РАЗДЕЛ 3 КОРПОРАТИВНОЕ УПРАВЛЕНИЕ В ЯПОНИИ

SECTION 3 CORPORATE GOVERNANCE: JAPAN

INITIAL PUBLIC OFFERING INTENTION: EVIDENCE FROM START-UP FIRMS IN JAPAN

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Abstract

This paper explores the initial public offering (IPO) strategy of start-up firms. Using an original survey of start-up firms in the Japanese manufacturing and information service industries, we investigate what factors are associated with the intention to go public. It is found that among start-up firms, those investing more heavily in research and development (R&D) are more likely to wish to go public. Furthermore, we provide evidence that spin-offs and family businesses are less likely to have IPO intentions, and that entrepreneur-specific characteristics affect IPO intentions, with younger and highly educated entrepreneurs tending to desire to go public.

Keywords: entrepreneur; initial public offering; new stock market; research and development; start-up

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1. Introduction

In recent years, new firm creation has become one of the most important issues --- especially in stagnating developed economies. It is expected that the emergence of innovative firms promotes economic revitalization and development through innovation and job creation. On the other hand, it is often argued that among start-up firms, only a few high-growth firms are essential contributors to economic growth. According to Jovanovic (2001), in the United States, four giant firms --- Microsoft, Cisco Systems, MCI, and Dell --- were less than twenty years of age on the end of August 1999, and their value added up to 12 or 13 percent of gross domestic product (GDP) at that time. Even though most start-up firms do not achieve rapid growth, a small proportion of start-up firms often play a major role in economic revitalization and development. These firms tend to outperform their counterparts by a wide margin, and will, it is hoped, stimulate future economic growth. For this reason,

governments, including that of Japan that has suffered from deflation, have paid more attention to the role of start-up firms with high-growth potential, which are seen as pioneers in the development of new business fields in stagnating economies.

Start-up firms with high-growth potential are expected to contribute to innovation and job creation. In fact, recent public attention has been paid to initial public offering (IPO) firms --- more specifically, Internet IPO firms, such as Google and Yahoo --- that have remarkably expanded their businesses. Although going public is not a stage that all firms eventually reach, it must be often a crucial stage in firm growth. Some entrepreneurs (or founders) have an opportunity to be rewarded for their initial efforts through the eventual sale of their firms. In addition, investors are attracted to high-growth firms with IPO intentions because of the potential for high capital gain. In these respects, IPOs have become one of the most critical issues not only for entrepreneurs but also for investors, including venture capitalists and business angels.

This paper explores the IPO strategy of start-up firms. While many firms still remain privately held and do not seek to go public, some firms pursue the possibility of raising funds through IPOs to expand their businesses. In this paper, using an original survey of start-up firms in the Japanese manufacturing and information service industries, we investigate what factors are associated with the intention to go public. It is found that among start-up firms, those investing more heavily in research and development (R&D) are more likely to wish to go public. In addition, entrepreneur-specific characteristics and firm types are found to relate to IPO intentions. A better understanding of what actually has an influence on IPO intentions, and of what types of firms or entrepreneurs have the propensity to go public, can hopefully fulfill a role in fostering micro-level contributors to future economic growth.

The remainder of the paper is organized as follows. The following section introduces related literature and explains the research background. Section 3 discusses the theoretical framework and hypotheses development, and Section 4 explains the sample of start-up firms used in the analysis. After describing estimation methods in Section 5, we present estimation results in Section 6. Finally, we provide some concluding remarks.

2. Literature review and research background

To date, a number of studies in finance literature have investigated firms' decision to go public. Although the decision to go public has been simply considered a stage in the growth process, this decision is actually a complex one, and the choice of going public or staying private is due to a variety of reasons. To sum up, previous studies have addressed that the decision to go public depends on the trade-off between the benefits and costs of going public (e.g., Pagano, 1993; Pagano and Röell, 1998; Chemmanur and Fulghieri, 1999; Boot et al., 2006). Among them, Zingales (1995) emphasizes the benefits of going public: diversification, the possibility of equity financing beyond the initial entrepreneurs' limited wealth, a less costly access to the capital market, an increased liquidity of the firms' share, and some outside monitoring. In addition, Röell (1996) noted the reasons for going public: access to new finance, enhanced company image and publicity, motivating management and employees, cashing in, and exploiting mispricing. [23] In contrast, going public entails additional costs, such as the registration, underwriting, underpricing, and annual disclosure costs. Pagano et al. (1998) also found that adverse selection, administrative expenses and fees, and loss of confidentiality are costs of going public.

Although there are considerable arguments on reasons for IPOs, only a few empirical studies have directly examined the determinants of IPOs. The pioneering work, Pagano et al. (1998), estimated the determinants of the decision to go public by using a proprietary database of private Italian firms and comparing these firms with public Italian firms. Based on the results of IPOs, they argued that the likelihood of an IPO increases with company size and the industry's market-to-book ratio. Whereas their research focused on the results of IPOs, it is unclear what types of firms or entrepreneurs have the propensity to go public.

In addition, from the viewpoint of entrepreneurs, Brau and Fawcett (2006) examined motivations for conducting IPOs by using an original questionnaire survey in the United States. They found that chief financial officers identify the creation of public shares for acquisitions as the most important motivation for going public. In contrast, they argued that lowering the cost of capital and the pecking order of financing are not among the most important reasons for conducting IPOs. However, acquisitions do not seem to be the only reason for the IPO motivation --- particularly in other countries, including Japan, where mergers and acquisitions are not as popular as in the United States.[24] Moreover, Brau and Fawcett's results are based on univariate analyses, including firms with a long history, and they do not control for entrepreneur-specific characteristics, such as entrepreneurs' background, and firm-specific characteristics, including firm age.[25]

[23] More recently, Bodnaruk et al. (2008) pointed out that shareholders' portfolio diversification is an important driver of the IPO process.

[24] Matsuda et al. (1994) pointed out that while greater proportions of U.S. firms prefer to use their money primarily for the purchase of other companies, much higher proportions of Japanese firms intend to put most of their new funds into physical plant and R&D.

[25] In fact, much literature has emphasized the effects of entrepreneurs' (or founders') characteristics on the strategies and performance of firms (e.g., Nelson, 2003; Florin, 2005). While, as Wiklund et al. (2003) pointed out,

While Pagano et al. (1998) and Brau and Fawcett (2006) examined the determinants and motivations of IPOs, we highlight IPO intentions for start-up firms. This paper extends research on the determinants of IPOs, by focusing on start-up firms and IPO intentions. Although the emergence of IPO firms with high-growth potential is expected to encourage economic growth, potential IPOs have been largely ignored in the literature. Given the importance of potential IPOs as the source of future economic growth, the ability to identify whether firms seek to go public would be of interest to employees, investors, and policy makers. In particular, high-growth firms with IPO intentions attract investors, including venture capitalists and business angels that look to IPOs to diversify their investment portfolios. The motivations of entrepreneurs among start-up firms are highlighted to identify which types of firms or entrepreneurs have the propensity to go public, and that information would provide further evidence on the IPO mechanism.

On the other hand, as already mentioned, start-up firms with high-growth potential are expected to encourage economic growth. In order to foster innovative firms with high-growth potential, some developed countries have introduced "new stock markets," while taking into consideration the NASDAQ market in the United States. For instance, the Nouveau Marche (France), the Neuer Markt (Germany), and the Nuovo Mercato (Italy) have been launched since the late 1990s. In these countries, the trend toward the creation of new stock markets has been apparent since the late 1990s. Most of these markets mainly target innovative start-ups, and they provide opportunities for raising equity finance. In Japan, for example, MOTHERS (market of the high-growth and emerging stocks) in Tokyo Stock Exchange was opened in 1999 to provide easier funding for emerging companies with high-growth potential.[26] However, many, if not all, entrepreneurs may have little expectation of equity financing through the markets, partly because, as Black and Gilson (1998) suggested, Japan has a bank-centered financial system, rather than a stock market-centered financial system.

