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The distinct signaling effects of R & D subsidy and non-R & D subsidy on IPO performance of IT entrepreneurial firms in China

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ABSTRACT

This study investigates how R & D subsidy and non-R & D subsidy affect entrepreneurial firms' initial public offering (IPO) performance in an emerging economy like China. Analyzing data from 269 IT (information technology) entrepreneurial firms in China, we found that R & D subsidy has an inverted U-shape effect on IPO performance, while non-R & D subsidy has a positive effect on IPO performance. Furthermore, both state ownership and patent intensity moderate the inverted U-shape relationship between R & D subsidy and IPO performance. In contrast, neither of them moderates the positive relationship between non-R & D subsidy and IPO performance. These findings contribute to the literature on the effectiveness of government subsidy by highlighting the symbolic effect of government subsidy on external financing in emerging economies, and offer important practical implications to entrepreneurial firms and government funding agencies in China.

1. Introduction

The past two decades have witnessed an ongoing debate about the effectiveness of government subsidy (David et al., 2000; Dimos and Pugh, 2016). Most hitherto studies have focused on the direct policy effect of government subsidy (e.g., the effectiveness of R & D subsidy in stimulating or crowding out private R & D investments, activities, and outputs). Extending this literature on subsidy additionality, recent studies suggest that government subsidy can also be regarded as an effective signal to external investors (Feldman and Kelley, 2006; Lerner, 1999; Meuleman and Maeseneire, 2012). Such a symbolic role of government subsidy is particularly crucial to entrepreneurial firms, compared to well-established firms, as there are substantial information asymmetries between entrepreneurial firms and external investors (Hsu and Ziedonis, 2013; Stuart et al., 1999). Moreover, in emerging economies like China where the government is the most powerful actor and major source of resources (Hoskisson et al., 2000; Ring et al., 2005), examining the signaling effect of government subsidy on entrepreneurial firms' ability to raise external capital has great implications. However, Meuleman and Maeseneire (2012) have pointed out that the signaling effect of government subsidy on entrepreneurial firms' external financing has attracted relatively less attention than its direct policy effect.

To address this important research gap, this study aims to investigate the signaling effect of government subsidy on entrepreneurial firms' IPO (Initial Public Offerings) performance – an important milestone for entrepreneurial firms' external financing – in an emerging economy, China. We conduct our inquiry in the context of China for two reasons: (i) China currently contributes 20% of the global R & D expenditures and is expected to overtake the United States before 2020 to become the single largest contributor to global R & D expenditures (Boeing, 2016), and (ii) government subsidies made up more than 50% of high-tech R & D expenditure in China (The National Bureau of Statistics of China, 2009). To rule out cross-industry variances, we focus on the IT industry which has attracted more than half of government subsidy allocated to entrepreneurial firms in China (Ministry of Science and Technology of China, 2009).

In particular, we differentiate between two types of government subsidies – R & D subsidy and non-R & D subsidy – as their objectives are distinct from each other. The former promotes R & D activities which have high returns to society but little private returns (i.e., addressing the market failures of innovation) (Arrow, 1962; Kleer, 2010; Nelson, 1959; Paraskevopoulou, 2012), while the latter focuses on non-R & D activities which help form a self-organized innovation system with well-connected components (i.e., addressing the system failures of

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innovation) (Metcalfe, 2005; Paraskevopoulou, 2012). Therefore, the two types of government subsidies may convey distinct signals to external investors and should be examined separately. Specifically, we argue that R & D subsidy sends positive information about technology competence and negative information about R & D risks, while non-R & D subsidy conveys only positive information about organizational and market competences. To further affirm our arguments, we introduce two important firm characteristics as moderators in China's IPO market, i.e., state ownership and patent intensity, as the former may change the factors to which external investors attribute the receipt of R & D or non-R & D subsidies, whereas the latter may modify how external investors perceive the risks of R & D subsidies.

Using data on 269 IPOs of entrepreneurial firms in China's IT industry from 2004 to 2015, we find that R & D subsidy has an inverted U-shape effect on IPO performance, while non-R & D subsidy has a positive effect on IPO performance. Furthermore, the presence of state ownership flattens the inverted U-shape relationship between R & D subsidy and IPO performance. An increase in patent intensity also flattens the inverted U-shape relationship between R & D subsidy and IPO performance. However, neither state ownership nor patent intensity is found to moderate the positive relationship between non-R & D subsidy and IPO performance. These results support our argument that R & D and non-R & D subsidies convey different signals in China's IPO market.

This study makes several important contributions to the literature. First, it extends the literature on the effectiveness of government subsidy by revealing the symbolic effect of government subsidy on external financing. Second, unlike earlier efforts focusing on the effect of R & D subsidy or examining government subsidy as a whole, this study adds to the literature by highlighting the importance of differentiating the signaling effects between R & D and non-R & D subsidies. Third, going beyond prior studies that rarely considered how contextual factors might moderate the symbolic effect of government subsidy, this study offers a contingency perspective and refines our understanding of how the effects of government subsidy on external financing of entrepreneurial firms might change under different circumstances. It also offers important practical implications to entrepreneurial firms and government funding agencies in emerging economies like China.

