

Family Control and Stock Market Reactions to Innovation Announcements

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Summary

Although family firms are common around the world, studies on family-controlled business are limited. Prior studies mainly focused on the influences of family ownership on overall firm performance, and the results were mixed. In this study we attempted to explore the impacts of family ownership on innovation by examining the association of family control and stock market reactions to innovation announcements. We found that firms with greater family control experienced significantly more negative stock market reactions to innovation announcements. The results further indicated that divergence of cash flow and voting rights was strongly and negatively correlated with announcement-period abnormal returns. In addition, the findings suggested a significantly positive moderating effect of institutional ownership. The conclusions were robust under various measures of family control, and remained valid after controlling other influential factors for stock market reactions to innovation announcements.

Keywords: family control, innovation, institutional ownership, stock market reactions

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INTRODUCTION

Firms predominantly controlled by families are common around the world (La Porta, Lopez-De-Silanes and Shleifer, 1999; Claessens, Djankov and Lang, 2000; Morck, Wolfenzon and Yeung, 2005). In Western Europe, the majority of public held firms remain family-controlled (La Porta et al., 1999; Faccio and Lang, 2002). Even in the U.S., where ownership structures are relatively less concentrated, one-third of S&P 500 firms are still classified as family-controlled (Anderson and Reeb, 2003a). Most prior studies on family business investigated the impacts of family ownership on overall firm performance, and the results so far have been inconclusive.¹ To better understand the influence of family business, a deeper analysis is needed in understanding the channels through which family control influences business performance. This study contributes to this line of research by studying the impacts of family control on stock market reactions to innovation announcements. The literature suggests that the capability of innovation plays an essential role in creating competitive advantage and organizational success (Porter, 1985; Kanter, 1997). Prior studies documented strong evidence that innovation was strongly associated with firm value.² In this study, we ask if family control matters in the stock market reactions to innovation announcements.

Family ownership may influence innovation in several different dimensions. Agency theory argues that the separation of ownership and control in public firms induces potential conflicts of interest that managers may pursue their own interests at the expense of shareholders' interests (Jensen and Meckling, 1976). In a family business, since family wealth is heavily tied to firm value, family shareholders have strong incentives to minimize agency costs by monitoring managerial decisions so that the resources will not be wasted (Anderson and Reeb, 2003a). In addition, because family owners incline to pass a firm's assets on to their heirs rather than to consume them only for their generation (Casson, 1999), they tend to take a longer-term view on investment decisions, and act as stewards of a firm's resources by deploying them in ways that create family wealth (Ezzamel and Watson, 1993; Bruton, Ahlstrom and Wan, 2003; Steier, 2003). The reduction of agency costs and the long-term attitude toward investment associated with family business both encourage the exploration of value-creating innovation (Zahra, 2005), and may result in more favorable responses from investors in the value assessment of innovation announcements.

Some studies, however, pointed out that family ownership might have negative impacts on innovation. Because family owners usually have a large portion of wealth tied to the firm, it is difficult to diversify the risks of their wealth. As a result, family owners may prefer risk-averse corporate strategies (Donckels and Frohlich, 1991). In addition, prior research has suggested that the attitude of preserving the status quo as well as the emphasis on short-term decision-making (Ellington, Jones and Deane, 1996) might make family firms become resistant to changes, and thus follow conservative strategies (Shepherd and Zahra, 2003). Furthermore, the effect of altruism typically found in family business may reduce the value of innovation. For example, a family business may hire unqualified and incompetent employees simply because they are family members. Altruism may also reduce the effectiveness of family managers in monitoring other family agents (Schulze, Lubatkin, Dino and Buchholtz, 2001; Schulze, Lubatkin and Dino, 2003; Lubatkin, Schulze, Ling and Dino, 2005). The cost of poor monitoring is expected to be more serious for innovative projects that are associated with a high level of information asymmetry. Finally, family control may create another kind of agency cost, what Young, Peng, Ahlstrom and Bruton (2002) called a principle-principle agency relationship. The common practice of a pyramidal ownership structure and cross-holdings among family businesses enables family owners to control a larger proportion of voting rights than those granted strictly by their ownership (La Porta et al., 1999). The divergence between cash flow rights and voting rights creates additional agency costs that family owners may expropriate firm

resources for their own interests (Claessens, Djankov, Fan and Lang, 2002). Upon the innovation announcements, the agency costs associated with family control may negatively influence investors' perceive value of innovation.

In this study, we measured investors' perceptions by stock market reactions to innovation announcements with the framework of event-study methodology. Under the assumption of efficient market hypothesis, announcements of innovative outputs bring unanticipated information into financial markets that cause share prices assessment on shareholders' wealth. In response to the new information, changes in stock prices represent investors' revision of their expectation with regard to the net present value of a firm's risk-adjusted expected cash flow generated by the inventive outputs that are related to the quantity, quality and the underlying risks associated with the innovations. Numerous studies suggested that financial markets were capable of distinguishing value-enhancing innovations from value-destroying ones by considering innovation-specific characteristics (Chaney, Devinney and Winer, 1991; Kelm, Narayanan and Pinches, 1995; Hendricks and Singhal, 1997; Cho and Pucik, 2005).³

The events of new product, process and service announcements made by Taiwanese firms were collected to test against the hypotheses. This sample provided an ideal setting for our study for three reasons. First, family-controlled businesses are common in Taiwan. Yeh (2005) documented that about 58.2 percent of Taiwanese firms were family-controlled. Second, industries relying on innovation play an important role in Taiwan's economy. Sheu and Yang (2005) indicated that the electronics industry alone accounted for 72 percent of total profits of firms listed on the Taiwan Stock Exchange. Moreover, computers and peripherals, telecommunication and electronics industries together accounted for 31 percent of Taiwan's total exports, and its shipment volumes of LCD monitors and notebooks were ranked first in the world in 2005.⁴ Finally, Taiwan's stock market is relatively efficient (Aitken and Siow, 2003).⁵ Chang, Chen and Liu (2004) documented that Taiwan stock market was efficient in responding to corporate news announcements. Consequently, the unique characteristics of Taiwanese firms provide an appropriate context for testing the effect of family control on market reactions to innovation announcements.

The results of our study showed that innovation announcements generated strong and positive stock market reactions. The evidence further showed that family control had a significant negative relationship with stock market reactions to innovation announcements, implying that family ownership created more harms than benefits with regard to stock market valuation of innovation. In addition, we found that institutional ownership had a significantly positive moderating effect. The participation of institutional investors significantly mitigated the negative influence of family control. The conclusions were robust under various measures of family control, and remained valid after controlling other influential factors for stock market reactions to innovation announcements.

This paper proceeds as follows. Section 2 provides the framework of corporate governance in Taiwan. Section 3 discusses the theoretical background. Section 4 shows the sample and methodology. The empirical results are presented in section 5. Section 6 and 7 offer the discussion and conclusion.