Whereas most firms need funds to start businesses, there is no evidence that those entrepreneurs have indeed hoped for the creation of new stock markets.[27] Whether new stock markets operate more efficiently depends not only on investors' supply side but also on entrepreneurs' demand side. Identification of innovative start-ups as more likely to have an IPO intention would enhance the legitimacy of the creation of new stock markets. Although new stock markets tend to target innovative start-ups, there is, as Yosha (1995) indicated, the probability that young, innovative, and private firms are reluctant to go public because of loss of confidentiality. Needless to say, the significant effects of stock markets in fostering innovative start-ups would to a large extent depend on the existence of strong and vibrant demand by entrepreneurs. In this paper, therefore, we seek to shed some light on entrepreneurs' motivations, as to which entrepreneurs are willing to go public among start-up firms and to confirm the needs of new stock markets from their viewpoint. An understanding of entrepreneurs' motivations is the first step and would be essential to evaluate the role of new stock markets introduced for innovative firms with high-growth potential in some developed countries. If the improvement of listing requirements in the stock markets is needed to promote new businesses, then the IPO intentions of start-up firms, which reflect the potential demand for going public, provide important evidence of how stringent the requirements of stock markets are on these firms.

3. Theoretical framework and hypotheses development

As discussed, previous literature has considered that the decision to go public depends on the trade-off between the benefits and costs of going public. According to the literature, it is conceivable that factors associated with more benefits than the current value of a firm increase the intention to go public, while those associated with more costs decrease this intention. If the expected market value of the firm after going public exceeds the current value through, as Zingales (1995) pointed out, diversification and the possibility of equity financing beyond the initial entrepreneurs' limited wealth, then the firm seeks to go public. As Röell (1996) argued, for example, access to new finance may be one of the most important reasons for going public. It is considered that an entrepreneur is willing to go public when he or she expects that an IPO realizes the value of the firm by financing due to new access to finance.

the supremacy of the economic motive is taken for granted --- people act in ways to maximize their profit --- in economic literature, a more diverse view is relevant in entrepreneurship literature. Corporate strategies toward IPOs may also depend on entrepreneurs' aspirations and capabilities, and there is the possibility that IPO intentions tend to reflect an outcome of entrepreneurs' personal attributes.

[26] In Japan, Sapporo Securities Exchange, Nagoya Stock Exchange, Osaka Stock Exchange, and Fukuoka Stock Exchange established new stock markets --- Ambitious, Centrex, Hercules, and Q-board, respectively --- in order to target innovative firms at an early stage of their development.

[27] In Japan, a special-rule issues market of the over-the-counter (OTC) market was opened in July 1995 in order to enable young firms investing heavily in R&D to list their stocks even though they ran deficits. However, only three firms were listed in this market, which was closed and absorbed into the original OTC market in December 1998. In Germany, the Neuer Markt was closed in June 2003.

Among start-ups, firms facing financially constraints may tend to secure external sources of finance to raise funds. In particular, innovative start-ups are likely to raise more funds because of large investments in R&D, which may increase the value of the firm. However, entrepreneurs may be discouraged with high interest rates or credit rationing due to the existence of uncertainty and information asymmetries between entrepreneurs and providers of finance. Perhaps, the existence of uncertainty and information asymmetries is particularly severe for innovative start-ups because of the difficulty involved in evaluating new businesses and technologies. Therefore, innovative start-ups may seek to access equity markets in order to acquire alternative sources of finance. Also, equity financing has an advantage of financing highly risky business activities partly because equity holders can receive a large capital gain if success is achieved. On the other hand, corporate policies and objectives may relate to IPO intentions, irrespective of the expected market values after going public. Even though entrepreneurs receive the proceeds from the eventual sale, some of them indeed are not willing to go public, preferring that they retain corporate control. In fact, many small businesses tend to be oriented toward maintaining the status quo. Therefore, IPO intentions may decrease due to entrepreneurs' attitudes toward risk of loss of corporate control. Furthermore, corporate strategies toward IPOs may depend on entrepreneur-specific characteristics, while, as Davidsson and Wiklund (2000) argued, growth motivations differ across entrepreneurs, and the small business managers' attitudes toward expanding their firms affect firm growth.

Consequently, it can be concluded that IPO intentions depend on the expected utilities of entrepreneurs, including the market values by profitability for the post-IPO outcomes. Let ΔU denote the difference of the expected utility before and after the IPO. If the utility increases through the IPO, then the firm has an incentive to go public. It is assumed that ΔU is a linear function of a vector of variables, X, which indicates factors relating to the utility through the IPO. That is, we write

$$\Delta U = \alpha + \beta X + e, \tag{1}$$

where α is a constant term, β (vector) is a parameter to be estimated, and e represents an error term. Here, the IPO intention of the firm, *IPO*, is defined as a binary variable, since the IPO intention is an unobserved latent variable. The IPO intention is written as follows:

$$IPO = \begin{cases} 1 & \text{if } \Delta U > 0 \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

The variable, *IPO*, takes the value one if the firm has the intention to go public, and takes the value zero otherwise.

By estimating the regression model, we identify the determinants of IPO intentions among start-up firms. [28] In the following subsections, we discuss several hypotheses concerning the vector of variables, X.

3.1. Innovative activities

Many previous studies have argued that adverse selection and moral hazard problems due to information asymmetries hinder external financing of highly risky business activities, including R&D (e.g., Arrow, 1962; Himmelberg and Petersen, 1994). Among them, Carpenter and Petersen (2002) argued that new equity financing has several advantages over debt, and for high-tech firms, the limited collateral value of assets, together with adverse selection, moral hazard, and financial distress cause the marginal cost of debt to increase rapidly with leverage. [29] Even though adverse selection and moral hazard problems due to information asymmetries hinder external financing of highly risky business activities, capital gain after going public is expected to offset high risk for providers of finance. Deeds et al. (1997) emphasize that firms are usually required to access the public equities market by issuing an IPO to raise the significant sums of capital required to pursue extensive R&D projects or to finance rapid growth and expansion. Moreover, as Stoughton et al. (2001) and Brau et al. (2003) pointed out, the decision to go public provides a signal to investors and customers and, particularly, this aspect may be important for firms in high-tech industries where there is a significant amount of uncertainty about the quality of their products.

On the other hand, as already introduced, Yosha (1995) argued that young, innovative, and private firms are reluctant to go public, fearing the reaction of established competitors to the disclosed information. As also suggested by Campbell (1979), loss of confidentiality may reduce the value of the firm. In this regard, innovative start-ups do not wish to go public, preferring that they avoid loss of confidentiality. This notion implies that innovative start-ups are less likely to go public. In contrast, Deeds et al. (1997) found a positive relationship between the total amount of capital raised by a firm's IPO and the scientific capabilities of the firm in the biotechnology industry of the United States. Honjo (2001) also found that firms investing heavily in R&D

[28] For an alternative model formulation, see Honjo (2001).

[29] Carpenter and Petersen argued that insiders have much better information than outsiders about the prospects of the firm's investment. Even if firms could educate outsiders, appropriability problems may induce firms to limit the amount of information they are willing to provide to suppliers of funds.

are more likely to have IPO intentions, using a sample of electrical manufacturing firms in Japan.

