaction and coordination costs, thus increases investors' concern. Moreover, it may also result in a higher level of information asymmetry, which in turn leads to a further price discount in IPOs. Therefore, we test for the existence of a non-linear relationship by introducing a squared term of the scope of pre-IPO internationalization in the regression estimation. We didn't find the U-shape relationship between the scope of pre-IPO internationalization and IPO underpricing ($\beta=-0.00$, $p>0.1$) in Model 3, Table 2. However, we did find a U-shaped relationship between the scope of pre-IPO internationalization and IPO long run market return. The effect of the squared term is positive and significant ($\beta=0.01$, $p<0.001$) in Model 3, Table 3. Specifically, the IPO long run market return involves a gradual decline as new ventures first start international activities, followed by a rapid increase after firms expand into more than two other countries. It may be driven by the fact that some IPO firms do not have international activities before IPO, so we test whether the dummy variable of pre-IPO internationalization is any

different will make a difference in IPO long run market returns. However, the effect of the indicator of pre-IPO internationalization on IPO long run market return is negative but not statistically significant ($\beta=-0.22$, $p>0.10$). We also perform a test to check the moderator effect of technological innovation on nonlinear relationship between pre-IPO internationalization and IPO long run market return. The results are insignificant with regard to either the volume or the scope of technological innovation.

Discussion and conclusion

We use one of the most important phenomena in a company's lifetime, its IPO, to examine whether the internationalization at the pre-IPO stage will influence the IPO underpricing and long-run performance of INVs in high technology industries. A firm's international expansion is one of the direct examples of potential value creating activities. INVs provide a unique opportunity to examine the role of internationalization in IPO valuation. We find that the scope of pre-IPO internationalization impacts IPO valuation through reduced underpricing, and provides a source for long-term competitiveness of the firm. Specifically, in a sample of 180 IPOs in high technology industries between 1998 and 2008, we find that firms entering into more countries before IPO receive less underpricing. The negative and significant relationship between a broader scope of early internationalization and IPO underpricing suggest that internationalization may provide a signal to investors about the quality of the firm, thus reducing the information asymmetry between investors and firms. This is consistent with the international entrepreneurship literature that INVs may gain learning advantages at an early stage as one of dynamic capabilities to grow (Autio et al., 2000; Carr et al., 2010; Ferhaber & Li, 2010).

Moreover, we also find that the effect of the scope of early internationalization on the long-term market return of INVs demonstrates a U-shaped relationship. This supports the

argument that as the scope of international entries increases, the gains, such as, profitability and marketability, are likely to increase as well as the economic and political risks, governance costs, coordination costs, etc. However, the benefits will surpass the negative influences once the scope of international entries reaches a certain degree. Our result supplements previous studies investigating international diversification with firm performance. It demonstrates the interactive effect of governance costs and learning benefits (Delios & Beamish, 1999; Lu & Beamish, 2001). At an early stage, a broader scope of internationalization may reduce firms' value creation because the complexity of the international strategy is costly without commensurate revenues. However, the profitability starts to increase after firms gain experience to overcome the liability of newness and foreignness. This is especially effective in explaining why some entrepreneurial firms' performance declines initially, but increases with further internationalization through experiential learning. This is manifested by the U-shaped relationship in the long-run market return of IPO firms.

We also indicate that a company's technological innovation moderates the relationship between the scope of internationalization and IPO performance. Both the volume and the scope of patents help to reduce IPO underpricing and boost long-term valuation. Our results support the argument that a higher degree of internationalization promotes firms' ability to improve performance through technological innovations (Zahra et al., 2003). Although technological innovations in the high technology industry may potentially raise the issue of information asymmetry since investors need to know firm-specific information to assess the value of their investment (Aboody & Lev, 2000; Heeley et al., 2007), our results confirm the joint signaling effect of the dynamic capabilities --- a broader scope of internationalization and technological innovation. We suggest that firms demonstrate the ability to recoup the costs of investing to

produce, experiment, market, and secure inventions, and realize economic benefits during further growth in international markets.

This paper makes several important contributions. Our research may be useful to those international entrepreneurs who exploit international opportunities at the growth stage of the firm (Oviatt & McDougall, 2005). Our results demonstrate an important insight for international entrepreneurs. They can obtain a higher valuation from investors by using the dynamic capabilities as a positive quality signal. Some scholars find that international expansions increase the growth prospect of INVs, while others question the negative effects, especially the survival issues (Sapienza et al. 2006). Scholars have argued that the information asymmetry fosters the adverse selection given the uncertainty associated with international entrepreneurs, which impedes the exploitation of entrepreneurial opportunities. Nevertheless, we find in our sample that the scope of international expansion is effective in signaling the firm capabilities, thus attracting better IPO valuation. While our study confirms the results from previous studies on internationalization and INVs performance, we advance the understanding by suggesting INVs can turn dynamic capabilities into value creation activities.

