

行政院國家科學委員會專題研究計畫 成果報告

不確定性與企業成長之關聯

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行政院國家科學委員會專題研究計畫成果報告
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The Link between Uncertainty and Firm Growth

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主持人：譚丹琪

國立政治大學國際貿易系助理教授

Email: dctan@nccu.edu.tw

一、中文摘要

公司成長往往伴隨著一系列公司對無形及有形資產的投資，雖然不確定性被廣泛認為會影響到公司投資，然而有關不確定性是否會對公司成長產生影響的研究卻付之闕如，這項研究意在探討不確定性和公司成長的關係。根據台灣公司的實證資料，我們發現在控制公司年齡，獲利率，大小及產業特性後，不確定性和公司成長的關係是不顯著的，我們並發現，研發密集度越高，不確定性對公司成長的影響越為負面；而公司越大，不確定性對公司成長的影響越不顯著。

關鍵詞：公司成長，不確定性，投資

Abstract:

Firm growth is accompanied by a series of investments in tangible and intangible assets. Although the role of uncertainty in affecting firm investments is widely recognized, we know little about how uncertainty influences firm growth. This study is an attempt at exploring the relationship between uncertainty and the growth of the firm. Based on a sample of Taiwanese firms, it is found that after controlling for firm age, profitability, size, and industry heterogeneity, the relationship between uncertainty and firm growth is contingent on firm characteristics. In particular, uncertainty makes a more negative impact on growth for R&D intensive Taiwanese firms, and makes a less negative impact on growth for larger Taiwanese firms.

Keywords: Firm growth, uncertainty, investment

二、緣由與目的

Firm growth is an important aspect of the dynamics of a firm (Delmer, Davidsson, and Gartner, 2003; Weinzimmer, Nystrom, and Freeman, 1998). It is not surprising that much work has been done to enhance the understanding of the growth of the firm. Given that growth is an

outcome of a firm's *adjusting* its size based on past performance and future expectation (Mata and Portugal, 2002), a number of researchers have focused on exploring the sources of adjustment costs, which take place when adjustments of inputs or investments, such as installing new equipment or recruiting new employees, disrupt current operations (Hammermesh and Pfann, 1996; Lucas, 1967; Mortensen, 1973; Treadway, 1970). For example, a number of studies deal with the limited abilities of a firm in increasing internal and external capital to finance its expansion projects (Almus and Nerlinger, 1999; Becchetti and Trovato 2002; Brito and Mello, 1995; Bruton 2002; Marris, 1964; Stiglize and Weiss, 1981). Penrose (1959) and her followers (e.g., Shen, 1970; Rubin, 1973; Slater, 1980; Thompson, 1994; Shane, 1996) emphasize the difficulty of a firm in increasing its managerial and administrative capacities to manage the increased complexity resulted from firm expansion.

While these studies shed important light on the sources of (production factors) adjusting costs, the understanding of what determines the growth of the firm is yet complete. In particular, uncertainty is likely to make it difficult for a firm to evaluate its past performance and form future expectation. Because past performance and future expectation provide information about how a firm should adjust its scale of investment, uncertainty can have important impacts on the growth of the firm. Despite the important role of uncertainty in shaping firm decision concerning future investments, little attempt has been made at improving the understanding of how uncertainty influences firm growth.

To fill this gap, this study aims to explore the relationship between uncertainty and the growth of the firm. On one hand, since uncertainty increases a firm's difficulties in assessing its past performance and in forming future expectation, it is likely to reduce a firm's incentive in making irreversible commitments that are often required for achieving growth. On the other hand, there are reasons to believe that uncertainty and growth might be positively linked. Specifically, volatile past performance could be an outcome of a firm choosing high-variance, high-expected returns projects over low-variance, low-expected returns ones (Black, 1987). As a result, such a firm might present high growth with a volatile growth pattern. Built on the proposition that growth and uncertainty may be (either negatively or positively) linked, we develop a set of hypotheses and test them empirically with a longitudinal sample of Taiwanese firms.

三、結果與討論

Growth is an outcome of a firm's adjusting its size based on past performance and future expectation (Mata and Portugal, 2002). As Jovanovic (1982) suggests, a firm learns about its potential in the specific industry from its own performance. A firm experiencing and/or expecting good performance will expand, and a firm doing otherwise will contract or even exit.