In practice, some empirical studies have found that intangible assets, such as technologies, yield more market value (e.g., Cockburn and Griliches, 1988; Hall, 1993). If the expected value after going public exceeds costs including loss of confidentiality, then the IPO intention increases for innovative start-ups. As already mentioned, entrepreneurs may expect greater reliance on equity financing rather than on debt financing about highly risky business activities, including R&D. Therefore, we hypothesize that among start-up firms, those investing more heavily in R&D are more likely to wish to go public. This would suggest that new stock markets, which are expected to provide funds for innovative start-ups, are needed from the viewpoint of entrepreneurs.

3.2. Financial constraints

Diversified equity financing beyond the initial funds is required when firms raise funds to overcome financial constraints. In particular, start-up firms tend to face financial constraints due to information asymmetries because of a limited business history. Given that access to equity markets through IPOs mitigates financial constraints, firms may be able to obtain a stronger bargaining position against banks by the availability of an alternative source of funds. As already mentioned, access to new finance is often cited as a reason for going public. Pagano et al. (1996) indeed found that going public reduces the cost of credit. By overcoming financial constraints, entrepreneurs expect their firms' business to expand and gain more profits, which results in the high valuation of firms by reducing the cost of credit or expanding their businesses. Start-up firms with insufficient funds need to gain access to a source of finance alternative to banks. It is considered that start-up financial constraints relate to IPO intentions, and start-up firms that cannot achieve a sufficient initial fund supply have an incentive to go public. We hypothesize that firms having faced financial constraints at start-up are more likely to have IPO intentions.

3.3. Corporate control

By contrast, the disadvantages of IPOs may prevent entrepreneurs from going public. Some entrepreneurs desire to retain privately held status in order to maintain control of their firms. For instance, Field and Karpoff (2002) pointed out that many firms deploy takeover defenses when they go public in the United States, and found that 53% in their sample have at least one takeover defense at the time of their IPO. Although, in practice, hostile takeovers in Japan then were not as prevalent as in other countries, such as the United States, the possibility of takeovers may reduce the incentive to go public for some entrepreneurs. Even though the values of firms are expected to increase after going public, firms that wish to avoid the risk of loss of corporate control, including hostile takeovers, may have less intention to go public. Thus, we hypothesize that firms that wish to avoid the risk of loss of corporate control are less likely to have IPO intentions.

3.4. Entrepreneur-specific characteristics

In addition to the above factors, the motivations of IPOs vary among entrepreneurs. As already mentioned, much literature has emphasized the effects of entrepreneurs' characteristics on the strategies and performance of firms. Particularly for start-up firms, IPO intentions may depend heavily on entrepreneur-specific characteristics. With respect to entrepreneur-specific characteristics, for example, younger entrepreneurs may have growth aspirations thorough IPOs, since perhaps they tend to believe more potential to gain more benefits. As mentioned later, data on some entrepreneur-specific characteristics are obtainable from our questionnaire survey. The variables for age, education level, and work experience of the entrepreneur are included to identify what types of entrepreneurs are willing to go public, as well as to control for entrepreneur-specific characteristics.

3.5. Others

IPO intentions differ across firm types, including differences in market conditions between industries, and they may be associated with firm-specific characteristics. As explained later, our sample includes two types of legal forms, a joint-stock corporation and a privately limited company. A privately limited company is a more simplified legal form than a joint-stock corporation, and the behavior and strategies of start-up firms may be different between these two legal forms. In addition, some firms in the sample have started businesses as a subsidiary or an affiliated company of a large corporation. Compared with independent firms, these firms may have less incentive to go public, partly because they can raise funds from their parent companies. Furthermore, traditional family businesses may not wish to go public, since they have more need to retain their businesses rather than to expand them.[30]

[30] In addition to the above firm-specific characteristics, IPO intentions may depend on the difference of start-up financing between firms. In particular, some studies have highlighted the vital role of venture capitalists and the performance of venture capital (VC)-backed firms in the creation of publicly traded firms (e.g., Lerner, 1994; Brav and Gompers, 1997; Florin, 2005). Megginson and Weiss (1991), for example, compared VC-backed IPOs with a control sample of non VC-backed IPOs, and found that VC backing lowers the costs of going public and maximizes net proceeds. In the sample, however, only a few firms did indeed raise funds from venture capital at start-up, and,

4. Data

In practice, it is difficult to obtain adequate data on IPO intentions and the determinants from existing data sources.[31] Despite the limitations of previous literature on the IPO, little empirical data exist to elucidate the IPO mechanism. Regarding the benefits and costs of going public --- especially for entrepreneurs' viewpoint --- empirical evidence remains scarce. Since the data source needed to implement our approach is not generally available, we attempt to construct a data set through a questionnaire survey named *Survey on Management of Start-ups in Japan* (*Wagakuni Start-up Kigyo no Keiei Jittai ni Kansuru Chosa*). Using this data source, we capture IPO intentions among start-up firms. Additionally, we use the *Census of Manufacture*s and *Survey on Specified Service Industries: Information Services* to measure a variable for industry growth.

The name and address list for the questionnaire survey was obtained in December 2001 from Tokyo Shoko Research, Ltd. (TSR) that is a major credit investigation company in Japan like Dun and Bradstreet in the United States. The list consists of 5,684 firms founded during the period 1995-1997.[32] These firms are joint-stock corporations (*kabushiki-gaisha*) and privately limited companies (*yugen-gaisha*) in the manufacturing and information service industries of Japan.[33] We asked a major transportation company, Sagawa Express Co. Ltd., to send out the questionnaires to the firms in January 2002 and to retrieve them in February 2002. As a result, answered questionnaires were received from 1,045 firms.[34]

We construct a sample to estimate the determinants of IPO intentions among start-up firms. As already mentioned, firms founded in the manufacturing and information service industries during 1995-1997 are targeted in the survey. However, since some firms were regarded as founded before or after the observation period, 1995-1997, or could not be regarded as founded during the period, these firms were excluded from the sample. In addition, firms from industries other than the manufacturing or information service industries were excluded. Moreover, all the firms did not necessarily answer all the questions, and the number of observations depends on variables used in the regression model. Consequently, 522 start-up firms remained in the sample.[35]

In the questionnaire, we inquire about the IPO strategy based on the following alternatives: (1) have already gone public, (2) intend to go public within one year, (3) intend to go public within a few years, (4) have not decided when the firm will go public but intend to go public, (5) do not intend to go public, and (6) have not considered whether or not to go public. Table 1 shows the ratio of each alternative for the IPO strategy. Among the sample, only two firms (0.4%) had already gone public. Even though the creation of new stock markets has happened in Japan, the percentage of the firms going public is remarkably low. While, as is shown in Table 1, about a quarter of entrepreneurs in our sample are willing to go public, many entrepreneurs do not pursue IPOs.[36] By using

hence, we do not examine whether VC finance at start-up affects IPO intentions.

[31] There are only a few existing data sources that provide information on start-ups in Japanese industries. First, *Nikkei Venture Business Annual Repor*t (*Nikkei Venture Business Nenkan*) compiled by Nihon Keizai Shimbun, Inc. (Nikkei) provides data on new ventures. Using this data source, Honjo (2001) empirically examined IPO intentions in the Japanese electrical manufacturing industry. However, this source includes not only start-up firms but also small firms with a long history. In addition, whether or not the firm is registered as a new venture in the data source is based entirely on the judgment of Nikkei. Then, the *Survey on Business Start-ups in Japan* (*Shinki Kaigyo Jittai Chosa*) compiled by the National Life Finance Corporation (NLFC) provides data on start-ups annually. However, this source is restricted to data only on firms financed by the NLFC.

[32] The name and address list was obtained in 2001, but firms founded during 1998-2001 were excluded from the sample. The questionnaire survey was limited to firms that were at least three years past their foundation, since several data, such as sales, were collected for the past few years. Another reason the survey was limited is that a few years were required until TSR had compiled data.