CORPORATE GOVERNANCE IN TAIWAN

The legal framework of corporate governance in Taiwan is based on Company Law, Securities and Exchange Law, and the related rules and regulations. Company Law sets out rules to protect present and future shareholders and creditors. Securities Law enhances the regulation of disclosure and transparency for listed companies.

Similar to that in Japan, a corporate board in Taiwan is comprised of a board of directors and supervisors. Directors are responsible for maintaining the value of a firm and ensuring good practices in terms of audit, transparency and accountability, while supervisors

are responsible for independent monitoring. Managerial decisions are determined by directors voting during board meetings. Boards of publicly-traded corporations should include at least five directors and three supervisors. To further enhance corporate governance, firms listed after January 2002 are required to appoint two independent directors and one independent supervisor on the board, and at least one each of the elected independent directors and supervisors must be a professional in accounting or finance. In addition, Company Law allows institutional shareholders to elect representatives to the board. This allows the controlling families to increase board seats by establishing nominal investment companies, or by investing and controlling other firms that are institutional shareholders and hold board seats in the company.

Taiwanese listed firms are required to disclose information regularly. The regular disclosure documents include financial reporting, annual report, announcements of total operating revenues, internal auditing operation and insider trading information. In addition, listed firms are required to disclose the identities of shareholders owning more than 10 percent of equity. Moreover, directors, supervisors, and senior executives are required to report the changes in equity ownership on a monthly basis. To protect the rights of minority shareholders and creditors, a parent firm and its subordinate companies are required to report consolidated financial statements and a statement regarding the relationship of legal acts and the status between them at the end of each business year.

Information on corporate events that may have large impacts on shareholders' equity has to be disclosed on a timely basis. Any approved resolution with investment greater than or equal to 20 percent of the company's paid-in capital, or NT\$1 billion is required to be fully disclosed to the public. To ensure the accuracy and generality of information, a listed company is required not to disclose any information to the public before the information is published on the Market Observation Post System, a website maintained by the Taiwan Stock Exchange. Listed firms in Taiwan are also required to report on the Market Observation Post System any material effect on company finances or business resulting from the completion of development of a new product, or successful development and formal entry into the full-scale production stage of an experimental product.

BACKGROUND AND HYPOTHESES

The effects of family control on innovation

Altruism

A unique nature of family business is that the agency relationship is embedded by the past and ongoing parent-child relationship of the household, and thus characterized by altruism (Lubatkin et al., 2005). Altruism tends to generate a belief among family members employed by the family firm that they have a residual claim or an option on the firm's estate (Holtz-Eakin, Joulfian and Rosen, 1993; Stark and Falk, 1998). This claim helps align preferences for a growth strategy and risk-taking between the family and the firm. Moreover, as a result of altruism, family members are likely to be considerate of each other in such a way that the family bond is promoted (Simon, 1993; Eshel, Samuelson and Shaked, 1998). This effect fosters loyalty and aligns incentives among members that could stimulate the family to commit to the long-run prosperity of the organization (Ward, 1987; Lubatkin et al., 2005). In addition, family shareholders are likely to have better knowledge and information about the firm. Thus, they are more willing to take a longer-term strategic view toward business operations, rather than evaluating them by the short-term returns (Bruton et al., 2003). The attitude toward long-term firm wealth encourages family businesses to engage in innovative investments which are essential to sustained competitive advantages (Anderson and Reeb, 2003a).

Family business, however, may suffer from parental altruism (Lubatkin et al., 2005). The problem of altruism arises because parents often have an incentive to be generous to and spoil their children, even if this generosity may cause their children to have a free-ride and shirk their duties (Schulze et al., 2003; Lubatkin et al., 2005). Parental altruism may provide family members with secure employment, as well as perquisites and privileges that are not available elsewhere. When the labor pool is limited to family members, parental altruism is likely to expose family to the risk of hiring unqualified individuals (Gersick, Davis, Hampton and Lansberg, 1997; Lubatkin et al., 2005).⁶ In addition, to maintain effective control of the board, a family business is likely to limit the directors to family members rather than competent professionals, which may significantly constrain its capability in selecting and evaluating valuable innovation projects (Hendry, 2005; Lee, 2006). Compounding this problem, altruism reduces the effectiveness of monitoring and disciplining family agents when altruism systematically and favorably biases family CEOs' perception of children employed by the firm (Schulze et al., 2003). When backed by powerful family members, it is often very difficult for other stakeholders to replace family agents (Schulze et al., 2001). The incompetent family members thus protected by altruism may be incapable of allocating resources into value-creating innovation projects.

Agency cost

Agency theory suggests that ownership concentration reduces agency costs because large owners have enough control and incentive to monitor the managers' interests in line with their own (Shleifer and Vishny, 1986; Shleifer and Vishny, 1997). Similar to other large shareholders, a family will possess the incentives, power and information to monitor managers given its significant shareholdings, thereby reducing the likelihood that managers will pursue their own personal interests (Morck, Shleifer and Vishny, 1988; Anderson and Reeb, 2003a). Innovation investments usually involve a temporal trade-off in which the firm sacrifices short-term earnings for long-term financial performance (Laverly, 1996). When compensation is based on current earnings, agency cost may prevent managers from actively engaging in innovation. To the extent that family ownership aligns the interest in growth opportunities and risk between a family and a firm (Jensen and Meckling, 1976; Fama and Jensen, 1983), a family business may be motivated to take effective monitoring on managerial decisions that promote exploring risky but valuable innovative ideas. Prior research indicated that concentration of ownership enabled owners to reduce managers' discretion (Jensen and Meckling, 1976; Shleifer and Vishny, 1986; Gedajlovic and Shapiro, 1998). Hill and Snell (1988) and Francis and Smith (1995) found ownership concentration was positively related to innovation performance. Lee and O'Neill (2003) found the effect of ownership concentration was important for U.S. firms, but insignificant for Japanese firms. Zahra et al. (2000) suggested that the effect of ownership on innovation performance differed depending on the types of shareholders.

Family business, nevertheless, may be confronted with the agency costs of self-control associated with altruism (Schulze et al., 2003). The self-control problem arises because individuals lack complete foresight and are often not fully rational or perfectly disciplined. The changes of impulse, emotion, and circumstance can induce individuals to take actions that compromise their welfare, as well as those who depend on them (Thaler and Shefrin, 1981; O'Donoghue and Rabin, 2000). In addition, prior evidence indicated that not only is ownership concentrated in family firms, but also management (Westhead and Cowling, 1998). As a result, family firms may be more vulnerable to self-control problems because the concentration in ownership and management of the controlling family enjoy almost unchallenged discretion over the use of the firm's assets. Often family members do not have to justify their decisions to an independent board of directors, nor do they have their performance monitored by external

stakeholders. Therefore, family shareholders are likely to have the ability and power to use a firm's resources as they see fit, which gives the controlling family an incentive to be generous to other members in advancing their personal well-being at the expense of other stakeholders (O'Donoghue and Rabin, 2000; Lubatkin et al., 2005). When innovation is motivated by the private interest of the controlling family, it is often difficult to have a disciplined and careful project screening process aimed at the long-term value creation.