This study sheds some new light on the studies of international entrepreneurs in financial markets. Although previous studies have focused on the growth and sales performance of INVs (Jantunen et al., 2008; Zhou et al. 2010), their performance in financial markets is important as well (Moen et al., 2008). IPO underpricing and poor post-IPO performance of firms is widely documented (Loughran & Ritter, 1995; Jain & Kini, 1994). Thus, it's critical to explore how the pre-IPO activities directly impact firms' ability to generate rent in the IPO market. The internationalization process and technological innovation of an INV is inherently uncertain, and their impact on the firm's profitability and growth prospect takes time to realize. Accordingly, it

is difficult for the market to determine the firm value when firms go from private to public. We have attempted to provide insights regarding the financial consequence of internationalization for young IPO firms in high technology industries. Our research confirms that internationalization, as a dynamic capability, has an impact on entrepreneur performance through signaling a learning advantage for further growth. In our study, the scope of internationalization before IPO plays a significant information-dissemination role at the financial markets. We propose that investors clearly appreciate the learning potential of international entrepreneurs, thus pricing them more favorably.

Our results extend the signaling theory of underpricing. Although innovative activities have been used to evaluate the firm quality, more internal components should be included to understand the signaling effect (Heeley et al., 2007). Technological capabilities, international marketing as well as managerial capabilities have been considered as dynamic capabilities to support a firm's long-term performance (Matthew and Zander, 2007; Mudambi & Zahra, 2007; Rialp et al., 2005; Weerawardena et al., 2007). However, whether they can signal firm quality to outside investors is unclear. Moreover, firms' ability to achieve a superior performance through international activities is determined by their adaptation to the dynamic environment (Autio et al. 2000; Prashantham & Floyd, 2012; Prange & Verdier, 2011; Zahra et al. 2000). We find that the pre-IPO internationalization interacts with technological innovations to send a collective signal to attract investors for better value creation. Thus, our study extends the theory by showing it is not sufficient to evaluate one activity's signaling effect in isolation, especially for international entrepreneurs.

Our study provides implications also for financial market participants. In preparing for an IPO, entrepreneurial firms may do well by structuring their signaling activities so as to indicate

the breadth and the depth of international and technological knowledge. Specifically, a broader scope of internationalization and technological innovation are predicated to increase the amount of capital raised through the IPO process. In this way, firms may fund more investment opportunities. Thus, our study provides evidence on the valuation of an understudied asset – the scope of internationalization. Our results are particularly interesting for those with specialized investment in both international markets and technological innovations. We also provide meaningful implications to international entrepreneurs who pursue an opportunity to obtain long-term capital for their ventures.

Our findings are not without limitations. Given the data constraints, we only focused on the technical innovation measured by the number and type of patents. Our study didn't capture the effect of other types of technological innovations such as new product development or academic knowledge, which may as well signal a high prestige of the firm and reduce the uncertainty associated with only considering patents. In addition, due to the data limitations, some firms didn't report new countries entered for the first three years after they were founded. Therefore, the effect of "Global Born" firms, which conduct IPO at the age between four and six, are not taken into consideration. Although we control for the age at IPO, "Global Born" firms may be a unique phenomenon to understand value creation.

Despite the caveats, our paper has both theoretical and managerial implications for further research. By bridging finance and international entrepreneurship literatures, our study advances the research with a great deal of insights regarding valuation of international entrepreneurs. First, further study could investigate other internationalization events such as international sales, international acquisition and international alliances. Thus a wide range of activities of foreign direct investment can be compared to understand the valuation of IPO

performance. Second, IPO firms tend to be the most prestigious firms and could therefore represent a unique sample of international entrepreneurs. Through the application of the concept of prestige as a signaling effect between firms and potential investors, this study has expanded our understanding of internationalization as an indicator to show the prestige of being an international entrepreneur, thus further impacting investor valuation of IPOs. Third, as we discussed earlier, our sample didn't specify the characteristics of "Global Born" firms. Some problems associated with "Global Born" firms during the inception time are likely to be critical to understand long-term performance. Thus, further study may focus on the difference between global IPOs and "Global Born" start-ups. We hope this study will bring some attention to this relationship and serve as a critical step in understanding implications of the IPO process of INVs.

