FORESIGHT AND STI GOVERNANCE

ISSN 2500-2597
2019
Vol.13 No 3

JOURNAL OF THE NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS

IN THIS ISSUE

ABOUT THE JOURNAL

Foresight and STI Governance is an international interdisciplinary peer-reviewed open-access journal. It publishes original research articles, offering new theoretical insights and practice-oriented knowledge in important areas of strategic planning and the creation of science, technology, and innovation (STI) policy, and it examines possible and alternative futures in all human endeavors in order to make such insights available to the right person at the right time to ensure the right decision.

The journal acts as a scientific forum, contributing to the interaction between researchers, policy makers, and other actors involved in innovation processes. It encompasses all facets of STI policy and the creation of technological, managerial, product, and social innovations. *Foresight and STI Governance* welcomes works from scholars based in all parts of the world.

Topics covered include:

- Foresight methodologies and best practices;
- Long-term socioeconomic priorities for strategic planning and policy making;
- Innovative strategies at the national, regional, sectoral, and corporate levels;
- The development of National Innovation Systems;
- The exploration of the innovation lifecycle from idea to market;
- Technological trends, breakthroughs, and grand challenges;
- Technological change and its implications for economy, policy-making, and society;
- Corporate innovation management;
- Human capital in STI;

and many others.

The target audience of the journal comprises research scholars, university professors, post-graduates, policy-makers, business people, the expert community, undergraduates, and others who are interested in S&T and innovation analyses, foresight studies, and policy issues.

Foresight and STI Governance is published quarterly and distributed worldwide. It is an open-access electronic journal and is available online for free via:
https://foresight-journal.hse.ru/en/

INDEXING AND ABSTRACTING

WEB OF SCIENCE™ CORE COLLECTION
EMERGING SOURCES CITATION INDEX

SCOPUS™

RePEc RESEARCH PAPERS IN ECONOMICS

SSRN

ProQuest

GENAMICS™ JOURNALSEEK

EBSCO

Academic Search Premier

OAJI.net Open Academic Journals Index

FORESIGHT AND STI GOVERNANCE

National Research University
Higher School of Economics

Institute for Statistical Studies
and Economics of Knowledge

Address:
National Research University Higher School of Economics
20, Myasnitskaya str., Moscow, 101000, Russia
Tel: +7 (495) 621-40-38
E-mail: foresight-journal@hse.ru

http://foresight-journal.hse.ru/en/

Periodicity — quarterly

ISSN 2500-2597
ISSN 2312-9972 (online)
ISSN 1995-459X (Russian print version)

Publisher:
National Research University
Higher School of Economics

CONTENTS

User Innovation in the Digital Economy

Fred Gault

Professorial Fellow[a]; Visiting Professor, South African Research Chair in Industrial Development[b], gault@merit.unu.edu

[a] Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT), Boschstraat 24, 6211 AX Maastricht, The Netherlands

[b] College of Business and Economics, University of Johannesburg, 21 Kingsway Ave, Rossmore, Johannesburg, 2092, South Africa

Abstract

The paper reviews the current state of user innovation in the business and household sectors and considers the impact of the digital economy on user innovation. A general definition of innovation, applicable in all sectors of the economy, is introduced to expand the domain of user innovation to all economic sectors, not just the business sector and households. This raises questions about innovation policy, especially in a digital economy, and how policy affects innovation in households. The outcomes of this study include the implications for skills needed to support user innovation in the different economic sectors of the digital economy and the relevance of user innovation to policy objectives.

Keywords: digital economy; economic sectors; education; general definition of innovation; innovation; skills; training; user innovation.

Citation: Gault F. (2019) User Innovation in the Digital Economy. *Foresight and STI Governance*, vol. 13, no 3, pp. 6–12. DOI: 10.17323/2500-2597.2019.3.6.12

This paper examines user innovation and its place, or lack thereof, in official statistics and in innovation policy. Presence in official statistics provides an entry point for the development of innovation policy that focuses on promoting innovation in the business sector. The discussion starts with the state of user innovation a decade ago and then considers the impact of two significant changes: digitalization and the introduction of a general definition of innovation.

Digitalization goes beyond the use of computers and the internet to include the ways in which computer services are provided and the impact of artificial intelligence and the internet of things. A characteristic of the digital economy is the connectivity illustrated by social media and platforms for transferring knowledge and products. Digitalization is a radical change affecting both the economy and society, including how work takes place and which different skill sets are required to participate and to innovate.

The second change is in the general definition of innovation in the fourth edition of the Oslo Manual [OECD, Eurostat, 2018]. After the recognition of the presence of innovation in 'any sector of the economy' in the third edition [OECD, Eurostat, 2005, para. 27], a general definition of innovation was introduced in the fourth edition of the Oslo Manual [OECD, Eurostat, 2018, para. 1.25], which is applicable in all sectors.

In order to maintain the continuity of measurement for innovation in the business sector, the general definition in the Oslo Manual was restricted to provide a definition of innovation in the business sector [OECD, Eurostat, 2018, para. 3.9] that was very close to the definition in the third edition of the Oslo Manual. The implications of this are discussed below.

After a review of user innovation a decade or longer ago and a discussion on user innovation in the digital economy, conclusions are drawn about where user innovation may be going in the future and the policy implications if user innovation is to be encouraged.

User Innovation before 2018

Work on user innovation has been led by Eric von Hippel. He examined the phenomenon in firms, public institutions, and households, including individuals. His most recent definition of user innovation is the following [*von Hippel,* 2017, p. 144].

> *User innovation is sharply focused on the functional relationship that innovators have to have an innovation they develop. If the innovator develops an innovation for personal or in-house use, he, she, or it is a user innovator. If the innovator develops the innovation to sell, he, she, or it is a producer innovator [von Hippel, 1976, 1988, 2005]. The presence or absence of self-rewards and compensated transactions does not play a role in this simple definition. As a consequence, the user innovation lens can include both free innovators and profit-seeking individuals and firms as user innovators. A user innovator firm, for example, would be one that develops a novel process machine for in-house use rather than sale. The firm is indeed a user—but, unlike free innovators, it is also seeking profit from using that machine in its operations.*

To simplify this, a user innovator is an innovator that develops a product or process for their own use. As von Hippel notes, a user innovator can be a firm or an individual. This paper adds general government institutions and those of the non-profit institutions serving households (NPISH).

User Innovation by Businesses

Business process innovation. The von Hippel definition fits well for firms where it aligns with the definition of innovation for the business sector in the third and fourth editions of the Oslo Manual. The business sector innovation definition [OECD, Eurostat, 2018, para. 3.9] follows.

> *A **business innovation** is a new or improved product or business process (or combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm.*

As with all definitions of innovation in the Oslo Manuals, there are two requirements which have to be met for there to be an innovation. The product or business process has to be 'new or improved' and it has to be introduced on the market (product) or brought into use by the firm (business process). From a survey perspective, the respondent reports that the product is 'new or improved' and this requires judgement, but the second requirement is to report on what the firm did. Was the product introduced on the market (yes or no?) or was the business process brought into use by the firm (yes or no)?

Gault [*Gault,* 2016a] discusses process innovation at firms, which includes user innovation and notes that information on process innovation is collected in official surveys and reported in official statistics. The only problem in the reported statistics is that 'process innovation', where appropriate[1], is not labeled 'user innovation' which makes user innovation invisible to policy makers.

Product innovation. Moving to product innovation, firms are not user innovators of products. They do not use products, they introduce them on the market in the hope that they will be purchased at economically beneficial prices [European Commission et al., 2009, para. 4.18]. To be an innovation, the product has to be introduced on the market, but it does not

[1] Process innovation can include the purchase and use of technologies or services which are new to the firm. This is not an example of user innovation [OECD, Eurostat, 2018, section 3.3.2].

have to sell. The 'introduced on the market' condition is discussed further.

User Innovation by Households or Individuals

Households, including individuals, may acquire products and change them for their own use, or, in the absence of the desired product, they may develop it for their own use. Both are cases of user innovation if they meet the two conditions of the innovation definition 'new or significantly improved' and 'introduced on the market'. However, they are not introduced on the market as the product developed or modified by the household or individual is not necessarily for sale but for one's own use.

This question was raised in a user innovation project in Finland in 2011 [*de Jong et al.,* 2015] and a modification to the definition was proposed [*Gault,* 2012]. The third edition of the Oslo Manual was in use at this time and the definition of business innovation appeared in two paragraphs, 146 and 150 [OECD, Eurostat, 2005]. They are the following.

> *146. An **innovation** is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.*
>
> *150. A common feature of an innovation is that it must have been implemented. A new or improved product is implemented when it is 'introduced on the market'. New processes, marketing methods or organisational methods are implemented when they are brought into actual use in the firm's operations.*

The proposed change was to replace 'introduced on the market' with 'made available to potential users' [*Gault,* 2012]. This preserved the requirement that, to be a product innovation, the product had to be 'new or significantly improved' and it had to be 'made available' by some means. In the case of a business product innovation, one such means of making it available is to introduce the product to the market. This is not the only way of making it available, but this is discussed below.

The modification to the definition of innovation proposed in [*Gault,* 2012] had application in public sector innovation and this gave rise to proposals for definitions of innovation that could be applied in the government sector [European Commission et al., 2009, para. 4.24] and later, in any economic sector [*Gault,* 2015; *Gault,* 2016b; *Gault,* 2018].

The Digital Economy and User Innovation

Evolution

The digital economy has grown out of the availability of computing capacity for people and institutions. The personal computer (PC) appeared in the 1980s and grew in use as the internet was introduced and became a means of communication and data transfer, which further increased with the arrival of the world wide web (WWW). Mobile phones became the preferred means of communication, compared with land lines, especially in developing countries.

Statistical offices gathered data from firms on whether they used computers, had access to the internet or used the world wide web. As internet use became more common, the next set of questions asked about websites for promoting the business and then for engaging in electronic commerce. The OECD established a working party on indicators for the information society (WPIIS) in 1997 which produced definitions of the information and communication technology (ICT) sector and electronic commerce. This allowed statistical offices to provide information on the use of computers and networks and the magnitude of transactions on the web. It also supported policy to provide internet access everywhere by various means and then broadband access so that businesses could function anywhere. This period also saw questions about the digital divide (those with and without a computer and network access) and about the knowledge divide [*Chataway et al.,* 2003] (there is a computer and network access, but the knowledge needed to make use of the technology is not present).

In the 21st century, connections between agents and objects became more relevant and extended to the internet of things, cloud computing and storage, and artificial intelligence (AI). AI has become a tool rather than a curiosity and is raising ethical questions about the use of personal data and what happens when machines write their own algorithms and create other machines. To address some of these questions, the OECD convened a Ministerial meeting in Cancun in 2016 on the digital economy which resulted in the Cancun Declaration [OECD, 2016]. While the Cancun declaration refers more than once to innovation, there is no explicit mention of user innovation. However, it is implicit in item 7 of the declaration:

> ***Take advantage of the opportunities arising from online platforms** that enable innovative forms of production, consumption, collaboration and sharing through interactions among and between individuals and organisations, while assessing their social and economic benefits and challenges as well as the appropriateness of related policy and regulatory frameworks.*

The declaration also makes the point that people have to have the skills needed to participate in the digital economy and society, which has implications for education and training. Nowhere is innovation limited to the business sector.

Innovation

A characteristic of the digital economy is that everything in it is digital, or soon will be, and can be manipulated by software or machines managed by software. This includes goods that carry a means of identification, such as a bar code and which can be moved and delivered by machines such as driverless vehicles and drones. As with the pre-digital economy, innovation, and user innovation can happen anywhere, but the

issue remains that outside of the business sector, innovation statistics are not present in official statistics.

Following [*Gault,* 2012] and research on public sector innovation[2] [*Gault,* 2018], the idea of a general definition of innovation was explored and presented in various international meetings including the OECD Blue Sky Forum [*Gault,* 2016b]. The fourth edition of the Oslo Manual provides the following general definition of innovation [OECD, Eurostat, 2018, para. 1.25].

> *An **innovation** is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).*

Before returning to user innovation in the digital economy, the general definition is compared with the definition for business innovation cited in the previous section. It is a restricted version of the general definition as expected for a sector specific definition. The first restriction is the inserting of the word 'business' before the word 'innovation' which makes clear which sector is being discussed. The second restriction is to replace 'made available to potential users' by 'introduced on the market'. The remaining changes are minor. Unit is replaced by 'firm' and the explanatory words in parentheses, (product) and (process) are removed as the definition of innovation in the business sector is well understood by the community that uses it.

The advantage of replacing 'made available to potential users' by 'introduced on the market' is that it makes the definition practically the same as the one used in the third edition of the Oslo Manual. This means that no fundamental change is required in surveys on innovation and there is no break in the series. This is important for survey statisticians and users of the data. However, this restriction excludes a class of products that, in the digital economy, are significant and of growing importance.

Consider the consequences of leaving 'made available to potential users' in place for the definition of innovation in the business sector. The first is that the market is just one way of making a product available to potential users, but it preserves the approach to statistical measurement that has gone on for decades. The second is that product innovations that are made available, but not at economically significant prices, could enter the class of official statistics on innovation in the business sector. This is an important change with implications for user innovation and for innovation in the digital economy.

In [*Gault,* 2012] there was reference to products that were free as examples of the free exchange of knowledge [*von Hippel,* 2005, p. 110]. Reference to free products also occurred in [*Gault,* 2018]. In 2012 Linux products were examples, but now there are many free products that influence the lives of consumers and can be product innovations[3]. They can also be the starting point for innovation by users. Examples are free internet addresses, access to cloud computing and storage, social media such as Facebook, YouTube, Instagram, and a growing number of free apps. These are products that, from time to time, are improved and provided to potential users at no cost. They have significant social and economic impact, they are part of the digital economy, but they are not present in official statistics. The observation that these products are unmeasured contributions to consumer welfare appears in the literature [*Brynjolfsson et al.,* 2018; *Diewert et al.,* 2017; OECD, 2018a, p. 7] but the additional point made here is that while these products may or may not be product innovation, they are a starting point for user innovation which has not been explored.

Innovation in other economic sectors is not part of official statistics although there have been surveys of household innovation documented by von Hippel [*von Hippel,* 1988, 2005, 2017] and of the public sector (general government sector plus government institutions) [*Arundel, Huber,* 2013; *Arundel et al.,* 2016; *Bloch,* 2010a, 2010b, 2013; *Bloch, Bugge,* 2013].

User Innovation

Now that there is a general definition of innovation that is an international standard for statistical measurement, it is possible to look more broadly at user innovation in all sectors of the economy and then to examine the influence and impact of the digital economy upon user innovation.

The general definition of innovation provided within the previous subsection is immediately applicable to the households sector (including individuals), the general government sector, and the non-profit institutions serving households (NPISH) sector while its application to the business sector has been discussed. Before the consideration of user innovation, some clarification on the use of language is needed.

The term 'unit' in the definition refers to an 'institutional unit' as defined in Chapter 4 of the SNA Manual 2008 [European Commission et al., 2009]. 'Product' is a good or a service [European Commission et al., 2009, para. 2.36]. In this, and other papers [*Gault,* 2018], the author refers to the 'business sector'. This term reflects the usage in all versions of the Oslo Manual [OECD, 1992; OECD, Eurostat, 1997, 2005, 2018] and in the Frascati Manual [OECD, 2015] which deals with research and development. The 'business sector' is a combination of non-financial corporations and financial corporations. The public sector

[2] References to public sector innovation are found in [Gault, 2015, 2018].

[3] As with any innovation, product innovation may not be used or purchased by potential users and, if they are, they may have good or bad outcomes.

is a combination of the general government sector and public institutions [European Commission et al., 2009, ch. 22]. Examples of NPISHs include[4]: churches and religious societies, sports and other clubs, trade unions, and political parties.

The general definition, without change, is applicable to all SNA sectors if products made available to potential users at non-economically significant prices are included for the business sector. The household sector raises some statistical problems related to what a household does. Chapter 24 of the SNA Manual 2008 [European Commission et al., 2009] notes that households undertake final consumption but do not necessarily undertake production: 'To the extent possible, the production activities within households are treated as quasi-corporations, included in one of the corporation sectors and separated from the rest of the household'.

This can be contested but for the purposes of this paper, user innovation in households is limited to products modified or developed for one's own use and made available to potential users. In the general government sector, process changes can be made that improve the provision of products. Such an example is a single platform for accessing information about government services and ways of paying taxes or applying for benefits. This is not different from what goes on at a firm, but it will be governed by a policy of government rather than a corporate strategy. A trade union (NPISH) can improve the way in which it serves its members.

Making a new or significantly improved product available to potential users in any sector can be done in three ways. The new or improved product, the knowledge to produce it, or a prototype can be transferred to the original producer in the hope that a better product is produced. This would be the case of a user innovator who does not wish to produce the product innovation. In the second case, the user decides that there is value in making the product innovation available to potential users and starts a business to do this, or an institution unit in any other sector. In the third case, the product could be made available to potential users in a community or a peer group. An example is a new or improved method for treating an illness where the peer group consists of people with the illness and the community works on treating the illness and tries to change its symptoms. If the new or improved product is not made available to potential users, it is not an innovation.

The Digital Economy and its Impact upon User Innovation

The characteristics of the digital economy are the speed with which it develops, its implications for society, innovation, and user innovation. Underlying this digital transformation are the skills needed by people to contribute to the transformation and, for the wider population, the skills needed to use digital products as a part of everyday life.

User innovation in the business, general government, and NPISH sectors will have to accommodate big data and artificial intelligence in their process innovation as well as the use of cloud computing and distributed databases for record keeping[5]. To use digital technologies, the institutional units will have to employ skilled people or train their staff to work with the technologies. This has implications for the education and training system in general, and the universities and technical colleges in particular. Further this will impact capacity building programs at firms, government departments, and in NPISH. User innovation will continue to happen as part of process innovation as it did in the predigital economy. Households (including individuals) may be another matter.

