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Do R & D tax incentives work? Firm-level evidence from China☆

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ABSTRACT

Tax incentives have been used worldwide to encourage firm R & D, but there is little evidence on their effectiveness as a policy tool in developing countries. We use a panel dataset of Chinese listed companies covering 2007 to 2013 to assess the effects of tax incentives on firm R & D expenditures and analyze how institutional conditions shape these effects. Our results show that tax incentives motivate R & D expenditures for our sample firms. A 10% reduction in R & D user costs leads firms to increase R & D expenditures by 3.97% in the short run. We also find considerable effect heterogeneity: Tax incentives significantly stimulate R & D in private firms but have little influence on state-owned enterprises' R & D expenditures. Moreover, the effects of tax incentives are more pronounced for private firms without political connections. Hence, reducing political intervention complements tax incentives' capacity to foster firm R & D in developing countries.

1. Introduction

Research and development (R & D) is a key driving force of technical progress and thus of sustainable economic growth (Aghion & Howitt, 1992; Romer, 1990). However, the market alone often fails to provide sufficient quantities of R & D from a socially desirable perspective, as the private rate of return to R & D tends to be lower than its social rate of return. Two primary policy tools—direct grants and tax incentives—can be used by the government to address this problem. Of the two, tax incentives reduces administrative burden and mitigates the risk of "picking losers" (Dechezleprêtre, Einiö, Martin, Nguyen, & Van Reenen, 2016),[1] thus are more market-friendly and have become more prevalent for facilitating R & D activities in both developed and developing countries (OECD, 2014).[2]

Although theoretically appealing and practically prevalent, considerable concern has been expressed about the effectiveness of this policy. It is often unclear whether tax incentives produce a meaningful private response. Early studies suggested that the tax incentive does little to encourage corporate R & D (Eisner, Albert, & Sullivan 1984; Mansfield, 1986), while later studies find much higher elasticities (Hall, 1993; Bloom, Griffith, & Van Reenen, 2002; Wilson, 2009; Guceri & Liu, 2015; Rao, 2016; Agrawal, Rosell, & Simcoe, 2014; Mulkay & Mairesse, 2013; Dechezleprêtre et al., 2016).[3] "However, almost all studies use data from the

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[1] For example, firms with political connections but low social returns may obtain direct grants.

[2] As of 2011, 27 of 34 OECD countries had adopted R & D tax incentives, up from 12 in 1995 and 21 in 2008. In these countries, over half of total public support for business R & D took the form of tax incentives (OECD, 2014). Meanwhile, partly in response to ceilings on direct subsidies imposed by the World Trade Organization (50% of upstream R & D, 25% of downstream R & D) and partly because of the growing tax competition for innovation activities, developing countries have also increasingly resorted to R & D tax incentives. In 2010, for example, tax incentives accounted for > 60% of total public support for business R & D in South Africa (OECD, 2014).

[3] See also Hall and van Reenen (2000) for a review of earlier literature.

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developed world. Although developing countries are increasingly reliant on tax incentives in their efforts to catch up with the global technology frontier, little is known about how tax incentives affect corporate R & D activities in developing countries, where firms often operate in a weak institutional environment. Weak institutional environment has led many policies to fail in developing countries (Acemoglu & Johnson, 2005).[4] Property rights protection and contract enforcements (including IPRs laws and enforcements) provide necessary protection to the fruits of R & D and protect investments that are complementary to R & D expenditures (Lin, Lin, & Song, 2010), thus tax incentive and institutions may be complements in encouraging R & D. In developing countries, poor protection on property rights, unjust legal system, and severe government intervention may undermine the role of tax incentives in motivating corporate R & D.

This paper seeks to fill this gap by evaluating the effects of tax incentives on firm R & D expenditures in China. As the world's largest developing economy, China provides a particularly interesting setting in which to examine these issues. Since the 1980s, China has made innovation one of its top priorities, and its R & D intensity (R & D expenditure as a share of GDP) has increased nearly fourfold over the past two decades, from 0.57% in 1995 to 2.01% in 2013. During this process, a tax incentive policy has been increasingly used to promote firm R & D: According to the OECD (2008a), China is among the eight countries with the most generous R & D tax treatments in the world.[5] However, China's institutional environment for firm innovation remains underdeveloped due to such problems as its poor property rights protection, weak contract enforcement and heavy government intervention (Allen, Qian, & Qian, 2005; Cull & Xu, 2005; Du, Lu, & Tao, 2015). Given prevalent state ownership and political connection among Chinese firms, we can also assess whether state ownership and political connection affect the effectiveness of tax incentives.

