



Expert paper

The SME Business Environment: Opportunities and Constraints to Implement Responsible Research and Innovation

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1. Introduction

This short input paper describes the business environment for OECD small firms and entrepreneurs, identifying potential opportunities and constraints in the adoption of responsible innovation. The paper also provides a rationale for public policy intervention.

Responsible Research and Innovation (RRI), or Responsible Innovation (RI) are concepts that encompass the ideal that innovation in processes, products, or techniques shall only be implemented if they bring in benefits for the society and abide by social, moral and ethical principles. RI can sometimes be understood as a sub-product of innovation itself that actively engages the civil sector, both in the research and innovation activities as well as in the access to scientific results.¹

Small and medium-sized firms (SMEs) confront both opportunities and constraints in the dimension of innovation. New processes, products, marketing or organisational changes are easier to implement in SMEs, precisely because of their size. The serial entrepreneur Sir Richard Branson is known to have said that the ideal firm size is about 150 employees, because if the firm is bigger, bureaucratic constraints emerge.² Therefore, RI would be ideally tested and implemented in a small environment first, and then, once successful and viable, expanded to bigger firms.

However, SMEs also face challenges in the uptake and implementation of innovation, related precisely to their size, as small firms have more difficulty in accessing finance, skilled labour, and in dealing with regulation. These dimensions are described and analysed in this paper. Next section describes the characteristics of SMEs. Section II describes the SME business environment along the finance, human, and social capital dimensions. Section III presents evidence on existing OECD programmes, and section IV presents the conclusions, which summarised in two sentences, mean that for SMEs to implement RI, they need public support, be it financial or in a more generally enabling environment (in accessing qualified human and social capital). In order for such public support to be maximised, transformative SMEs need to be identified, because they are the ones likely to successfully implement RI.

2. Characteristics of SMEs: identifying transformative businesses

SMEs are said to be the backbone of the European economy and comprise over 97% of all businesses. With such vast share, many heterogeneous firms are contained within this category. Further refinements can be done to classify firms; one of them is according to their entrepreneurial intensity.

Entrepreneurial intensity can be understood as a conceptual continuum of entrepreneurial attitudes and behaviour that ranges from low to high levels (Barringer and Ireland, 2015). At one end of this continuum are located the businesses with low entrepreneurial intensity, such as firms whose owners pursue salary-substitution opportunities, or firms owned by lifestyle entrepreneurs. The main objective of these two groups is not the implementation of a new

¹ In particular, RRI and RI strive for gender equality in the research process and in the research content, and seek to promote formal and informal science education (EC, 2017).

² <https://www.entrepreneur.com/article/223639>

process, idea, or product, but a lifestyle (e.g. tennis coaches, or bed and breakfast owners). At the other end of the continuum are located the businesses with high entrepreneurial intensity, the so-called transformative firms, whose objective is to disrupt the way things are done by bringing in new processes, products, or value added (Figure 1).

Figure 1: A classification of firms according to their entrepreneurial intensity



Source: Adapted from Barringer and Ireland (2015).

Firms with low entrepreneurial intensity tend to be reactive, risk averse, and conservative (and have, on average, a slower growth rate of annual sales or employees); in contrast, transformative enterprises tend to be proactive, risk takers and innovative (Barringer and Ireland, 2015). Transformative enterprises have an economic impact on society, both directly from the innovation itself, by introducing efficient processes or innovative products, and indirectly, by transferring their innovation to larger firms. Transformative firms also have a higher proportion of job creation. **These characteristics make transformative enterprises more prone to implement RRI.**

The classification of firms according to their entrepreneurial intensity is related but not conditioned to its size, although smaller firms have the advantage of being easier places where to test innovative ideas (as compared to firms of larger size). In the European Union, small firms have created 85% of new jobs and have provided over 67% of total private sector employment during the period 2010-15 (EU, 2017). In the United States, small innovative firms are 16 times more productive than larger innovative firms in terms of patents per employee (Barringer and Ireland, 2015).