Households (including individuals) can acquire digital products and modify them for their own benefit or, in the absence of the product being available, they can develop it and use it. So long as the product is made available to potential users it is user innovation. As with the other sectors, the difference with the predigital economy is the skill set required to modify and develop digital products. This suggests that the user innovator in the digital economy has a highly technical skill set and may be among a small number of user innovators. Compare the user innovator requirements with those required to modify or develop mountain bikes [*Lüthje et al.,* 2005], kayaks [*Hienerth et al.,* 2014], or domestic appliances.

There is a substantial literature on household innovation using products from the business sector, or the development of product innovations if the desired products were not available.

If all SNA sectors are considered, the products could come from any of them and they could be provided at economically significant prices or not. This adds another dimension to user innovation. In the user innovation literature there are examples of user innovation with products from the government sector, such as medical services, medical devices, and social welfare services [*von Hippel,* 2017]. NPISH can also provide products that can be the basis of user innovation by households.

As all of the economic sectors connect in various ways, being part of a network or a system, the policies to promote or focus user innovation in all sectors are complex as they will be influenced by strategic initiatives from institutional units in other sectors.

[4] https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Non-profit_institutions_serving_households_(NPISH)

[5] An example of a distributed database is blockchain and its role in recording and verifying Bitcoin transactions.

Policies for User Innovation in a Digital Economy

The digital transformation is rapid and covers the whole economy. The development of a relevant innovation policy is challenged by this speed but the need to develop such a policy is recognized [OECD, 2017, p. 27] and being debated in many countries. An example response to the urgency is the artificial intelligence strategy, 'AI Made in Germany', introduced by the federal government in November 2018 [Government of Germany, 2018].

From the perspective of 'user innovation', this is likely to take place as process innovation in the business, general government, and NPISH sectors and it will be subject to the strategies and policies that apply in those sectors. Where the user innovation of products in the digital economy will happen is in the household sector and this could be encouraged as part of developing a culture of innovation. At first, the government has to enable people to function and work in a digital world. This would require a strong link between education and the demands of the digital economy. As a further step, policy could include the provision of 'maker spaces' where there are tools, databases, broadband access, and expert advice. Such spaces are also provided by businesses, an example of which is the BMW Customer Innovation Lab discussed in OECD [OECD 2018b, p. 77]. While businesses support user involvement in product development, the activity may not result in user innovation. Where it could advance user innovation is in improving the skill set of users participating in collaboration with business. This is happening in countries in different ways.

For individual users to consider user innovation in the digital economy, they need to know how to take advantage of the digital products introduced on the market or made available to potential users at no cost. If they proceed with product innovation, they require more technical skills and access to databases that allow them to combine or develop products for their own use. The French government notes that thirteen million people in France have difficulty functioning in the digital economy. To deal with this, the Government of France has initiated a plan for an inclusive digital economy [Government of France, 2018]. Part of this plan is an experiment which will provide a 'digital pass' to provide access to training. More broadly, access to training to enable and support the use of digital products and their modification for one's own use has implications for the education and training system in all countries. This emphasis on the skills needed to work with digital products and processes does not preclude the type of user innovation that has been going on for years [*von Hippel,* 2017] involving different technologies.

In Russia, Strategy 2020 deals with innovation policy that emphasizes the fostering of mass innovation in all sectors of the economy, including low tech sectors. In a review of the policy by Gokhberg and Kuznetsova [*Gokhberg, Kuznetsova,* 2011], the emphasis is placed upon the social effects of innovation policy and the need to support the creative class. This fits well with policies in other countries to support the creative people who are able to engage in user innovation.

In Canada, there is an ongoing discussion of how to deal with the digital economy [*Wolfe,* 2019] and the challenges facing policy makers. One proposal is to create a federal innovation agency. There is no mention of user innovation but individuals engaging in innovation could access the support offered for innovation. However, individuals applying are likely to be more focussed on starting their business rather than innovating for one's own use.

In the developing world there are more challenges for supporting the digital economy and using it to engage in innovation [*Bukht, Heeks,* 2018]. A point made by Bukht & Heeks [*Bukht, Heeks,* 2018], which is applicable in all economies, is the need for ministries to understand the challenges and the opportunities of the digital economy for the coherence of policies. As user innovation by individuals is not seen in official statistics, there is a need for policy makers to understand the importance of an innovation culture in all sectors of the economy and for individuals and households to be a part of that.

Conclusion

This paper examined the scope of user innovation, especially in households, resulting from the publication in the fourth edition of the Oslo Manual of a general definition of innovation in all economic sectors. A second key influence has been the rapidly developing digital economy and its impact upon the skills that may be needed to function in it and to develop or change digital products for one's own use. To achieve this ability, there is a need for access to training and education that supports user activities and user innovation. An example of how to address this is France's digital pass or 'pass numérique' and related policies for social inclusion in promoting access to the digital economy.

Supporting individuals undertaking user innovation raises a question of the return on one's investment. Policy support could be seen as a long-term investment in a grass roots culture of innovation from which start-up firms that contribute significantly to the economy and society may arise.

An underlying issue with some technologies, of which AI and genetic editing are examples, is the ethical framework needed to guide major decisions by machines or altering of human embryos. While these activities can be regulated in businesses, governments, and NPISH institutions, households and individuals may require ethical guidance as well as policy support as these activities become more accessible.

References

Arundel A., Huber D. (2013) From too little to too much innovation? Issues in measuring innovation in the public sector. *Structural Change and Economic Dynamics*, vol. 27, pp. 146–159.

Arundel A., Bloch C., Ferguson B. (2016) *Measuring innovation in the public sector*. Paper presented at the OECD Blue Sky Forum III, 19-21 September 2016, Ghent, Belgium. Available at: http://www.oecd.org/sti/blue-sky-2016-agenda.htm#ps4_d2, accessed 28.01.2019.

Bloch C. (2010a) *Measuring Pubic Innovation in the Nordic Countries: Final Report*, Aarhus: The Danish Centre for Studies in Research and Research Policy.

Bloch C. (2010b) *Towards a Conceptual Framework for Measuring Public Sector Innovation, Module 1 – Conceptual Framework*, Aarhus: The Danish Centre for Studies in Research and Research Policy.

Bloch C. (2013) Measuring innovation in the public sector. *Handbook of Innovation Indicators and Measurement* (ed. F. Gault), Cheltenham, Northampton, MA: Edward Elgar, pp. 403–419.

Bloch C., Bugge M. (2013) Public Sector Innovation – From theory to measurement. *Structural Change and Economic Dynamics*, vol. 27, pp. 133–145.

Brynjolfsson E., Eggers F., Gannamaneni A. (2018) *Using Massive Online Choice Experiments to Measure Changes in Well-being* (NBER Working Paper no 24514), Cambridge, MA: National Bureau of Economic Research.

Bukht R., Heeks R. (2018) *Development implications of digital economies*, Manchester: University of Manchester.

Chataway J., Gault F., Quintas P., Wield D. (2003) From Digital Divide to Knowledge Divide – A Primer. *Monitoring the Digital Divide… and Beyond* (ed. George Sciadas), Montreal: Orbicom, pp. 89–120.

de Jong J.P.J., von Hippel E., Gault F., Kuusisto J., Raasch C. (2015) Market failure in the diffusion of consumer-developed innovations: Patterns in Finland. *Research Policy*, vol. 44, no 10, pp. 1856–1865.

Diewert E., Fox K.J., Schreyer P. (2017) The Digital Economy, New Products and Consumer Welfare (Discussion Paper no 17-09), Vancouver: Vancouver School of Economics, University of British Columbia.

European Commission, IMF, OECD, UN, The World Bank (2009) *System of National Accounts, 2008*, New York: United Nations.

Gault F. (2012) User Innovation and the Market. *Science and Public Policy,* vol. 39, pp. 118–128.

Gault F. (2015) *Measuring innovation in all sectors of the economy* (UNU-MERIT Working Paper no 2015-038), Maastricht: UNU-MERIT.

Gault F. (2016a) User Innovation and Official Statistics. *Revolutionizing Innovation: Users, Communities and Open Innovation* (eds. D. Harhoff, K. Lakhani), Cambridge, MA: The MIT Press, pp. 89–105.

Gault F. (2016b) *Defining and measuring innovation in all sectors of the economy: Policy relevance.* Paper presented at the OECD Blue Sky Forum III, 19-21 September 2016, Ghent, Belgium. Available at: http://www.oecd.org/sti/blue-sky-2016-agenda.htm#ps4_d2, accessed 28.01.2019.

Gault F. (2018) Defining and measuring innovation in all sectors of the economy. *Research Policy*, vol. 47, pp. 617–622.

Gokhberg L., Kuznetsova T. (2011) Strategiya-2020: novye kontury rossiyskoy innovatsionnoy politiki [Strategy 2020: New Outlines of Russian Innovation Policy]. *Foresight-Russia*, vol. 5, no 4, pp. 8–30 (in Russian).

Government of France (2018) *Pour une France connectée, Plan national pour un numérique inclusive,* Paris: Secrétariat d'Etat au Numérique.

Government of Germany (2018) *Artificial Intelligence Strategy*, Berlin: The Federal Government of Germany.

Hienerth C., von Hippel E., Jensen. M.B. (2014) User community vs. producer innovation development efficiency: A first empirical study. *Research Policy,* vol. 43, no 1, pp. 190–201.

Lüthje C., Herstat C., von Hippel E. (2005) User innovation and 'local' information: The case of mountain biking. *Research Policy,* vol. 34, no 6, pp. 951–965.

OECD (1992) *OECD Proposed Guidelines for Collecting and Interpreting Technological Innovation Data – Oslo Manual* (OCDE/GD (92)26), Paris: OECD.

OECD (2015) *Frascati Manual 2015: Guidelines for collecting and reporting data on Research and Experimental Development*, Paris: OECD.

OECD (2016) *Ministerial Declaration on the Digital Economy: Innovation, Growth and Social Prosperity ("CANCÚN DECLARATION")*, Paris: OECD. Available at: https://www.oecd.org/internet/Digital-Economy-Ministerial-Declaration-2016.pdf, accessed 14.02.2019.

OECD (2017) *Digital Economy Outlook*, Paris: OECD.

OECD (2018a) *Innovation Policies in the Digital Age* (*OECD Science, Technology and Innovation Policy Paper* no 59), Paris: OECD.

OECD (2018b) *OECD Science, Technology and Innovation Outlook 2018: Adapting to Technological and Societal Disruption*, Paris: OECD.

OECD, Eurostat (1997) *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data, Oslo Manual*, Paris: OECD.

OECD, Eurostat (2005) *Oslo Manual, Guidelines for Collecting and Interpreting Innovation Data*, Paris: OECD.

OECD, Eurostat (2018) *Oslo Manual 2018, Guidelines for Collecting, Reporting and Using Data on Innovation*, Paris: OECD.

von Hippel E. (1976) The Dominant Role of Users in the Scientific Instrument Innovation Process. *Research Policy,* vol. 5, no 3, pp. 212–239.

von Hippel E. (1988) *The Sources of Innovation*, New York: Oxford University Press.

von Hippel E. (2005) *Democratizing Innovation*, Cambridge, MA: MIT Press.

von Hippel E. (2017) *Free Innovation*, Cambridge, MA: MIT Press.

Wolfe D. (2019) *A Digital Strategy for Canada: The Current Challenge* (IRPP Insight 25), Montreal: Institute for Research on Public Policy.

The Innovative Platform Programme in South Korea: Economic Policies in Innovation-Driven Growth

Seong Soo Kim

Professor, Department of Public Administration, seskim@hufs.ac.kr

Yo Sop Choi

Associate Professor, Graduate School of International & Area Studies, yosopchoi@hufs.ac.kr

Hankuk University of Foreign Studies, Imun-ro 107, Dongdaemun-gu, Seoul, South Korea, 02450

Abstract

After several decades of rapid development, South Korea has recently experienced a critical economic downturn. The paper considers the prerequisites for the current state-of-the-art, as well as the new economic policy agenda aimed at fostering innovation in various sectors, thereby suggesting improved policy directions. To implement the innovation-driven policy, the Korean government produced the framework for the Innovative Platform Programme (IPP), which covers a wide range of sectors related to Industry 4.0, such as artificial intelligence and blockchain. For the IPP to be successful, the authors believe, it is vital to understand and resolve the trade-offs between contradictory policy priorities — innovation-led growth, income-led growth, and a fair economy.

Keywords: South Korea; Innovative Platform Programme; innovation-driven growth; income-led growth; economic regulation; fair economy; dynamic efficiency; fourth industrial revolution.

Citation: Kim S.S., Choi Y.S. (2019) The Innovative Platform Programme in South Korea: Economic Policies in Innovation-Driven Growth. *Foresight and STI Governance*, vol. 13, no 3, pp. 13–22. DOI: 10.17323/2500-2597.2019.3.13.22

There is no doubt that South Korea is one of the most successful countries in the world when it comes to industrialization and democratization over a short period of time. In 2018, Korea achieved six hundred billion USD in exports for the first time in history. Korea also became the sixth largest exporter in the world and the seventh biggest economic powerhouse in the '30-50 Club' [*Ungson et al.*, 1997; *Bailey et al.*, 1998; *Kim*, 2019]. In particular, the well-known candlelight demonstration of the Korean people for the impeachment of` former President Park in the winter of 2016-2017 and the subsequent peaceful regime change in May 2017 demonstrate the maturity of Korean democracy. Despite recent developments in Korean economy and democracy, the country has faced new challenges. It is notable that the rates of Korean economic growth and employment have recently declined. Consequently, this has prompted demand for new policies for the growth engines that are critical for the Korean economy at present.

In consideration of the issue of economic development, the government of President Moon Jae-In appears to move towards more 'innovation-driven growth' in an effort to provide an impetus for economic growth and the move towards the fourth industrial revolution. Accordingly, the Korean government announced a new policy for the innovation initiative in 2018, the so-called Innovative Platform Program (hereinafter the IPP). Under the IPP, the Korean government seeks to improve the platform economy, which is a comprehensive ecosystem and infrastructure for future industries [Korean Government, 2018]. This explains the Korean government's goal of a gradual shift towards becoming a global center for information and communications technology (ICT) in the era of digitalization[1]. This policy is part of an all-inclusive plan to create new growth drivers.

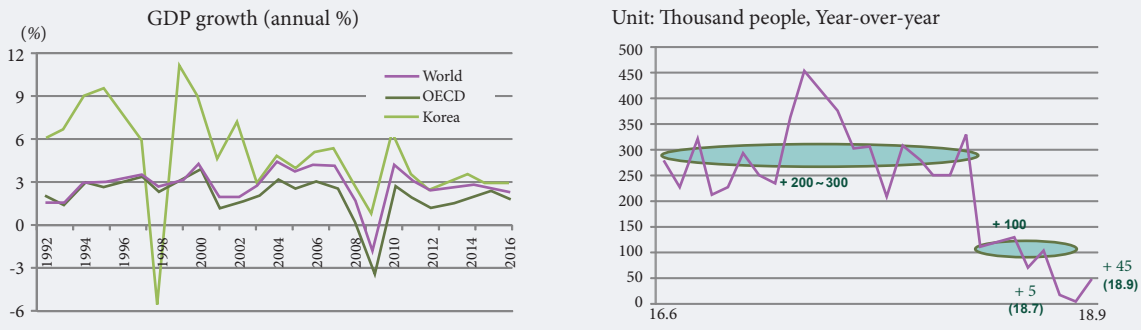
In particular, recent economic policy on unemployment and income polarization has brought serious discussions on the role of the IPP, with an emphasis upon job creation and deregulation relating to science and technology. To solve these existing problems, the IPP focuses on the three major areas of strategic investment: a data economy, artificial intelligence (AI), and a hydrogen economy. In addition to these three areas, the government further emphasized the importance of raising innovative human resources [Korean Government, 2018]. The overall framework of the IPP is shown in Table 1.

The purpose of this article is to explore recent Korean economic policies on innovation-driven growth, together with income-led growth, as will be further discussed below, thereby to suggest proposals for future policy on the new digitalization economy.

The Challenges of the Korean Economy from a Historical Perspective

Since the Second World War and Korean War, Korea has shown its ability to overcome various obstacles to development, such as the division of the country, poverty, and dictatorship. Most of all, economic and political recovery lies at the heart of the government's policy. Eventually, Korea made a notable economic leap from one of the poorest countries to becoming a high-income industrial democracy through the so-called Miracle on the Han River. During the 1960s and 1970s, the Korean government introduced export-oriented policies to overcome intrinsic limitations in the small market economy. Its policy focused on the support of heavy and chemical industries. However, its approach generated economic concentration in large conglomerates, the so-called *chaebols* of family-owned business groups. In other words, its designation of na-

Figure 1. **The Growth Rate and Job Creation**



Sources: [OECD, 2017; Statistics Korea, 2019].

[1] Among the key elements of the digital economy, different authors highlight, for example, search engines, social network services, software, computers, communications, pharmaceuticals, and so on. [Posner, 2001; Viscusi et al., 2018].

Table 1. **The Framework of the Korean Government's IPP**

Dimensions	Contents
Four Policy Directions	• Innovation of the Social System • Innovation of Science & Technology • Innovation of Human Resources • Innovation of Industries
Three Strategic Investment Areas	• Data Economy (Block Chain & Sharing Economy) • Artificial Intelligence • Hydrogen Economy
Eight Leading Industries	• Smart Factory • Smart Farm • Smart City • Future Vehicle • Fintech • New Energy • Bio-Health • Drone

Source: [Korean Government, 2018].

tional-champion companies brought various problems [*Eichengreen, Chung*, 2004]. For example, the market power of large firms created anti-competitive or unfair business practices from unequal bargaining powers. This brought about a call for economic reform that was based on the concept of a social market economy and economic democratization [*Kim S.S.*, 2017]. This idea focused on the protection of individual economic freedom from the abuse of large conglomerates and has influenced overall government policies on the market economy in Korea since the 1990s [*Choi*, 2014].