[33] In addition to a joint-stock corporation and a privately limited company, two types of partnerships (*gomei-gaisha* and *goshi-gaisha*) and a sole proprietorship are available in Japan. Essentially, the number of these partnerships is much lower than that of joint-stock corporations and privately limited companies, and the existing data sources do not sufficiently cover data on sole proprietorships. Therefore, we collected data only on joint-stock corporations and privately limited companies.

[34] In response, 1,113 completed questionnaires were returned. On the other hand, 223 questionnaires were returned to us because the address was unknown. The others were not returned even though the deliverers of Sagawa Express visited each firm to retrieve the questionnaire. Among the 1,113 returned questionnaires, 1,045 firms answered at least one question.

[35] We assessed whether there are response biases in the distribution of industrial sectors (two-digit standard industrial classification), based on the comparison between our sample and data obtained from the *Census of Manufactures* and *Survey on Specified Service Industries: Information Services*. Although not completely tested, there may be the possibility of bias in the distribution of several industrial sectors, such as printing and chemical. We estimated the regression models by using these industry dummies, and by excluding the sectors of printing and chemical from the sample. Even when these estimations were made, the relationships discussed in Section 6 were not almost changed.

[36] Similar tendencies have been seen in other surveys in Japan. According to Sakakibara et al. (2000), the ratio of entrepreneurs with IPO intentions is 25.1% in a sample of start-ups in technology-oriented manufacturing industries. Also, the Japan Small Business Research Institute (2003) reports that the ratio is 14.1% in a sample of start-ups in various industries, including manufacturing, transportation and communication, wholesale and retail trades, eating and drinking places, and service.

our sample of 520 firms from which two IPO firms are excluded, the alternatives are classified into two categories: "intention to go public" and "no intention to go public." While alternatives (2), (3), and (4) are regarded as "intention to go public," alternatives (5) and (6) are regarded as "no intention to go public." As indicated in Table 1, the number of firms that have IPO intentions (i.e., *IPO* = 1) is 126 among the 520 firms, and the ratio is 24.2% in the sample.

(Insert Table 1 here)

In practice, start-up firms whose entrepreneurs are willing to go public may tend to expand their businesses. That is, the performance of start-up firms may vary across the IPO intentions. Using the growth rates of employment and sales, we thus verify the difference in the firms' performance according to the IPO intention. We inquire about the numbers of employees and board members both at that time and at start-up. The growth rate of employment is defined as the difference of the logarithms of the number of employees plus board members between the two periods, divided by firm age. On the other hand, we inquire about sales for the preceding three years. The growth rate of sales is defined as the difference of the logarithms of sales between the two years, divided by two.

Table 2 shows the descriptive statistics of the growth rates according to the IPO intention. Since Table 2 excludes firms for which the numbers of employees and board members or sales were not obtainable, the total numbers of observations vary across the growth rate measures, and they are 501 and 478, respectively. On average, start-up firms with IPO intention expand employment at 15.1% and increase sales at 18.4%. The growth rates of firms with IPO intention are much higher than those of firms without this intention, regardless of the growth rate measure. The relationship between the IPO intention and firm growth is significant and positive, although its causality may be obscure. The findings indicate that start-up firms pursuing IPOs actually succeed in expanding their businesses, and contribute to more employment and sales growth.

(Insert Table 2 here)

5. Estimation methods

The definitions of variables that indicate the vector of factors, *X*, are shown in Table 3. First, the variable for innovative activities, *RD*, is measured by R&D intensity, defined as R&D investment divided by sales, which can be obtained from the questionnaire.

(Insert Table 3 here)

On the other hand, obtaining an objective proxy of firms that are financially constrained is problematic when one measures financial constraints at start-up. In many previous studies, cash flow is used to proxy financial constraints (e.g., Fazzari et al., 1988). However, it is difficult to obtain and use this proxy because cash flow cannot be measured at the time the firm was founded. In the questionnaire, we ask entrepreneurs how much initial capital was required relative to the actual initial capital when the firm was founded. If the actual initial capital is less than the required capital, then the firm is regarded as facing financial constraints at start-up. In this paper, the variable for start-up financial constraints, *FCONS*, is measured by a dummy variable for whether the actual initial capital is less than the required one.

In the questionnaire, we inquire about some corporate objectives, including strategies, such as "sales," "profit rate," "market value," "avoidance of business failure," and "avoidance of being acquired." About these corporate objectives, we asked to assign a score on each corporate objective with the five-point Likert scale (5: very important, 4: important, 3: average, 2: unimportant, 1: very unimportant). In order to assess the impact of corporate control purpose on IPO intentions, we assume that if the entrepreneur assesses "avoidance of being acquired" at more than "market value," corporate control, which implies takeover defense as a corporate objective, is regarded as higher. That is, the valuable for corporate control, *CONT*, is calculated by the difference of scores between "avoidance of being acquired" and "market value" as a corporate objective.

With respect to entrepreneur-specific variables, we use the variables for education level, and work experience in the model.[37] The variable for age, *MAGE*, is defined as the logarithm of the entrepreneur's age at start-up. Education level is measured by a dummy variable, *EDUC*, which indicates whether the entrepreneur has had university or post-graduate school education. Work experience is also measured by a dummy variable, *EXPE*, which indicates whether the entrepreneur has had work experience as a board member of a company or a full-time employee before starting the business. In addition, some firms are managed no longer by those who have founded the firms, but by their successors. Since, as Nelson (2003) argued, the persistent influence of the founder on the firm may exist, a dummy variable for a founder at start-up, *FOUND*, is included in the model to control whether the entrepreneur is a founder or its successor.

Moreover, the variable for joint-stock corporations, *JCORP*, is included to control the difference between the two types of legal forms. In order to identify the different firm types, the variables

[37] The ownership of entrepreneurs may also be associated with IPO intentions. In the questionnaire, we inquire what percentage the entrepreneur invests in the initial funding. In practice, the variable for the ratio of the entrepreneur's funds was used to examine its effect on the IPO intention, but we could not obtain statistically significant results.

for spin-offs, *SPIN*, and for family businesses, *FAMIL*, are included in the model. These variables may also control for the difference in corporate governance due to firm types.

Furthermore, the sample covers all the manufacturing and the information service industries. The behavior and strategies of start-up firms may be related to industry characteristics. Pagano et al. (1998) argued that the probability of an IPO is positively affected by the stock market valuation of firms. Entrepreneurs presumably tend to expect high valuation of their firms in such a growing industry, and a boom may raise awareness of the IPO. In the questionnaire, we inquire about the main industry of firms, based on the two-digit standard industrial classification (SIC) level for the manufacturing sector, including medical preparations, computer software products, and information services --- totaling 25 industry groups. The variable for industry growth, *IGROW*, is used to control the difference between industries, and it is measured with data for 1998-2000, by using the *Census of Manufactures* and *Survey on Specified Service Industries: Information Services*[38].

On the basis of the above discussions, we specify Equation (1) as follows:

$$\Delta U = \alpha + \beta_1 RD + \beta_2 FCONS + \beta_3 CONT + \beta_4 MAGE + \beta_5 EDUC + \beta_6 EXPE + \beta_7 FOUND + \beta_8 JCORP + \beta_9 SPIN + \beta_{10} FAMIL + \beta_{11} IGROW + e, \quad (3)$$

where $\beta_1, \beta_2, \ldots, \beta_{11}$ are parameters to be estimated. We estimate this equation, using a probit model.