2.1. Rationale for public policy intervention

There is a set of personal characteristics of entrepreneurs that can be identified with the likelihood of generating ideas, identifying opportunities (an opportunity is an idea that is viable), and creating transformative enterprises. These characteristics are: cognitive factors, creativity (which can be promoted for example, through brainstorming sessions, focus groups, or just desk research), and social capital (the network of strong and weak ties of the entrepreneur).

Although cognitive factors are unobservable, they are strongly correlated to observable characteristics such as prior experience and educational attainment. There is a role for public policies easing the path towards the acquisition of such characteristics, for example, facilitating dual models of learning, where technical and managerial skills can be acquired through stages at firms.

In addition, there is a role for public policies fostering an entrepreneurial culture and facilitating the transfer of knowledge from universities to businesses. Furthermore, there is a role for



public policies to play, fostering an entrepreneurship environment within and beyond the education system and favouring the creation of synergies through i.e. clusters and networks that promote the creation, diffusion, and transfer of knowledge (Potter, 2008).

In the third place, there is a role for public policies in easing access to finance for innovative and viable projects, alleviating the constraints to accessing one of the inputs of production (physical capital), by creating markets (that is, intervening where the private sector does not provide finance, also known as economic additionality) or by expanding markets (offering products that are not provided by the market, also known as financial additionality).

The next section discusses the SME business environment and presents more evidence on existing public policies in OECD countries.

3. The SME business environment

All firms need access to finance, to skilled labour, to a network of researchers and other transformative entrepreneurs, and to government policies to successfully develop their business plans. This section discusses about the different inputs SMEs need and identifies who are the likely SMEs that might be capable of implementing RRI.³ The section finishes with a discussion on SMEs and the regulatory environment.

3.1. Getting finance

Firms need finance to carry on with the day-to-day activities of the firm (e.g. keeping inventories, paying employees, advertising), to expand, to implement innovative ideas (which sometimes imply a lengthy development cycle), to acquire machinery and buildings, and even to cope with restructuring and exit.

From the supply side, the targets of bank lending are firms with a strong cash flow, financially healthy, and with good management. Therefore, some banks might be unwilling to lend to unproven business models, or might even be unable, given the new regulatory changes implemented since Basel III that entail higher capital requirements (OECD, 2014).

From the demand side, the financial knowledge of the entrepreneur acts as a constraint on the suitability of benefiting from borrowing using available instruments. In general, entrepreneurs do not have experience or expertise in raising capital for their firm, unless the specific purpose of the firm is a financial one, and as a result, entrepreneurs attempt this task unsystematically. Informal evidenced gathered at the Working Party on SMEs and Entrepreneurs of the OECD suggests that entrepreneurs allocate about one day to ask for finance, that in general they go to only one bank and if rejected, stop looking for other finance instruments.

Different types of financial instruments are needed depending on the purpose of the funding, on the life stage of the firm, on the financial knowledge of the entrepreneur, and on the availability of funds, which is often locally or regionally determined.