Although other blockholders may pursue their self-interests at the expense of minority shareholders, the agency problem, however, may be more serious in family ownership. The private interest of the controlling family is deeply rooted in parental altruism - the intention of being generous to other family members. Unlike other individual blockholders, a family member may pursue not only his/her own private interest, but also the private interest of other family members. For example, a family firm may have an explicit objective to grow at a scale consistent with providing future generations of the family with employment. This may not be consistent with firm value maximization. Thus, the agency problem associated with the controlling family may be more costly. In addition, the careers and wealth of family members are often more closely tied to the firms than other blockholders. It is more difficult for family members to diversify their investments in both financial and human capital. As a result, the extent of entrenchment associated with the controlling family is expected to be stronger. Schulze et al. (2003) suggested that the problem of self-interest deriving from altruism could not be controlled easily, and it was difficult to resolve than the problem that faced by non-family firms. Yen (1994b) indicated family members were allocated more resources than professional managers in Taiwanese family-controlled firms.

Moreover, the portfolio perspective argues that shareholders may only be concerned with systematic risks, such as political and economic risks, when they hold diversified portfolios (Wright, Kroll, Load and Van, 2002). Since family shareholders usually invest a relatively high proportion of their wealth, or are deeply involved in the management of the firm, they cannot easily diversify their investment in financial assets or human capital. The lack of diversification could lead family shareholders to be risk-averse and to oppose certain projects with inherent risks (Donckels and Frohlich, 1991; Zhang, 1998; Hausman, 2005; Zahra, 2005), and thus creativity and innovation are usually considered less important in family firms (Donckels and Frohlich, 1991). Some studies showed that family-controlled firms were indeed more likely to be associated with few new products (Ellington et al., 1996), little investment in new technologies (Chandler, 1990), or misallocation of firm's resources on inefficient investments (Stulz, 1988). Perel (2002) pointed out that families might be the major impediment to innovation since strategic change was risky and required heavy investment without guarantees of financial success. Gallo (1995) documented that family firms functioned with less risk than non-family firms. The empirical results of Gamble (2000) showed that concentrated ownership had a negative relationship with R&D intensity.

Both the altruism and agency cost suggest positive as well as negative effects of family control on innovation. The net effect is thus ambiguous. Based on the above arguments, we have the following hypotheses.

Hypothesis 1a: Family control is positively associated with stock market reactions to innovation announcements.

Hypothesis 1b: Family control is negatively associated with stock market reactions to innovation.

Divergence of cash flow and voting rights

Recent research has emphasized the agency problem that controlling shareholders may appropriate value from minority shareholders (La Porta et al., 1999; Dharwadkar, Gerard and Brandes, 2000). In a family business, the agency cost associated with major and minor

shareholders could be important when the divergence between cash flow rights and voting rights created through the pyramid structures and cross-holdings of a family group becomes significant. A pyramid structure is formed when one firm owns the equity stocks of another corporation that may in turn holds the stock of another firm, a process that can be repeated a number of times (La Porta et al., 1999; Claessens et al., 2000). To give an example of how pyramid structure could result in divergence of voting rights and cash flow rights, assume a family owns 20 percent of the votes in firm A, and firm A has 25 percent of the votes of firm B. The pyramidal structure allows the family to retain control of 25 percent voting shares of firm B, but the family only holds 5 percent ($20\% \times 25\%$) of cash flow stake of firm B.⁷ As demonstrated in the example, a family can control a great proportion of voting shares without a corresponding amount of investment. The deviation of cash flow rights and voting rights is even worse when firms have cross-holdings that allow for interlocking shares between firms in the same family business group (Morck et al. 2005). La Porta et al. (1999), Claessens et al. (2000), and Faccio and Lang (2002) indicated that through pyramid control structures and cross-holdings, voting rights held by controlling shareholders significantly exceeded cash flow rights in most countries.

When family shareholders hold more voting rights than cash flow rights, they have effective control over the investment decisions, and may use a firm's resources for their own interests while other stakeholders bear the costs (Shleifer and Vishny, 1997; La Porta et al., 1999). High voting rights and small cash flow rights give the controlling shareholder greater power for wealth expropriation, but reduce the share of losses from such practices (Yeh, 2005). Thus, families have an inducement to expropriate a firm's resources. A controlling family may be motivated to invest in innovation projects with the intention to control more resources and gain better status associated with the investment (Brush, Bromiley and Hendrickx, 2000; Jensen and Smith, 2000). Gompers, Ishii and Metrick (2004) and Villalonga and Amit (2006) found that a greater divergence in voting rights and cash flow rights was associated with low firm value. Yeh (2005) found that there was a negative entrenchment effect in Taiwanese family-controlled firms. Therefore, we establish the following hypothesis.

Hypothesis 2: The divergence of cash flow rights and voting rights is negatively associated with stock market reactions to innovation announcements.

The moderating impact of institutional investors

The problem of interest conflicts between managers and shareholders suggests that family managers may not always invest in innovation projects that aim to create the wealth of other minority shareholders. Indeed, some investment projects may be undertaken solely to enhance family members' private interests (Jensen, 1993). To mitigate this potential cost, agency theorists argue that external monitoring and internal governance mechanisms can help reduce these conflicts, and ensure that managerial decisions of family firms are in line with other shareholders' interests (Fama and Jensen, 1983; Shleifer and Vishny, 1997; Aguilera, 2005). However, given the profound influence of family blockholders on board composition and business management, it is often difficult to resolve the agency problem with internal governance systems (Schulze et al., 2001; Yeh and Woidtke, 2005). In this situation, the external governance mechanism may do a better job in mitigating agency costs by effective monitoring of managerial decisions. Institutional investors are professionals in financial markets that are equipped with knowledge and skills in evaluating investment decisions. With their large shareholdings, institutional investors have a strong incentive to monitor and influence the management of the firms they invest in (Zahra, 1996; Wright, Kroll and Elenkov, 2002). In addition, without the involvement of firm management, the decisions of institutional investors are unlikely to be distorted by controlling families. Prior research has shown that external monitors help diminish agency problems in R&D investments (Hill and Snell, 1988;

Baysinger, Kosnik and Turk, 1991). Le, Walters and Kroll (2006) found that institutional investors could positively moderate the relationship between R&D expenditure and firm performance. Therefore, we suggest the following hypothesis.

Hypothesis 3: Institutional ownership can positively moderate the relation between family control and stock market reactions to innovation announcements.