6. Results

Table 4 shows the descriptive statistics of the independent variables explained in the previous section. Table 5 presents the correlation matrix of the independent variables. Table 6 shows the estimated results.[39] In column (i) of Table 6, the variables for innovative activities, financial constraints, corporate control, and entrepreneur-specific characteristics are included. In column (ii), firm-type effects are controlled, and industry growth is included. In Table 6, marginal effects as well as estimated coefficients are presented. As already mentioned, our sample includes the two types of legal forms. The behavior and strategies of privately limited companies may originally differ from those of joint-stock corporations. In fact, the variable for joint-stock corporations, *JCORP*, is positive at the 1% significance level in Table 6. Similarly to columns (i) and (ii), columns (iii) and (iv) present estimated results, based on the subsample only with joint-stock corporations.

(Insert Tables 4, 5, and 6 here)

In Table 6, the coefficients of *RD* are constantly positive at least on a significance level of 5%, which supports our hypothesis. The results indicate that among start-up firms, those investing more heavily in R&D are more likely to wish to go public. While this finding does not support Campbell's (1979) and Yosha's (1995) arguments, it is consistent with Honjo (2001). This may also be consistent with Deeds et al. (1997) who found a positive relationship between the total amount of capital raised by the IPO and the scientific capabilities of the firm. This suggests that innovative start-ups wish to go public, in order to secure alternative financial sources to raise funds because of large and uncertain investments needed for R&D. In addition, the findings imply that entrepreneurs believe the effectiveness of R&D investment is a signal to potential investors when the firms raise funds through IPOs. As a result, innovative start-ups may expect to be evaluated with high values in the stock markets after their IPOs.

The coefficients of *FCONS* are constantly positive. The results tend to support our hypothesis, but, in part, the coefficients are insignificant. The positive relationship between IPO intentions and start-up financial constraints suggests that firms having faced start-up financial constraints seek to access equity markets in order to acquire alternative sources of finance. By overcoming financial constraints at start-up, entrepreneurs may expect to gain more profits through further investment opportunities, which yield higher valuation of firms. In addition, as Pagano et al. (1998) pointed out, firms may go public not to finance future investments and growth, but to rebalance their accounts, and gaining access to new finance alternative to banks is the benefits of going public. The results may also indicate that entrepreneurs expect to reduce borrowing costs by creating new access to finance, which leads to the higher valuation of firms by gaining more profits.[40]

[38] While the *Census of Manufactures* covers establishments with four or more persons employed each year, it reports data on all sizes of establishments only in 1998, 2000, and 2003 after the foundation years, 1995-1997. Since the effects of small establishments on industry cannot be ignored, the variable for industry growth is measured for 1998-2000.

[39] As Pagano et al. (1998) and Chemmanur and Fulghieri (1999) argued, the probability of going public is related to the age and size of firms due to the potential for adverse selection, since adverse selection is a more serious obstacle for young and small firms, which have little track record and low visibility, than for old and large firms. In order to control for the difference in firm age, two dummies that indicate firms founded in 1995 and 1996 were included in the model, but the estimated coefficients were not significant. Also, IPO intentions may depend on firm size. In order to control for firm size, the variable for firm size, defined as the logarithm of the number of employees plus board members at start-up, was included in the model. However, we could not obtain statistically significant results.

[40] In addition to start-up financial constraints, leverage appears to have a positive effect on IPO intentions; that is, highly leveraged firms wish to go public. Besides allowing firms to raise equity capital, going public may enable firms

By contrast, *CONT* tends to have a negative effect on IPO intentions for joint-stock corporations in (iii) and (iv) of Table 6, but the results are not significant. Although it is considered that the risk of being acquired reduces the incentive to go public for start-up firms, especially for joint-stock corporations, which pay more attention to this risk, nevertheless we cannot find this relationship. As a result, we do not find evidence to support the hypothesis that firms that wish to avoid the risk of loss of corporate control are less likely to have IPO intentions. [41] As already mentioned, hostile takeovers in Japan then were not as prevalent as in other countries, such as the United States, and entrepreneurs may pay less regard to the risk of being acquired by other firms. However, more precise data and methods to measure loss of corporate control or risk of being acquired might be needed to verify the effects of loss of corporate control on IPO intentions.

As for entrepreneur-specific characteristics, the coefficients of *MAGE* are negative, indicating that younger entrepreneurs are willing to go public. Also, *EDUC* has a positive effect on IPO intentions. This suggests that highly educated entrepreneurs are willing to go public. Younger and highly educated entrepreneurs may be more interested in expanding their businesses by going public rather than holding their firms privately, since they tend to believe more potential to gain more benefits. It is generally recognized that younger and highly educated people have more opportunities to be employed. Despite having more opportunities to be employed, these entrepreneurs that start businesses may be willing to expand their businesses and to go public to gain more benefits. In addition, the findings imply that corporate strategies toward IPOs are explained by aspirations and capabilities based on entrepreneurs' personal attributes. On the other hand, since the coefficients of *EXPE* are positive but insignificant, we cannot find any difference according to work experience. Moreover, *FOUND* has a positive effect on IPO intentions, suggesting that entrepreneurs are more likely to desire to go pubic than successors, but overall the effects are insignificant.

With respect to firm types, both the variables for spin-offs and for family businesses, *SPIN* and *FAMIL*, have a negative effect on IPO intentions, although, in part, the coefficients of *SPIN* are insignificant. These types of start-up firms are less likely to have IPO intentions. The findings suggest that start-up firms financed by parent firms --- that is, spin-offs --- do not have to seek alternative sources of finance. It is also found that family businesses have less incentive to go public. Much literature has discussed whether family businesses are different from non-family businesses in terms of their resources, behavior, and decisions (e.g., Chrisman et al., 2003). Our findings imply that the strategies of entrepreneurs to gain access to equity markets differ between these types of firms.

Finally, the coefficients of *IGROW* are positive and significant, which indicates that start-up firms have IPO intentions as their industries grow. The entrepreneurs in a growing industry can expect a high valuation of their firms in the stock markets, and entrepreneurs are more likely to have IPO intentions in such an industry. As Pagano et al. (1998) argued, there is a positive relationship between the probability of an IPO and the stock market valuation of firms, and a boom may raise awareness of the IPO. In addition, this finding implies that market conditions, such as industry growth, are key determinants of IPO intentions among entrepreneurs.[42]

7. Conclusions

This paper has explored the IPO strategy of start-up firms. Using an original survey of start-up firms in the Japanese manufacturing and information service industries, we investigate what factors are associated with the intention to go public. Whereas previous literature has mainly examined IPOs by using their results, we shed some light on potential IPOs as seen from the viewpoint of entrepreneurs. This paper examines whether not only the determinants of going public discussed in previous literature, such as innovative activities, financial constraints, and loss of corporate control, but also entrepreneur-specific characteristics indeed have an impact on IPO intentions. The main result is that among start-up firms, those investing more heavily in R&D wish to go public. While this finding does not support Campbell's (1979) and Yosha's (1995) arguments, it is consistent with Deeds et al. (1997) and Honjo (2001). It is also found that spin-offs and family businesses are less likely to have IPO intentions.

to borrow from banks more cheaply. In this paper, the effects of leverage measured by debt ratio were also examined. In practice, the positive relationship between the IPO intention and leverage was found, but the results were not statistically significant. Furthermore, gaining access to a source of finance alternative to banks may become the incentive to go public, and Pagano et al. (1998) used the bank rate that is defined as the lagged value of the relative cost of borrowing to the average borrowing rate of all the firms in the sample. However, we could not use this variable because of data availability.

[41] Instead of *CONT*, we used another variable that is measured simply by using the score for avoidance of being acquired, but we could not obtain statistically significant results.

