



SME POLICY FACED WITH DEVELOPMENT OF
FINANCIAL TECHNOLOGY

Promoting SME R&D and Innovation

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Abstract

SMEs are subject to constraints in internal resources such as capital, human resources, and knowledge due to their small size. Also, access to external resources is limited due to market failures. Thus, SMEs have disadvantages in R&D and innovation when compared to larger firms. To overcome these gaps, various public policies have been implemented to include financial, networking, and IPR support programs. We discuss the effectiveness of these policies based on empirical evidence and propose a better policy framework for SME's R&D and innovation, with special attention to networking and IPR support programs.



Challenge

Constraints of SMEs for R&D and innovation

Innovation is a major engine of economic growth. Small and medium-sized enterprises (SMEs), which account for most of the enterprises, are expected to significantly contribute to innovation. However, it is known that SMEs' contribution to research and development (R&D) activities is limited (Terziovski 2010). According to the *4th National Innovation Survey* in Japan, only 11% of SMEs (<250 employees) achieved product innovation during 2012-2014 compared to 27% for large firms (NISTEP 2016). Some reasons may be pointed out for the relatively low level of R&D and innovation by SMEs worldwide¹. Many SMEs may not be interested in R&D and innovation, but we can observe severe SME resource constraints for conducting R&D and innovation activities².

1. Constraints of internal business resources

Due to their small size, SMEs face severe constraints in internal resources, such as capital (funding), human resources, and advanced knowledge. In addition to liquidity constraints, SMEs often lack sufficient knowledge and human resources to absorb external knowledge, which is essential for R&D and innovation. As opposed to larger firms, SMEs lack complementary assets for innovation, including intellectual property protection (Cockburn and Henderson 2001; Hall and Ziedonis 2001; Ceccagnoli et al. 2010).

2. Constraints in accessibility to external resources

Therefore, SMEs should rely on external business resources to conduct R&D activities. They must seek external funding and collaborate with other organizations to obtain advanced knowledge. Capital constraints are severe for SME R&D activities because of high uncertainty and information asymmetry

¹ Trends similar to Japan can be observed in European countries, according to the results of the *Community Innovation Survey* in 2014 (Eurostat).

² According to the results of the *4th National Innovation Survey* in 2014 (NISTEP 2016: p. 101), SMEs cite lack of internal funds (37%), difficulty of obtaining external funding (25%), difficulty in finding partners (39%) and a lack of skilled workers (61%) as major deterrents to innovation.



(Hall and Lerner 2010; Hottenrott and Peters 2012; Mancusi and Vezzulli 2014). Recent studies suggest the importance of open innovation via inter-organizational alliances (O’Sullivan et al. 2013; Warwick and Nolan 2014), which also may be difficult for SMEs due to information asymmetry and high search and transaction costs³.

3. Difficulties in protecting and utilizing intellectual property rights (IPR)

Even for innovative SMEs, it is often difficult to capture the benefits of innovation because it is difficult to build a patent portfolio, and no complementary assets (including IPR management) are available to protect their competitive advantage. Lanjouw and Schankerman (2004) show that small firms are more subject to patent litigation. Lack of complementary assets reduces marginal revenues that SMEs would obtain from R&D investment and lowers their incentive to invest in R&D. Also, lack of absorptive capacity and high search costs prevent SMEs from utilizing external IPR to their own innovative and competitive advantage.

Proposal

Who should be the targets of public support for R&D and innovation?

Social returns on R&D investments are usually higher than private returns to inventors due to the positive externality of R&D (Hall et al. 2010). Hence, policy intervention to close the gaps between actual and desired R&D levels may be warranted.

Most SMEs may suffer from internal and external resource constraints, but supporting all SMEs regardless of R&D orientation and innovation potential is inefficient and cannot be justified. On the other hand, governments tend to pick

³ According to OECD (2017), on average only 13% of innovating SMEs (<250 employees) achieve their innovation in collaboration with universities or research institutes, compared to 31% for large firms (p. 134). Moreover, in each country, SMEs are also less likely to collaborate with business partners than large firms are (p. 135).



winners for their policy targets to secure positive outcomes for their support policies. However, this strategy is inefficient because these targets would conduct R&D with their own resources and achieve innovation without public support. Therefore, public policy should consider backing challengers rather than backing losers or picking up winners (Stam 2018), regardless of different economic developments and social contexts of each country. In any country and society we may find challengers for innovation who cannot secure access to resources due to market incompleteness.

What are the most binding constraints for SMEs? What policy interventions are possible to remedy these constraints?

For R&D and innovation, firms need capital, human resources, and knowledge. Traditionally, the lack of internal and external capital (funding) has been regarded as the most binding constraint to an SME's R&D and innovation. Therefore, public policy discussion has concentrated on direct financial support through public subsidies and tax credits. It has been argued that direct financial support is important for innovative young firms and start-ups due to severe information asymmetry. Compared to these supply-side measures, demand-side measures (public procurement of innovative goods) are recognized as efficient programs.