METHOD AND SAMPLE

Method

The standard event-study method was used to examine stock price responses to announcements of innovations.⁸ To measure the abnormal stock returns to announcements, we followed Brown and Warner (1985) by using the market model to obtain estimates of expected returns. The market model depicts the return on a security as varying with market portfolio return, which is adjusted for the security's risk factor. That is,

$$E(R_{it}/I_{t-1}, R_{mt}) = \alpha_i + \beta_i R_{mt}$$

where $E(R_{it}/I_{t-1}, R_{mt})$ is the expected return on the i th firm at time t , given the available information (I_{t-1}) and the return on the market portfolio (R_{mt}), β_i measures the risk or sensitivity of the firms' returns relative to the market portfolio, and α_i is the intercept. The daily abnormal return was calculated as the residual from the actual return and an expected return generated by the market model, with parameters, α_i and β_i , estimated over a period from 200 to 31 days before the initial announcements. The value-weighted Taiwan Stock Exchange All-Share Index was used to measure market return. Daily stock return information was from the Taiwan Economic Journal (TEJ) Data Bank. The cumulative abnormal return, $CAR(a, b)$, for each security was measured by the sum of the abnormal returns over the window period between day a and b .

Measures of Family Control

One important issue in this study is the identification of family-controlled firms. As prior research provided only limited guidance on how to identify family firms, to strengthen our empirical evidence, we used different measures of family-controlled variables in our empirical analysis.

A. Family-Controlled Board

Controlling shareholders have important influence on board composition (Huse, 2005). If a family controls the majority of ownership, it would have the power to influence the process of board member selection (Yeh and Woidtke, 2005). The decision-making of the board is then likely to respond to the interests of the controlling family. When a controlling family is committed to govern a firm with a focus on long-term value creation, it may select board members that support innovation investments consistent with this perspective (Bruton et al., 2003). On the other hand, if a controlling family is resistant to change and follows conservative strategies, the board is likely to invest in safer but lower-return projects.

We measured the influence of a family based on board director membership. The dummy variable of *Family-Controlled Board* equaled one when a family controlled more than half the seats in a board, and zero otherwise. Following Yeh and Woidtke (2005), which also investigated Taiwan family businesses, we defined family-controlled directors as those board

seats that were held either by the largest controlling family, by the largest controlling family's relatives, or by legal representatives from other companies controlled by the largest controlling family through the practices of pyramid control or cross-holdings. Although those legal representatives might have no family ties, their decisions had to be approved by the controlling family in their companies. Two individuals were considered as family if they had ties of parents, children, spouses, siblings and in-laws (Yeh, 2005).

B. Family Cash Flow Rights and Voting Rights

Following La Porta et al. (1999), Yeh and Woidtke (2005), and Ben-Amar and Andre (2006), we also measured family control based on the fractional equity ownership held and voting rights controlled by the controlling family, the family group with the largest voting shares when summing direct and indirect voting rights (La Porta et al., 1999; Yeh and Woidtke, 2005; Ben-Amar and Andre, 2006). The cash flow rights were calculated as the proportion of shares directly owned by the largest family in the target firm and the proportion of shares that were indirectly held by the largest family through the control chain. As we discussed in hypothesis 2, the pyramid control and cross-holding structure in a family business group tend to result in a deviation between voting rights and cash flow rights. Following La Porta et al. (1999), we measured voting rights by summing direct and indirect voting shares controlled by the controlling family through the control chain.

To have tight control of a firm, some families need the majority of equity ownership, while others may need a much smaller percentage of ownership for the same level of control, because of differences in firm size, industry, business practices and so on (Anderson, Mansi and Reeb, 2003b). La Porta et al. (1999) argued that in most cases it takes less than 50 percent of share holdings to lock-in full control. Therefore, in addition to fractional ownership, we also measured family control depending on if the family ownership was greater than 20 percent as the indicator of family participation. The cut-off level of 20 percent was selected, because most small shareholders do not vote at annual meetings, and voting stakes of 20 percent is generally sufficient for control (La Porta et al., 1999; Claessens et al., 2000; Faccio, Lang and Young, 2001; Harris and Ogbonna, 2005; Villalonga and Amit, 2006). Yeh (2005) documented that under the 20 percent cut-off level, family-controlled firms in Taiwan accounted for 58.2 percent in his sample. The dummy variable, *Voting Rights > 20%*, was equal to one if the controlling-family shareholding was greater than 20 percent, and zero otherwise.

C. Excess Family Control

Pyramids or cross-holdings can create a deviation between voting rights and cash flow rights. Yeh (2005) argued that most Taiwanese listed companies controlled by the largest controlling family often possessed several control chains to control voting shares of a company. In our analysis, following the definition of La Porta et al. (1999), Yeh and Woidtke (2005), and Ben-Amar and Andre (2006), the variable, *Excess Family Control*, was defined as the difference between family voting rights and cash flow rights.

D. Institutional ownership

To capture the governance effect of external blockholders, a variable, *Institutional Ownership*, was used to examine the moderating effect of external governance mechanisms. Institutional ownership was defined as the sum of percentage equity ownership held by

domestic investment funds, domestic banks, and foreign investment trusts.⁹ Data on institutional ownership was obtained from the Taiwan Economics Journal (TEJ) Data Bank.

Control Variables

Prior research had shown that past performance might be associated with the value of innovation (Kanter, 1986; Zahra et al., 2000). Successful past performance provides more resources for firms to explore new strategy options and enhance innovation activities. However, successful performance may reduce managers' incentives to pursue innovative activities because managers do not want to change the status quo (Zahra, 2005). We measured past performance by the three-year average of returns on equity prior to innovation announcements.

The second control variable is a firm's technological opportunity. Technological opportunity reflects the potential for future growth and innovation opportunities (Hansen and Hill, 1991; Johnson, Hoskisson and Hitt, 1993). Chaney et al. (1991), and Chen, Ho, Ik and Lee (2002) found that stock markets responded more positively to new products announced by firms with greater technological opportunities. To measure technological opportunity, we used a dummy variable that was one when the announcing firm was in a high-tech industry, as based on the classification in *the Monthly Bulletin Statistics* published by the Taiwanese government, and zero otherwise.¹⁰

Firm size was found important in explaining variations in stock market responses. Unlike large firms, small firms are more source-constrained and vulnerable to market competition. The future streams of cash flow coming from new products would thus be more valuable to small firms (Chaney et al., 1991). In addition, large firms tend to be more closely followed by financial analysts, and as such may have less unanticipated information than small firms (Hertzel and Smith, 1993; Kang and Stulz, 1996). Atiase (1985) and Chaney et al. (1991) argued that information production and dissemination was a negative function of firm size. Prior studies reported a negative association of firm size with market reactions to announcements of new product introductions (Kelm et al., 1995; Chen et al., 2002). We measured firm size by the natural logarithm of book value of assets one year before innovation announcements.