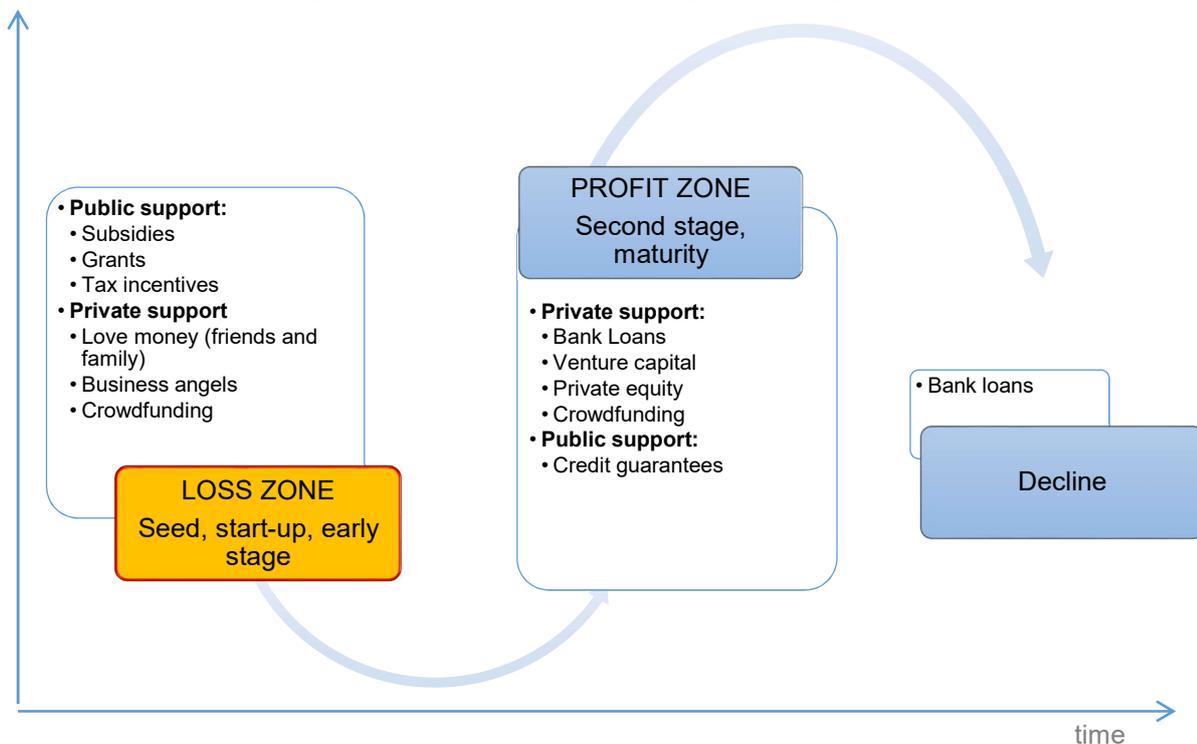
³ Some researches highlight the power asymmetry that exists with different stakeholders, questioning the practical applicability of RI (Owen et al., 2013).

3.1.1. Finance needs according to the lifecycle of the firm

The finance needs of a firm vary along their lifecycle. At the beginning, when projects or firms are not yet economically viable, the main finance provider is the personal network of the entrepreneur. Depending on the social value of projects, the public sector can provide direct funding, usually through subsidies (i.e. grants, credit at below-market rates, or with other special conditions, such as without collateral), in order to foster RRI and RI in specific projects that are beneficial to society. Because RI outcomes have some public goods characteristics (i.e. non-excludable and non-rival), public intervention allows SMEs to appropriate the benefits of innovation that otherwise can be diluted because other firms implement one firm's RI outcomes. That is one of the reasons why in OECD countries, R&D activities, including RI, are publicly funded.

Once the firm starts production and becomes viable, the private finance market can supply access to funding, either through debt or equity instruments. There is less of a justification for public intervention at this stage, given the likelihood of crowding-out private providers, unless the public provision offers economic or financial additionality (Figure 2).

Figure 2: Finance needs along the life cycle of a firm



Source: Own construction, adapted from OECD (2012).

Note: profits are depicted on the y-axis

3.1.2. Available finance instruments

During the loss-period (seed, start-up or inception), **personal funds** are the main source of finance for a firm or start-up, along with friends and family's money, who are willing to provide lending because they are able to observe a characteristic of the entrepreneur (such as being hardworking, responsible) that is not yet observed by the market. At this stage, **business angels** can provide finance as well, because they usually have a capital base, along with knowledge and willingness to take risks. In the United States, business angels invest on average between USD 10,000 and USD 500,000 per start-up (Barringer and Ireland, 2015).⁴

Crowdfunding (the monetisation of the social network of an entrepreneur) is a financial instrument suitable at this stage.⁵ Crowdfunding activities can be classified in financial and non-financial ones. Financial crowdfunding comprises peer-to-peer lending (P2P) or equity crowdfunding. The main characteristic is that funds are provided with the expectation of a financial return. P2P is similar to debt borrowing, where the entrepreneur borrows a certain amount of money to finance a product or a project and is obliged to repay it at a certain interest rate and within a certain time framework. With equity crowdfunding, the entrepreneur gives shares of the firm (and rights to profits and control) in exchange for the money collected. Non-financial crowdfunding involves donations and rewards, where funds are provided in exchange of a product (e.g. a ticket to a show, a book, a hotel room stay), or just donated because funders care about some characteristic of the project (e.g. its local dimension, bringing in job creation, or development, or social inclusion) (Robano, 2015).