Korea has faced new challenges over the past decade: the decrease of its economic growth rate and employment rate has been significant (Figure 1). This means that the traditional growth model, which relied upon big businesses and export-led approaches, has reached its limits, and a new growth model has to be created. Moreover, policies based on the 'trickle-down effect' were proven unsuccessful in the period of the conservative governments of two former Presidents, Lee Myung-Bak and Park Geun-Hye. While the trickle-down effect tends to recall *chaebol*-friendly policies in that the growth of the rich could improve that of the poor [*Aghion, Bolton,* 1997], the boom of exports and big businesses has not led to an increase in middle class income. In this context, the new Moon government adopted new economic policies that mainly focus on the income growth of the middle class and brought the emergence of political goals for economic democratization which widely regulates large conglomerates through stringent amendments to the Korean competition act, the Monopoly Regulation and Fair Trade Act (hereinafter the MRFTA). Moreover, it was ultimately necessary for the government to change the direction of economic policy to be more effective in the actual distribution of wealth. As a result, the Korean government started considering the creation of a new growth model.

New Economic Strategy

The current government's policy pursues economic democratization while emphasizing the importance of an effective balance between innovation-led economic growth, rising incomes, and social welfare in many cases based on fair competition[2]. The concept of innovative growth involved the creation of new growth engines for the Korean economy. Income-driven development would be critical for sustainable economic growth and income- and innovative-driven growth would be possible where a fair economy and fair competition was ensured.

Among others, the governmental strategy of income-led growth is composed of three main policies: (i) increasing the household incomes of both regular employees and the self-employed, (ii) the reduction of living costs to improve actual income level, and

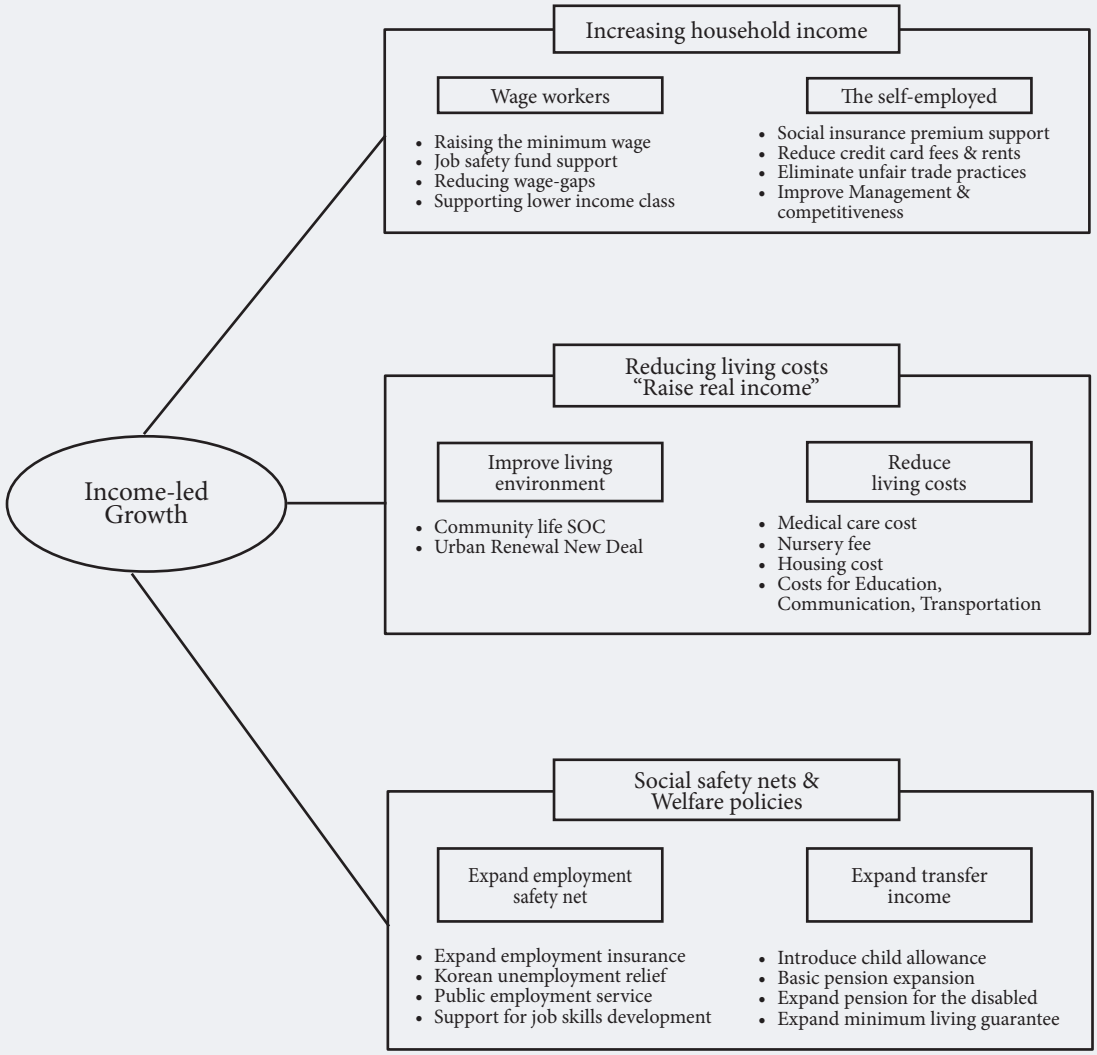
Table 2. **Three Policies for Economic Growth**

Policy Direction	Contents
The Policy for Income-led Growth	• Improvement of household income • Reduction in living costs • Expansion of social security nets and welfare services (e.g., basic livelihood support, medical care, housing, childcare, basic pension, etc.)
The Policy for Innovation-driven Growth	• Deregulation, including regulatory sandbox projects • Fostering new entrepreneurship, including the commercialization of new technologies • Strengthening major industry sectors • The promotion of the fourth industrial revolution
The Policy for Fair Economy or Competition	• Improvement of corporate governance with the aim of greater transparency and accountability • Establishment of fair market order (or fair competition), such as the protection of franchisees, small businesses, and weaker parties in subcontracting agreements • Effective cooperation between large and small businesses with regards to the protection of innovative ideas or products of spin-offs • Protection of consumer interests

Source: [Korean Government, 2018].

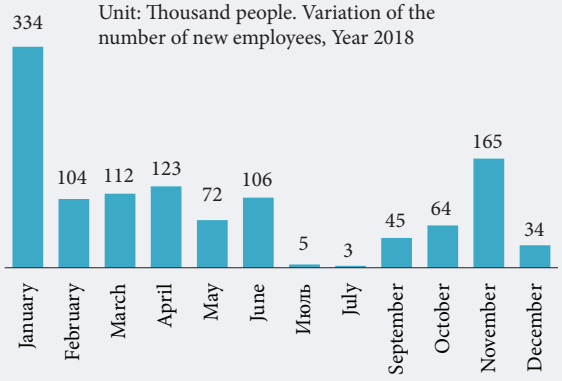
[2] Speech of the President at the Ministerial Meeting (28 August 2018) is available online at: https://www1.president.go.kr/articles/4094, accessed 30.05.2019 (in Korean).

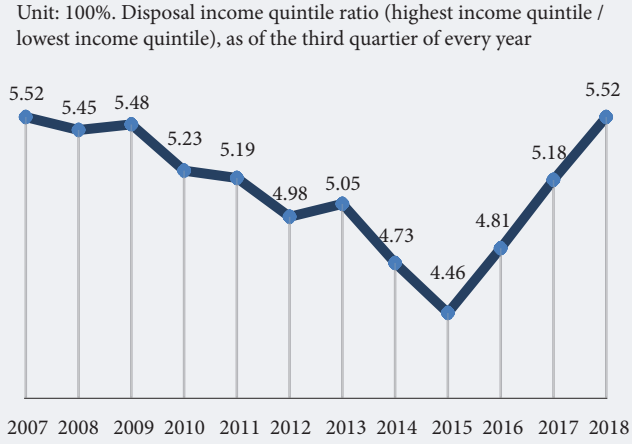
Figure 2. **The Structure of Income-Led Growth Policy**



Source: [Presidential Committee, 2019].

Figure 3. **Statistics of Employment and Income Distribution in 2018**





Sources: [Statistics Korea, 2018, 2019a, 2019b, 2019c].

Note: The graph on the right indicates the relative distribution of disposal income for the top 20% and bottom 20% households; the larger number means more inequality. Disposal income is the sum of employee income, self-employment income, property income and transfer income with a minus of public transfer expenditure, such as a regular tax, etc.

Table 3. **The Growth Engine Programs in Korea**

Implementation Period	G7 Project	Next Generation Growth Engine	New Growth Engine	Future Growth Engine	Innovation Growth Engine
	1992–2002	2003	2009	2014	2017
Keywords	Joining S&T Leading Countries	Securing Technology Competence of Major Industries	Green Growth, Fostering Service Industries	Convergence of S&T and ICT	S&T, ICT, the 4th Industrial Revolution
Number of Target Industries	18	10	17	19	13
Responsible Ministry	Ministry of S&T	Ministry of S&T	Ministry of Industry	Ministry of Education and S&T	Ministry of Science and ICT

Source: compiled by the authors based on [MSICT, 2018].

(iii) the expansion of social security nets and the scope of welfare policies (Figure 2).

The income-led policy has been a controversial issue in the recent government's economic policy. One of the critical questions about this policy is whether the minimum wage, set by the government, can improve economic growth and create jobs on the labor market. In effect, this subject has been hotly debated in Korea. There are some dissenting views about the actual effects of economic growth by income-led policy [*Park*, 2019]. Interestingly, the assessments of income-led policy depend upon political views because the opinions of progressive parties are different from those of conservative ones. Most of all, as the empirical economic statistics on unemployment and income distribution deteriorated in the summer of 2018, the debate on the effects of income-led growth intensified. Accordingly, an argument for innovation-led growth emerged as an alternative way to achieve economic development.

At the time of writing, it is not certain whether increasing the minimum wage was the key reason for the deterioration of employment. Commentators, who favor increasing the minimum wage, appear to explain that the existing difficulties of small businesses stem from the depression in major manufacturing industries, including automobiles and shipbuilding, and the rapid changes in consumers' behavior. On the contrary, opposing critics assert that there is an intrinsic problem within the policy on the minimum wage increase and income-led growth itself. They called for an innovation-led growth policy to revitalize the economy for the benefit of the public [*Kim G.H.*, 2017; *Lee*, 2018; *Kim*, 2018]. This argument formed the background of the innovation-led policy of the current government.

The Innovation-led Growth Policy of Korea

A Brief History of the Growth Engine Programs in Korea

Since the 1990s, the Korean government has implemented overall policies on growth engine programs (Table 3). Starting with the G7 project (1992–2002), the government carried out numerous programs, including the next generation growth engine (2003), the new growth engine (2009), the future growth engine (2014), and the innovative growth engine (2017). The main goals of each growth engine program can be categorized into three topics: (i) the advancement of major industries, (ii) the increase of global market shares, and (iii) the support of new industrial sectors. These programs have strengthened Korea's position on the global market. It became a leading country in major manufacturing industries, including automobiles, telecommunications, and semiconductors. Moreover, Korean companies in the fields of high-speed railways, rechargeable batteries, and robot industries have acquired important technologies and improved their shares on the global market. In recent years, the new economic sectors involving the fourth industrial revolution have been included in the Korean growth engine program.

The innovation growth engine program, which has been implemented by the current government, targets numerous sectors: big data, next generation communications, AI, autonomous driving vehicles, drone, smart city, virtual reality, personalized healthcare, intelligent robot, innovative new drugs, new and renewable energy, intelligent semiconductors, and advanced materials[3]. In effect, the government's IPP was the outcome of a discussion regarding the 13 aforementioned sectors, which served as the foundations for four policy directions, three strategic investment areas, and eight leading businesses[4].

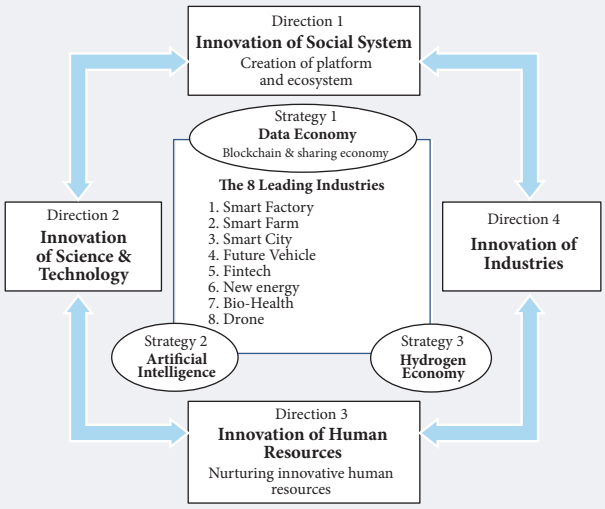
The Main Tasks of the Innovative Platform Program (IPP)

The focus of the program is on progress concerning infrastructure, technologies, and ecosystems that are essential in numerous industrial sectors, such as big data and algorithms. It is beyond doubt that the platform economy has become vital in Korea, especially in the era of the fourth industrial revolution. Nonetheless, it

[3] This program was created in December 2017 at the National Science and Technology Advisory Council, a private advisory body.

[4] Approved at the fifth innovative growth ministerial meeting in August 2018 [Ministry of Economy & Finance, 2018]

Figure 4. **The Main Structure of the IPP**



Source: [Korean Government, 2018].

is difficult for Korean enterprises to invest in platforms due to the large financial investments necessary along with the associated risk of failure. Therefore, it appears that governmental strategic investment is necessary for the development of IPP-related industries. As a result of a series of ministerial meetings, the government's 2018 announcement contains its financial investments relating to big data, AI, blockchain, sharing economies, and hydrogen economies.

The four policy directions that comprise IPP are presented in Table 4

The Three Strategic Investment Areas

Under the IPP scheme, the government also provides three major strategies for investment areas: (i) big data, blockchain, and sharing economies, (ii) AI, and (iii) hydrogen economies. These are commonly reinforced by supporting innovative human resources in promising future technologies. The three fields of strategic investment are selected for a number of reasons: (i) the possibility of leaping forwards as a leading country through providing investment and (ii) the establishment of platforms and infrastructure that innovate economic structures and industrial ecosystems, create jobs, and contribute to the quality of living [Korean Government, 2018].

Firstly, with regards to the *data economy*, the Korean government focuses on areas relating to big data, blockchain, and a sharing economy. The government seems to include various fields for the data economy, such as big data platforms, big data networks, data vouchers, and public Wi-Fi. Most of all, the big data networks can be established by activating data opening and trading in major fields, such as transportation, energy, environment, communications, and finance. With regards to data transactions, the government is preparing to design standards for transaction and quality control. To build a big data network, the government is also willing to revise the relevant regulations in 2019, including those concerning data protection and privacy. In addition, this project includes the area of blockchain, which is concerned with experimental projects and advanced technology for securing data and reliable data transactions.

Secondly, the area of *AI* is also the basis for big data, blockchain, and sharing economies. It is a founding technology for the creation of high value-added industries by linking other sectors. The key technologies are quantum computers, AI-involved algorithms, and intelligent semiconductors, among others. In effect, big data and AI are closely related. As a result, the government aims to develop the big data market by investing 30 trillion KRW by 2023. In particular, the government is willing to educate 10,000 experts in the areas of big data and AI. Its mid-term plan includes launching one hundred big data centers and ten big data platforms, the promotion of data production and its utilization, and the establishment of AI hubs [Ministry of Economy & Finance, 2019a].

Table 4. **The Four IPP Policy Directions**

Innovation Fields	Tasks
Social System and Institutions	• revise regulations • improve fairness on the market • establish a framework to promote innovative start-ups by advancing a culture of entrepreneurship
Science and Technology	• hi-tech improvement • create infrastructure for the fourth industrial revolution • facilitate an environment for creative research • enhance efficiencies, promote research on science and technology • adopt international standards
Human Resources [Ministry of Economy & Finance, 2019b]	• design a new policy for education and training programs to nurture creative human resources. • establish three graduate schools for AI research to train world-class experts (the plan is to educate 40,000 AI engineering specialists by 2022)
Innovative Industries [Korean Government, 2019]	• create an ecosystem to accelerate venture enterprises • develop service sectors and emerging industries • strengthen major industries • promote corporate innovation

Source: compiled by the authors.

Table 5. **The Investment Plan for Three Strategic Areas and Human Resources (*billion KRW*)**

Programs	2018 (A)	2019 (B)	Increase	
			(B-A)	%
Total	870.0	1490.0	620.0	71
Data, AI, Block Chain, Sharing Economy	579.9	1040.0	460.0	79
Building infrastructure for big data, AI and block chain	39.7	190.0	150.0	378
Resolving the data divide, sharing economy package	6.8	130.0	120.0	1765
Hydrogen Economy	42.2	110.0	70.0	166
Testing R&D and constructing production bases	37.2	100.0	60.0	161
Human Resource Development	247.9	340.0	90.0	36
Training and developing 10,000 talented personnel, introducing educational program	24.0	90.0	70.0	292

Source: [Korean Government, 2018].

Thirdly, the project for *hydrogen economies* is an important platform for the new energy paradigm shift, energy security, and future industries. The hydrogen economy policy deals with programs for hydrogen production and storage for transportation, usage, and safety purposes. The government has also attempted to expand the demand base for hydrogen energy. This plan includes its aim to increase hydrogen fuel cell cars from 2,000 in 2018 to approximately 80,000 in 2022. Its purpose includes an ecosystem for the mutual growth of large and small enterprises, the development of high-quality human resources, and the achievement of international standards [Ministry of Economy & Finance, 2019a].

The plans for investing in the considered directions are presented in Table 5.

The Eight Major Leading Industries

The 2019 governmental project also listed the eight leading industries associated with the IPP: smart factory, smart farm, fintech, new energy, smart city, drone, future vehicle, and bio-health [Korean Government, 2019]. The first leading industries sector is the smart factories field. The government plans to increase its investment amount, thereby establishing 4,000 smart factories in 2019, and has further announced its focus on 5G technology for improving smart factories by developing and smart-manufacturing hardware and software technology packages. The second sector involves the field of bio-health. The government aims to provide a development strategy for the mid- and long-term perspectives, which includes creating various new medical services by offering a regulatory sandbox relating to gene inspection and wearable electrocardiograms. It has also tried to establish a 'healthcare big-data showcase' for providing and managing big healthcare data. The overall project also includes an amendment to the Bioethics Act for expanding the scope of research on gene therapies.