References

- Adoody, D., & Lev, B. (2000). Information asymmetry, R&D, and insider gains. *Journal of Finance*, 55(6): 2747-2766.
- Aggarwal, R., & P. Rivoli, (1990). Fads in the Initial Public Offering Market? *Financial Management*, 45-47, Winter 1990
- Allen F. and G.R. Faulhaber, 1989, Signaling by underpricing in the IPO market, *Journal of Financial Economics* 23, 303-324.
- Autio, E., Sapienza, H. J., & Almeida, J. G. (2000). Effects of age at entry, knowledge intensity, and imitability on international growth. [Article]. *Academy of Management Journal*, 43(5), 909-924.
- Autio, E. (2005). Creative tension: the significance of Ben Oviatt's and Patricia McDougall's article 'toward a theory of international new ventures'. [Article]. *Journal of International Business Studies*, 36(1), 9-19.
- Barry, C., C. J. Muscarella, J. W. Peavy, III, and M. Vetsuypens, 1990, The role of venture capital in the creation of public companies, *Journal of Financial Economics* 27, 447-471.
- Baum, J. R., Locke, E. A., & Smith, K. G. (2001). A multidimensional model of venture growth. *Academy of Management Journal*, 44(2): 292-303.
- Booth, J.R. and R. Smith, 1986, Capital raising, underwriting and the certification process, *Journal of Financial Economics* 15, 261-281.
- Carpenter, M. A., Pollock, T. G., & 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.

- Carr, J. C., Haggard, K. S., Hmleleski, K. M., & Zahra, S. A. (2010). A study of the moderating effects of firm age at internationalization on firm survival and short-term growth. *Strategic Entrepreneurship Journal*, 4(2): 183-192.
- Carter, R.B. and S. Manaster, 1990, Initial public offerings and underwriter reputation, *Journal of Finance* 45, 1045-1067.
- Carter, R. B., F. H. Dark, and A. K. Singh, 1998, Underwriter reputation, initial returns, and long-run performance of IPO stocks, *Journal of Finance* 53, 285-311.
- Casillas, J. C., Moreno, A. M., & Acedo, F. J. (2012). Path dependence view of export behavior: A relationship between static patterns and dynamic configurations. *International Business Review*, 21(3): 465-479.
- Certo, S.T., Holcomb, T.R., & Holmes, R.M. (2009). A synthesis of IPO research in management and entrepreneurship: Moving the research agenda forward. *Journal of Management*. 35(6): 1340-1378.
- Chahine, S., & Filatotchev, I. (2008). The effects of information disclosure and board independence on IPO discount. *Journal of Small Business Management*, 46(2): 219-241.
- Chandra, Y., Styles, C., Wilkinson, I. F. (2012). An opportunity-based view of rapid internationalization. *Journal of International Marketing*, 20(1): 74-102.
- Chemmanur, T.J., 1993, The pricing of initial public offers: A dynamic model with information production, *Journal of Finance* 48, 285-304.
- Chemmanur, T. J. and Fulghieri, P. (1999), A Theory of the going-public decision, *Review of Financial Studies* 12, 249-279.
- Connelly, B. L. Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling Theory: a Review and Assessment. *Journal of Management*, 37(1): 39-67.

- De Clercq, D., Sapienza, H. J., Yavuz, R. I., & Zhou, L. (2011). Learning and knowledge in early internationalization research: Past accomplishments and future directions. *Journal of Business Venturing*, 27 (1): 143-165.
- Deeds, D. L., Decarollis, D., & Coombs, J. E. (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(1): 31-46.
- Delios, A., & Beamish, P. W. (1999). Geographic scope, product diversification, and the corporate performance of Japanese firms. *Strategic Management Journal*, 20(8): 711-727.
- Efrat, K. & Shoham, A. (2012). Born global firms: the differences between their short- and long-term performance drivers. *Journal of World Business*, 47(4): 675-685.
- Fernhaber, S. A., & Li, D. (2010). The impact of interorganizational imitation on new venture international entry and performance. *Entrepreneurship Theory and Practice*, 34(1): 1-30.
- Gassmann, O., & Keupp, M. M. (2007). The competitive advantage of early and rapidly internationalizing SMEs in the biotechnology industry: a knowledge-based view. *Journal of World Business*, 42(3): 350-366.
- Gleason, K. C., & Wiggenhorn, J. (2007). Born globals, the choice of globalization strategy, and the market's perception of performance. *Journal of World Business*, 42(3): 322-335.
- Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market value and patent citation. *Rand Journal of Economics*, 36(1): 16-38.
- Heeley, M. B., Matusik, S. F., & Jain, N. (2007). Innovation, appropriability, and the underpricing of initial public offerings. *Academy of Management Journal*, 50(1): 209-225.