2. Theoretical foundation

2.1. Symbolic effect of government subsidy on external financing

Public finance theory has argued for the direct policy effect of government subsidy, including innovation input additionality (i.e., increasing investment by firms in innovative activities), behavioral additionality (i.e., encouraging firm behaviors in a desirable direction favoring innovation, such as innovation collaboration), and output additionality (i.e., increasing innovation outputs) (David et al., 2000; Dimos and Pugh, 2016; Klette et al., 2000).

Extending the discussion on the direct policy effect, some studies that draw from the signaling theory (Spence, 1974) have suggested a symbolic effect of government subsidy on external financing; that is, government subsidy plays an important role in certifying firm quality to external investors (Cumming, 2007; Feldman and Kelley, 2006; Kleer, 2010; Lerner, 1999; Meuleman and Maeseneire, 2012; Takalo and Tanayama, 2010). The earliest empirical evidence of government subsidy's symbolic effect is Lerner's (1999) study on the U.S. Small Business Innovation Research (SBIR) program. His results revealed that firms with SBIR subsidies (a type of R & D subsidy), compared to those without, were more likely to attract venture financing, and this relationship was stronger in high-technology industries. Additionally, Feldman and Kelley (2006) examined firms participating in the Advanced Technology Program (ATP, a type of R & D subsidy) at the National Institute of Standards and Technology (NIST) of the U.S. and found that receiving ATP subsidy increased external funding from venture capitalists and strategic alliances. Cumming's (2007) investigation on the Australian Innovation Investment Fund (IIF, a mixture of R & D and non-R & D subsidy) governmental program revealed that IIFs significantly contributed to the external financing of entrepreneurial firms. Furthermore, Meuleman and Maeseneire (2012) found that in Belgium, R & D subsidy can positively signal the quality of small firms and thus resulted in more long-term debt. A few other theoretical discussions also endorsed the symbolic effect of government subsidy (Kleer, 2010; Takalo and Tanayama, 2010).

The essential rationale for the symbolic effect of government subsidy on external financing can be explained as follows. As entrepreneurial firms are start-ups vulnerable to the liability of newness but with little information disclosed to the public, external investors often find themselves at a disadvantage in assessing the prospects and risks of the firms relative to the entrepreneurs (Stuart et al., 1999; Zhang and Wiersema, 2009). This gives rise to a situation of information asymmetries between the entrepreneurs and external investors, which makes raising external capital difficult for entrepreneurial firms or even precludes it entirely (Lerner, 1999). To mitigate information asymmetries, entrepreneurial firms can send signals about their reliability, quality, and prospects to external investors (Decarolis and Deeds, 1999; Hsu and Ziedonis, 2013; Zhang and Wiersema, 2009).

Government subsidy can serve as such a signal to external investors because it meets the two criteria of an effective signal: observable to signal receivers, and credible due to high cost for signal senders (Spence, 1973). First, being awarded by government subsidy is publicly observable. Second, government's decisions on subsidies are not random (Meuleman and Maeseneire, 2012). Indeed, government subsidies are based on careful ex ante screening of the subsidy applications (Takalo and Tanayama, 2010). To sort good firms from bad, government funding agencies assemble review panels comprising scientific experts from academic fields to aid in firm selection (Pahnke et al., 2015). By taking into account the overall social benefits, government funding agencies have a larger interest in screening than the market-based investors and can avoid potential free-riding problems among market-based investors (Takalo and Tanayama, 2010). In addition, government is a centralized screening apparatus that has more resources for screening, compared to market-based investors (Takalo and Tanayama, 2010). Prior literature has shown that government's assessments of subsidy applications are independent, educated and technically sophisticated (Feldman and Kelley, 2006; Lerner, 1999). As a result, government subsidy can act as an observable and credible indicator of the unobservable firm quality, and thus can confer a halo effect to external investors (Meuleman and Maeseneire, 2012).

Such a symbolic effect of government subsidy would be particularly salient for entrepreneurial firms in an emerging economy like China, where government exerts greater power than in developed countries. With government subsidy, entrepreneurial firms will be regarded as capable of navigating the uncertain waters of political institutions in China, because government subsidy can help entrepreneurial firms gain financial resources, political legitimacy (Peng et al., 2004), and shortcuts to exclusive government endorsement and favorable treatment (Sheng et al., 2011), all of which are crucial for their survival. Consequently, government subsidy in China serves as a crucial signal for entrepreneurial firms that would otherwise have difficulty attracting the attention of external investors.

2.2. Symbolic effect of government subsidy on IPOs

Despite the emerging research on the symbolic effect of government subsidy on external financing, most studies focused on private financiers such as venture capitalists. Very few studies have paid attention to the context of the public market, such as IPO. IPO is not only a significant milestone for entrepreneurial firms as it would be some time before conventional financial indices can be used to measure their performance (Chang, 2004), but also an early-stage measure for firm