The third sector of IPP is the fintech industry. The government attempted to withdraw any legal measure that unnecessarily impedes the development of fintech and to design certain innovative financial services by providing a regulatory sandbox. This regulatory development includes an amendment to the Financial Information Act and the adoption of a regulation on peer-to-peer (P2P) finance. The fourth is future automobiles, which focuses on both eco-friendly and autonomous cars. The government has also established an infrastructure plan for autonomous cars, such as cooperative-intelligent transportation systems.

The remaining leading industries are smart city, smart farm, new energy, and drone. Similar to the other areas, the government plans to provide financial support and sandbox measures for developing the rest of the selected leading industries. Details about the overall investments are shown in Table 6.

The Political Economy of the Innovation Policy

Trade-offs among Policy Goals and Dynamic Efficiency

The Korean government recently provided various measures and policies to resolve issues relating to low economic growth, a high unemployment rate, and income polarization. Interestingly, the government explained its priorities: creating new jobs as a key means of solving these problems. However, it needs to recognize some intrinsic problems in its policy of income-led growth. It is possible that there have been adverse effects from the drastic increase in the minimum wage. For example, in the first quarter of 2018, the employment rate decreased by 16.8% from the same period in 2017. Earned household income also declined by 22.6% [Statistics Korea, 2019]. In effect, the income-led growth theory includes the indirect influence of rising consumption, thereby improving economic growth through wage increases. Nevertheless, it appears that the rapid increase in the minimum wage has generated a side effect of unemployment because small businesses are reluctant to hire employees. To solve this problem, the government has tried to promote innovation-driven growth. This means that there is a clear functional logic within the IPP, which is allegedly

Table 6. **The Investment Plan for the Eight Leading Industries (*billion KRW*)**

	2018 (A)	2019 (B)	Increase	
			(B-A)	%
Total	2168.6	3520.0	1350.0	62
Future Automobiles	590.7	760.0	170.0	29
Drone	69.8	120.0	50.0	72
New Energy	597.1	870.0	280.0	47
Bio-Health	271.8	350.0	80.0	29
Smart Factory	444.6	1030.0	590.0	133
Smart City	76.7	130.0	50.0	65
Smart Farm	114.4	240.0	130.0	114
Fintech	36	100	60	167

Source: [Korean Government, 2018].

to resolve the current economic downturn caused by the rapid minimum wage increase.

However, there are notable conflicts among the principles of economic growth in government policies. The policies for income-led growth and a fair economy (or fair competition) may clash with that of innovation-driven growth. In particular, it is certain that the improvement of equity through increasing incomes and the enhancement of dynamic efficiency through innovation are important for modern society. The critical question is, therefore, how to appropriately balance the two objectives.

Importantly, innovation policies should be promoted with a long-term perspective, not short-term performance. Therefore, the recent project that aims to solve the unemployment problem should not be pursued based on a short-term perspective. This implies that an attempt to solve the current problem of unemployment through an innovation policy would ignore the fact that innovation policies are essentially effective over a long period of time. Therefore, there is a trade-off among the policy goals. The important question is not whether an innovation-driven growth policy can solve the short-term problem of unemployment, but what conditions are needed for the long-term successes of the IPP.

Fair Economy: The Dilemma between the Past and Future

Some may argue that the government policy supporting a number of selected firms during the 1960s and 1970s created the problem of economic concentration by the *chaebols*. This problem explains why the current government has adopted the policies of income-driven growth and fair economy, as shown in Table 2. Regarding the fair economy policy, there is also a strong belief that a fair economy plays a pivotal role in resolving economic concentrations and societal inequality as a whole. This eventually generates the fair economy concept for the redistribution of wealth by vigorously enforcing competition law [*Stiglitz*, 2012].

However, implementing fair economy policies can often bring about excessive market intervention and there is the possibility of having another trade-off in policy goals between a fair economy and innovation. In particular, recent fair economy policies may hamper a series of individual investments on the market, especially those involving the development of AI. A failure, such as the hindrance of AI innovation due to stringent regulations, represents a 'government failure'.

In effect, quite a number of competition law cases against large technology companies, such as Microsoft, Intel, and Qualcomm, indicate the demonstration of a social market economy in view of fairness. The Korean competition authority has imposed notable sanctions on these companies, and Korean companies have been no exception. This trend seems to prefer fair economies over the dynamic efficiency rationale [*Choi*, 2010].

In order for the IPP-related industries to be developed, large-scale capital investment is needed in the emerging stage of the industrial life cycle and typically only big companies can afford this. Consequently, we need to distinguish between the rationale of regulating economic concentrations formed in the past and the rationale of fostering capital concentrations preparing for the future. The distinction between the two may appear easy to make in theory but difficult in practice, because together the two rationales are simultaneously concerned with *chaebols*. Therefore, in its implementation of a fair economy, the government should examine the dynamic efficiency factor [*Baldwin et al*., 2012; *Viscusi et al*., 2018].

Deregulation: Regulatory Sandbox and a Competent Government

As Schumpeter mentioned, innovation is 'a gale of creative destruction' [*Schumpeter*, 1942]. Creative destruction reconstructs existing social relations between individuals, businesses, capital, and labor. Regulations can be used as a tool to monitor and interrupt such reconstructions. The objective of regulation is to protect consumers and ensure safety when new technologies are introduced. On the contrary, the development of new tech businesses can be hindered when large incumbents are able to use regulatory tools to prevent new entrants on the market. Such is the case of regulatory capture when strong regulations trigger an impediment to innovation [*Stigler*, 1971].

Regarding the implementation of the IPP, there are discussions about reforming technology regulations. For example, certain legal regulations on IPP-related industries are broadly concerned with the following areas: remote digital healthcare (or medical treatment), a new banking system, and a new taxi system based on the sharing economy. This also concerns institutional issues, such as ensuring flexible labor markets and resolving conflicts between large manufacturers and small innovators (namely, industrial ecosystems). Excessive regulations may be used as a means

of unnecessary monitoring and hinder technological progress. Technological innovations can be achieved with parallel regulatory reforms. In effect, the general definition of deregulation involves the issues of market entry and price, and it should indicate that any entry restrictions to innovation are removed [*Decker*, 2015].

The Korean government has tried to deal with technology deregulation by adopting a regulatory sandbox. The concept of a regulatory sandbox refers to a mechanism for the easing of regulations for new goods and services under certain conditions for the sake of making it possible for tests to be done before they are launched on the market [*Lee*, *Chung*, 2019]. This approach has been discussed by numerous ministries in various areas, including ICT, industry convergence, and financial regulatory sandboxes. Sandboxes are granted through inter-agency consultations, because it concerns inter-agency responsibilities. This means that regulatory reforms are not a matter of a single ministry, but that of collaboration, which is not an easy task for the government [Ministry of Economy & Finance, 2019c]. To keep up with technological changes, the Korean government needs to have more flexibility in policymaking and competencies to meet the speed of changes. Therefore, making the government itself more competent may represent the most challenging task for regulatory reform.

Concluding Remarks

The Korean government is trying to promote growth and income distribution through the three economic policies: income-led growth, innovation-driven growth, and fair economies. Income-led growth, best exemplified by the increase of the minimum wage, intended to boost household incomes to stimulate consumption and promote production. However, it has been criticized as a cause of the declining employment rate. Therefore, it was necessary for the government to consider innovation-driven growth as an alternative solution to this problem. Recently, the government adopted a focus on innovation-led growth relating to the growth engine, while supporting its labor market reform. We can only conclude that the government uses the IPP to provide actual spill-overs of its investments into the new economies.

We believe that the government's approach to the innovation-growth solution to overcome the current economic downturn is the right direction for future economic development because the recent policy shift towards innovation could help overall economic growth. However, Korean policymakers need to understand the intrinsic problem of existing economic regulations, including the law of fair economy and areas like data protection, which hamper innovation where vigorous enforcement of the law is in place. Therefore, for the IPP to be successful, it is vital to understand the trade-offs among the policy goals and to realize its dynamic efficiency by clarifying the scope of a fair economy and technology deregulation.

This article is based on a presentation given at the Second Korea-Russia S&T Policy Workshop in Moscow in January 2019. The English translation by the authors and titles of the works in Korean is authors' own and unofficial. The authors would like to thank Dr. Changyul Lee for his research assistance. This work was supported by the Hankuk University of Foreign Studies Research Fund.

References

Aghion P., Bolton P. (1997) A Theory of Trickle-Down Growth and Development. *The Review of Economic Studies*, vol. 64, no 2, pp. 151–172.

Bailey M.N., Zitzewitz E., Bosworth B., Westphal L.E. (1998) Extending the East Asian Miracle: Microeconomic Evidence from Korea. *Brookings Papers on Economic Activity. Microeconomics*, vol. 1998, pp. 249–321.

Baldwin R., Cave M., Lodge M. (2012) *Understanding Regulation: Theory, Strategy, and Practice* (2nd ed.), New York: Oxford University Press.

Choi Y.S. (2010) Analysis of the Microsoft, Intel, and Qualcomm Decisions in Korea. *European Competition Law Review*, vol. 31, no 11, pp. 470–475.

Choi Y.S. (2014) The Rule of Law in a Market Economy: Globalisation of Competition Law in Korea. *European Business Organization Law Review*, vol. 15, no 3, pp. 419–437.

Decker C. (2015) *Modern Economic Regulation: An Introduction to Theory and Practice*, Cambridge: Cambridge University Press.

Eichengreen B., Chung D.-K. (2004) Introduction. *The Korean Economy Beyond the Crisis* (eds. D.-K. Chung, B. Eichengreen), Cheltenham and Northampton: Edward Elgar, pp. 1–24.

Kim G.H. (2017) The Nature and Limits of Income-led Growth Theory. *Labor Society*, vol. 197, pp. 27–31 (in Korean).

Kim S.S. (2017) A Study on Policy Problem Structuring and Problem Definition: Focusing on the Frame (Discourse) of Economic Democratization. *Korean Society and Public Administration*, vol. 28, no 3, pp. 53–81 (in Korean).

Kim T.I. (2018) Assessments of the Income-led Growth and Future Policy Direction. *Proceedings of the Autumn Conference of 2018 of the Korean Association for Policy Studies*, pp. 257–286 (in Korean).

Kim W. (2019) A Review on the Fourth Industrial Revolution: Income of the Old Age from Financial Technology. *ChosunBiz*, 19.05.2019. Available at: http://biz.chosun.com/site/data/html_dir/2019/05/17/2019051701120.html, accessed 22.05.2019 (in Korean).

Korean Government (2018) *Innovative Platform: The Policy Direction of Strategic Investment for Innovation-Driven Growth* (published online 13.08.2018). Available at: http://www.moef.go.kr/nw/nes/detailNesDtaView.do?searchBbsId1=&searchNttId1=MOSF_000000000018581&menuNo=4010100, accessed 18.05.2019 (in Korean).

Korean Government (2019) *The Governmental Policy on the Eight Leading Industries* (published online 20.02.2019). Available at: http://www.moef.go.kr/nw/nes/detailNesDtaView.do?searchBbsId1=&searchNttId1=MOSF_000000000026977&menuNo=4010100, accessed 19.05.2019 (in Korean).

Lee J.-H., Chung H.-Y. (2019) *Regulatory Sandbox, Korea's New Regulation Paradigm*, Seoul: KISTEP (in Korean).

Lee S.M. (2018) The Effects of Wage-Led Growth Policy on Economic Revival, Price and Employment. *Koreanische Zeitschrift fur Wirtschaftswissenschaften*, vol. 36, no 4, pp. 87–111 (in Korean).

Ministry of Economy & Finance (2018) *5th Ministerial Meeting on 'Growth through Innovation'* (published online 14.08.2018). Available at: http://english.moef.go.kr/ec/selectTbEconomicDtl.do?boardCd=E0001&seq=4533&boardCdKey=N, accessed 31.05.2019.

Ministry of Economy & Finance (2019a) *1st Ministerial Meeting to Promote Innovation in Industries* (published online 16.01.2019). Available at: http://english.moef.go.kr/ec/selectTbEconomicDtl.do?boardCd=E0001&seq=4615&boardCdKey=N, accessed 31.05.2019.

Ministry of Economy & Finance (2019b) *Measures to Boost Ventures* (published online 12.03.2019). Available at: http://english.moef.go.kr/ec/selectTbEconomicDtl.do?boardCd=E0001&seq=4640&boardCdKey=N, accessed 31.05.2019.

Ministry of Economy & Finance (2019c) *13th Ministerial Meeting on Boosting the Economy* (published online 17.04.2019). Available at: http://english.moef.go.kr/ec/selectTbEconomicDtl.do?boardCd=E0001&seq=4662&boardCdKey=N, accessed 31.05.2019.

MSITC (2018) *The Innovation Growth Engine. Leading Preparations for the Fourth Industrial Revolution*, Seoul: Ministry of Science and ICT. Available at: https://iac.nia.or.kr/board_files/96/download, accessed 11.06.2019.

OECD (2017) *Economic Outlook No. 101 – June 2017,* Paris: OECD.

Park J. (2019) Labor Productivity and Wage in Korean Economy. *Korean Economic Forum*, vol. 12, no 1, pp. 81–112 (in Korean).

Presidential Committee (2019) *Income-led Growth* (Note by the Presidential Special Committee for Income-led Growth in Korea). Available at http://ilg.go.kr/html/sub2_1.do, accessed 30.05.2019 (in Korean).

Posner R.A. (2001) Antitrust in the New Economy. *Antitrust Law Journal*, vol. 68, no 3, pp. 925–943.

Schumpeter J.A. (1942) *Capitalism, Socialism, and Democracy*, New York: HarperPerennial.

Statistics Korea (2018) *Household Income Trends in the Third Quarter of 2018*. Available at http://kostat.go.kr/portal/eng/pressReleases/6/1/index.board, accessed 30.05.2019.

Statistics Korea (2019) *Economically Active Population Survey* (published online 15.05.2019). Available at http://kostat.go.kr/portal/eng/pressReleases/5/1/index.board, accessed 30.05.2019.

Stigler G. (1971) The Economic Theory of Regulation. *Bell Journal of Economics*, vol. 11, pp. 3–21.

Stiglitz J.E. (2012) *The Price of Inequality: How Today's Divided Society Endangers Our Future*, New York: W.W. Norton & Co.

Ungson C.R., Steers R.M., Park S.-H. (1997) *Korean Enterprise: The Quest for Globalization*, Cambridge, MA: Harvard Business School Press.

Viscusi W.K., Harrington Jr. J.E., Sappington D.E.M. (2018) *Economics of Regulation and Antitrust* (5th ed.), Cambridge, MA: MIT Press.

“Whirlpools” and “Safe Harbors” in the Dynamics of Industrial Specialization in Russian Regions

Evgeniy Kutsenko
Director, Russian Cluster Observatory, Institute for Statistical Studies and Economics of Knowledge (ISSEK)[a], ekutsenko@hse.ru

Yaroslav Eferin
Analyst, Digital Development Global Practice[b]; Postgraduate Student, ISSEK[a], yeferin@worldbank.org

[a] National Research University Higher School of Economics, 11, Myasnitskaya str., Moscow 101000, Russian Federation
[b] World Bank (Russian Office), 36/1, Bolshaya Molchanovka str., Moscow 121069, Russian Federation

Abstract

This article analyzes sectors of specialization and sectoral dynamics in the regions of the Russian Federation from 2005 to 2015. The study is based on the methodology of the European Cluster Observatory in the 2016 edition as revised by the authors. It proposes a typology of regions depending on the number of specialization industries and the depth of sectoral development: agglomeration, diversification, specialization, and differentiation. Four types of specializations are identified based on the depth of their development and distribution among Russian regions: national leadership, distribution, concentration, and niche development. The authors implemented an approach to study regions through alternative scenarios of sectoral development over a ten-year period: occurrence, strengthening, extinction, and disappearance. The study identifies various structural models that combine the implementation of the described scenarios in relation to various specializations within a particular region. It is shown that the scale and intensity of structural changes largely depends on the region’s proximity to million-strong cities but does not always directly affect economic growth rates. The authors introduce the concepts of “vortexes”, “streams”, and “safe harbors”, which describe the types of regions with a different type of structural changes that occur depending on the presence or proximity of the million-strong city.

Keywords: regional specialization; smart specialization; regional economic policy; sectoral development of the regions; localization coefficient; structural policy; industry diversification.

Citation: Kutsenko E., Eferin Y. (2019) “Whirlpools” and “Safe Harbors” in the Dynamics of Industrial Specialization in Russian Regions. *Foresight and STI Governance*, vol. 13, no 3, pp. 24–40. DOI: 10.17323/2500-2597.2019.3.24.40

Structural changes in the economy is a key element of achieving sustainable economic development and increased wellbeing [*Hidalgo, Hausmann,* 2011; *Boschma,* 2017]. Transformations caused by the development of new sectors and the diversification of national and regional economies' industry structure command the highest interest of researchers [*Hidalgo et al.,* 2007; *Pinheiro et al.,* 2018]. Such transformations may involve not only the emergence of new economic activities, but also their growth, decline, or even disappearance, while these radically different processes may simultaneously arise in the same region.

Regional economies develop unevenly [*Hausmann, Rodrik,* 2003; *Hudson,* 2009]. In Russia, regions have very different resource potentials, territorial characteristics, economic development levels, and wealth. This leads to high socioeconomic inequality [*Zubarevich,* 2010]. This mismatch gives one grounds to expect that Russian regions will face structural changes on different scale and at varying rates.

One of the main objectives of the "Spatial Development Strategy for the Russian Federation Until 2025"[1] was to increase regions' competitiveness by promoting "effective economic specialization". However, relevant efforts are hindered by the lack of targeted studies of Russian regions' specialization industries and their development paths.