- Hitt, M. A., Hoskisson, R. E., & Ireland, R. D. (1994). A midrange theory of the interactive effects of international and product diversification and product diversification on innovation and performance. *Journal of Management*, 20(2): 297-326.
- Jantunen, A., Nummela, N., Puumalainen, K. & Saarenketo, S. (2008). Strategic orientations of born globals – Do they really matter? *Journal of World Business*, 43(2): 158-170.
- Jain, B. A., & Kini, O. (1994). The Post-Issue Operating Performance of IPO Firms. *Journal of Finance*, 49(5): 1699-1726.
- Jones, M. V., & Coviello, N. E. (2005). Internationalisation: Conceptualizing an entrepreneurial process of behavior in time. *Journal of International Business Studies*, 36(3): 284-303.
- Knight, G. A., & Cavusgil, S. T. (2004). Innovation, organizational capabilities, and the born-global firm. [Article]. *Journal of International Business Studies*, 35(2), 124-141.
- Kocak, A., & Abimbola, T. (2009). The effects of entrepreneurial marketing on born global performance. *International Marketing Review*, 26(4): 439-452.
- Kropp, F., Lindsay, N. J., & Shoham, A. (2006). *International Marketing Review*, 23(5): 504-523.
- Kulvalainen, O., Sundqvist, S., & Servais, P. (2007). Firms' degree of born-globalness, international entrepreneurial orientation and export performance. *Journal of World Business*, 42(3): 253-267.
- Kylaheiko, K., Jantunen, A., Puumalainen, K., Saarenketo, S., & Tuppuru, A. (2011). Innovation and internationalization as growth strategies: The role of technological capabilities and appropriability. *International Business Review*, 20(5): 508-520.
- Leland, H., and D. Pyle, 1977, Information asymmetries, financial structure, and financial intermediation, *Journal of Finance* 32, 371-387.

- Li, L., Qian, G., & Qian, Z. (2012). Early internationalization and performance of small high-tech “born-globals”. *International Marketing Review*, 29(5): 536-561.
- Liesch, P. W., Buckley, P., Simonin, B. L., Knight, G. (2012). Organizing the Modern Firm in the Worldwide Market for Market Transactions. *Management International Review*, 52(1): 3-21.
- LiPuma, J. A. (2012). Internationalization and IPO performance of new ventures. *Journal of Business Research*, 65(7): 914-921.
- Loughran, T., & Ritter, J. R. (1995). The New Issues Puzzle. *Journal of Finance*, 50(1): 23-51.
- Lu, J. W., & Beamish, P. W. (2001). The internationalization and performance of SMEs. *Strategic Management Journal*, 22 (6): 565-586.
- Mathews, J. A., & Zander, I. (2007). The international entrepreneurial dynamics of accelerated internationalisation. [Review]. *Journal of International Business Studies*, 38(3), 387-403.
- Meggison, W. L. and K. A. Weiss, 1991, Venture capital certification in initial public offerings, *Journal of Finance* 46: 879-903.
- Moen, O., Sorbeim, R., & Erikson, T. (2008). Born Global Firms and Informal Investors: Examining Investor Characteristics. *Journal of Small Business Management*, 46(4): 536-549.
- Mudambi, R., & Zahra, S. A. (2007). The survival of international new ventures. [Review]. *Journal of International Business Studies*, 38(2), 333-352.
- Oviatt, B. M., & McDougall, P. P. (1994). Toward a Theory of International New Ventures. [Article]. *Journal of International Business Studies*, 25(1), 45-64.

- Oviatt, B. M., & McDougall, P. P. (2005). Defining international entrepreneurship and modeling the speed of internationalization. [Article]. *Entrepreneurship Theory and Practice*, 29(5), 537-553.
- Powers, J. B., & McDougall, P. (2005). University start-up formation and technology licensing with firms that go public: a resource-based view of academic entrepreneurship. *Journal of Business Venturing*, 20(3): 291-311.
- Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: a resource dependence perspective*. Harper and Row, New York.
- Prange, C., & Verdier, S. (2011). Dynamic capabilities, internationalization processes and performance. *Journal of World Business*, 46(1): 126-133.
- Prashantham, S. & Floyd, S. W. (2012). Routine microprocesses and capability learning in international new ventures. *Journal of International Business Studies*, 43(6): 544-562.
- Presutti, M., Boari, C., & Fratocchi, L. (2007). Knowledge acquisition and the foreign development of high-tech start-ups: A social capital approach. *International Business Review*, 16(1): 23-46.
- Rialp, A., Rialp, J., & Knight, G. A. (2005). The phenomenon of early internationalizing firms: what do we know after a decade (1993-2003) of scientific inquiry? [Article]. *International Business Review*, 14(2), 147-166.
- Ripolles, M., Blesa, A., & Monferrer, D. (2012). Factors enhancing the choice of higher resource commitment entry modes in international new ventures. *International Business Review*, 21(4): 648-666.
- Ritter, J. R. (1987). The Costs of Going Public. *Journal of Financial Economics*, 19(2): 269-281.