During the profit zone (second stage of projects, maturity of the firm), both private and public supports are observed in financing entrepreneurship in OECD countries. Debt instruments (i.e. credit loans) are the most commonly used form of finance (OECD, 2014). Debt finance is not suitable for all entrepreneurs, especially those lacking collateral.

Equity finance means that the entrepreneurs are exchanging partial ownership in a firm, usually in the form of stock, for funding for capital (Barringer and Ireland, 2015). Family businesses and sole-proprietor firms tend to be reluctant on using this finance instrument (EIF, 2017).

Venture capital is money raised by financial firms that gather funds from a pool of investors (e.g. wealthy individuals or institutional investors) and that invest in start-ups with exceptional growth potential. Venture capitalists fund fewer firms than business angels, and also they invest at a later stage of the firm's life (Barringer and Ireland, 2015).

The use of **crowdfunding** is not limited to the early stage of a project. Depending on the characteristics of the firm, crowdfunding can be used for expansion purposes.

Public sector intervention is observed in the profit stage of the firm by offering **partial credit guarantees** that compensate for the lack of collateral and enable the firm to gather funds on the market.

In order to maximise the rate of return of projects, most public financial support programmes for SMEs and entrepreneurs offer jointly **mentoring, coaching, and other non-financial services** (ADB, 2014).

⁴ Further evidence on business angel funding of innovation is available at Wilson and Silva (2013), "Policies for Seed and Early Stage Finance", OECD Science, Technology and Industry Policy Papers, No. 9, OECD Publishing. DOI: 10.1787/5k3xqsf00j33-en

⁵ Crowdfunding itself is not new; one of the first projects to be financed with crowdfunding was the construction of the Liberty Statue by Auguste Bartholdi, who offered bonds in exchange of small replicas of the statue.

3.1.3. Evidence on the use of finance instruments

This section provides evidence on the use of finance instruments by SMEs across OECD countries. Since 2012, the OECD collects in a comparable form, a scoreboard of indicators of debt and equity finance conditions for SMEs across 37 countries. Such evidence is best analysed over time, in order to gauge variations in the use of financial instruments. For 2016, the key highlights on the finance conditions of SMEs are that debt finance continues to be the main source of *external* finance for SMEs and entrepreneurs, and that while credit conditions have improved, the lending levels previous to the 2008-09 crisis have not been reached in a number of countries. Regarding venture capital, a similar situation is observed: while the amounts have increased with respect to previous years, the 2007 levels have not yet been reached. Lastly, alternative finance instruments continue to grow, but often from a small base. In particular, business angels keep funding innovative firms and providing non-finance services at the same time (OECD, 2016).⁶

Furthermore, a 2017 research paper from the European Investment Fund has investigated the taxonomy of SME financing across Europe, identifying seven different clusters of SMEs, depending on some firm characteristics, such as ownership, location, and industry characteristics, where different financing instruments are used either as complements or substitutes. The study finds that innovative SMEs are strongly represented in mixed-finance clusters and in state-subsidised clusters (Table 1).⁷⁸ Among the reasons that explain this fact are: the relatively higher risk of innovative firms with unproven business models, the higher asset intangibility, higher information asymmetries, and higher risk due to less diversification possibilities, which make debt-financing relatively less used as financial instrument and condition innovative firms to use short-term debt or alternative finance instruments (EIF, 2017).

Innovative SMEs tend to use short-term debt finance on a relatively larger extent (19.5%) compared to the average SMEs in the sample (18.9%). Moreover, state-subsidised clusters not only provide grants and loans at better rates than the market, but also send a positive signal to private capital providers (EIF, 2017).

Table 1: Cluster comparison of finance sources for innovative SMEs (in percentages)

Variable	Total sample	N	Mixed-finance SMEs (with focus on other loans)	Mixed-finance SMEs (with focus on retained earnings)	State-subsidised SMEs	Debt-financed SMEs	Trade-financed SMEs	Asset-based SMEs	Internally-financed SMEs
SMEs per cluster			8.6	10.1	4.6	18.9	10.6	6.6	40.6
Product or services innovation	33.3%	13098	10.7	12.4	6.2	19.5	11.3	6.0	33.9

Note: The table should be read by comparing the share of SMEs per cluster and the share of SMEs in each category of passive cluster variables.