For the purposes of this paper, the known methodology for identifying and assessing industry development proposed by the Harvard Business School and the European Cluster Observatory [*Ketels, Protsiv,* 2014] was adjusted to reduce the effects of one-sided concentration and the specialization of industries within specific regions. The created database allows one to analyze regional growth in the following terms:

- the industries that Russian regions specialize in;
- grouping territories by the number of economic sectors represented and the latter's development level;
- particular industries' status in the regional economy: key or niche;
- the nature of structural changes in Russian regions' economy during the ten-year period under consideration (2005-2015);
- the correlation between the actual changes and geographical proximity to major agglomerations.

The paper presents a review of techniques for identifying regions' specialization industries and proposes an original methodology and static and dynamic models of Russian regions' industrial development. On the basis of interpreting the obtained results, recommendations to improve government policies were prepared.

The Methodology for Identifying and Assessing Regions' Industrial Specializations

Over the last several decades, the role of regional factors in national and global economic development has significantly increased [*Toffler,* 2006; *Ohmae,* 2002]. Regions and individual cities are turning into independent actors in economic processes, which leads to increased international competition and creates the need to review existing approaches that do not take into account local specifics [OECD, 2012]. Territorial development largely depends on geographic, demographic, and sociocultural aspects [*Rodrik,* 2003]. Government policies should consider the latter's diversity when designing tools for various regions moving along specific structural development paths [*Barca et al.,* 2012; *Grillitsch, Asheim,* 2018; *Shenoy,* 2018].

Most professionals choose diversification as the preferred regional development model [*Hausmann, Klinger,* 2007; *Boschma,* 2017; *Chen,* 2018], since it makes the strongest impact upon the regional economy [*Hidalgo, Hausmann,* 2009; *Neffke et al.,* 2011]. However, the vector of changes does not always match the territory's current industry profile [*Frenken et al.,* 2007; *Boschma et al.,* 2013; *Pinheiro et al.,* 2018].

Studying the specific features of regional economies and specialization industries remains a major aspect of economic development, important in scientific and practical terms alike [*Leksin, Shvetsov,* 2012; *Liubimov et al.,* 2017]. Drivers of economic growth, conditions, and processes leading to prosperity have been studied for a sufficiently long amount of time. Identifying regions' competitive advantages and specialization industries help one understand the nature of the structural changes, design regional policies, choose the most effective tools for implementing them, and evaluate the results [*Klimanov,* 2007; *Klimenko et al.,* 2015; *Simachev at al.,* 2014]. Given the lack of a generally accepted approach to identifying and analyzing regional specialization industries, a meaningful discourse on territory types and their development models does not seem to be possible. In other words, it would be hard to find empirical evidence to support theoretical constructs and transform them into specific policies and support measures. Choosing an appropriate method is paramount here, one which, among other things, would take into account the specific features of particular territories' statistics.

Various indicators and methods of their calculations are applied in international and Russian practices to identify regions' specialization industries. One of the most popular ones is the localization coefficient [*Fracasso, Marzetti,* 2018; *Kopczewska et al.,* 2017; *Lu et*

[1] Approved by the RF Government instruction No. 207-r of 13.02.2019

al., 2011; *Beaudry, Schiffauerova,* 2009], also known as Balassa-Hoover Index or Hoover Specialization Index [*Hoover,* 1936; *Kim,* 1995]. Other methodologies for identifying industrial diversity and geographical distribution of industries by region apply various other indices including the Gini Concentration Index [*Gini,* 1936; *Devereux et al.,* 1999], Hachman Index [*Sharma,* 2008], Krugman Concentration Index [*Krugman,* 1991; *Bickenbach, Bode,* 2008], Hallet Index [*Hallet,* 2000], Lilien Index [*Lilien,* 1982], Ellison-Glaeser Index [*Ellison, Glaeser,* 1999; *Kominers,* 2008; *Rothenberg et al.,* 2017], and others.

Mainstream techniques for identifying regional specialization industries described in the Russian literature include various coefficients such as the depth of sector development, inter-district marketability, and per capita production [*Gavrilov*, 2002; *Kovalenko*, 2005, *Prokopiev*, 2015], the Herfindahl-Hirschman Index [*Belov*, 2012], and the Localization Coefficient. The latter is used most commonly since it allows one to measure the concentration of particular industries in the region using indicators such as output, number of workers, and investments in fixed assets. In its generalized form, the Localization Coefficient looks as follows:

$$LQ = \frac{\left(I^R/_{I^{TR}}\right)}{\left(I^N/_{I^{TN}}\right)}, \qquad (1)$$

where: *LQ* is the localization coefficient, is regional industry, is national industry; is regional economy, and is national economy. The coefficient's values above 1 indicate specialization, though certain researchers use the threshold range between 0.8-1.25 [*Bergman, Feser,* 1999; *Porter,* 2003; *Kutsenko et al.,* 2011].

The calculation of the localization coefficient is frequently based on the average number of employees [*Ketels, Protsiv,* 2016; *Kutsenko et al.,* 2011; *Pavlov et al.,* 2014; *Pinkovetskaya,* 2015], which is less dependent upon the specifics of national taxation regimes and corporate accounting standards. For example, Moscow's shipped product export statistics give one grounds to conclude that the oil and gas industry is likely to become the capital city's main industry, due to of the residents who in reality do business in other regions [*Kadochnikov, Fedyunina,* 2013].

Several factors impose certain limitations on the localization coefficient. In absolute terms, its high values can be combined with low ones, which is fraught with overestimating the industry concentration in the region under consideration. The opposite situation is also possible, when low values of the coefficient are combined with high ones. This is typical for regions which host large urban agglomerations and thus have a wide range of industries. Finally, the emergence of new technologies and robotization are likely to lead, over time, to reduced employment in a number of industries [*Prokopyev*, 2015]. Introducing additional regional specialization indicators will help to remedy this technique's shortcomings.

An integrated methodology for identifying and mapping specialization industries was suggested by the European Cluster Observatory in 2014 (further on, ECO-2014). Industries were distributed between clusters based on the principle of interconnected, compactly localized activities [*Ketels, Protsiv*, 2014]. The ECO-2014 toolset includes an algorithm for identifying such groups proposed by Michael Porter [*Porter*, 2003]. It involves dividing all industries into two groups: local ones (focused on meeting the needs of the region's population, such as consumer services, retail, etc.), and traded ones (i.e., those oriented towards inter-regional and international trade, such as the automotive industry) [*Delgado et al*., 2014]. According to Porter, the latter group is particularly important since such industries determine the competitiveness of a particular region.

The algorithm for identifying cluster groups adjusted in [*Delgado et al.,* 2016] comprises five sequential stages:

1) Pairwise comparison of industries by region to detect localization patterns, including by building similarity matrices;
2) Identifying inter-sectoral links at the national level;
3) Identifying various clustering forms of the studied objects through specialized analysis;
4) Evaluating the quality of the created cluster groups;
5) Eliminating statistical errors.

Applying this algorithm produces as objective a set of cluster groups as possible, comprising steadily interconnected trading industries.

The Porter model provided the basis for ECO-2014, which was adjusted to reflect the changes in the European classification of economic activities NACE. This methodology was designed not only to identify specialization areas but also to assess the level of their development in the region, using the following criteria:

- Specialization level LQ (localization coefficient);
- Size S (ratio of regional/national employment in the industry);
- Productivity P (average wage in the industry in the region);
- Growth G (ratio of this/last year's employment in the industry in the region).

The ECO-2014 toolset allows one to onedetermine the number of specialization industries in all regions of the studied country or group of countries and their development level. For Russia it was tested in [*Kutsenko et al*. 2019; *Simachev et al*., 2014]. Points ("stars") were used to measure the development level of each sector. A star was assigned to the region if it fell into the top 20% of regions according to the relevant criterion (therefore the maximum number of stars a regional industry could receive was 4). Only the top regions that collectively accounted for 80% of national employment in the industry were considered. This rule was

introduced to exclude specialization industries insignificant on the national scale.

In 2016, the European Cluster Observatory made a number of changes to the ECO-2014 methodology, mainly related to the algorithm for assigning stars. According to the updated approach (ECO-2016), regions were filtered out on the basis of stars assigned in line with the LQ criterion. Additional stars can be assigned to regional specialization industries on the basis of the criteria S, P, or G, the same way as in ECO-2014. Unlike the previous version, however, the ECO-2016 methodology allows one to significantly reduce the total number of regional specialization industries. The new filtration principle helps regions with large economies to focus on the most important industries, while abandoning the old methodology allows one to assign stars to regions with a small workforce.

Our approach combines the two filtering conditions of the ECO-2014 and ECO-2016 methodologies. In our model, to classify an industry as a regional specialization, the region must be one of the top 80% in terms of size (S) *and* have a specialization level star (according to the LQ criterion). This allowed us to exclude regions with one-sided concentration or specialization, while the resulting list was as conservative as possible since the likelihood of errors in determining core industries was reduced to the minimum (Figure 1).

Statistical Typology of Russian Regions' Industrial Development

Adapted for the purposes of our study, the methodology was applied to a sample comprising 80 Russian regions[2] for the period of 2005-2015, using data on the average number of employees and accrued wages by industry[3]. The results were specialization industry lists for 71 Russian regions,[4] with an assessment of their development level.

The regions with the largest number of specialization industries in 2015 included the Vladimir Region (22 specialized sectors), St. Petersburg (16), Moscow, the Yaroslavl, Leningrad, and Perm Regions (15 each). An assessment of the development level of the identified specialization industries provides a different picture. For example, the range of relevant activities in the Vladimir Region is wide, but their development remains relatively low, while for example St. Petersburg shows an inverse situation.

Taking into account the number of specialization industries and their development level in 2015, four types of regions were identified (Figure 2):

- "Agglomeration": a large number of specialization industries and a high level of their development: St. Petersburg, Moscow, Moscow and Leningrad Region, Republic of Tatarstan, etc.
- "Diversification": large number of competency areas but not very impressive progress: Vladimir[5], Yaroslavl, Kirov Regions, etc.
- "Specialization": a narrow range of highly developed specialization areas: Murmansk, Tyumen, Rostov Regions, etc.
- "Differentiation" few specialization industries with a low development level: Republic of Buryatia, Tambov, Astrakhan Regions, etc.

The most common specialization areas in Russian regions include: wood products (16 regions); clothing, telecommunication equipment, meat products, plastic and rubber products, refractory materials (15); oil and gas, heavy mechanical engineering, chemical products, forestry, and pulp-and-paper products (14).[6]

Specialization industries have different overall development level values. For example, 14 regions specialize in the "Oil and gas" cluster group and the progress rate of the respective industries remains among the highest with a total of 45 stars. An opposite example is the cluster group "Heavy mechanical engineering"; 14 regions specialize in it, but the development level of the relevant sectors remains low with only 22 stars in total.

Similar to regions, four types of industries can also be identified (Figure 3):

- "National leaders": high proliferation combined with a high development level: oil and gas, plastic products, business services, ICT, etc.;
- "Proliferation": wide proliferation combined with a low development level: clothing, meat products, heavy mechanical engineering,[7] etc.;
- "Concentration": low coverage with a high development level: leather goods, jewellery, sound recording, etc.;

[2] The Nenets, Khanty-Mansi, and Yamal-Nenets Autonomous Regions were excluded from the sample because they were accounted for in the calculations for the Archangelsk and Tyumen Regions. The Republic of Crimea and the Federal City of Sebastopol were not analyzed due to the lack of compatible data for the period under consideration.

[3] The calculations were based on the All-Russian Classification of Economic Activity Types OK 029-2007 (NACE Rev. 1.1) (OKVED-1), the fourth level of detail for the indicators "Average number of employees during the reporting period, individuals" and "Amount of accrued wages during the reporting period, thousand rubles" as reported in the statistical observation form P-4.

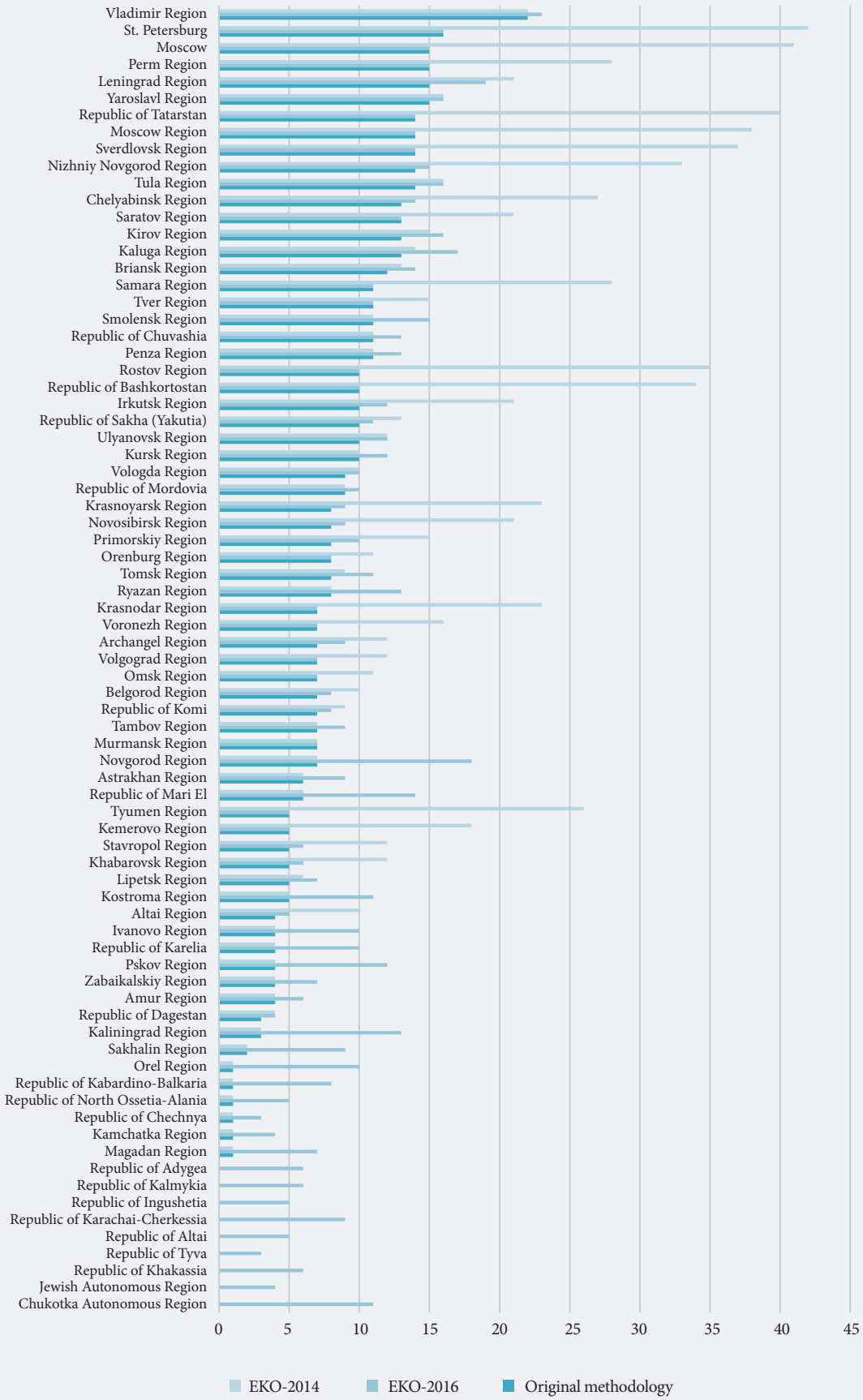
[4] The presented methodology did not reveal a concentration of employment sufficient to definitely identify specialization industries in the following regions: Republics of Adygea, Kalmykia, Ingushetia, Karachai-Cherkessia, Altai, Tyva, Khakassia, the Jewish Autonomous Region, and the Chukotka Autonomous Region.

[5] Interestingly, the largest number of specialization areas were identified in the Vladimir Region, with a relatively low development level. Also, the identified specialization areas were almost exactly the same as in Moscow, especially manufacturing industries. Differences with Moscow were identified in the production of home appliances, wood products, refractory materials and rubber goods (Vladimir Region's specialization), and in industries such as finance, education, R&D, insurance, and film production (Moscow's specialization).

[6] In Porter's study and the European Cluster Observatory's methodologies, certain cluster groups combine industrial and service activities. In particular, telecommunication equipment and services and construction and construction materials.

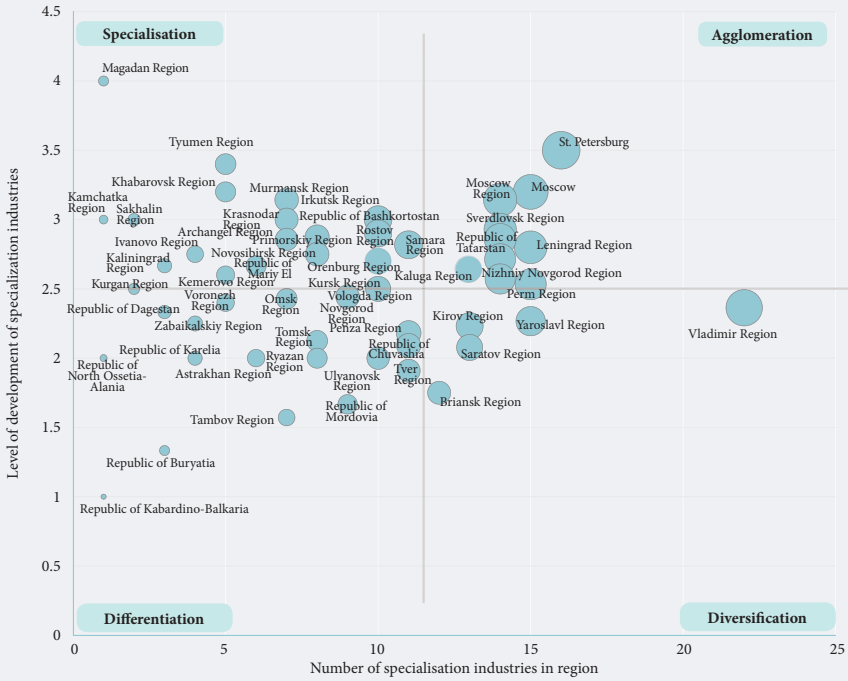
[7] The "Heavy mechanical engineering" cluster group includes the production of railway rolling stock with the highest number of employees.