[42] In columns (ii) and (iv) of Table 6, we attempt to use industry dummies based on 25 industry groups. As a result, the coefficients of the dummy for both computer software products and information services were found to be positive, which suggest that start-up firms in the information service industry tend to have an intention to go public. In fact, successful information technology (IT) ventures have gained benefits by going pubic in such a booming industry, and, hence, the IT boom may affect IPO intentions. However, since this dummy is correlated with the variable for industry growth and other variables, we exclude it from the model to avoid multicollinearity.

Furthermore, entrepreneur-specific characteristics are found to relate to IPO intentions, with younger and highly educated entrepreneurs tending to desire to go public.

Needless to say, there are several limitations in this study, particularly due to the lack of arguments from the underwriter and investor sides. The availability of data on both demand and supply sides would provide more evidence on the IPO mechanism by describing the equilibrium. In addition, more precise data on the benefits and costs of going public, including how to measure financial constraints and the loss of corporate control, may be able to elaborate our findings. Moreover, this paper is based on cross-section analysis, but entrepreneurs' motivations toward IPOs may change over time as they learn market conditions of industrial structure and financial markets. For this purpose, longitudinal research is needed, and further development of this paper would provide greater insight on IPO intentions, which may be able to overcome reverse causality concerns. Furthermore, it can be said the results are peculiar to Japanese industries, but the analysis may be able to be replicated in other countries that pursue their policies of pushing start-up firms to go public. Further research should seek to understand better how start-up firms raise funds through IPOs and achieve growth.

Despite the limitations of this study, this paper contributes to providing further evidence on how the IPO mechanism is articulated in entrepreneurship and finance literature. While only a few empirical studies have directly examined the determinants of IPOs, we identify whether the determinants of going public discussed in previous literature, such as innovative activities, financial constraints, and loss of corporate control, indeed have an impact on IPO intentions. This paper also identifies whether attitudes toward IPOs vary across entrepreneur-specific characteristics and firm types. In particular, we provide evidence that R&D-intensive firms tend to pursue IPOs, partly because these firms secure alternative sources of finance for R&D investment.

The emergence of innovative firms has been the focus of much public policy discussion, and, as already mentioned, some developed countries have introduced new stock markets to provide funds for innovative firms with high-growth potential, while taking into consideration the NASDAQ market. These markets are expected to help overcome financial obstacles to entrepreneurship and to the development of high-tech industries, but there may be little evidence as to whether new stock markets operate efficiently enough to encourage entrepreneurship and innovation in these countries. On the other hand, as shown in this paper, R&D-intensive firms among start-ups wish to have greater access to equity markets, and they are more likely to grow. The findings of this paper would provide an empirical support for the creation of new stock markets for innovative firms with high-growth potential from the viewpoint of entrepreneurs. Innovative start-up firms seek to obtain new equity financing even in Japan that is often characterized by a bank-centered financial system. As Carpenter and Petersen (2002) emphasize, debt is likely to be a poor substitute for equity. In order to foster future entrepreneurs and innovative firms with high-growth potential, further development of equity markets is needed, which should lead to more innovation and enhanced future economic growth.

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Appendix: robustness check

In order to assess the robustness of the estimated relationships, we attempt to use alternative estimation approaches. As shown in Table 1, IPO intentions are measured by several levels: alternatives (2), (3), and (4). As an additional approach, an ordered probit model is employed. The results are shown in Table A1. In the ordered probit model, "intention to go public" is divided into three levels: alternatives (2), (3), and (4) of Table 1. That is, the dependent variable, including "no intention to go public," is categorical and ordered with four levels. In Table A1, we obtain similar results to those of Table 6. More specifically, the coefficients of *RD* are significant and positive. In addition, the coefficients of *MAGE* and *EDUC* are significant, and the results are consistent with those of Table 6.

(Insert Table A1 here)

Furthermore, one of the main findings is that among start-up firms, those investing more in R&D are more likely to wish to go public. However, *RD* is not a value at the initial year when the firm was founded, but a value at the recent accounting year. Thus, the causality may be in some sense ambiguous, and R&D investment may be endogenously determined. Although it is difficult to disentangle the endogeneity issue completely, we attempt to use the further estimation approaches, Newey's (1987) two-step method and the conditional maximum likelihood method, in order to fit models with dichotomous dependent variables and endogenous variables. As additional instrument variables, the values of R&D intensity for the previous two years are employed because we inquire about R&D intensity for the preceding three years. Since data on R&D intensity for the previous two years are not obtainable for several firms in the sample, the numbers of observations become 511 and 359 for all firms and joint-stock corporations, respectively. The results are

shown in Table A2.[43] Regardless of the estimation methods, we obtain similar results to those reported in Table 6. As shown in Table A2, R&D intensity has a significantly positive effect on IPO intentions, although the null hypothesis that there is no endogeneity was not rejected at the 5% significance level. Among start-up firms, those investing more heavily in R&D wish to go public, and the positive relationship between the IPO intention and R&D intensity is found to be robust in the additional estimation.

(Insert Table A2 here)

References

1. Arrow, K. J. (1962), "Economic welfare and the allocation of resources for innovation," in Nelson, R. R. (ed.) *The Rate and Direction of Inventive Activity: Economic and Social Factors*, Princeton University Press, Princeton, pp.609-625.
2. Black, B. S., Gilson, R. J. (1998), "Venture capital and the structure of capital markets: banks versus stock markets," *Journal of Financial Economics*, 47, pp.243-277.
3. Bodnaruk, A., Kandel, E., Mass,a M., Simonov, A. (2008), "Shareholder diversification and the decision to go public," *Review of Financial Studies*, 21, pp.2779-2824.
4. Boot, A. W. A., Gopalan, R., Thakor, A. V. (2006), "The entrepreneur's choice between private and public ownership," *Journal of Finance*, 61, pp.803-836.
5. Brau, J. C., Fawcett, S. E. (2006), "Initial public offerings: an analysis of theory and practice," *Journal of Finance*, 61, pp.399-436.
6. Brau, J. C., Francis, B., Kohers, N. (2003), "The choice of IPO versus takeover: empirical evidence," *Journal of Business*, 76, pp.583-612.
7. Brav, A., Gompers, P. A. (1997), "Myth or reality? The long-run underperformance of initial public offerings: evidence from venture and nonventure capital-backed companies," *Journal of Finance*, 52, pp.1791-1821.
8. Campbell, T. (1979), "Optimal investment financing decisions and the value of confidentiality," *Journal of Financial and Quantitative Analysis*, 14, pp.913-924.
9. Carpenter, R. E., Petersen, B. C. (2002), "Capital market imperfections, high-tech investment, and new equity financing," *Economic Journal*, 112, pp.F54-F72.
10. Chemmanur, T. J., Fulghieri, P. (1999), "A theory of the going-public decision," *Review of Financial Studies*, 12, pp.249-279.
11. Chrisman, J. J., Chua, J. H., Steier L. P. (2003), "An introduction to theories of family business," *Journal of Business Venturing*, 18, pp.441-448.
12. Cockburn, I., Griliches, Z. (1988), "Industry effects and appropriability measures in the stock market's valuation of R&D and patents," *American Economic Review*, 78, pp.419-423.
13. Davidsson, P., Wiklund, J. (2000), "Conceptual and empirical in the study of firm growth," in Sexton, D., Landström, H., (eds.) *The Blackwell Handbook of Entrepreneurship*, Blackwell, Oxford, pp.26-44.
14. Deeds, D. L., Decarolis, 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, pp.31-46.
15. Fazzari, S. M., Hubbard, G., Petersen, B, C. (1988), "Financing constraints and corporate investment," *Brooking Papers on Economic Activity*, 2, pp.141-206.
16. Field, L. C., Karpoff, J. M. (2002), "Takeover defenses of IPO firms," *Journal of Finance*, 57, pp.1857-1889.
17. Florin, J. (2005), "Is venture capital worth it? Effects on firm performance and entrepreneur returns," *Journal of Business Venturing*, 20, pp.113-135.
18. Hall, B. H. (1993), "The stock market's valuation of R&D investment during the 1980's," *American Economic Review*, 83, pp.259-264.
19. Himmelberg, C. P., Petersen, B. C. (1994), "R&D and internal finance: a panel study of small firms in high-tech industries," *Review of Economics and Statistics*, 76, pp.38-51.
20. Honjo, Y. (2001), "Do innovative start-ups really wish to go public? Evidence from Japanese electrical manufacturing companies," *Applied Economics Letters*, 8, pp.493-497.
21. Japan Small Business Research Institute (2003), "Report of the study group on Japanese start-ups (*Shinkikaigyo kenkyukai hokokusho*)," Japan Small Business Research Institute, Tokyo.
22. Jovanovic, B. (2001), "New technology and the small firm," *Small Business Economics*, 16, pp.53-55.
23. Lerner, J. (1994), "Venture capitalists and the decision to go public," *Journal of Financial Economics*, 35, pp.293-316.
24. Matsuda, S., Vanderwerf, P., Scarbrough, P. (1994), "A comparison of Japanese and U.S. firms completing initial public offerings," *Journal of Business Venturing*, 9, pp.205-222.
25. Megginson, W. L., Weiss, K. A. (1991), "Venture capitalist certification in initial public offerings," *Journal of Finance*, 46, pp.879-903.
26. Nelson, T. (2003), "The persistence of entrepreneur influence: management, ownership, and performance effects at initial public offering," *Strategic Management Journal*, 24, pp.707-724.
27. Newey, W. K. (1987), "Efficient estimation of limited dependent variable models with endogenous explanatory variables," *Journal of Econometrics*, 36, pp.231-250.
28. Pagano, M. (1993), "The floatation of companies on the stock market: a coordination failure model," *European Economic Review*, 37, pp.1011-1125.
29. Pagano, M., Panetta, F., Zingales, L. (1996), "The stock market as a source of capital: some lessons from