- Ritter, J. (1991) "The long-run performance of initial public offerings", *Journal of Finance*, 46, 3-27.
- Ritter, J. R., & Welch, I. (2002). A review of IPO activity, pricing and allocations. *Journal of Finance*, 57(4): 1795-1828.
- Rock, K., 1986, Why new issues are underpriced, *Journal of Financial Economics* 15, 187-212.
- Ruokonen, M., Nummela, N., Puumalainen, K., & Saarenketo, S. (2008). Market orientation and internationalization in small software firms. *European Journal of Marketing*, 42(11): 1294-1315.
- Ruokonen, M., & Saarenketo, S. (2009) "The strategic orientations of rapidly internationalizing software companies", *European Business Review*, 21(1): 17 - 41
- Sapienza, H. J., Autio, E., George, G., & Zahra, S. A. (2006). A capabilities perspective on the effects of early internationalization on firm survival and growth. [Article]. *Academy of Management Review*, 31(4): 914-933.
- Shrader, R.C., Oviatt, B. M., & McDougall, P. P. (2000). How new ventures exploit trade-offs among international risk factors: Lessons for the accelerated internationalization of the 21st century. *Academy of Management Journal*, 43(6): 1227-1247.
- Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, 87: 355-374.
- Spence, M. (2002). Signaling in retrospect and the informational structure of markets. *American Economic Review*, 97: 999-1012.
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13): 1319-1350.

- Tsang, E. W., Yip, P. S. L., & Toh, M. H. (2008). The impact of R&D on value added for domestic and foreign firms in a newly industrialized economy. *International Business Review, 17*(4): 423-441.
- Varshney, S., & Robinson, R. (2004). IPO Research Symposium Review. *Journal of Economics and Finance, 28*(1): 56-67.
- Weerawardena, J., Mort, G. S., Liesch, P. W., & Knight, G. (2007). Conceptualizing accelerated internationalization in the born global firm: A dynamic capabilities perspective. *Journal of World Business, 42*(3): 294-306.
- Zahra, S. A., Ireland, R. D., & Hitt, M. A. (2000). International expansion by new venture firms: International diversity, mode of market entry, technological learning, and performance. [Review]. *Academy of Management Journal, 43*(5): 925-950.
- Zahra, S. A. (2005). A theory of international new ventures: a decade of research. [Article]. *Journal of International Business Studies, 36*(1): 20-28.
- Zettinig, P., & Benson-Rea, M. (2008). What becomes of International New Ventures? A coevolutionary approach. *European Management Journal, 26*(6): 354-365.
- Zhou, L., Barnes, B. R., & Lu, Y. (2010). Entrepreneurial proclivity, capability upgrading and performance advantage of newness among international new ventures. *Journal of International Business Studies, 41*(5): 882-905.
- Zuckerman, E. W. (2000). Focusing the corporate product: Securities analysts and de-diversification. *Administrative Science Quarterly, 45*(3): 591-619.