Figure 1. **Russian Regions' Specialization Industries Identified Using Different Methodologies (*number of sectors*)**



Source: compiled by the authors.

Figure 2. **Distribution of Russian Regions by the Number of Specialization Industries and Their Development Level: 2015**

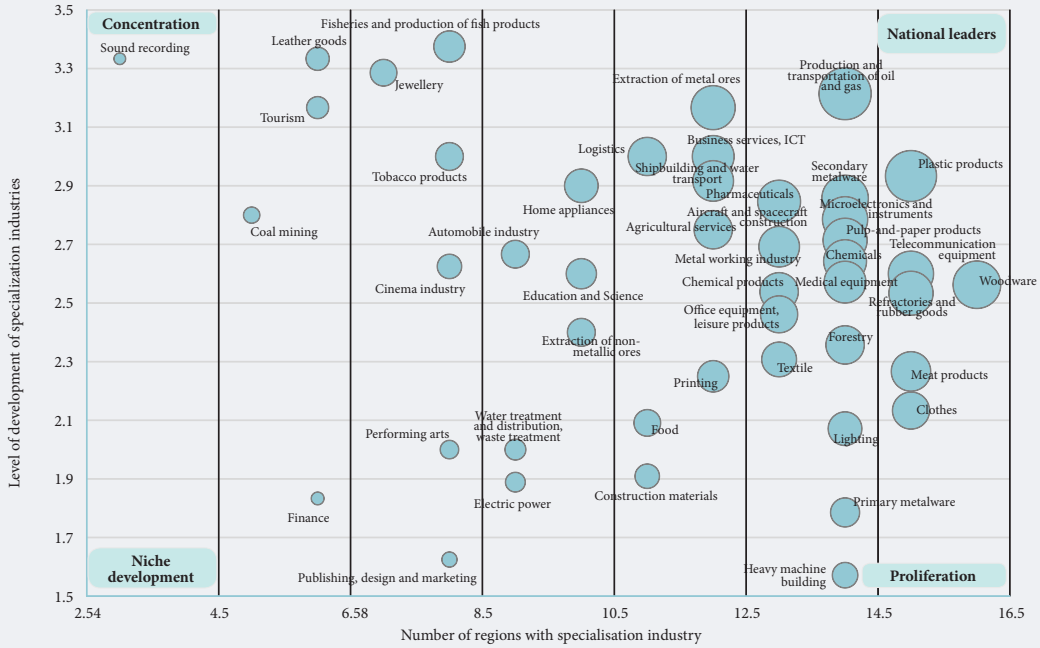


Notes:

1. Number of specialization industries (X axis): the total number of specialization industries in the region
2. Overall development level of specialization industries (circle size): combined development level of all specialization industries in the region
3. Average development level of specialization industries (Y axis): the ratio of the overall development level of specialization industries to their number in the region

Source: compiled by the authors.

Figure 3. **The Distribution of Specialization Industries by Proliferation and Development Level in Russian Regions: 2015**



Notes:

1. Number of regions with specialization industry (X axis): the total number of regions specializing in this industry
2. Overall development level of the specialization industry (circle size): the combined development level of the specialization industry in all regions
3. Average development level of the specialization industry (Y axis): the ratio of the overall development level of the specialization industry to the number of regions specializing in this industry

Source: compiled by the authors.

- "Niche": low proliferation and development level values: performing arts, publishing, finance, etc.

The database we have created allows one to move from static regional development typologies to a more complex, dynamic analysis, to identify relevant models and patterns.

Scenarios and Structural Models of Regions' Industrial Development

Any industry can be described using four possible development scenarios: (a) "Emergence", (b) "Growth", (c) "Fading", and (d) "Deterioration", measured using the proposed methodology (Figure 4). Each model is based on the growth of regional specialization industries (measured in "stars") over the course of the period of 2005–2015.[8]

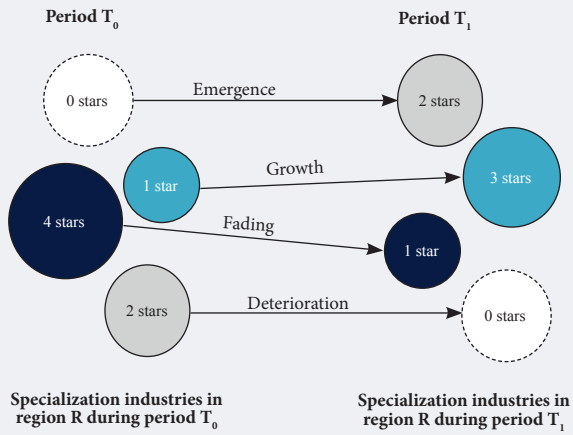
During the decade under review here, new specialization industries most frequently emerged in the Central Federal District (CFD) regions, such as the Vladimir, Bryansk, Tula, Smolensk, and other regions. The Vladimir Region is the leader, with 12 new specialization industries: household appliances, jewelry, pharmaceuticals, furniture, leather goods, business services and ICT, telecommunication equipment and services, footwear, meat processing, medical equipment, publishing, design and marketing, and primary metalware.

St. Petersburg, the Republic of Tatarstan, the Vladimir, Sverdlovsk, Kursk, and other regions are the leaders in the "Growth" scenario. In the first two of the aforementioned Russian regions, eight specialization industries have improved their positions, while only two and one new ones, respectively, have emerged. In St. Petersburg, this is business services and ICT, wholesale trade and e-commerce, education and science, tourism, jewellery and leather goods, medical equipment, and the film industry while in Tatarstan these industries are business services and ICT, telecommunication equipment and services, oil and gas, plastic products, aircraft construction, and chemical products.

The "Fading" scenario most accurately describes the industry portfolios of the city of Moscow, the Moscow, Kaluga, Yaroslavl, and Vologda regions. Note that the "Fading" in Moscow and the Moscow Region was relatively minor, averaging a single star. Interestingly, there has been a slight decrease in industry concentration in the capital city over the past ten years,[9] especially after 2008, which may be explained by the global economic crisis of 2007-2009.

"Deterioration" primarily affected the specialization industries in the Tula, Moscow, Oryol, Volgograd, Novosibirsk, and some other regions. In particular, in the Tula region, the production of heavy machinery, medical equipment, leather goods, textile products, printed materials, office equipment, and leisure products declined over the past ten years.

Figure 4. **Regional Industrial Development Scenarios**



Source: compiled by the authors.

The four above scenarios can simultaneously unfold in different specialization industries in the same region.[10] Therefore, when analyzing industry growth in regions it would be more correct to speak not about scenarios, but structural models comprising different sets of simultaneously implemented industry development scenarios. This allows one to classify regions based on the scenario set: from no changes in specialization industries to the transformation of all four modalities. This measure of the absolute scale of structural changes can be supplemented by relative coverage or intensity, describing just the affected set (share) of specialization industries.

A comparison of static types and dynamic models of industry development shows that regions with a large number of specialization industries (the "Agglomeration" and "Diversification" types) experience major structural changes. Apparently, this is due to the increased volatility of poorly developed specialization industries (Table 1). In addition, the regions of the "Specialization" or "Differentiation" type show a wide variation in structural models, which needs further explanation.

Possible factors leading to the uneven distribution of structural changes between regions include geography. For example, territories where the most significant

[8] In certain cases, the period between 2006-2015 was used because the growth criterion (G) is based on the ratio between employment in the current and previous year. Therefore, the 2005-2015 period would not allow one to measure the growth in the "fading" model due to the lack of data for 2004.

[9] In 2006, the development level of specialization industries in Moscow was 3.5 and in 2015 - 3.2. The overall share of Moscow's stars in total for all regions was 4% in 2005 and 3% in 2015.

[10] For example, in the Tula Region in 2006-2015 six specialization industries have "deteriorated" (–15 stars), one industry "faded" (–2 stars), three "grew" (+4 stars), and five "diversified" (+13 stars). After such a major restructuring of the regional economy, its total number of stars remained unchanged, while the number of specialization industries decreased by one.

Table 1. **Distribution of Regions by Static Type and Dynamic Industry Development Model**

Static industry development model	Vortex (regions with a million-strong city)	Stream (areas adjacent to regions with a million-strong city)	Safe Harbor (regions with no million-strong cities and not adjacent to areas which do have one)
Agglomeration	St. Petersburg Moscow Republic of Tatarstan Perm Region Nizhniy Novgorod Region Samara Region Sverdlovsk Region	Kaluga Region Tula Region Leningrad Region	—
Diversification	—	Vladimir Region Yaroslavl Region Kirov Region Saratov Region	Briansk Region
Specialisation	Voronezh Region Volgograd Region Rostov Region Republic of Bashkortostan Chelyabinsk Region Krasnoyarsk Region Novosibirsk Region Omsk Region	Belgorod Region Kursk Region Lipetsk Region Orel Region Smolensk Region Tver Region Republic of Komi Stavropol Region Republic of Mari El Republic of Udmurtia Krasnodar Region Orenburg Region Kurgan Region Tyumen Region Altai Region Irkutsk Region Kemerovo Region Republic of Sakha (Yakutia)	Ivanovo Region Kostroma Region Archangel Region Vologda Region Kaliningrad Region Murmansk Region Novgorod Region Pskov Region Republic of Mordovia Kamchatka Region Primorskiy Region Khabarovsk Region Amur Region Magadan Region Sakhalin Region
Differentiation	—	Ryazan Region Tambov Region Astrakhan Region Penza Region Republic of Chuvashia Ulyanovsk Region Tomsk Region	Republic of Karelia Republic of Dagestan Republic of Kabardino-Balkaria Republic of North Ossetia-Alania Republic of Chechnya Republic of Buryatia Zabaikalskiy Region
No model identified	—	Republic of Kalmykia Republic of Tyva Republic of Khakassia	Republic of Adygea Republic of Ingushetia Republic of Karachai-Cherkessia Republic of Altai Jewish Autonomous Region Chukotka Autonomous Region

Source: compiled by the authors.

structural changes took place are concentrated in the western part of Russia (Figure 5). In the eastern part, the opposite situation was noted: in some of the regions no changes were observed at all or specialization industries "deteriorated" (in Kamchatka, the Khabarovsk Region, etc.). The strongest industry dynamics were noted in the regions of the Central (CFD), Volga (VFD), and North-West (NWFD) Federal Districts

Million-Strong Cities' Effect on Structural Changes in the Region

An analysis of the map of structural changes in Russian regions (Figure 5) suggests that the rate of these processes depends upon the proximity of an area to a million-strong city or to regions where such cities are located. To test this hypothesis, we divided the sample of regions into three groups:

1) Regions with a million-strong city;[11]
2) Regions with no million-strong cities but adjacent to territories which do have one;
3) Regions with no million-strong city not adjacent to regions which do have one.

An analysis of structural development models of the three above groups of regions (Table 2) revealed several trends:

- 75% of regions in the first group followed the model "Emergence – Deterioration", with varying intensity; none of the group members completely avoided structural changes;
- Over 80% of regions in the second cluster that experienced the most profound transformation (three- and four-scenario industry development models) were located next to regions with a million-strong city;

[11] The Moscow Region was also included in this group because its geographical location in relation to the capital is similar to that of other regions with million-strong cities in relation to their administrative center.

Figure 5. **Structural Development Models of Russian Regions**

Source: compiled by the authors.

- About 30% of regions in the third cohort did not experience any structural changes over the last ten years.

Let us consider the rate of structural changes (the average number of specialization industries matching a particular industry development scenario) for each of the groups (Table 3). The overall value of this indicator is the highest in the regions of the second group, closely followed by the first one. The "Emergence – Deterioration" model (which describes the changes in the industry structure) is the most common for the second group of regions. Regions with million-strong cities tended to focus on strengthening the industries they were specializing in ten years ago.

Another important parameter in terms of the regions' socioeconomic wellbeing is the industry portfolio's sensitivity to structural changes. For example, in the case of Moscow (15 specialization industries were identified there in 2015), only two new industries appeared and dropped out of the city's portfolio. In other words, structural changes affected only 13% of it. On the contrary, in the Lipetsk Region which has five specialization industries, structural changes affected three, that is, the industry portfolio was transformed by 60%.

Interestingly, in regions with a million-strong city, lower economic growth rates were noted than in the areas adjacent to them (Table 4). Perhaps the observed differences are due to the "low base" effect. At the same time, there is no reason to believe that the success of catch-up development was directly related to structural changes: the third group of regions (with no million-strong cities nearby and a low level and rate of structural changes) is almost as quickly catching up with the first group in terms of economic development. Our preliminary findings are counterintuitive: structural changes are not related to the regional economic growth rate.[12]

To gauge the directions of structural changes, we have divided the list of industries into five categories: traditional industries, high-technology sectors, knowledge-intensive, creative, and traditional services (Table 5).

Let us turn our attention to structural changes in the Central Federal District regions from this perspective. In regions of the second group, the changes primarily affected traditional industries and, to a lesser extent, high-tech industries and knowledge-intensive services. In particular, the "Emergence" and "Growth" of specialization were noted in production of footwear, clothing, furniture, meat products, and business and ICT services. On the contrary, a number of sectors including the food industry, heavy mechanical engineering, and aircraft construction were "Fading" and "Deteriorating" industries (Figure 6). These changes are particularly apparent in the Bryansk, Kostroma, Kursk, and Lipetsk Regions.

The nature of the structural transformation in the CFD regions is typical for most regions of the second group located in the NWFD and the VFD. On average,

[12] The correlation between structural changes and growth rate can be more complex or become apparent only after a lag, which requires special econometric research. Calculating a paired regression revealed a weak connection between the number of new industries and the average annual GRP growth rate in the regions.

Table 2. **The Distribution of Regions by Structural Development Model and Location in Relation to Million-Strong Cities**

Dynamic industry development models	Regions with a million-strong city	Regions with no million-strong cities but adjacent to areas that have one	Regions with no million-strong cities that are not adjacent to areas which do have one
Emergence – Growth – Fading – Deterioration	–	Belgorod Region Kaluga Region Tver Region	–
Emergence – Growth – Deterioration	Nizhniy Novgorod Region Samara Region	Kursk Region Moscow Region Smolensk Region Tambov Region Tula Region Leningrad Region Republic of Udmurtia Ulyanovsk Region	–
Emergence – Fading – Deterioration		Tula Region Kirov Region Saratov Region Tomsk Region	Vologda Region
Emergence – Deterioration	Voronezh Region City of Moscow St. Petersburg Republic of Tatarstan Volgograd Region Chelyabinsk Region Republic of Bashkortostan Sverdlovsk Region Krasnoyarsk Region Novosibirsk Region Omsk Region	Lipetsk Region Ryazan Region Yaroslavl Region Astrakhan Region Republic of Chuvashia Orenburg Region Altai Region Irkutsk Region Kemerovo Region Republic of Sakha (Yakutia)	Primorskiy Region Briansk Region Ivanovo Region Archangel Region Murmansk Region Republic of Dagestan Zabaikalskiy Region
Deterioration – Growth	–	Vladimir Region	Novgorod Region
Deterioration – Fading	Perm Region	–	–
Growth – Deterioration	–	Orel Region Krasnodar Region Republic of Mari El Penza Region	–
Fading – Deterioration	–	–	Kaliningrad Region Kostroma Region
Emergence	Rostov Region	Stavropol Region Tyumen Region	Amur Region Magadan Region Sakhalin Region Pskov Region Republic of Chechnya
Deterioration	–	Republic of Komi Kurgan Region	Kamchatka Region Khabarovsk Region
No model identified	–	Republic of Tyva Republic of Khakassia Republic of Kalmykia	Republic of Altai Republic of North Ossetia-Alania Republic of Karachai-Cherkessia Republic of Kabardino-Balkaria Republic of Ingushetia Republic of Adygea Republic of Karelia Chukotka Autonomous Region Jewish Autonomous Region

Source: compiled by the authors.

significant growth in traditional industries is noted in these districts (first of all in the Leningrad, Pskov, Novgorod, Saratov, Kirov Regions, and the Udmurt and Chuvash Republics). As to this category in other federal districts, the transformation there amounted to the growth of traditional service sectors (wholesale trade, tourism, oil transportation, etc.) with a shift towards creative industries (publishing, sound recording, etc.) in a number of regions. Significant changes were noted in the Irkutsk, Primorsky, Stavropol, and Krasnodar Regions.

A different trend was identified in the regions that did have million-strong cities: the "Growth" of knowledge-intensive services (such as business- and ICT-services) and high-tech industries (telecommunication equipment) (Figure 7).

In all Russian regions structural changes in 2005-2015 primarily affected traditional industries and services and high-tech industries (Figure 8). For example, telecommunications and medical equipment became the leaders in terms of emerging specialization industries, along with electricity generation, meat products, etc.

Table 3. **The Incidence of Various Industry Development Scenarios in Regions in Relation to Million-Strong Cities: 2005-2015 (*number of specialization industries*)**

Industry development scenario	Regions with a million-strong city	Regions with no million-strong cities adjacent to areas that do have one	Regions with no million-strong cities not adjacent to areas that have one
"Emergence"	2.7	**2.93**	1.1
"Deterioration"	2.13	**2.2**	0.82
"Growth"	**3.9**	2.3	0.83
"Fading"	1.5	**1.6**	0.6
Overall rate of structural changes	23.73	**23.83**	17.85

Source: compiled by the authors.

(Figure 9). Traditional manufacturing sectors typically follow the "Emergence" scenario, while traditional service sectors mainly tend to display "Growth" and "Strengthening". This is particularly true for regions with no million-strong cities. Knowledge-intensive and creative services usually change to a lesser extent, and generally are distributed among the Russian regions less evenly. "Emergence" and "Growth" of these sectors is mainly observed in the regions of the first group.