Source: (EIF 2017).

⁶ <http://www.oecd.org/cfe/smes/SME-Scoreboard-2016-Highlights.pdf>

⁷ The high proportion of internally financed SMEs is consistent with the hypothesis of financial constraints for entrepreneurship, which implies that on average, wealthier people choose entrepreneurship as a career option.

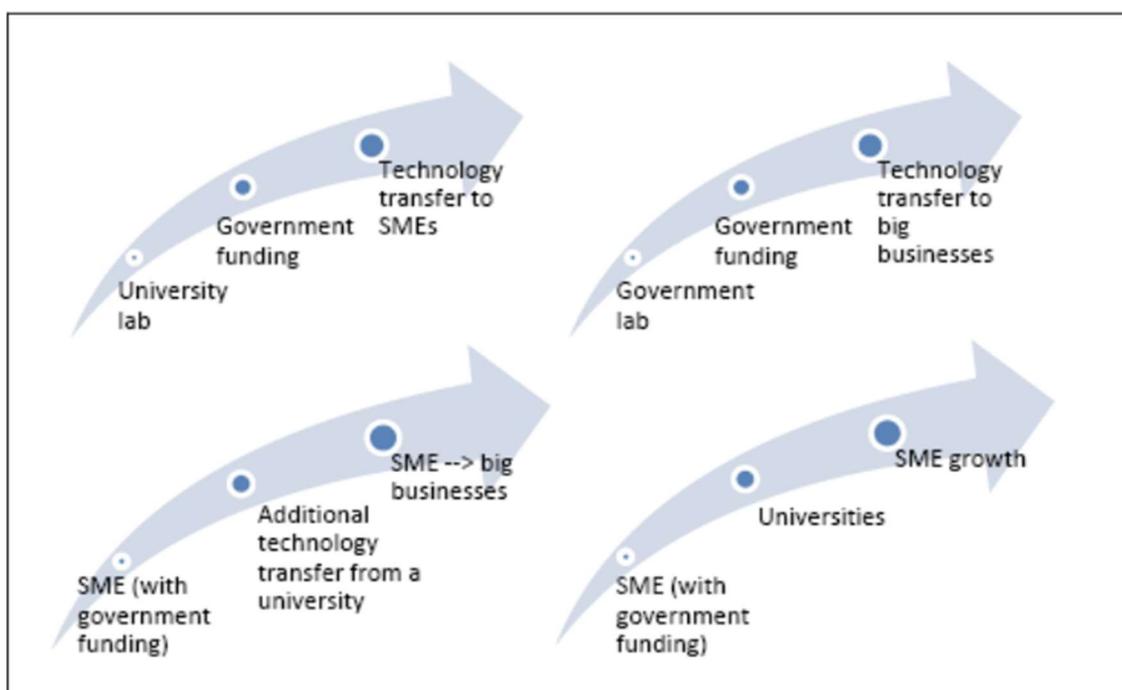
⁸ Mixed-finance clusters with a focus on other loans use subordinated debt, participatory loans and crowdfunding as finance instruments, while mixed-finance clusters with a focus on retained earnings use equity capital as other financial instrument.

The evidence regarding the financing of RI is still scarce. Nevertheless, some stylised facts can be drawn: (i) at the onset of the innovation, it is usually the public sector the one with interests in funding RI activities, because of their public good characteristics, through grants or other type of subsidies. (ii) Social entrepreneurs (e.g. business angels or crowdfunders) can intervene at this stage, again for reasons other than financial profits, but for the interest in the intrinsic idea and its benefits to the environment in which the firm is located. (iii) Once the innovative process or product is in place, and analogously to what happens with the average SME, the public financial instrument used more often are partial credit guarantees, because they keep the incentives for the entrepreneur of being economically and financially viable by itself, while alleviating the finance constraint. If the RI is economically viable, there is no reason why the private sector should not be financing the new product through e.g. debt instruments.