We also controlled for the effect of firm age. Younger firms are generally considered as more innovative because they are often established to exploit specific technological advances by introducing radically new products (Acs, Morck, Shaver and Yeung, 1997; Zahra et al., 2000). Hence, firm age was expected to be negatively associated with stock market reactions to innovation announcements. Firm age was measured as the years after establishment at the innovation announcement date. Finally, we used Tobin's Q to capture the relative undervaluation of family firms. We estimated Tobin's Q by the two-year average ratio of the market value of equity plus book value of debts to the book value of firm's assets (Chung and Pruitt, 1994)

Sample

The sample of innovation announcements from 1999 to 2005 was collected from the news databank of Taiwan Securities and Futures Institute Database (TSFID), which provided news-service abstracts from major Taiwanese newspapers. Based on Damanpour (1991), Zahra et al. (2000) and Hayton (2005), corporate innovations included activities of new products, new services and new processes.¹¹ We used the key words of "new products", "new services" and "new processes" to search for the activities of corporate innovation. In our sample, product innovations were usually new products or services introduced to meet an external user or market need. Process innovations were new elements introduced into a firm's production or

service operations, such as input materials, task specifications, work and information flow mechanisms and equipment used to produce a product or offer a service.

To avoid the problem that repeated announcements may bias the results, when repeated announcements were found, the announcement on the earliest date was kept in the sample. The announcement date (day 0) was defined as the date of publication in which the company's initial announcement appeared. To control the possibility of information leakage, we deleted those announcements that had appeared in the news up to one year before the announcement dates. Furthermore, to avoid confounding effects, observations were deleted if other major announcements occurred 30 days before and after the event day. Finally, we matched the ticker of each sample firm from the news databank articles with the corresponding one in the TEJ Data Bank, and excluded sample firms if their stock price information or financial data was not available in the TEJ. Following these selection criteria, the final sample consisted of 359 announcements made by 181 firms. Data of board composition, and family share ownership including cash flowing rights and voting rights were obtained from the TEJ Data Bank.

The sample distribution by year and industry is presented in Table 1. In our sample, most of the innovation occurred in recent years. There were 102 announcements in 2004, accounting for 28.41% of the sample. As shown in Panel B, there about 65.18% of the announcements were from the electronic industry, indicating the importance of this high-tech industry to Taiwan's economy. Some concentration among specific industries is expected since neither the distribution of investment opportunities nor their valuation should be random across industries.

[Insert Table 1 about here]

The sample statistics of explanatory variables in this study are provided in Table 2. Our sample firms on average had 15.83% cash flow rights and 12.15% at the median; 22.33% voting rights on average and 20.20 % at the median; The mean value of excess family control was 4.49% .

[Insert Table 2 about here]

In our sample, the average board size was 10.5 seats, relative to 9.7 seats for all firms listed on the Taiwan Stock Exchange in 2006. For the sample firms, family members on average occupied 2.3 seats (22%) at the board, representing 10.06% of ownership. The mean number of seats taken by legal representatives from other companies controlled by the largest controlling family was 3.2 (30%), representing 12.27 % ownership. The rest of the seats belonged to the other board members unrelated to the controlling family. The board distribution in our sample was similar to that reported in Yeh and Woidtke (2005). Furthermore, the average cash flow rights and voting rights of firms with complete family control (more than 50 percent of board seats) were 17.64 % and 22.72 % . For institutional ownership of the sample firms, domestic investment funds on average held 7.44% ownership. Domestic banks, and foreign investment trusts held a mean ownership of 2.31% and 3.62%, respectively.

EMPIRICAL RESULTS

The evidence on stock market reactions to innovation announcements indicated that the announcing firms experienced a significant mean abnormal return only on the announcement day (0.93%, two-tailed, $P < 0.001$), and one day before (0.79%, two-tailed, $P < 0.001$). The average cumulative abnormal return from day -1 to 0 was 1.72%, statistically significant at the 1% level using a two-tailed test.¹² For the two-day event window, there were more than 64% of

the sample announcements with positive cumulative abnormal returns. No significant abnormal returns were observed preceding and following the two-day event window.¹³ As a result, we used the cumulative abnormal returns over day -1 and 0 as the dependent variable.

To further examine the actual dollar increase in shareholders wealth, we measured the change in dollar value by multiplying the two-day cumulative abnormal return with the market value of equity 30 days preceding the announcement. The results showed that, on average, innovation announcements increased firm value by \$2.1 billion (two-tailed, $P < 0.001$). Our evidence is consistent with prior research that innovation announcements created strong and favourable changes in shareholder wealth (Chaney et al., 1991; Kelm et al., 1995; Cho and Pucik, 2005).

To test the effect of family control on stock market reactions to innovation announcements, the comparison of wealth gains between high and low family-controlled subgroups is presented in Table 3. The family-controlled board was based on whether family members occupied more than 50% of the seats at the board. As shown in Panel A, both high and low family-controlled subsamples experienced positive stock market reactions to innovation announcements. The magnitude of abnormal return for high family-controlled firms was significantly lower than that for low family-controlled firms. The comparison based on cash flow rights is presented in Panel B. The high family-controlled firms were those with family cash flow rights greater than the sample median. The evidence indicated that firms with higher family cash rights had lower mean stock market reactions to innovation announcements, although the difference was not statistically significant. The comparison based on family voting rights is presented in Panel C. High (low) family-controlled firms were those with family voting rights greater (smaller) than the sample median. The results of voting rights showed that low family-controlled firms experienced significantly greater stock market reactions than the high family-controlled firms. In addition, we also tested the effect of family control based on whether the family voting rights were greater than 20%. The evidence in Panel D was consistent with the findings of other measures that higher family control was harmful to the market valuation of innovation announcements. Investors responded significantly less favorably to innovation announcements by firms with family voting rights greater than 20%. Finally, we tested the effect of excess family control based on whether the deviation of voting and cash flow rights was greater than the sample median. The finding showed that firms with greater excess family control received significantly less stock market reactions to innovation announcements. Overall, the findings in Table 3 generally support the hypothesis that family control negatively influences the stock market reactions to innovation announcements.

[Insert Table 3 about here]

Although the univariate results in Table 3 support the notion that market reactions to innovation announcements were influenced by family control, the tests did not control for other important determinants on market reactions to innovation announcements as suggested in prior studies. Therefore, in the cross-sectional regression analysis we included those control factors to test if the findings in Table 3 were driven by some other important factors.

Before conducting regression analysis, we checked the skewness and kurtosis of the variables. The results in Table 2 showed that the majority of the independent variables were not normally distributed based on Z-test.¹⁴ To apply an ordinary least square regression technique, we followed the approach suggested in Blom (1958) to transform the data into normal scores. We found that all variables after the Blom transformation followed normal distribution. Therefore, we used the transformed variables in the following regression analyses.¹⁵

The results of family control on abnormal stock market reactions are presented in Table 4. The number of observations was smaller because of data availability. After

controlling for other determinants, the result in Model 1 shows that a family-controlled board was significantly and negatively associated with the announcement-period abnormal returns. The coefficient of cash flow rights in Model 2 was negative but insignificant.

[Insert Table 4 about here]

The results of voting rights are presented in Models 3 and 4. With different measures of voting rights, we found consistent evidence that higher family control of voting rights was significantly associated with less favorable share price responses to innovation announcements. In Model 5, we tested hypothesis 2 that divergence of control rights and cash flow rights created negative impacts on stock market response to innovation announcements. The regression results indicated that excess family control was strongly and negatively related with the abnormal returns. The evidence in Table 4 lends a strong support for the hypothesis that family control is harmful to the market valuation of innovation.¹⁶ Hypotheses 1b and 2 are thus supported.