But access to advanced knowledge may be a binding constraint for innovative SMEs. Recent studies suggest that 'soft' or indirect support (including matching and networking with universities and other organizations) may be more effective than 'hard' or direct financial support (Nishimura and Okamuro 2011). For innovative SMEs, utilizing external knowledge and protecting their own innovations via an intellectual property right (IPR) system is an important strategy. The availability of human resources is another essential constraint for SME innovation, but this Policy Brief will focus solely on access to external human resources who have advanced knowledge via collaboration with universities and other research institutes.

Various policy measures are available to promote R&D and innovation by SMEs: R&D subsidy and tax credits (deduction), networking and matching support for R&D collaboration, public innovation procurement, and a more SME-friendly IPR system. We should also consider a better balance and combination of public



and private R&D investment. In the following sections, we will elaborate on each proposal in more detail.

Improving public support schemes for SMEs' R&D activities

To resolve insufficient SME R&D investment and its outcomes, governments have been working on improving access to R&D resources for SMEs (OECD 2015). Traditional financial support policies include public subsidies and tax credits (deductions). The former may incur moral hazards and crowding out, which would lower the policy effects. Previous studies suggest that public subsidies positively affect SME's R&D investments and their outputs, such as patents (Almus and Czarnitzki 2003; Hyytinen and Toivanen 2005; Koga 2005). Tax credits, which account for nearly half of public R&D support in OECD countries in 2015, significantly increased its share since 2006 (OECD 2017: pp. 156-157). Tax incentives may theoretically be better schemes than subsidies because they will not incur moral hazards or crowding out, whereas previous studies show mixed results or negative effects, specifically in the case of the patent box program in Europe (see Appendix).

These support schemes should be made more effective for SMEs (Keizer et al. 2002) based on empirical evidence and by appropriately considering the incentive mechanism. In addition to this traditional support, demand-side support and 'soft' or indirect support for R&D has recently been attracting attention.

1. It is essential for public R&D support policies to rebuild incentive schemes based on empirical evidence (Okamuro and Nishimura 2018). Public support programs should be designed to enhance incentives to participating SMEs while discouraging moral hazards and free-riding (Nishimura and Okamuro 2018). It is also important to design an intensive monitoring scheme for public R&D support to avoid agency problems (Lerner 2002).
2. "Soft" or indirect R&D support (including business/academic/financial matching, networking, consulting and mentoring) may be more effective for innovation than "hard" or direct support (Huggins and Johnston 2009; Ortega-Argilés et al. 2009; Martin et al. 2011; Nishimura and Okamuro



2011; Suzuki 2017). Intermediaries that match scientific seeds and market innovation needs are particularly important (Mindura 2013; Nagaoka et al. 2014; Banal-Estañol et al. 2017).

3. In addition to traditional supply-side support measures (such as public subsidies), more attention should be paid to *demand-side* support measures (public procurement of innovative products). Recent studies suggest the effectiveness of such demand-side policies (Georghiou et al. 2014; Edler and Yeow 2016). Guerzoni and Raiteri (2015) indicate that demand-side policies may be more effective than supply-side policies when controlling for interaction with other policies. This policy measure provides similar benefits as selective subsidies (e.g. signaling benefits) without the associated costs for SMEs arising from the (generally) ineffective management of selective support schemes by governmental authorities.

It is noteworthy from the viewpoint of efficient evidence-based policy making (EBPM) that every support program mentioned above for SME's R&D and innovation should be subject to a constant third-party monitoring and evaluation. It is true that it may take time for public R&D and innovation policies to be effective. These policies may have various unforeseen indirect effects. It is important to insert third-party monitoring and evaluation of support policies into relevant laws and ordinances.

Promoting public-private partnership for R&D investment in SMEs

The efficiency of public R&D support is limited due to budget constraints and potential "government failures." The private sector (including banks and venture capital) can play an important role as a promoter of SME R&D and innovation. Banks increasingly recognize SME lending as a core strategic business (De la Torre et al. 2010). Venture capital investment in innovative SMEs has been attracting attention. But as argued above, information asymmetry is severe for R&D funding from banks and investors under uncertainty. To overcome the problems of both market and government failures, we must promote a better public-private R&D support partnership for SMEs as follows.

1. Develop human resources for public and private agencies who can evaluate



the growth and innovation potential of SMEs (Meuleman et al. 2012; Okamuro and Nishimura 2015; Nishimura et al. 2018).

2. Build networks of investors, banks and SMEs to provide open access to investment opportunities (Nishimura and Okamuro 2011).
3. Encouraging combinations of public and private investments to increase SME opportunities, such as matching the funds of public and private sectors (Kim et al. 2015) and public venture capital (Bertoni et al. 2015; Colombo et al. 2016).