3.2. Enabling an innovative environment

Beyond having access to finance, entrepreneurs need also access to skilled labour and an environment that fosters innovation. As R&D activities tend to be perceived as non-essential, their budgets are undercut in times of crisis, driving the countries to lower innovation and competitiveness levels. To counter-react this, public policies often seek to foster innovative environments and maximise the use of public money. One of such public policies follows the idea proposed by Etzkowitz (2002), who develops a model where the main actors driving innovation (i.e. universities, businesses, and academia) interact in an equally and interdependent relationship, promoting business innovation and knowledge capitalisation. This model is known as the Triple Helix, and some examples of Triple Helix partnerships are depicted in Figure 3.

Figure 3: Examples of Triple Helix partnerships



Source: OECD (2013), based on Causevic (2010).

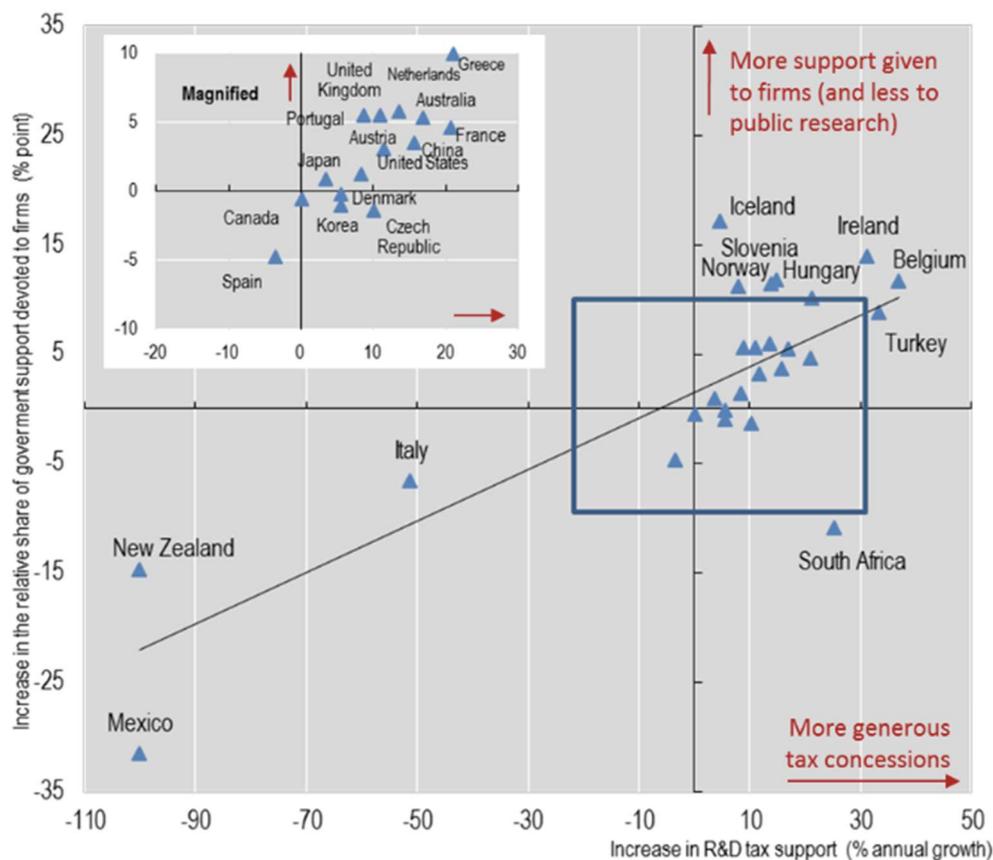
The Triple Helix model aims to create favourable synergies between all stakeholders, ensuring firm access to new technologies, providing feedback to researchers about the commercial viability of research, and providing governments with evidence to guide public policy and in particular, funding of R&D (OECD, 2013).