Using a large panel dataset of Chinese listed companies covering 2007 to 2013, this paper estimates a price elasticity model that treats the user cost of R & D as an important determinant of firm innovation decisions. This approach is arguably better grounded in economic theory and has thus been widely used in previous studies (see Bloom et al., 2002; Rao, 2016; Wilson, 2009). We employ the system Generalized Method of Moments (GMM) to address potential endogeneity. Our results show that tax incentives have statistically significant effects on stimulating firm R & D expenditures for the full sample. A 10% reduction in R & D user costs leads firms to increase R & D expenditures by 3.97% in the short run. The short-run elasticity of R & D on user cost is smaller than most recent studies on developed countries.[6] It is likely that institutions and tax incentives are complements in encouraging R & D, thus poor institutions undermine the effectiveness of tax incentives.

We then observe considerable heterogeneity in the response to R & D tax incentives between state-owned enterprises (SOEs) and private firms. User cost reduction through tax incentives has little influence on SOEs' R & D expenditures, whereas a 10% decrease in R & D user costs leads private firms to increase their R & D expenditures by 4.63% in the short run. We argue that SOEs are not sensitive to R & D user costs because they bear many political responsibilities beyond profit maximization and also face soft budget constraints.

For private firms, we further detect that political connections—identified when either one of the firm's board chairmen or its chief executive officer (CEO) is a former government official or a deputy of either the People's Congress (PC) or the People's Political Consultative Conference (PPCC)[7]—play an important role in determining the effectiveness of R & D tax incentives. Unlike non-connected private firms, politically connected ones do not significantly increase R & D expenditures in response to a reduction in R & D user costs. We argue that politically connected firms have easier access to external finance and other beneficial treatments and are thus less sensitive to the increase in internal funds caused by R & D tax incentives. Moreover, politically connected firms are more likely to pursue short-term rent seeking and thus be reluctant to invest in high-risk and long-term R & D activities.

Our study makes three main contributions to the literature on R & D tax incentives. First, it extends this literature to include the experience of developing countries. As mentioned, the relationship between tax incentives and R & D expenditure in industrialized economies has been widely studied, but little evidence has been generated on the effects of tax incentives on firm R & D expenditure in developing countries (one exception is Özçelik and Taymaz (2004), who find a positive effect of R & D tax incentives for Turkish manufacturing firms[8]). Our study on China sheds new light on this issue and finds that the short-run elasticity of R & D on tax user cost is smaller than most recent studies on developed countries.

Second, our study contributes to the understanding of how institutional factors—particularly, state ownership and political connections—interact with R & D tax incentives policy. A large body of literature has found that SOEs tend to be less innovative (see Choi, Lee, & Williams, 2011; Hu & Jefferson, 2009; Lin et al., 2010; Qian & Xu, 1998; Shleifer, 1998). There is also considerable evidence that political connections help private firms improve their operating performance by bringing them more favorable treatment (such as easier access to external finance and more government procurements). Despite this issue's theoretical relevance and policy significance, however, the research has paid surprisingly little attention to the role of these institutional factors in

[4] Many developing countries tend to use generous tax benefits to compensate for the weakness of their institutions, given the substantial difficulty of conducting structural reforms (Li, 2006).

[5] The other seven countries are Spain, Mexico, France, Portugal, the Czech Republic, India, and Brazil.

[6] Mulkay and Mairesse (2013) obtain a short-run elasticity of − 0.6 for French firms; Agrawal et al. (2014) estimate a short-run elasticity of approximately − 1.5 for Canadian firms; Guceri and Liu (2015) and Dechezleprêtre et al. (2016) obtain a elasticity of approximately − 2.5 and − 2.6 for UK firms, respectively; and Rao (2016) finds a short-run elasticity of − 1.98 for the United States.

[7] The People's Congress and the People's Political Consultative Conference are influential quasi-government organizations within the Chinese political system, and both operate at the national and local levels. The former is the lawmaker, and the latter is the sole official advisory body. Because appointments of main government officials must be approved by the People's Congress and are often influenced by comments from deputies of the Consultative Conference, these two organizations have a significant influence on, and are closely related to, key government officials.

[8] Zhu, Xu, and Lundin (2006) empirically investigate the effects of tax incentives on R & D investments in China, but their study is based on industrial-level panel data on Shanghai City.