"Vortexes" and "Safe Harbors" in Regions' Industrial Development: Interpretation and Implications for Government Policies

This paper established a correlation between the scale and rate of industry transformation in Russian regions and the region's proximity to a million-strong city. Major structural changes happen in regions where such cities are located, while in areas far from economic centers, these processes tend to be much weaker. Similar to the world-systems analysis theory [*Wallerstein*, 2015], we can identify the core (i.e. regions with a million-strong city), semi-periphery (regions adjacent to such areas), and periphery (regions not bordering such territories). Interestingly, the most significant transformations stemming from the core are concentrated in semi-periphery regions. In other words, in such areas the depth of industrial development and structural changes are determined by external factors rather than by internal effort. For example, in the National Ranking of Investment Climate in Russian Regions 2015[13], the Kaluga and Vladimir Regions were the 2nd and 63rd, respectively. However, radical transformations were observed in 2005–2015 in both these territories, which were largely due to external conditions, that is, their geographical proximity to Moscow.

According to the world-systems analysis theory, the relationship between the core and the periphery is reduced to the exploitation of the latter, whose dependence upon the core only grows over time while the economic gap widens. In this case, it is impossible to draw a full-fledged parallel with Russian regions, if only because according to our calculations, over the past 10 years the gap has narrowed.

Therefore, we propose a different typology of regions, based on the rate of structural change. Figuratively, structural changes in Russian regions are comparable to the mechanics of a whirlpool where water masses rotate at an increasing rate.

The first type is the center of the whirlpool, the "Vortex" which causes accelerated movement and draws in water flows. Similarly, regions with a million-plus city cause structural changes around them "drawing in" the neighboring areas through investments, demand, and internal transformations. Being the center of the whirlpool, vortex regions are more likely to develop and "grow" their current industry portfolio than create a new one.

Table 4. **Average Annual GRP Growth Rate in Regions in Relation to Million-Strong Cities: 2005-2015 (%)**

	Regions with a million-strong city	Regions with no million-strong cities adjacent to areas which do have one	Regions with no million-strong cities not adjacent to areas which do have one
Average annual GRP growth rate in 2005-2015, %	13.5	14.8	14.5
Total GRP, 2005, *million roubles*	9 015 970	4 826 817	1 809 579
Total GRP, 2015, *million roubles*	31 961 006	19 251 681	7 030 102

Source: calculated by the authors based on Rosstat data.

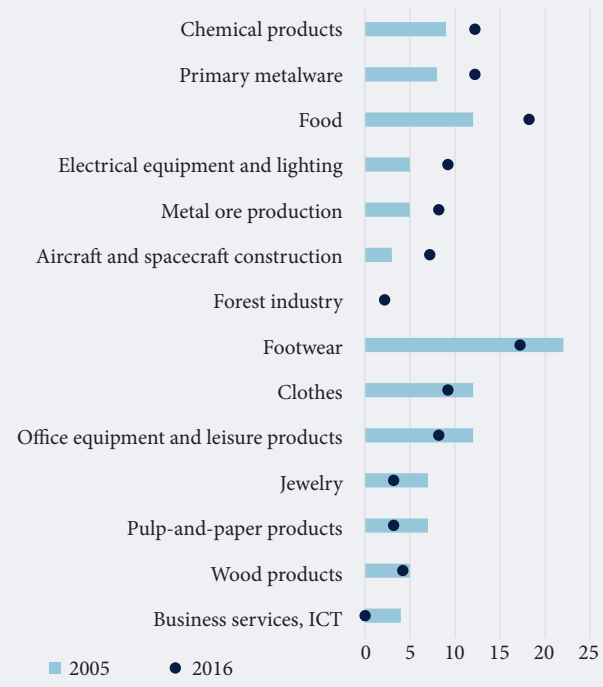
[13] See: https://asi.ru/regions/rating/index_old/ for more; last accessed on 15.06.2019.

Table 5. **Specialization Industry Groups**

Category	Cluster group
Traditional industries	Clothing
	Construction materials
	Chemical products
	Secondary metalware
	Generation and transmission of electricity
	Fisheries and production of fish products
	Food
	Footwear
	Furniture
	Jewelry
	Leather goods
	Meat products
	Pulp-and-paper products
	Plastic products
	Textile
	Tobacco products
Traditional services	Agricultural services
	Wholesale trade and e-commerce
	Water treatment and distribution, waste treatment
	Tourism
	Production and transportation of oil and gas
	Printing
	Transport and logistics
High technology industries	Aircraft and spacecraft construction
	Automobile industry
	Pharmaceuticals
	Telecommunication equipment
	Microelectronics and instruments
	Electrical equipment and lighting
	Medical equipment
	Heavy mechanical engineering
	Office equipment, leisure products
	Shipbuilding and water transport
Creative industries	Publishing, design, marketing
	Sound recording
	Culture
	Film industry
Knowledge-intensive services	Business services, ICT
	Education and R&D
	Financial services
	Insurance

Source: compiled by the authors.

Figure 6. **Changes of the Industry Structure in the CFD Regions Adjacent to Areas with Million-Strong Cities in 2006-2015: the Overall Development Level of Specialization Industries**



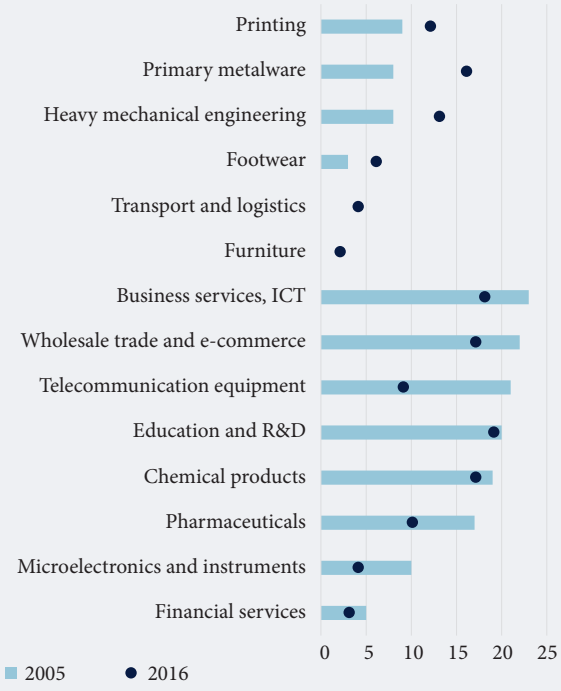
Note: The overall development level of the specialization industry is calculated as the combined development level of the specialization industry in all regions. For each region, the development level of the specialization industry can vary between 0 (the region does not specialize in this industry) and 4 (meets all development criteria).

Source: compiled by the authors.

Russian regions of the second type, that is, those adjacent to regions with a million-strong city, are comparable to the rapid flow of water around the vortex. Such "Streams" experience the greatest structural changes due to external influences, the "Vortexes". Due to their rapid movement around the "Vortex", "Streams" constantly change and display a lack of stability. Radical structural changes in "Streams" are much more evident in their industry portfolios and, accordingly, more strongly felt by the population. This is because "Stream" regions have fewer specialization industries than "Vortexes" do, so the emergence of new competencies and the deterioration of old areas of activity have a stronger effect upon the socioeconomic situation in the region.

The third type are those regions removed from the nearest "Vortex", the ones least susceptible to structural changes: the so-called "Safe Harbots". Industry development processes occur more calmly here in line with prevailing trends. The waves of structural changes generated by the "Vortex" region practically do not reach here and only slightly affect industry portfolios of regions in this group.

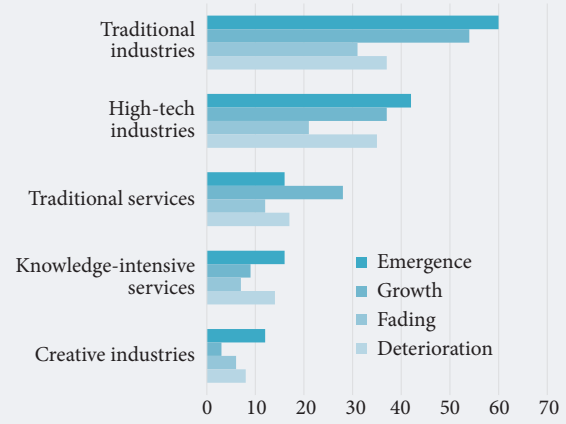
Figure 7. **Changes of Industry Structure in Regions with Million-Strong Cities in 2006-2015: the Overall Development Level of Specialization Industries**



Note: The overall development level of the specialization industry is calculated as the combined development level of the specialization industry in all regions. For each region, the development level of the specialization industry can vary between 0 (the region does not specialize in this industry) and 4 (meeting all the development level criteria).

Source: compiled by the authors.

Figure 8. **Distribution of Development Scenarios by Category of Regional Specialization Industry in 2005-2015 (*number of times scenario was implemented*)**



Source: compiled by the authors.

Geographical proximity to "Vortexes" primarily reduces the "Streams'" sectoral autonomy. In other words, regions that do not have a million-plus city turn out to be dependent upon the industry structure of the neighboring regions which do and upon the demand generated there. There may be a migration of industries from the "Vortex" to the "Stream" zone. In turn, the members of the first group of regions increasingly focus on knowledge-intensive services and high-tech industries.

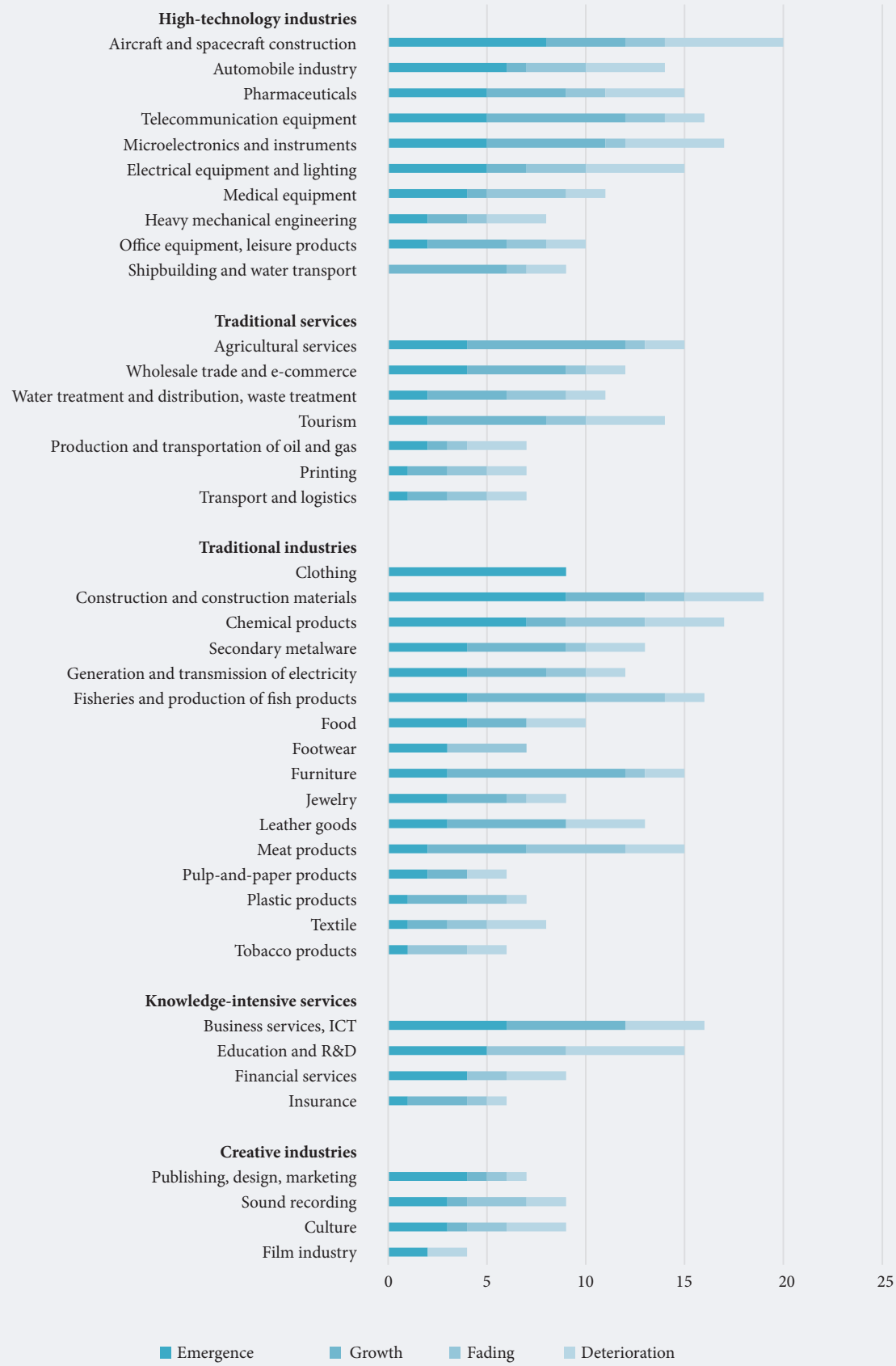
"Stream"-type regions captured by the structural transformations stemming from the "Vortex" begin to focus on traditional manufacturing and service sectors, often abandoning high-tech ones. For example, the Oryol and Kursk Regions have lost their specialization in microelectronics, the Kurgan and Smolensk Regions — in the automotive industry, and the Saratov Region — in electrical equipment and lighting.

It was discovered that high-tech production, knowledge-intensive and creative services are proliferating much more slowly, remaining the prerogative of major economic centers. Probably "Stream" regions use the potential left over from the Soviet period, restructuring the available capacities to meet consumer demand from the nearest million-plus cities. Attracting additional investments, including foreign ones, plays a significant role here.

It takes more than just strategic vision and efforts by the public and private sectors, science, and education to successfully implement structural changes. The region's location is also important: whether it happens to be in a "Vortex", "Stream", or "Safe Harbor" zone. However, there are no grounds to speak about fate, dependence, or pressure. Compared to "Vortexes," structural changes in "Stream" regions are much more pronounced, since the latter have a smaller population, are engaged in fewer activities, and have a smaller GRP. They tend to be more highly specialized, with "Emergence" and "Deterioration" models dominating. As a result, structural transformations in such regions are more tangible for the economy and the population, who have to adjust to new economic realities imposed from the outside more often than people in other regions do. Furthermore, the rate of such changes is not always connected with the wellbeing of the population and economic growth. Apparently, "Stream" regions do not always fully benefit from the changes taking place in them due to external factors, primarily the proximity to large economic centres.

When designing approaches to planning the territorial development of a country, compiling a list of promising regional specialization sectors and developing socioeconomic strategies, it is important to take into account the macro-regional logic of industry dynamics described in this paper. For example, as was already noted, the federal Spatial Development Strategy comprises a list of

Figure 9. **Distribution of Development Scenarios by Specialization Industry in Regions in 2005-2015 (*number of times scenario was implemented*)**



Source: compiled by the authors.

"effective economic specializations" whose development should strengthen the competitiveness of regional economies. However, implementing the current objectives requires more than just a list: an integrated approach is in order, regularly verified and updated, and impartial in relation to the authorities.

In our opinion, the verification of regional development priorities in terms of specialization industries should involve not only a comparison with the list of current specialization areas, but also being aware of and understanding the region's type and structural model. The scale and rate of structural changes play an important role here as does their impact upon the current industry portfolio. Knowledge of these factors allows one to clarify the requirements and support measures for specific territories. In some cases, additional incentives to promote change provided by the federal center will turn out to be meaningless., while in others redoubled efforts will be required. For example, unlike in "Safe Harbor" regions, major transformations occur in "Vortex" and "Stream" areas. It makes sense to revise the list of effective specialization industries there more often. In "Vortexes", experiments with launching new industries can be carried out on a particularly large scale due to their highly diversified economy which reduces the population's sensitivity to possible failures. In contrast, "Stream" regions need additional social support due to their economies' high sensitivity to structural change. Promoting the development of major agglomerations has a powerful impact upon the development of the neighboring regions.

Finally, the new data allows us to clarify the requirements for regional authorities in the structural development field, in particular choosing new specialization areas. In some cases, a region is "squeezed" by objective limitations related, for example, to geographical and logistical factors. In others there may be significant scope for shaping the industry structure of the regional economy, which is not always used effectively, not by far.

Conclusions

Identifying specialization industries is fundamental to the socioeconomic evolution of the Russian regions. The results of our study indicate the need to understand not only the composition of such sectors, but also the level of their development and the dynamics of structural change.

Over the past decade, the regions in the western part of the country have been affected by structural changes more than others. For example, a full-scale transformation occurred in the CFD: increased production of goods and services to meet consumer demand, and reduced output of products for industrial application. Such changes are typical of regions located in geographic proximity to million-plus cities whose demand sets directions for sectoral restructuring, and for the profiling of the neighboring territories.

In our opinion, the dynamics of structural changes in Russian regions is comparable to the rapid flows of water in a whirlpool, which are changing the structure of the economy and affect the well-being of the population and economic growth in different ways. As in the epicenter of a maelstrom, regions with a million-strong city focus on promoting the development of their current specialization industries, first of all knowledge-intensive services and high-tech industries. The neighbouring territories fall into the turbulent flows of structural change streaming from the center and promote the development of traditional services and industries. Last of all, the changes affect regions removed from major economic centers. These are comparable to "Safe Harbors" where structural transformations occur at a much slower rate, with no evidence of sharp bursts.

This proposed approach provides a theoretical basis for fine-tuning measures to support industry development in regions that vary not only in terms of welfare and economic development, but also in the rate of structural transformation, sensitivity to changes in the industry portfolio, and territorial proximity to major agglomerations.

This article was prepared as part of a research project on the topic: "Analysis and modelling dynamics of science and technology development with the use of statistical indicators", performed by the HSE in 2019. The authors are grateful to Vasily Abashkin and Kirill Tiurchev — staff members of the Russian Cluster Observatory of the Institute for Statistical Studies and Economics of Knowledge of the National Research University Higher School of Economics for their contribution to discussing the methodology for identifying and evaluating regional specialization industries.

References

Barca F., McCann P., Rodríguez-Pose A. (2012) The Case for regional development intervention: Placed-based versus place-neutral approaches. *Journal of Regional Science*, vol. 52, no 1, pp. 134–152.

Beaudry C., Schiffauerova A. (2009) Who's right, Marshall or Jacobs? The localization versus urbanization debate. *Research Policy*, vol. 38, no 2, pp. 318–337.

