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The time-varying impacts of government incentives on innovation

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ABSTRACT

This paper advances extant theoretical research through focusing on the time-varying effects of government fiscal incentives on the innovative performance of firms. Findings show that direct government subsidies favor firms in the short-term, but hinder them in their long-term innovation performance. Indirect tax credit, on the other hand, is favorable to a firm's short-term and long-term innovation performance. Importantly, combining resource-based theory and social capital theory, we suggest that two dimensions of resource endowment — financial and human slack — should be considered in evaluating the effectiveness of incentives. Specifically, our analysis utilizes a unique panel of data from Chinese high-tech companies based in Beijing Zhongguancun Science Park, allowing for our analysis of interior firm variation over time. The study shows solid empirical support for the effects of government incentives over time and offers the interesting result that financial slack positively moderates the relationships between government incentives and firms' innovation performance, while human slack has the opposite moderating role. As such, our paper contributes to the present debate on government incentives in generating innovation, not only by investigating how effects of specific fiscal instruments on innovation performance vary with time, but also by attempting to incorporate firms' resource endowment conditions as contingent factors. Future research directions, implications for innovation research, and policy implications are discussed.

1. Introduction

How do government financial incentives affect a firm's innovation performance? Researchers have tried to answer this question, but their studies yield mixed findings (Mahmood and Rufin 2005; Hall and Lerner 2010; Carboni, 2017). Some scholars have claimed that having more government financial support is often perceived to be better than having less (Lerner 2000). However, other scholars suggested that government financial incentives have several drawbacks, such as their role in the substitution of a firm's own innovation expenditures (Zhang and Wu, 2014).

Researchers have long struggled to reconcile these conflicting perspectives in at least two different ways. Firstly, the different results from prior research suggest that the efficacy of government support for private innovation activities may vary with respect to some contingent factors. Specifically, studies have argued how industry conditions, country institutional factors, and firm characteristics (e.g., tenure, size and ownership and so on) may intervene in the relationships between government financial incentives and innovation performance (Lach 2002; Mani 2002; Huergo et al., 2016). Secondly, scholars have illuminated that the innovation performance effect of government financial incentives may depend upon the level of that incentive. Specifically, government financial incentives are positively associated with innovation performance until a certain threshold value, above which their positive effect will gradually diminish and eventually turn negative, expressed as an inverted U-shaped associations between government financial incentives and innovation outcomes. Guan and Yam (2015) claimed that direct subsidies failed to improve, and even negatively affected, firms' innovative performances. Although quantitative research has been investigating the role of government incentives in firms' innovation performances, the findings are not universal, and this topic is in urgent need of further work. Our study broadens these perspectives by arguing that different types of government incentive tools play distinct roles in short-term and long-term innovation outcomes.

Our study uses a different approach to reconcile present conflicts and contributes to the ongoing work on the judgment of government fiscal policy. Firstly, government policy regarding financial incentives is considered to be a crucial element in firms' development. Governments utilize a wide variety of incentive instruments to promote innovation, such as tax credit, R&D subsidy, and special loans (Guan and Yam 2015; Lee and Cin 2010; Borrás and Edquist, 2013). Evaluating the effects of subsidies and tax credit is meaningful, because they are primary but

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distinct policy tools (Qiu and Tao 1998). Tax incentives are often considered better than direct subsidies, because tax tools allow firms to freely fund R&D projects, increase their own private R&D expenditure, and sustain their long-term growth (OECD). In this study, we focus on the distinct roles of subsidy and tax credit in influencing firms' innovation performance. Support from external resource holders (e.g. governmental agencies) helps firms to complement a significant amount of resources, such as knowledge-based resources, and contribute critically to their innovative capacity. The heterogeneity of resources and innovative capabilities would explain innovators' innovation performance differences (Kazadi et al., 2016; Qian et al., 2017; Guan and Yan, 2016). Grounded on resource-based and organizational dynamics literature, which depict time as a crucial factor (Richard et al. 2007), we investigate how government fiscal incentives exert effects on firms' short- and long-term innovation performance.