[43] In addition to *RD*, *CONT* is not measured at start-up among the independent variables. Since, in fact, the coefficients of *CONT* are not significant in Table 6, we attempt to estimate the models without *CONT*. Even for the models without *CONT*, the estimated results are almost identical to those reported in Table A2.

initial public offerings in Italy," *European Economic Review*, 40, pp.1057-1069.
30. Pagano, M., Panetta, F., Zingales, L. (1998), "Why do companies go public? An empirical analysis," *Journal of Finance*, 53, pp.27-64.
31. Pagano, M., Röell, A. (1998), "The choice of stock ownership structure: agency costs, monitoring, and the decision to go public," *Quarterly Journal of Economics*, pp.113, 187-225.
32. Röell, A. (1996), "The decision to go public: an overview," *European Economic Review*, 40, pp.1071-1081.
33. Sakakibara, K., Koga, T., Honjo, Y., Kondo, K. (2000), "Survey research on technology-based start-ups and their entrepreneurs in Japan (*Nippon ni okeru gijutsukei venture kigyo no keiei jittai to sogyosha ni kansuru chosakenkyu*)," Material No. 73, National Institute of Science and Technology Policy, Science and Technology Agency, Tokyo.
34. Stoughton, N. M., Wong, K. P., Zechner J (2001), "IPOs and product quality," *Journal of Business*, 74, pp.375-408.
35. Wiklund, J., Davidsson, P., Delmar, F. (2003), "What do they think and feel about growth? An expectancy-value approach to small business managers' attitudes toward growth," *Entrepreneurship: Theory and Practice*, 27, pp.247-270.
36. Yosha, O. (1995), "Information disclosure costs and the choice of financing source," *Journal of Financial Intermediation*, 4, pp.3-20.
37. Zingales, L. (1995), "Insider ownership and the decision to go public," *Review of Economic Studies*, 62, pp.425-448.

Appendices

Table 1. IPO strategy

	Alternative	*N*	Ratio (%)
(1)	Have already gone public	2	0.4
(2)	Intend to go public within one year	7	1.3
(3)	Intend to go public within a few years	21	4.0
(4)	Have not decided when the firm will go public but intend to go public	98	18.8
(5)	Do not intend to go public	321	61.5
(6)	Have not considered whether or not to go public	73	14.0
	Total	522	100.0

Note: *N* indicates the number of observations.

Table 2. Growth rates according to the IPO intention

	Employment growth		Sales growth	
	IPO = 0	*IPO* = 1	*IPO* = 0	*IPO* = 1
Mean	0.069	0.151	0.087	0.184
S.D.	0.124	0.138	0.284	0.391
Median	0.036	0.145	0.059	0.129
N	380	121	363	115
t statistic	-6.209***		-2.454**	
Mann-Whitney's *U* statistic	-6.363***		-3.090***	

Note: S.D. indicates the standard deviation. *N* indicates the number of observations. ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. Since the variance ratio test fails to reject the null hypothesis that the variances are equal between the two categories of sales growth, Welch's formula is used to calculate the *t* statistic.

Table 3. Definitions of variables

Variable	Definition
(Dependent variable)	
IPO	Dummy variable for whether the firm has the intention to go public.
(Independent variable)	
RD	R&D investment divided by total revenue.
FCONS	Dummy variable for whether the actual initial capital is less than the required capital when the firm was founded.
CONT	The score for "avoidance of being acquired" minus the score for "market value" as a corporate objective.
MAGE	Logarithm of the entrepreneur's age at start-up.
EDUC	Dummy variable for the entrepreneur who has had university or post-graduate school education.
EXPE	Dummy variable for the entrepreneur who has had work experience as a board member of a company or a full-time employee before starting the business.
FOUND	Dummy variable for whether the entrepreneur is a founder.
JCORP	Dummy variable for a joint-stock corporation.
SPIN	Dummy variable for the firm founded as a subsidiary or an affiliated company at start-up.
FAMIL	Dummy variable for the firm founded as a family business at start-up.
IGROW	Growth rate of sales in the industry where the firm is classified at the two-digit SIC level.

Note: All the dummy variables take the value one if the stated condition holds, and zero otherwise.

Table 4. Descriptive statistics

	All				*IPO* = 0		*IPO* = 1	
Variable	Mean	S.D.	Min.	Max.	Mean	S.D.	Mean	S.D.
RD	0.053	0.148	0.000	2.100	0.042	0.140	0.087	0.167
FCONS	0.298	-----	-----	-----	0.277	-----	0.365	-----
CONT	-1.162	1.523	-4.000	4.000	-1.145	1.541	-1.214	1.473
MAGE	3.818	0.233	3.045	4.317	3.839	0.225	3.754	0.245
EDUC	0.533	-----	-----	-----	0.492	-----	0.659	-----
EXPE	0.929	-----	-----	-----	0.921	-----	0.952	-----
FOUND	0.817	-----	-----	-----	0.792	-----	0.897	-----
JCORP	0.706	-----	-----	-----	0.645	-----	0.897	-----
SPIN	0.292	-----	-----	-----	0.312	-----	0.230	-----
FAMIL	0.060	-----	-----	-----	0.076	-----	0.008	-----
IGROW	-0.008	0.051	-0.119	0.080	-0.014	0.048	0.011	0.055
Entrepreneur's age	46.706	10.218	21.000	75.000	47.591	10.056	43.937	10.266
Firm's age	5.960	0.805	5.000	7.000	5.954	0.803	5.976	0.815
N	520				394		126	

Note: S.D. indicates the standard deviation. *N* indicates the number of observations.