Public policies can also safeguard these networks through institutional structures, and ensure a successful interaction among participants. The OECD has streamlined a set of good policy practices that foster an innovative business environment, including the need to have local institutions capable of identifying regional demands and potential areas for development, ensuring an effective transfer of knowledge from academia to universities. The OECD has also identified the main challenges to its implementation. They are: the existence of a weak entrepreneurial culture at the local/regional level, the weak involvement of small firms in cluster projects (e.g. with a reactive role), the lack of seed capital and qualified labour, and the existence of poor policy co-ordination between levels of government (OECD, 2014).

Traditionally, the state has had an active role in providing finance for R&D activities, given its characteristics of public good, and the existence of market failures that prevent innovators to appropriate the benefits of its innovation. The OECD evidence on public financing activities of R&D shows that they have increased in the period 2006-14 (OECD, 2016). However, there has been a change in the targeting of recipients, from less expenditure on R&D support to public research towards more R&D tax incentives given to firms (Figure 4).⁹ The rationale behind moving towards more R&D tax incentives is that it would allow firms to allocate funding to the activities the own firm think are best, and not the ones identified by the public policy. However, this policy has the risk that the firm will move towards financing R&D for profitable activities and not, for example, for RRI activities, if they are not economically profitable.

⁹ Data are available for the encompassing R&D dimension, of which RI is a sub-product.

Figure 4: Percentage change in the relative share of government support granted to firms (y-axis) and annual growth of R&D tax support estimates (x-axis), 2006-14 or nearest years available



Source: OECD STI (2016).

The figure shows that while there has been an increase in R&D tax support towards more generous tax concessions, such support is given to specific firms as opposed to public research. An additional problem, as stated in the OECD STI Outlook 2016 is that public research has been transferred to universities, which are dependent on private funding, and this change also has implications for the purpose of research conducted, in particular it opens the possibility of re-orienting research towards profitable activities instead of activities deemed desirable by the government, because of their positive effects on the rest of society (OECD, 2016). This trend might be a challenge to surmount when trying to foster RI activities.

3.3. Ensuring quality human capital

An enabling environment for innovation needs to have access to skilled labour (aka human capital). Moreover, social norms and cultures determine the entrepreneurial behaviour of the population and their attitudes towards entrepreneurship. In addition, the trend towards decentralisation and allocating more autonomy to local governments, fostering a higher participation of the civil sector, along with the need to seek funding from private sources, has shifted the way entrepreneurship is taught at universities, and therefore the way knowledge is transferred and spread to society.

The relationship between European universities and firms has been evolving since the 2000s. While traditionally European higher education tended to be academically oriented and with a reactive role, there is an increasing offer for entrepreneurship education through higher education institutions, trying to follow the steps of the United States experience, where traditionally the link between universities and businesses has been more pragmatically and pro-actively oriented (Potter, 2008).

Nevertheless, Europe has a long tradition of collaboration between universities and businesses that started in Germany since the XIX century with the dual learning model of apprenticeship and tertiary education. In the dual model, technical and managerial skills are acquired through internship stages at businesses (Potter, 2008).

Figure 5: A model for entrepreneurship education



Source: Own construction based on Potter (2008).

Empirical evidence on the causal relationship between knowledge spillovers from universities to small firms is scarce because of the many factors affecting simultaneously the business and the research environment (Potter, 2008).

3.4. Regulation

The entrepreneurial activity of the firm is both constrained and benefitted from regulations. The public interest theory states that governments regulate to correct for market failures, in order to reduce negative production externalities and thus increase productivity. The regulatory environment affects firm's decisions along their lifecycle (entrance, development, exit).

Moreover, the regulatory environment affects firms differently according to their size. Small firms would be more affected in complying with regulation because they would be forced to reallocate time away from productive activities. Larger firms tend to have a team especially to deal with regulatory requirements (Robano, 2014, mimeo).

In particular, the regulatory environment affects the firm's decision to innovate, contingent on whether they can appropriate completely the results from innovation and accrue private gains.