Table 1 Descriptive Statistics

	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Underpricing	0.75	0.99	1															
2. 3 years market return	-0.04	1.47	-.19**															
3. Firm Age	5.16	1.72	-.13 †	.10 †														
4. Firm Size (LOG)	18.10	0.65	.31***	-.06	-.13 †													
5. HOT IPO	0.68	0.47	.36***	-.38***	-.26***	.10												
6. Underwriter	0.92	0.28	.12 †	-.01	-.04	.10 †	-.03											
7. VC Dummy	0.93	0.26	.11 †	-.01	.09	-.10	.09	-.01										
8. IPO year Effect (dummy variable)	0.65	0.48	.32***	-.27***	-.36***	-.15*	.74	.05	.02									
9. Industry Dummy (Computer Related)	0.41	0.49	.02	.03	.02	-.03	.01	-.06	.07	.08								
10 Industry Dummy (Communication)	0.25	0.43	.23***	-.10 †	-.08	.11 †	.15*	.18**	.03	.18***	-.48***							
11. Industry Dummy (Semiconductor)	0.10	0.30	-.01	-.05	.02	.17***	.04	.02	-.14*	-.12*	-.28***	-.19**						
12. Industry Dummy (Medical Health)	0.14	0.35	-.23**	.12*	.07	-.10 †	-.18**	-.19***	-.09	-.22***	-.34***	-.23***	-.13**					
13. Industry Dummy (Biotechnology)	0.10	0.30	-.13*	.01	-.01	-.15**	-.08	.02	-.09	-.03	-.28***	-.19**	-.11*	-.13**				
14 R&D Expenses (ln)	0.37	0.44	-.09	.00	.02	-.15*	-.00	-.03	.11	.01	-.12	-.06	-.04	.09	.22***			
15. Scope of Pre-IPO Internationalization	1.94	3.50	-.08	.13**	-.03	.37***	-.11	.06	-.30***	-.18**	.01	.04	.13**	-.07	-.13*	-.05		
16. Volume of Technological knowledge (ln)	1.19	1.49	.01	.04	.15*	.02	-.01	.04	.01	.15*	-.20***	-.02	.18**	.02	.17**	.24***	.05	
17. Scope of Technological knowledge (ln)	2.02	3.32	-.001	0.1	.23*	.05	-.01	.01	-.02	.11 †	-.19***	-.04	.25***	.01	.10 †	.16**	.05	.76***

Two-tailed test: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 2 Regression Results for IPO Underpricing

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
_Constant	- 11.50*** (2.03)	- 13.82*** (2.37)	- 14.37*** (2.48)	- 13.85*** (2.38)	- 14.65*** (2.42)	- 13.87*** (2.38)	- 17.05*** (2.45)
Firm Age	0.02 (0.04)	0.01 (0.04)	0.02 (0.04)	0.02 (0.04)	0.01 (0.04)	0.02 (0.04)	0.02 (0.04)
Firm Size (LOG)	0.60*** (0.12)	0.74*** (0.13)	0.77*** (0.14)	0.74*** (0.13)	0.82*** (0.14)	0.75*** (0.13)	0.93*** (0.14)
HOT IPO	0.30* (0.22)	0.27* (0.21)	0.25* (0.22)	0.27* (0.22)	0.24 (0.22)	0.26* (0.25)	0.20* (0.21)
Underwriter	0.21 (0.25)	0.24 (0.25)	0.22 (0.25)	0.24 (0.25)	0.24 (0.25)	0.28 (0.27)	0.24 (0.24)
VC Dummy	0.39 † (0.27)	0.29 † (0.27)	0.31 † (0.27)	0.29 † (0.27)	0.23 (0.27)	0.29 † (0.27)	0.17 (0.26)
IPO year Effect (dummy variable)	0.50* (0.27)	0.44* (0.27)	0.47* (0.27)	0.46* (0.27)	0.45† (0.28)	0.46* (0.27)	0.46* (0.27)
Industry Dummy (Computer Related)	0.24 (0.23)	0.31† (0.23)	0.29† (0.23)	0.28† (0.24)	0.30 (0.24)	0.27† (0.23)	0.30† (0.22)
Industry Dummy (Communication)	0.46 † (0.25)	0.49 * (0.24)	0.47 * (0.25)	0.47 * (0.25)	0.48* (0.25)	0.46 * (0.25)	0.42* (0.24)
Industry Dummy (Semiconductor)	0.06 (0.31)	0.06 (0.30)	0.04 (0.30)	0.07 (0.30)	0.07 (0.30)	0.11 (0.31)	0.03 (0.29)
Industry Dummy (Medical Health)	- 0.19 (0.28)	- 0.18 (0.28)	- 0.21 (0.28)	- 0.19 (0.28)	- 0.23 (0.28)	- 0.19 (0.28)	- 0.27 (0.27)
R&D Expenses (ln)	- 0.01 (0.08)	0.00 (0.07)	0.00 (0.07)	0.01 (0.07)	0.01 (0.08)	0.01 (0.07)	0.01 (0.06)
Independent Variables							
Scope of Pre-IPO Internationalization		- 0.05** (0.02)	- 0.07** (0.04)	- 0.05** (0.02)	- 0.29** (0.14)	- 0.05** (0.02)	- 0.02 (0.02)
Scope of Pre-IPO Internationalization^2			- .00 (0.00)				
Volume of Technological Knowledge				- 0.02 (0.05)	- 0.02 (0.05)		
Scope of Technological Knowledge						- 0.07 (0.09)	- 0.03 (0.08)
Volume of Technological Knowledge X Scope of Pre-IPO Internationalization					- 0.02† (0.01)		
Scope of Technological Knowledge X Scope of Pre-IPO Internationalization							- 0.07*** (0.02)
Adjusted R-square	22.93***	36.67***	36.91***	36.74***	37.90***	36.97***	42.17***
Observations	180	180	180	180	180	180	180