Table 5. Correlation matrix

Variable	*RD*	*FCONS*	*CONT*	*MAGE*	*EDUC*	*EXPE*	*FOUND*	*JCORP*	*SPIN*	*FAMIL*	*IGROW*
RD	1.000										
FCONS	-0.000	1.000									
CONT	-0.059	-0.072	1.000								
MAGE	-0.069	-0.042	0.042	1.000							
EDUC	0.058	-0.072	0.037	-0.003	1.000						
EXPE	-0.008	0.050	-0.034	0.095	0.071	1.000					
FOUND	0.076	0.123	-0.060	-0.322	-0.114	0.101	1.000				
JCORP	-0.000	-0.022	-0.021	0.140	0.182	0.150	-0.131	1.000			
SPIN	-0.096	-0.151	0.007	0.249	0.127	0.046	-0.309	0.239	1.000		
FAMIL	-0.038	-0.093	0.043	-0.021	0.024	-0.088	-0.091	-0.087	-0.162	1.000	
IGROW	0.074	-0.051	-0.019	-0.200	0.081	0.121	0.093	0.085	-0.072	-0.144	1.000

Note: The number of observations is 520.

Table 6. Estimated results: probit

	All				Joint-stock			
	(i)		(ii)		(iii)		(iv)	
Variable	Coef.	*dF/dx*	Coef.	*dF/dx*	Coef.	*dF/dx*	Coef.	*dF/dx*
Constant term	1.318		1.056		2.414*		2.008	
	(1.123)		(1.199)		(1.318)		(1.361)	
RD	0.879**	0.265**	0.841**	0.232**	1.669***	0.572***	1.498***	0.506***
	(0.368)	(0.111)	(0.387)	(0.107)	(0.566)	(0.195)	(0.562)	(0.190)
FCONS	0.245*	0.076*	0.201	0.057	0.321**	0.114**	0.269*	0.093*
	(0.134)	(0.043)	(0.143)	(0.042)	(0.155)	(0.056)	(0.159)	(0.057)
CONT	-0.006	-0.002	0.011	0.003	-0.032	-0.011	-0.022	-0.008
	(0.041)	(0.012)	(0.043)	(0.012)	(0.047)	(0.016)	(0.047)	(0.016)
MAGE	-0.776***	-0.234***	-0.784**	-0.216**	-1.024***	-0.351***	-0.833**	-0.281**
	(0.281)	(0.084)	(0.308)	(0.085)	(0.332)	(0.114)	(0.349)	(0.118)
EDUC	0.431***	0.128***	0.321**	0.088**	0.395***	0.132***	0.378**	0.125**
	(0.127)	(0.037)	(0.136)	(0.037)	(0.150)	(0.049)	(0.153)	(0.049)
EXPE	0.316	0.085	0.076	0.020	0.259	0.083	0.160	0.052
	(0.276)	(0.065)	(0.306)	(0.079)	(0.367)	(0.107)	(0.376)	(0.115)
FOUND	0.301	0.084	0.284	0.072	0.337*	0.109*	0.255	0.082
	(0.188)	(0.048)	(0.203)	(0.047)	(0.202)	(0.061)	(0.212)	(0.065)
JCORP			0.978***	0.223***				
			(0.178)	(0.032)				
SPIN			-0.294*	-0.077*			-0.230	-0.076
			(0.160)	(0.040)			(0.168)	(0.054)
FAMIL			-1.142**	-0.188**			-1.049**	-0.241**
			(0.502)	(0.037)			(0.533)	(0.066)
IGROW			3.426***	0.945***			3.214**	1.085**
			(1.316)	(0.364)			(1.485)	(0.501)
N	520		520		367		367	
log-likelihood	-268.9		-241.2		-204.8		-198.5	
LR test	38.0***		93.4***		43.5***		56.2***	
Pseudo R^2	0.066		0.162		0.096		0.124	

Note: Coef. and *dF/dx* represent estimated coefficients and marginal effects, respectively. Figures in parentheses are standard errors. ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations.

Table A1. Estimated results: ordered probit

	All		Joint-stock	
	(i)	(ii)	(iii)	(iv)
Variable	Coef.	Coef.	Coef.	Coef.
RD	0.830**	0.808**	1.348***	1.295***
	(0.345)	(0.357)	(0.459)	(0.461)
FCONS	0.207	0.160	0.275*	0.231
	(0.127)	(0.134)	(0.144)	(0.148)
CONT	-0.014	0.005	-0.036	-0.025
	(0.039)	(0.041)	(0.044)	(0.045)
MAGE	-0.807***	-0.809***	-1.024***	-0.860***
	(0.267)	(0.288)	(0.310)	(0.323)
EDUC	0.415***	0.302**	0.384***	0.361**
	(0.122)	(0.129)	(0.142)	(0.145)
EXPE	0.367	0.151	0.363	0.255
	(0.268)	(0.292)	(0.345)	(0.352)
FOUND	0.255	0.242	0.282	0.209
	(0.182)	(0.195)	(0.194)	(0.203)
JCORP		0.926***		
		(0.172)		
SPIN		-0.231		-0.173
		(0.151)		(0.157)
FAMIL		-1.147**		-1.053**
		(0.498)		(0.525)
IGROW		3.293***		3.071**
		(1.228)		(1.366)
N	520	520	367	367
log-likelihood	-351.0	-324.2	-280.1	-273.7
LR test	38.8***	92.5***	42.9***	55.7***
Pseudo R^2	0.052	0.125	0.071	0.092

Note: Coef. represents estimated coefficients. Figures in parentheses are standard errors. ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations.

Table A2. Estimated results: probit with endogenous independent variables

	All		Joint-stock	
	(i)	(ii)	(iii)	(iv)
	Two-step	ML	Two-step	ML
Variable	Coef.	Coef.	Coef.	Coef.
Constant term	0.730	0.697	1.538	1.524
	(1.231)	(1.213)	(1.386)	(1.381)
RD	1.161**	1.170**	1.810***	1.832***
	(0.498)	(0.475)	(0.647)	(0.640)
FCONS	0.218	0.214	0.295*	0.293*
	(0.146)	(0.144)	(0.162)	(0.161)
CONT	0.007	0.007	-0.029	-0.028
	(0.044)	(0.043)	(0.048)	(0.048)
MAGE	-0.700**	-0.689**	-0.715**	-0.711**
	(0.316)	(0.312)	(0.358)	(0.357)
EDUC	0.313**	0.314**	0.368**	0.369**
	(0.140)	(0.137)	(0.156)	(0.155)
EXPE	0.073	0.071	0.136	0.136
	(0.335)	(0.327)	(0.422)	(0.416)
FOUND	0.280	0.283	0.260	0.262
	(0.207)	(0.204)	(0.215)	(0.214)
JCORP	0.952***	0.952***		
	(0.181)	(0.179)		
SPIN	-0.291*	-0.290*	-0.232	-0.232
	(0.164)	(0.162)	(0.171)	(0.170)
FAMIL	-1.239**	-1.239**	-1.107*	-1.111*
	(0.567)	(0.548)	(0.574)	(0.568)
IGROW	3.323**	3.289**	3.046**	3.022**
	(1.346)	(1.329)	(1.515)	(1.505)
N	511	511	359	359
Wald test	69.0***	71.8***	45.5***	46.8***
Wald test of exogeneity	3.10*	3.17*	1.09	1.11

Note: *RD* is an endogenous independent variable, and instrument variables are the values of R&D intensity for the previous two years. Two-step and ML represent Newey's two-step method and the conditional maximum likelihood method, respectively. Coef. represents estimated coefficients. Figures in parentheses are standard errors. ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. *N* indicates the number of observations. Wald test of exogeneity tests the null hypothesis that there is no endogeneity.