The evidence on public policy intervention shows that the transfer and commercialisation of knowledge in OECD countries is safeguarded with institutional support offices (Technology Transfer Offices/Technology Licensing Offices) that act as intermediaries between the production of ideas and their commercialisation. In Canada, the Netherlands and Sweden have additional supports to entrepreneurial channels for knowledge exchange that involve SME participation.¹⁰

Further OECD evidence on public policies shows that the United States and the United Kingdom have modified its national patent system to promote SME and start-ups patenting (e.g. the US America Invents Act and the fast track system for green patenting applications in the United Kingdom), and efforts to concentrate supports in one roof, to avoid coordination problems (e.g. the French Technology Transfer Accelerator Programme and Japan Innovation Network); along with targeted support for intellectual property management in the United Kingdom, Australia, and Denmark (OECD, 2012).

4. Evidence on existing programmes

While entrepreneurship might look gender blind, in the European Union the average entrepreneur is male, white, wealthy, native born, and well-educated (OECD, 2014). OECD countries implement active labour market policies to bring in under-represented groups to entrepreneurial activities. These policies target not only subsistence entrepreneurial activities with an objective of social inclusion, but also transformative entrepreneurship among under-represented groups (OECD, 2014). For example, in Canada, the Business Development Bank of Canada has allocated CAD 50 million towards developing a specific programme targeting women entrepreneurs in high-tech companies.¹¹

The United States has two programmes available for early-stage funding for small technology firms implementing innovative programmes: the Small Business Innovation Research (SBIR) and the Small Business Technology Transfer Programme (STTR). While both programmes offer cash grants, the STTR programmes requires the participation of researchers from other universities or research centres (Barringer and Ireland, 2015). The SBIR programme offers USD 1 billion per year in grants to early stage and development projects in small firms; it is phased on three steps, and small firms are able to receive and accumulate federal funding in each of them. The firms retain the rights to the intellectual property generated as a result of the initiative (Barringer and Ireland, 2015).

Evidence for the United Kingdom states that SMEs receiving public funding were more likely to innovate than comparable firms without financial support, and grew faster in the period 2002-04 (Foreman-Peck, 2012).

The mentioned evidence suggests that it might be possible to foster RI implementation in SMEs through public policies.

¹⁰ OECD STI e-Outlook (2012), <https://www.oecd.org/sti/outlook/e-outlook/stipolicyprofiles/interactionsforinnovation/commercialisationofpublicresearch.htm>

¹¹ https://www.bdc.ca/en/about/mediaroom/news_releases/pages/bdc-invest-50-million-more-in-women-led-start-up-tech-firms.aspx

5. Conclusions regarding the implementation of RRI in SMEs

This input paper has provided critical and original expert input to the discussion of how to implement Responsible Research and Innovation (RRI) in Small and Medium-Sized Businesses (SMEs). It focused on the SME environment, in particular the available finance instruments, the SME regulatory environment, and the interaction with other knowledge creators and innovation stakeholders.

Among the SME universe, which comprises more than 95% of all firms in Europe, the subset of small firms that are likely to successfully implement RRI are the transformative firms, driven by entrepreneurs who are on average less averse to risk, and whose main goal is precisely the implementation of new products, processes or ideas in their business activities. Transformative firms, furthermore, have direct and indirect impacts on the rest of society.

Nevertheless, in order to implement RRI activities, even transformative entrepreneurs need to face the right incentives, be them in financial or non-financial support. Public policies can help creating the incentives, by e.g. providing grants and subsidies at the loss-stage of the idea, when the innovation is not yet financially viable. Other types of incentives are the creation of networks and synergies (e.g. Triple Helix Models) that enable the circulation, diffusion, and testing of ideas among firms, and between firms and academia. Once the RRI innovation is successful and viable, public policies can help in the knowledge transfer to bigger firms, and also can provide indirect financial support in the form of partial credit guarantees, the most used instrument at this stage of the lifecycle of the business.

The paper has provided as well a rationale for public intervention in SME RRI activities and existing evidence of good practices at OECD countries.

Because RI and R&D&I have characteristics of public goods (i.e. non-excludability and non-rivalry), transformative firms might be unable to fully appropriate the benefits of their research and thus would not innovate. Not only public policies can provide an enabling environment fostering the creation, diffusion, and commercialisation of knowledge, but also public policies can directly finance R&D&I activities (with grants and subsidies) and indirectly with partial credit guarantees.

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