Two-tailed test: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3 Regression Results for IPO long-run market return

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
_Constant	- 0.47	(3.91)	2.63	(4.32)	7.62*	(4.30)	2.58	(4.32)	4.90	(4.40)	2.47	(4.28)	7.21	(4.57)
Firm Age	- 0.02	(0.08)	- 0.01	(0.08)	- 0.04	(0.07)	- 0.03	(0.08)	- 0.02	(0.08)	- 0.04	(0.08)	- 0.03	(0.07)
Firm Size (LOG)	0.07	(0.21)	- 0.12	(0.24)	- 0.38†	(0.24)	- 0.12	(0.24)	- 0.32	(0.26)	- 0.12	(0.24)	- 0.40	(0.26)
HOT IPO	- 1.09***	(0.40)	- 1.04***	(0.40)	- 0.89***	(0.39)	- 1.01***	(0.41)	- 0.94***	(0.40)	- 1.02***	(0.40)	- 0.92***	(0.39)
Underwriter	- 0.01	(0.43)	- 0.03	(0.43)	0.10	(0.41)	- 0.04	(0.43)	- 0.04	(0.42)	- 0.02	(0.42)	- 0.02	(0.42)
VC Dummy	0.10	(0.49)	0.22	(0.49)	0.01	(0.48)	0.23	(0.49)	0.38	(0.49)	0.27	(0.48)	0.44	(0.48)
IPO year Effect (dummy variable)	- 0.18	(0.50)	- 0.12	(0.50)	- 0.29	(0.47)	- 0.18	(0.50)	- 0.15	(0.50)	- 0.18	(0.49)	- 0.18	(0.48)
Industry Dummy (Computer Related)	0.08	(0.40)	- 0.01	(0.40)	0.11	(0.39)	0.10	(0.42)	0.03	(0.42)	0.14	(0.41)	0.08	(0.40)
Industry Dummy (Communication)	- 0.22	(0.44)	- 0.27	(0.44)	- 0.13	(0.42)	- 0.19	(0.45)	- 0.22	(0.44)	- 0.16	(0.44)	- 0.12	(0.43)
Industry Dummy (Semiconductor)	- 0.05	(0.57)	- 0.02	(0.57)	0.20	(0.54)	- 0.06	(0.57)	- 0.05	(0.56)	- 0.23	(0.57)	- 0.10	(0.56)
Industry Dummy (Medical Health)	0.28	(0.50)	0.28	(0.50)	0.48	(0.47)	0.31	(0.50)	0.40	(0.49)	0.30	(0.49)	0.42	(0.48)
R&D Expenses (ln)	- 0.01	(0.12)	- 0.02	(0.12)	- 0.06	(0.11)	- 0.04	(0.12)	- 0.06	(0.12)	- 0.05	(0.12)	- 0.06	(0.12)
Employee Growth after IPO	0.30	(0.25)	0.29	(0.25)	0.20	(0.24)	0.29	(0.25)	0.19	(0.25)	0.27	(0.25)	0.17	(0.25)
Independent Variables														
Scope of Pre-IPO Internationalization			0.07*	(0.04)	- 0.14**	(0.07)	0.06†	(0.04)	0.60†*	(0.26)	0.05†	(0.04)	0.02	(0.04)
Scope of Pre-IPO Internationalization^2					0.01***	(0.00)								
Volume of Technological Knowledge							0.07	(0.08)	0.08	(0.08)				
Scope of Technological Knowledge											0.29*	(0.15)	0.23*	(0.15)
Volume of Technological Knowledge X Scope of Pre-IPO Internationalization									0.05**	(0.02)				
Scope of Technological Knowledge X Scope of Pre-IPO Internationalization													0.09**	(0.02)
Adjusted R-square	38.21***		39.86***		47.95***		40.30***		42.95***		42.92***		45.69***	
Observations	159		159		159		159		159		159		159	

Two-tailed test: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 1a Effect of Scope of Pre-IPO Internationalization on IPO Underpricing (by Volume of Technological Knowledge).