Among the control variables, only technological opportunity and firm size were found to have a significant explanatory power for our sample. Small firms received significantly more positive market reactions to innovation announcements than large firms. Announcements by firms with greater technological opportunity experienced more favorable market reactions.

To test the robustness of the results, we conducted several additional tests. First, we tested the regression results by substituting the cumulative abnormal return in (-1, 0) for other event windows of (-5, +5), (-10, +10) and (-20, +20). The results under different event windows were very similar. Second, we used dollar change in wealth as the dependent variable by multiplying the two-day abnormal return with market value of equity of the announcing firm 30 days preceding the announcement. The results remained unchanged. Finally, for the measure of divergence between control rights and cash flow rights, family firms that did not operate via a control pyramid would have a score of zero, so that this type of family-controlled firms would have an identical “excess family control” score as any other large and widely-held, non-family-controlled firms in the sample. This may create a problem for the empirical results. To test if our results were sensitive to this problem, we re-did regression analyses by excluding those samples that had zero score of divergence and were classified as family-controlled firms based on various measures of family control. We found that the results from this sub-sample were very similar to those from the whole sample, suggesting that the results were not biased due to this potential problem.

In Table 5, we tested hypothesis 3 by including an interaction variable of institutional ownership with different measures of family control in the regression analysis. If institutional ownership is helpful in mitigating the negative influence of family control, the interaction variable is expected to be significantly and positively related to the market reactions to innovation announcements. The results confirmed this prediction. In all models, the coefficients of the interaction variable were consistently positive. In addition, we found that most measures of family control remained significant and negative after including the interaction variable. The findings support hypothesis 3 that institutional investors play an important role in reducing the negative impacts of family control.

[Insert Table 5 about here]

Although the findings suggested family ownership has a strong influence on stock market reactions to innovation announcements, the results could be subject to the potential problem of multicollinearity since some of the independent variables were correlated and the

interaction term was constructed from other variables. To test if the results were strongly biased by multicollinearity, we first examined the vector inflator factor (VIF). The VIF values in the regression models were all less than five. In addition, Aiken and West (1991) suggested the approach of centering variables to reduce multicollinearity. We followed Aiken and West (1991) by subtracting each variable from its mean value in the sample, and re-did the regressions with the centered variables. Although not reported here, the results under the centering approach remained very similar to those presented above. Thus, the conclusion from our analysis is not susceptible to the problem of multicollinearity.

DISCUSSION

This paper examined how stock market reacted to the announcements of a firm investing in innovation projects, and further investigated the influence of family ownership on stock market reactions to innovation announcements. The evidence in this paper is in line with the conclusions of Cronqvist and Nilsson (2003) that family voting rights were negatively associated with firm performance and consistent with Faccio et al. (2001) and Yeh and Woidtke (2005) that firms with boards closely linked to controlling families were associated with greater agency costs and received lower valuation in the markets. This study also supports Claessens et al. (2002) that family control led to wealth expropriation in the presence of less transparent financial markets and weak investor protection. In addition, our evidence on the divergence of cash flow and voting rights is similar to the findings of Claessens et al. (2002), Gompers et al. (2004) and Yeh (2005), that all found a greater divergence in control rights and cash flow rights was associated with lower firm value. Our results, however, are in contrast with findings in Anderson and Reeb's (2003a) that found family firms delivered better performance than non-family firms. The finding that institutional ownership has a positive moderating effect on family control and innovation is consistent with the results of Baysinger et al. (1991), and Wahal and McConnell (2000), which argued that institutional investors played an important role in monitoring the decision-making processes of a firm. Similar evidence was documented in Le et al. (2006), which showed institutional ownership had a positive moderating effect on the relationship between R&D spending and firm performance. Our study suggests that the external control by institutional investors is particularly essential when the internal control mechanisms are not effective, as in the case of family business.

This study is related with Zahra et al. (2000) in that both papers investigated innovation performance. Nevertheless, our study differs from Zahra et al. (2000) as we focused on the effect of family control, while Zahra et al. (2000) emphasized the influence of ownership. In addition, Zahra et al. (2000) studied U.S. firms and argued that because business relations between banks and firms might weaken the monitoring effect, domestic banks were not found to have a positive impact on innovation and operating performance. We tested this conclusion against our sample. We found that the mean profitability of those firms with domestic banks as the largest institutional investor was insignificantly different from those firms with domestic investment funds as the largest institutional investor (t -value = 0.884).¹⁷ Different from Zahra et al. (2000), our evidence suggested that domestic banks had similar investment performance as domestic investment funds in Taiwan.¹⁸ Finally, Zahra et al. (2000) found that product innovation was associated with better operating performance. Although we did not test the post-announcement operating performance, our finding of strong positive stock market reactions to new product announcements is consistent with Zahra et al.'s (2000) that product innovation was expected to bring in positive risk-adjusted incremental cash flow for the announcing firms.

Prior research suggested that firms announce product innovation often for the purposes of image enhancement, distribution advantage, and demand stimulation (Eliashberg and Robertson, 1988). The benefits of announcing product innovation are tied to the advantage of

being a pioneer in the market, which gives the potential ability to position the new product in the most profitable segment (Urban, Theresa, Steven and Zofia, 1986). Consequently, new product announcements often send positive signals to investors (Chaney et al., 1991). The empirical results in our study are consistent with those documented in prior literature. Although both family and non-family-controlled firms may have similar incentives to make new product announcements, the market responses may differ due to information asymmetry. Ali, Chen and Radhakrishnan (2007) found that family firms disclosed less information on their corporate governance practices, and Chau and Gray (2002) showed that family firms were less likely to voluntarily reveal information to the market. Both studies suggested that the problem of information asymmetry might be greater for family firms. As a result, when new products are announced by family firms, investors may face greater uncertainty in assessing the impact on future earnings, and thus discount the market valuation due to the higher uncertainty. Our finding that family control was associated with less favorable market reactions to new product announcements is consistent with prior studies in this regard.

This study presents several potential avenues for future research. First, innovation is one important strategic investment that often influences not only the focal firm, but also other firms in the same industry. The influence, however, is usually unclear. Strategic investment decisions may permit a firm to gain competitive advantages over others in the industry (Woolridge and Snow, 1990) but they may also promote the performance of rivals. For instance, a new product introduced by one company may generate sales growth for the whole industry, and thus also benefits rivals (Klemperer and Padilla, 1997). Future research can explore how the innovative activities of a family-controlled firm affect their industry rivals. Second, the finding that institutional investors have a positive effect on the relationship between family control and innovation may be related with the fact that the legal system in Taiwan provides relatively weak protection for minority shareholders (La Porta, Lopez-De-Silanes, Shleifer and Vishny, 1998; Yeh and Woidtke, 2005). Future research may investigate whether our results can be generalized to other countries with better protection of shareholders' right. Third, in this study we presented the moderating effect of institutional ownership. Future research can identify other factors that may influence the impacts of family control. Finally, besides shareholders, other stakeholders are related to the value creation and distribution of a firm (Grandori, 2004; Huse, 2007), and may receive important influence from family control as well. This paper studies the influence of family control from the perspective of shareholder supremacy, and does not consider the impacts on other stakeholders. Future research may revisit this issue by investigating the effects of family control on other stakeholders.