Secondly, although scholars have considered certain characteristics of firms as critical contingency variables in the relations between government incentives and performance, no thorough and systematic research has studied the role of internal resources in the incentive—performance relationship. Resource-based views argue that firms' resources enable them to generate innovation capabilities. As such, we set out to integrate social capital and resource-based theory literature, and thus posit that the impacts of subsidies and tax credit on innovation performance can be truly understood by considering the nature of the firms' available resources. Furthermore, resource-based theory argues that innovators, like firms, are aggregations of heterogeneous and idiosyncratic bundles of resources and capabilities (Barney 1991; Wright et al. 2001; Guan et al., 2015a) and put forward the notion of the firm's slack resources relative to other firms (Sharfman et al. 1988). A firm's needs are more important than the absolute levels of its resources (Mishina et al. 2004). A series of previous studies analyzed the role of financial slack, which is the level of financial assets exceeding those needed for basic organizational operating expenses in innovation processes (Nohria and Gulati 1996). Recently, a small but growing body of literature has begun to pay more attention to human resource slack, which implies that the level of employees exceeds that needed for organizational basic demand (Mishina et al. 2004). In our paper, we focus on these two resource slacks, namely, financial and human resource slacks, because both are essential for the growth and development of firms (Vanacker et al. 2013).

Thirdly, we tested our hypotheses on high-tech firms in Beijing ZSP, which is the pioneer of Chinese S&T Parks. The context of China is interesting because its high-tech industries have boomed in recent decades, and it is always a prior task for the government to foster domestic innovative activities. As the world's largest developing economy and country, China uses several popular innovation policy instruments to support its developing firms. The Chinese government has put innovation and progress at the top of the agenda for firms in the Science Park. Most OECD, and some emerging economies, have provided R&D incentives on firms' R&D expenditure (OECD). However, most of this incentive research has concentrated on advanced countries, such as the Europe or the United States (Wallsten 2000; Czarnitzki et al. 2011). Solid empirical research on the innovation consequences of Chinese fiscal incentives in Science Park contexts is yet to be performed.

To sum up, our study offers three important contributions to extant literature. Firstly, our study examines the distinct roles played by subsidies and tax credit in the short- and long-term of innovation performance. Some studies have noticed the dynamic effects of government incentives, but the majority of them focus on the time pattern of the effects of tax credits or direct subsidies on R&D investment. Recently, the effects of the government's financial incentives on firms' innovation performances in the context of China have received a great deal of attention (Guan and Yam, 2015; Jiao et al., 2015). To our knowledge, no other study has attempted to test the time-varying impacts of government incentives on innovation. Secondly, our study also considers the roles of the resource slack in the incentive—performance relationship. By exploring the influence of the internal resources of a firm, along with its external policy, we extend the understanding of government subsidies into a new realm. Thirdly, our study is among the first to examine the effects of subsidies and tax credit simultaneously for all Chinese high-tech companies in the Science Park. Fourthly, based on a unique dataset of Beijing ZSP during 2005–2014, we conducted OLS regressions with fixed effects to test the time-varying impacts of government incentives on innovation. To test the robustness of our findings, we adopted several alternative approaches (such as GEE, GMM, PSM and random effect models) and used multiple measurements of innovation performance. The results remain consistent. Furthermore, we tested the moderating roles of financial and human slack in the above mechanisms. According to recent literature, in our robustness tests, we measured the slacks using expectation models. We began this study with a brief literature review of relevant research. In Section 2, we will develop our theoretical model and propose our main hypotheses. After that, we will describe our empirical context, and present the analyses and results. Finally, we will end with a conclusion and a deep discussion of the findings, and then provided implications for innovation research and managerial practice.

2. Theory and Hypotheses

Direct subsidies and indirect tax credit are primary instruments of government support for firms' R&D. Subsidies are direct expenditures targeted to specific objectives chosen by the government, while tax credit means the deduction in a firm's income tax system if they meet certain requirements (Guellec and Van Pottelsberghe 2003). There are some differences between subsidies and tax credit in both theoretical and operational aspects. We summarize some key characteristics of subsidies and tax credit in Table 1.

Slack represents the difference or gap between a firm's total resources and their necessary payments (Cyert and March 1963). Following previous research, we also distinguish resource slack along two dimensions. Financial slack indicates an excess of uncommitted financial resources, while human slack consists of an excess of human resources (Paeleman and Vanacker 2015). As such, we outline some key characteristics of financial slack and human slack in Table 2.

2.1. Subsidy, tax credit and innovation performance

Government fiscal incentives, which refer to subsidies and tax credit

Table 1
Comparison of subsidy and tax credit.

	Subsidy	Tax credit
Incentive measure	Subsidy is a direct fiscal measure	Tax credit is an indirect fiscal measure
Characteristic	Subsidy is unneutral regarding the firm characteristic or industry	Tax credit is irrespective of the firm nature, industry, or direction and aim of innovation activity
Incentive time	Beforehand subsidy	Afterward credit
Incentive object	Firms that participate in R&D projects selected by government	All firms that participate in R&D projects
Project decisions	Government chooses funding projects	Firms are free to choose their own projects
Equality degree	May distort equality	Fair and transparent

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