As the firm expands, it would make a series of investments in tangible and intangible assets, such as machines/equipment, advertising, human capital, and technology. The expenditure in making these investments are often sunk costs or at least partly irreversible (Pindyck, 1991). For example, investments in human capital such as the costs of recruiting and training are generally irreversible. Investments in advertising and marketing are typically specific to the firm and could not be recovered once the expenditure is made. A firm may be able to sell its machines

and equipment in the second hand market. However, due to the “lemon” problem and depreciation, the resale value is likely to be lower than the original expenditure that the firm has made in purchasing them (Pindyck, 1991). Finally, a firm may be able to recover some of its investments in technology by selling patents. However, typically not all of the investments in R&D could result in profitable innovation and not all of the innovations can be put into patents, especially for those related to process innovations (Levin, Klevorick, Nelson, Winter, 1987). Consequently, at least a part of R&D investments are sunk and could not be fully recovered once the firm makes the expenditure.

Uncertainty hampers the expansion of a firm in the following ways. First, uncertainty discourages irreversible investment that is often required for achieving growth. Uncertainty increases the likelihood that the firm miscalculates the prospects of an investment, and the firm may, after making the commitment, find itself better off exiting from the investment (Mitchell, Shaver, and Yeung, 1994). In addition, in the presence of uncertainty, a firm may make regrettable strategic choices that affect its future performance in the market (Oster, 1990). For example, it might be stuck in the wrong market niches or production locations, and might find it difficult to recover from the wrong strategic choice (Mitchell, Shaver, and Yeung, 1994). In this case, a firm may delay its investment until more information is available so that it could maintain flexibility in investment decisions and in strategy formulation (Pindyck, 1991). Such a delay in investment leads to slower accumulation of resources and ultimately to slower growth.

Second, uncertainty makes it difficult for a firm to learn about its potential based on past performance because there is ambiguity about the cause-effect relationships between past managerial decisions and firm performance. In other words, due to uncertainty, the firm does not have a clear idea about what accounts for its past success/failure and hence it may tend to be conservative about making further substantial commitments even when it achieved success in the past (Garnsey, 1998).

Third, uncertainty further inhibits firm expansion since it increases the difficulty for the entrepreneurs in finding profitable opportunities. As a result, firms may choose not to use their managerial resources at full capacity (Penrose, 1959: 58). Furthermore, as we argued above, a firm facing a high level of uncertainty is likely to delay its investments. The delay in investments hinders the speed of learning-by-doing (Majd and Pindyck, 1989). As a result, the speed of capability accumulation is likely to be lower, and so is the rate of growth of the firm.

In sum, uncertainty is likely to have a negative impact on the growth of the firm for at least two reasons. First, uncertainty is likely to lead to a delay in making irreversible investments, inhibiting the accumulation of strategic resources. Second, uncertainty is likely to hamper the speed of learning that facilitates the growth of the firm. Hence we hypothesize that uncertainty and firm growth should be negatively linked. However, it should be noted that the literature also suggests that firms have choices between high-variance, high-expected returns projects and low-variance, low-expected returns projects (Black, 1987). As a result, firms choosing high-variance and high-expected returns projects may present high growth with a volatile growth pattern. Here, uncertainty and growth could be positively linked. The relationship between uncertainty and growth is therefore an empirical question.

Aside from arguing that uncertainty and growth may be negatively associated, in this study I also develop three additional hypotheses concerning the moderating effect on the relationship between uncertainty and firm growth. As argued above, one key reason that uncertainty may have a negative impact on firm growth is that uncertainty discourages irreversible investments that are required to achieve growth. One such investment is R&D investment. I hypothesize that the relationship between uncertainty and growth is even stronger for R&D intensive firms.

I also hypothesize that uncertainty has a greater negative impact on firm growth for firms with higher debt ratios. Because such firms have higher costs of funds, a risky investment increases greatly the firms' probability of going bankrupt (Stiglitz & Weiss, 1981). If the investments turn sour, it will have difficulty in financing the loss and hence it will be more conservative toward expansion projects when high uncertainty is present.

Finally, I hypothesize that the relationship between uncertainty and firm growth is weaker for larger firms. Larger firms are likely to be less sensitive to uncertainty because they tend to have more slack to buffer investment risk. As a result, they may have less incentive to postpone investments in the presence of high uncertainty and hence may have result in higher growth rates.

Based on a sample of Taiwanese firms, I find that after controlling for firm age, profitability, size, and industry heterogeneity, the relationship between uncertainty and firm growth is not significant. As expected, uncertainty makes a more negative impact on growth for R&D intensive Taiwanese firms. Also consistent with my expectation, uncertainty makes a less negative impact on growth for larger Taiwanese firms.

四、計畫成果自評

This study advances the literature by exploring the relationship between uncertainty and firm growth. Despite the role of uncertainty in affecting investment decisions of firms, the literature has paid little attention on examining how uncertainty may influence firm growth, which involves a series of firm investments in tangible and intangible assets. This study is among the first attempt at examining this issue.

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