CONCLUSION

This study investigates the relationship between family control and stock market reactions to innovation announcement. Prior studies suggested that family control might involve both cost and benefit, and the results so far have been inconclusive. The findings of our research provided strong evidence that family firms received significantly weaker market response than non-family firms upon announcements of innovation. Specifically, firms in which family members occupied the majority of board positions experienced less favorable stock market reactions. Investors also responded more negatively when family members controlled greater voting rights. The results further indicated that the divergence of cash flow and voting rights was strongly and negatively correlated with announcement-period abnormal returns, consistent with the argument that deviation of cash flow and voting rights created additional problems of agency costs. Finally, the findings indicated that institutional ownership positively moderated the negative impacts of family control on stock market reactions to innovation announcements.

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Table1. Sample Distribution of Innovations by Year and Industry

<i>Panel A: Sample distribution by year</i>					
	New Product	New Service	New Process	Subtotal	
	Number	Number	Number	Number	%
1999	18	0	4	22	6.13
2000	17	0	8	25	6.97
2001	20	1	5	26	7.24
2002	36	0	7	43	11.98
2003	58	6	3	67	18.66
2004	87	10	5	102	28.41
2005	69	4	1	74	20.61
Total	305	21	33	359	100.00

<i>Panel B: Sample distribution by industry</i>					
Type of Innovation	New Product	New Service	New Process	Total	
Industry	Number	Number	Number	Number	%
Cement & Ceramics	0	0	0	0	0.00
Food	22	0	0	22	6.13
Plastics & Chemical	4	0	0	4	1.11
Textiles	3	0	0	3	0.84
Electric & Machinery	19	0	0	19	5.29
Elec. Appliance & Cables	12	0	0	12	3.35
Chemical	22	0	5	27	7.52
Ceramics & Glass Products	6	0	0	6	1.67
Paper & Pulp	3	0	0	3	0.84
Steel & Iron	5	0	0	5	1.39
Rubber	2	0	2	4	1.11
Automobile	0	0	0	0	0.00
Electronics	192	17	25	234	65.18
Construction	0	0	1	1	0.28
Transportation	0	0	0	0	0.00
Tourism	0	0	0	0	0.00
Department Stores	3	1	0	4	1.11
Others	12	3	0	15	4.18
Total	305	21	33	359	100.00

Notes: This table summarizes the distribution, by year and industry, of innovation announcements made by Taiwanese firms from 1999 to 2005. The announcements were collected from the data bank of *Taiwan Securities and Future Institute Database*.

Table 2. Means, Standard Deviations, and Correlations

<i>Variables</i>	<i>Mean</i>	<i>Median</i>	<i>S.D.</i>	<i>Skewness</i>	<i>Kurtosis</i>	2	3	4	5	6	7
1. Cash Flow Rights	15.83	12.15	13.56	1.34 ^{***}	2.75 ^{***}	0.60 ^{**}	-0.12 [*]	0.05	-0.02	0.20 ^{**}	-0.36 ^{**}
2. Voting Rights	22.33	20.20	17.00	1.98 ^{***}	8.09 ^{***}		0.33 ^{**}	0.12 [*]	-0.03	-0.08	0.16 ^{**}
3. Excess Family Control	4.49	1.35	8.38	2.18 ^{***}	10.03 ^{***}			0.15 ^{**}	0.04	-0.15 ^{**}	-0.13 [*]
4. Return on Equity (%)	11.23	11.39	12.64	-0.09	1.86 ^{***}				0.63 ^{**}	-0.34 ^{**}	0.06
5. Tobin's <i>Q</i>	1.56	1.15	1.26	2.21 ^{***}	5.81 ^{***}					-0.41 ^{**}	0.13 [*]
6. Firm Age	23.20	22.00	11.60	0.68 ^{***}	-0.04						-0.19 ^{**}
7. Firm Size (USD, millions)	1,405.85	286.30	2,922.21	3.15 ^{***}	9.45 ^{***}						

Notes: Skewness and kurtosis are assessed using Z-tests, respectively. “***”, “**” and “*” represents a 1%, 5% and 10% significance level, respectively

Table 3. Mean Announcement Period Abnormal Returns for Subsamples Stratified Based on Relative Family Control

<i>Panel A// Analysis of Subsamples Based on Family-controlled Board</i>		
High Family-controlled Board	Low Family-controlled Board	Difference
Mean abnormal return = 1.22%	Mean abnormal return = 2.25%	-1.03%
(5.90***, 183)	(8.51***, 176)	(-3.07***)
<i>Panel B// Analysis of Subsamples Based on Cash Flow Rights</i>		
High Cash Flow Rights	Low Cash Flow Rights	Difference
Mean abnormal return = 1.65%	Mean abnormal return = 1.80%	-0.15%
(7.23***, 179)	(7.21***, 180)	(-0.43)
<i>Panel C// Analysis of Subsamples Based on Voting Rights</i>		
High Voting Rights	Low Voting Rights	Difference
Mean abnormal return = 1.28%	Mean abnormal return = 2.17%	-0.89%
(6.52***, 179)	(7.99***, 180)	(-2.66***)
<i>Panel D// Analysis of Subsamples Based on Voting Rights > 20%</i>		
Voting Rights > 20%	Voting Rights < 20%	Difference
Mean abnormal return = 1.32%	Mean abnormal return = 2.14%	-0.82%
(6.67***, 183)	(7.84***, 176)	(-2.44**)
<i>Panel E// Analysis of Subsamples Based on Excess Family Control</i>		
High Excess Family Control	Low Excess Family Control	Difference
Mean abnormal return = 1.44%	Mean abnormal return = 2.01%	-0.57%
(6.37***, 179)	(8.03***, 180)	(-1.69*)

Notes: The firms in subsamples were classified as either the "high" or "low" group according to their relative family-control variables. For each cell, we report the mean abnormal return, and, in parentheses, the *t*-statistic and the number of observations. For the comparison of means, we report mean difference, the *t*-statistic in parentheses assuming equal variances. The results are similar with the assumption of unequal variances. "****", "***" and "**" represent 1%, 5% and 10% significance levels using a two-tailed test, respectively.