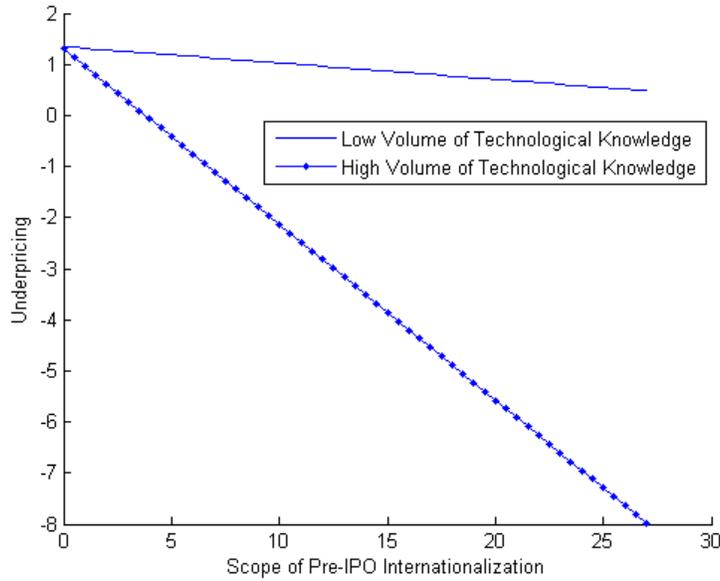


Figure 1b Effect of Scope of Pre-IPO Internationalization on IPO Underpricing (by Scope of Technological Knowledge).

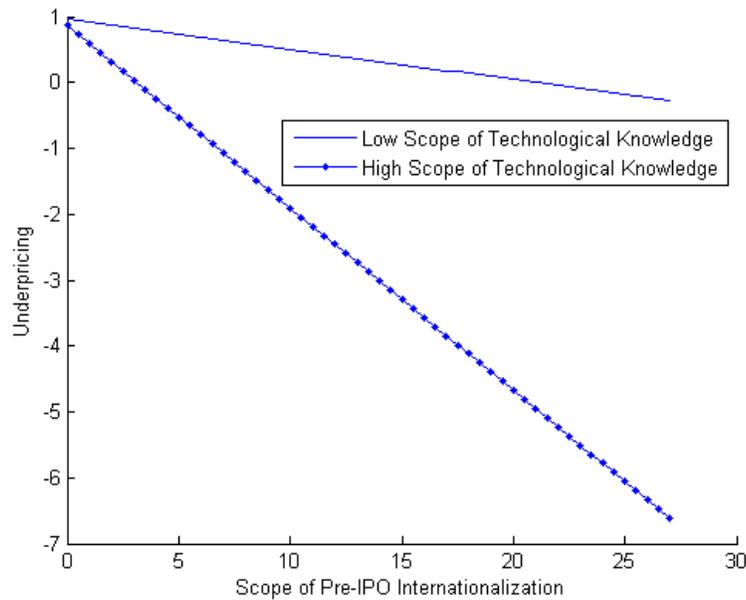


Figure 2a Effect of Scope of Pre-IPO Internationalization on IPO Valuation (by Volume of Technological Knowledge).

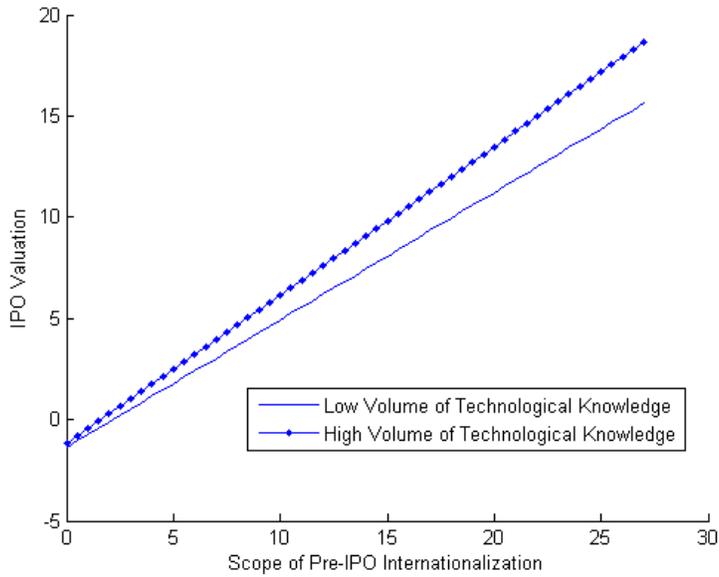


Figure 2b Effect of Scope of Pre-IPO Internationalization on IPO Valuation (by Scope of Technological Knowledge).