More efficient searching for potential R&D partners

For innovative SMEs with resource constraints, R&D partnerships with other firms, universities, and public research institutes is important because they can share the costs and risks of R&D activities with their partners (Okamuro 2007) and obtain valuable resources (such as advanced knowledge) (Nishimura and Okamuro 2011). Larger firms are more likely to engage in R&D partnerships with other firms and organizations (NISTEP 2016: p. 94 and 99; OECD 2017: pp. 134-135). It may be that SMEs have difficulties searching for appropriate partners for joint R&D due to lack of information about professional researchers (NISTEP 2016: p.105). Therefore, public policy should lower SME search costs for R&D partners--

1. by constructing comprehensive databases to link SMEs with other firms, universities, and public research institutes,
2. by encouraging information disclosures of the market needs and scientific seeds of R&D activities and utilizing networking intermediaries (Mindruta 2013; Nagaoka et al. 2014; Banal-Estañol et al. 2017), and
3. by directly supporting partner searches via matching events (Nishimura and Okamuro 2011).

The government should be more proactive in encouraging partnerships between SMEs and research organizations. However, it is noteworthy that sufficient absorptive capacity of SMEs is essential to efficient R&D collaboration.



Efficient protection and utilization of IPR

In addition to improving SMEs' access to external resources, the importance of an intellectual property system for patents, trademarks and copyrights must also be emphasized (Olander et al. 2009). It is known that the intellectual property system has two contrasting purposes: protecting inventions (to provide innovation incentives to inventors) and the diffusion of new knowledge (to avoid duplicates and encourage further inventions). Therefore, the intellectual property system should be useful to SMEs both to protect their own innovations and to obtain advanced external knowledge. IPR helps SMEs enhance business performance (Helmers and Rogers 2011; Farre-Mensa et al. 2016; Nishimura et al. 2018). However, the enforcement and operation of the intellectual property system is insufficient in some countries, especially to the disadvantage of SMEs (Lanjouw and Schankerman 2004).

To promote protection and utilization of intellectual property by SMEs, it is important to improve their intellectual property literacy (Rodwell et al. 2007; Hughes and Mina 2010) and design more "SME-friendly" intellectual property systems (Harhoff et al. 2009; Rassenfosse and Jaffe 2017) by lowering thresholds for patenting. Special support for SMEs protecting their own innovations against IPR litigation, such as by providing professional, legal support, is desirable. Also, acquiring and utilizing IPR is quite costly for most SMEs (Rodwell et al. 2007). Therefore, they should have better and easier access to intellectual property databases, including trademarks and copyrights.

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Appendix

Patent Box as a means of tax deduction in Europe

Governments worldwide grant a variety of tax incentives to boost R&D and innovation. In 2015, tax incentives accounted for nearly half of total government support for R&D in OECD countries (OECD 2017: p. 156). Yet tax expenditures are often ineffective in reaching their stated goals and trigger negative externalities. Therefore, their use should be minimized.

In Europe, patent boxes have been recently gaining momentum. An increasing number of countries have introduced this type of preferential tax treatment for corporate income earned through intellectual property.

However, empirical evidence is conclusive. Patent boxes are costly and governments usually must apply very low effective tax rates to increase patent registrations, which leads to significant revenue losses (Griffith et al. 2014). Also, patent boxes may attract patents, but their impact on R&D is less clear, as businesses' shift their patents' locations without shifting their research operations (Alstadsaeter et al. 2018).

Patent boxes also create economic distortions. Granting a tax benefit to businesses that register a patent discriminates against R&D projects that do not



result in a patent registration, either because they are unsuccessful (Griffith and Miller 2010) or because the research project is in a sector that is non-patent active (Alstadsaeter et al. 2018). And although young firms and SMEs are more likely to require support to secure the financing needed for R&D, most of the benefits of patent boxes are captured by large firms (particularly MNEs), since only a few multinationals are responsible for most of the patent registrations worldwide (Hall et al. 2013).

Tax incentives are not bad per se. Under certain conditions, a tax subsidy could be the most cost-effective policy instrument. This is true when eligibility conditions are directly linked to tax return data, when it is more important to maximize the number of beneficiaries than to minimize excess claims, or when the policy objective is to incentivize a clear and broadly defined activity by reducing its net price (Toder 2000). Indeed, other tax incentives for R&D and innovation have proven more effective than patent boxes, such as Dechezlepretre et al. (2016), Rao (2016), and Thomson (2017). If governments seek to boost SME R&D investment by implementing tax incentives, they should design them carefully so the benefits are captured by the target group and do not end-up triggering windfall gains for other sectors, e.g. MNEs (Romero-Jordán et al. 2014).