Table 4. Cross-Sectional Regression Analyses of Innovation Announcement Period Abnormal Returns

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
Intercept	1.609 (5.032)***	1.647 (5.133)***	1.754 (5.505)***	1.674 (5.254)***	1.675 (5.268)***
Family-controlled Board	-0.553 (-2.072)**				
Cash Flow Rights		-0.172 (-0.869)			
Voting Rights			-0.463 (-2.733)***		
Voting Rights>20%				-0.508 (-2.017)**	
Excess Family Control					-0.402 (-2.376)**
Return on Equity	-0.312 (-1.440)	-0.260 (-1.193)	-0.173 (-0.790)	-0.193 (-0.879)	-0.214 (-0.985)
Technological opportunity	0.867 (2.884)***	0.910 (3.020)***	0.797 (2.644)***	0.855 (2.836)***	0.920 (3.079)***
Firm Size	-0.308 (-1.789)*	-0.463 (-2.431)**	-0.443 (-2.635)***	-0.432 (-2.554)***	-0.464 (-2.722)***
Firm Age	0.195 (0.913)	0.141 (0.647)	0.040 (0.196)	0.093 (0.449)	0.074 (0.357)
Tobin's <i>Q</i>	0.065 (0.373)	0.042 (0.238)	-0.030 (-0.169)	0.024 (0.135)	0.026 (0.147)
Adjusted <i>R</i> ²	0.040	0.030	0.049	0.039	0.044
<i>F</i> -statistic	3.462***	2.845***	4.017***	3.423***	3.698***
Number of Observations	356	356	356	356	356

Note: The dependent variable is two-day (-1, 0) announcement period abnormal returns. “***”, “**”, and “*” represent 1%, 5%, and 10% significance levels using a two-tailed test, respectively.

Table 5. Cross-Sectional Regression Analyses of Moderating Effects of Institutional Ownership

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
Intercept	1.774 (10.425)***	1.880 (10.527)***	1.884 (11.058)***	1.844 (10.766)***	1.831 (10.688)***
Family-controlled Board	-1.066 (-2.010)**				
Cash Flow Rights		-0.517 (-1.482)			
Voting Rights			-1.467 (-3.879)***		
Voting Rights>20%				-1.510 (-2.894)***	
Excess Control					-0.852 (-2.394)**
Institutional ownership x Family Control	0.004 (1.634)*	0.003 (1.794)*	0.005 (3.154)***	0.006 (2.263)**	0.003 (1.683)*
Return on Equity	-0.110 (-0.440)	-0.111 (-0.445)	-0.006 (-0.023)	0.000 (-0.001)	-0.052 (-0.206)
Technological opportunity	0.935 (2.996)***	0.950 (3.042)***	0.758 (2.435)**	0.917 (2.967)***	1.030 (3.344)***
Firm Size	-0.301 (-1.709)*	-0.278 (-1.342)	-0.464 (-2.723)***	-0.387 (-2.247)**	-0.369 (-2.051)**
Firm Age	0.115 (0.507)	-0.001 (-0.003)	0.104 (0.475)	0.114 (0.522)	-0.044 (-0.194)
Tobin's <i>Q</i>	-0.251 (-0.917)	-0.251 (-0.913)	-0.155 (-0.569)	-0.215 (-0.795)	-0.273 (-1.003)
Adjusted <i>R</i> ²	0.041	0.039	0.074	0.055	0.048
<i>F</i> -statistic	3.001***	2.876***	4.707***	3.688***	3.355***
Number of Observations	326	326	326	326	326

Notes: The dependent variable is two-day (-1, 0) announcement period abnormal returns. “***”, “**”, and “*” represent 1%, 5%, and 10% significance levels using a two-tailed test, respectively.

Footnotes

1. For example, McConaughy, Matthews and Fialko (2001), and Anderson and Reeb (2003a) found that family firms generally performed better than non-family firms, while Gompers, Ishii and Metrick (2004) and Yeh (2005) documented that family-controlled firms were associated with lower firm value.
2. Chaney, Devinney and Winer (1991), and Kelm, Narayanan and Pinches (1995) found that the announcements of innovation generated a strong wealth effect for shareholders. Cho and Pucik (2005) also provided evidence that a firm's market value was significantly and positively associated with innovation.
3. It should be noted that stock market reactions to innovation announcements may only capture the perceived value, rather than the actual value of innovation, particularly for events with serious information asymmetry such as innovation announcements.
4. The data of Taiwan's exports was collected from the Summary of Explanation of Exports and Imports, Department of Statistics, Ministry of Finance, Taiwan R.O.C., and the data of shipment volumes of LCD monitors and notebooks including oversea shipments was from the Information Industry Yearbook, Market Intelligence Center, Institute for Information Industry, Taiwan R.O.C..
5. Aitken and Siow (2003) ranked the efficiency of stock exchanges around the world, and showed that Taiwan Stock Exchange was ranked number 8 in the world, and number 2 in Asia, second only to the Tokyo Stock Exchange. In 2006, there were 688 firms listed on the exchange, with market capitalization of US\$605 billion, trading value of US\$747 billion and trading volume of 733 billion shares.
6. Yen (1994a) indicated that the top management of Taiwanese corporations often stayed stagnant because of hiring family members. Weidenbaum (1996) also suggested that strong family ties led to a preference for incompetent and untrained relatives over outside professionals in Chinese family business
7. If there are several control chains in the same business group, the pyramid can even allow control firm B with a relatively smaller cash flow stake. For instance, if the same family owns 10% of firm C, which in turn owns 20% of firm B, through multiple control chains, the family controls 45% of firm B, while owning only about 7% cash flow rights of firm B.
8. For a review, see McWilliams and Siegel (1997).
9. Domestic investment funds included domestic investment trusts, and government funds such as the national financial stabilization fund, national development fund, postal life insurance fund, labor insurance fund, labor pension fund, and civil servant pension fund.
10. Based on *The Monthly Bulletin Statistics 2005*, an official publication of the Taiwanese government, hi-tech industries included the following business sectors: electronic parts and components, semiconductor, chemical materials, computer, communication, video and radio products, machinery and equipment (but not including woodworking machinery and mining equipment, and metal molding), transportation equipment (but not including parts for motorbike, bicycle and transportation equipment), chemical products (but not including calcimine, dyes, Chinese medicine, abstergents and cosmetics).
11. The empirical results remained the same when the sample excluded new process announcements.
12. We also conducted significance tests in Table 3 using the Z-statistic, as described in Dodd and Warner (1983). Similar results were obtained.
13. Except for day -1 and day 0, No significant abnormal daily stock returns were found from day -5 to day +5 in our sample. The average cumulative abnormal return for event windows of (-30, -2), (-20, -2), (-10, -2), (-5, -2), (1, 5), (1, 10), (1, 20) and (1, 30) were not statistically significant.

14. The Shapiro-Wilk Statistics provided further evidence that rejected the null hypothesis that the independent variables followed normal distribution at the 1% significant level.
15. The regression results with the raw data were very similar.
16. To identify the threshold which the negative effects of stock market reactions to innovation announcements become insignificant, we tested different threshold levels of the various measures of family control. The thresholds of family-controlled board, cash flow rights, voting rights and excess family control are 65%, 60%, 65% and 40%.
17. Profitability was measured by a ratio of operation income to total sales.
18. Lai, Chen and Ho (2005) investigated the Taiwanese market, and found that firms had higher average daily stock price returns when banks had representatives on the boards.

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