Belov A.V. (2012) K voprosu o prostranstvennom razmeshchenii faktorov proizvodstva v sovremennoi Rossii [On Spatial Distribution of Production Factors in Contemporary Russia]. *Prostranstvennaya ekonomika* [Spatial Economics], no 2, pp. 9–28 (in Russian).

Bergman E., Feser E. (1999) Industrial and Regional Clusters: Concepts and Comparative Applications. *The Web Book of Regional Science* (ed. S. Loveridge), Morgantown, WV: West Virginia University. Available at: http://www.rri.wvu.edu/WebBook/Bergman-Feser/contents.htm, accessed 28.03.2019.

Bickenbach F., Bode E. (2008) Disproportionality measures of concentration, specialization, and localization. *International Regional Science Review,* vol. 31, no 4, pp. 359–388.

Boschma R. (2017) Relatedness as driver of regional diversification: A research agenda. *Regional Studies,* vol. 51, no 3, pp. 351–364.

Boschma R., Asier M., Mikel N. (2013) The emergence of new industries at the regional level in Spain: A proximity approach based on product-relatedness. *Economic Geography,* vol. 89, pp. 29–51.

Chen J. (2018) Interpreting economic diversity as the presence of multiple specializations (RRI Working Paper 2018-02), Morgantown, WV: West Virginia University.

Delgado M., Bryden R., Zyontz S. (2014) Categorization of traded and local industries in the US economy (Discussion Paper). Available at: https://clustermapping.us/sites/default/files/files/page/Categorization%20of%20Traded%20and%20Local%20Industries%20in%20the%20US%20Economy.pdf, accessed 31.03.2019.

Delgado M., Porter M.E., Stern S. (2014) Clusters, convergence, and economic performance. *Research Policy,* vol. 43, no 10, pp. 1785–1799.

Delgado M., Porter M.E., Stern S. (2016) Defining clusters of related industries. *Journal of Economic Geography*, vol. 16, no 1, pp. 1–38.

Devereux M., Griffith R., Simpson H. (1999) *The Geographic Distribution of Production Activity in the UK* (IFS Working Paper 26/99), London: Institute for Fiscal Studies.

Ellison G., Glaeser E. (1997) Geographic concentration in US manufacturing industries: A dartboard approach. *The Journal of Political Economy*, vol. 105, no 5, pp. 889–927.

Fracasso A., Marzetti G.V. (2018) Estimating dynamic localization economies: The inadvertent success of the specialization index and the location quotient. *Regional Studies,* vol. 52, pp. 119–132.

Frenken K., van Oort F., Verburg T. (2007) Related variety, unrelated variety and regional economic growth. *Regional Studies,* vol. 41, no 5, pp. 685–697.

Gavrilov A.I. (2002) *Regionalnaya ekonomika i upravlenie* [Regional Economics and Management], Moscow: UNITY-DANA (in Russian).

Gini C. (1936) On the Measure of Concentration with Special Reference to Income and Wealth. *Proceedings of the Cowles Commission Research Conference on Economics and Statistics, July 6–August 8,* Colorado College Publications, General Series, no 208, Colorado Springs, CO: Colorado College, pp. 73–80.

Grillitsch M., Asheim B. (2018) Place-based innovation policy for industrial diversification in regions. *European Planning Studies,* vol. 26, no 8, pp. 1638–1662.

Hallet M. (2000) *Regional Specialisation and Concentration in the EU*, Brussels: European Commission.

Hausmann R., Hidalgo C.A. (2011) The network structure of economic output // Journal of Economic Growth, vol. 16, no 4, pp. 309–342.

Hausmann R., Klinger B. (2006) *Structural transformation and patterns of comparative advantage in the product space* (CID Working paper 128), Cambridge, MA: Harvard University Press.

Hausmann R., Rodrik D. (2003) Economic development as self-discovery. *Journal of Development Economics*, vol. 72, no 2, pp. 603–633.

Hidalgo C.A., Hausmann R. (2009) The building blocks of economic complexity. *Proceedings of the National Academy of Sciences (PNAS),* June 30, 2009, vol. 106, no 26, pp. 10570–10575. Available at: https://doi.org/10.1073/pnas.0900943106, accessed 18.02.2019.

Hidalgo C.A., Klinger B., Barabasi A.-L., Hausmann R. (2007) The product space conditions the development of nations. *Science*, vol. 317, pp. 482–487.

Hoover E.M. (1936) The measurement of industrial localization. *The Review of Economic Statistics*, vol. 18, no 4, pp. 162–171.

Hudson R. (2009) Life on the edge: Navigating the competitive tensions between the 'social' and the 'economic' in the social economy and in its relations to the mainstream. *Journal of Economic Geography,* vol. 9, no 4, pp. 493–510. Available at: https://doi.org/10.1093/jeg/lbp005, accessed 18.02.2019.

Kadochnikov S., Fedyunina A. (2013) *Export Diversification in the Product Space and Regional Growth: Evidence from Russia* (Working Paper in Series: Evolutionary Economic Geography (PEEG) no 1327), Utrecht: Utrecht University.

Ketels C., Protsiv S. (2014) *Methodology and Findings Report for a Cluster Mapping of Related Sectors*, Stockholm: Stockholm School of Economics.

Ketels C., Protsiv S. (2016) *European Cluster Panorama*, Stockholm: Stockholm School of Economics.

Kim S. (1995) Expansion of Markets and the Geographic Distribution of Economic Activities: The Trends in U.S. Regional Manufacturing Structure, 1860–1987. *The Quarterly Journal of Economics*, vol. 110, no 4, pp. 881–907.

Klimanov V.V. (2007) Reformirovanie regionalnykh finansov i strategii razvitiia sub'ektov RF [Reforming Regional Finance and Development Strategies of Subjects of the Russian Federation]. *Biudzhet* [Budget], no 9, pp. 42–45 (in Russian).

Klimenko A.V., Korolev V.A., Dvinskikh D.Yu., Slastikhina I.Yu. (2015) O garmonizatsii dokumentov gosudarstvennogo strategicheskogo planirovaniya [On the harmonization of state strategic planning documents], Moscow: HSE (in Russian).

Kominers S.D. (2008) *Measuring Agglomeration* (Discussion Paper for Harvard Urban and Social Economics Seminar). Available at: http://www.scottkom.com/articles/measure_agglomeration.pdf, accessed 18.02.2019.

Kopczewska K., Churski P., Ochojski A., Polko A. (2017) *Measuring Regional Specialisation: A New Approach*, Cham, Switzerland: Palgrave Macmillan. ISBN 978 3 319 51505 2.

Kovalenko E.G. (2005) *Regionalnaya ekonomika i upravlenie* [Regional Economics and Management], Saint-Petersburg: Piter (in Russian).

Krugman P. (1991) *Geography and Trade,* Cambridge, MA: MIT Press.

Kutsenko E.S., Abashkin V.L., Islankina E.A. (2019) Fokusirovka regional'noi promyshlennoi politiki cherez otraslevuyu spetcializatsiyu [Focusing regional industrial policy via sectorial specialization]. *Voprosy Ekonomiki*, no 5, pp. 65–89 (in Russian).

Kutsenko E.S., Kiselev A.N., Karnaukh A.P. (2011) Opredelenie prioritetnykh napravlenii dlya formirovaniia i razvitiya klasterov malykh i srednikh predpriyatii v regional'noi ekonomike (na primere goroda Moskvy) [Determination of priority areas for the formation and development of clusters of small and medium-sized enterprises in the regional economy (as exemplified by the city of Moscow)]. *Setevoi biznes i klasternye tekhnologii* [Network business and cluster technologies] (eds. V.P. Tretiak, M.Yu. Shereshev), Moscow: HSE, pp. 279–302 (in Russian).

Leksin V.N., Shvetsov A.N. (2012) *Gosudarstvo i regiony. Teoriya i praktika gosudarstvennogo regulirovaniya territorial'nogo razvitiya* [State and regions. Theory and practice of state regulation of territorial development], Moscow: Librokom (in Russian).

Lilien D.M. (1982) Sectoral shifts and cyclical unemployment. *The Journal of Political Economy*, vol. 4, pp. 777–793.

Liubimov I.L., Gvozdeva M.A., Kazakova M.V., Nesterova K.V. (2017) Slozhnost' ekonomiki i vozmozhnost' diversifikatsii eksporta v rossiiskikh regionakh [Economic Complexity of Russian Regions and their Potential to Diversify]. *Journal of the New Economic Association*, no 2 (34), pp. 94–122 (in Russian).

Lu Z., Flegg A.T., Deng X. (2011) Regional specialization: A measure method and the trends in China (MPRA Paper 33867), Munich, Germany: University Library of Munich. Available at: https://mpra.ub.uni-muenchen.de/33867/, accessed 24.02.2019.

Neffke F., Henning M., Boschma R. (2011) How Do Regions Diversify over Time? Industry Relatedness and the Development of New Growth Paths in Regions. *Economic Geography,* vol. 87, no 3, pp. 237–265.

OECD (2012) *Promoting Growth in all Regions,* Paris: OECD.

Ohmae K. (2002) *Triad Power,* New York: Simon and Schuster.

Pavlov K.V., Rastvortseva S.N., Cherepovskaya N.A. (2014) Metodicheskie osnovy identifikatsii potentcialnykh klasterov v regional'noi ekonomike [Methodical bases for the identification of potential clusters in the regional economy]. *Chasopis ekonomichnikh reform* [Bulletin of Economic Reforms], no 1, pp. 129–139 (in Russian).

Pinheiro F.L., Hidalgo C.A., Alshamsi A., Hartmann D., Boschma R. (2018) Shooting High or Low: Do countries benefit from jumping into unrelated activities? (The MIT Media Lab Paper 1801.05352). *arXiv.org,* revised version of March 2018. Available at: https://arxiv.org/abs/1801.05352, accessed 17.04.2019.

Pinkovetskaya Yu.S. (2015) O lokalizatsii okazaniya uslug predprinimatel'skimi strukturami v regionakh [On Localization of Entrepreneurial Units Services in the Regions]. *Ars Administrandi,* no 4, pp. 139–152 (in Russian).

Porter M.E. (2003) The economic performance of regions. *Regional Studies,* vol. 37, pp. 549–578.

Prokopyev E.A. (2015) K voprosu o vybore dannykh dlia opredeleniya spetcializatsii regiona [On the choice of data to determine the specialization of the region]. *Drukerovskii Vestnik* [Drucker Bulletin], no 2, pp. 236–245 (in Russian).

Rodrik D. (2003) *In Search of Prosperity: Analytic Narratives on Economic Growth*, Princeton, NJ: Princeton University Press.

Rothenberg A.D., Bazzi S., Nataraj S., Chari A.V. (2017) *Assessing the Spatial Concentration of Indonesia's Manufacturing Sector: Evidence from Three Decades* (RAND Labor & Population Working Paper), Santa-Monica, CA: RAND Corporation.

Sharma R.K. (2008) *Measuring Economic Diversification in Hawaii*, Honolulu: Government of Hawaii. Available at: http://files.hawaii.gov/dbedt/economic/data_reports/EconDiversification/Economic_Diversification_Report_Final%203-7-08.pdf, accessed 21.04.2019.

Shenoy A. (2018) Regional development through place-based policies: Evidence from a spatial discontinuity. *Journal of Development Economics,* vol. 130, pp. 173–189.

Simachev Y., Kuzyk M., Kuznetsov B., Pogrebnyak E. (2014) Russia Heading Towards a New Technology-Industrial Policy: Exciting Prospects and Fatal Traps. *Foresight-Russia*, vol. 8, no 4, pp. 6–23.

Toffler A. (2006) *Revolutionary Wealth,* New York: Knopf.

Wallerstein I.M. (2015) *The modern world-system: Capitalist agriculture and the origins of the European world-economy in the sixteenth century,* New York: Academic Press.

Zubarevich N.V. (2010) *Regiony Rossii: Neravenstvo, krizis, modernizatsiya* [Regions of Russia: Inequality, Crisis, Modernization], Moscow: Independent Institute for Social Policy (in Russian).

Russian Technograds: The Technological Profiles of the Cities

Ekaterina Streltsova

Senior Research Fellow, Institute for Statistical Studies and Economics of Knowledge (ISSEK), kstreltsova@hse.ru

Gleb Kuzmin

Leading Expert, Institute for Statistical Studies and Economics of Knowledge (ISSEK), gkuzmin@hse.ru

National Research University Higher School of Economics, 20 Myasnitskaya Str., Moscow, 101000, Russian Federation

Abstract

The paper discusses the technological specialization and patent portfolios of the Russian 'technograds' — the cities which are the key actors in contributing to the development of new technologies in the country. A patent analysis used for the study allowed us to identify technological domains where these cities have a significant competitive advantage and high potential for further growth. According to the research-intensity of the domains prevailing in their technological specialization, the technograds might be divided into three categories: oriented towards mostly high technologies (Moscow, St Petersburg, Tomsk), low technologies (Krasnodar, Perm), and those with mixed specialization including both high and low tech (Voronezh, Ufa, Kazan, Novosibirsk, Ekaterinburg, and Samara).

To achieve the aim of the research, a new methodological approach was elaborated upon to analyze patent data for individual cities and other smaller geographical units. As a result, the paper might be of interest not only for practitioners and decision makers on the regional and municipal levels, but also for researchers in the fields of regional economics, economic geography, and economics of science, technology, and innovation.

Keywords: technological specialization; technological development; technological resilience; cities; patent analysis; Russia

Citation: Streltsova E., Kuzmin G. (2019) The Russian Technograds: The Technological Profiles of the Cities. *Foresight and STI Governance*, vol. 13, no 3, pp. 41–49. DOI: 10.17323/2500-2597.2019.3.41.49

In the research literature, large cities are traditionally believed to be the main "growth points" of national economies, as industry, science, and technology development centers [*Boschma et al.*, 2014; *Jacobs*, 1969; *Glaeser et al.*, 1992; *O'hUallachain*, 1999]. Facilitating the emergence of agglomerations serves as an efficient tool for promoting this growth [*Andersson et al.*, 2005] by concentrating resources and creating conditions to encourage the free exchange of ideas between individuals, organizations, and industries which ultimately results in higher innovation activity [*Balland*, 2015a; *Carlino, Kerr*, 2014; *Jacobs*, 1969; 1984; *Jaffe et al.*, 1993]. Due to their important role, large cities inevitably command the attention of researchers specializing in a wide range of disciplines, including spatial and regional economics, economic geography, urbanistics, science, technology, and innovation economics, and so on. Apart from purely theoretical issues, these disciplines also deal with applied objectives, among other things, they analyze modern agglomerations' technological specialization and potential.

Major Russian cities certainly make a large contribution to the country's technological development. They are where most new technologies are developed, as evidenced by patent statistics. In 2017 about a third of all patent applications for inventions filed in Russia were filed in two cities, Moscow (5,500) and St. Petersburg (1,600) [Rospatent, 2018]. Meanwhile, the capital (and other) cities' technological specializations (i.e. priority areas for the development of new technologies that focus on the domestic or global market) remains poorly researched in the Russian literature. A possible reason is the lack or insufficient availability of the required data: relevant statistics are aggregated only at the regional level, while other data sources (such as patent databases) frequently have only national-level figures (by inventors' and applicants' country).

Our paper aims to fill a gap by presenting the results of analyzing the technological specialization of Russian "technocities", or "technograds", which are the national leaders in new technology development. This is an important and very practical research objective as it would help not only identify the cities' current thematic priorities and potential but also predict future technology development paths and assess their vulnerability in the event of a crisis. The importance of this work is confirmed by various studies on assessing the impact of specialization upon cities' technological diversification and the growth of their innovative activity.

Cities' Technological Specializations and Sustainability

Technological specialization is analyzed at different levels: for particular organization types [*Dachs et al.*, 2007; *Pattel, Pavitt*, 1991], industries [*Ha et al.*, 2015], regions, and countries [*Archibugi, Pianta*, 1992; *Ejermo*, 2005; *Pianta, Meliciani*, 1996]. However, at the level of cities, such studies are conducted much less often. For example, one of the best-known works in this field [*Cortright, Mayer*, 2001] presents an evaluation of the specializations of 14 US cities that are considered high technology development centers. Having analyzed the employment, patenting activity, and venture capital flows, the authors discovered that despite the cities' common focus on promoting high-tech industries, each of them has a particular and very narrow specialization. For example, developers in Atlanta specialize in databases, in Boston – computer technologies, medical equipment, and software, in Denver — data storage technologies and equipment, telecommunication software, and other areas. The dynamics of US cities' specialization and the different paths of their technological development are also discussed in [*Rigby*, 2015; *Kogler et al.*, 2013]. A few studies of this kind were carried out in other countries too, in particular in Germany [*Vlckova, et al.*, 2018] and China [*Xia, Hu*, 2014].

An attempt at international comparison was made in [*Kogler et al.*, 2018]. The authors compared the patent portfolios of 20 large cities in five countries: China, France, Israel, the Netherlands, and the US. The study revealed significant differences in the agglomerations' technological specializations, including in the same country. According to the authors, their results have significant practical value since they clearly demonstrated that a "one-fits-all" approach cannot be applied to manage cities' technological and innovative development.

Such rapt attention to technological specialization at all levels is due to the latter's potentially high economic importance. Understanding the limits of specialization allows one to identify the competitive advantages of organizations, regions, or countries, along with determining their position in regional, national, or global technology markets [*Giannitsis, Kager*, 2009], and (provided wise and efficient management decisions are made) turn the existing technology profile into a source of advantages. This analysis becomes particularly relevant during economic crises or cost optimization periods, when investment priorities need to be set.

Assessing specialization not only helps one to better understand the available competencies but forecast

future technological development, since the latter is path dependent while its scope is limited by the range of technologies that are being successfully developed in the country, region, or city at present [*Cantwell, Vertova*, 2004; *Strumsky et al.*, 2012]. [*Boschma et al.*, 2014] come to similar conclusions, having analyzed the patenting activity in 366 US cities in 1981-2010. Their study revealed that new technologies that fit into the specialization areas in the city's portfolio are more likely to emerge and successfully develop. And vice versa, technologies completely unrelated to these specialization areas (i.e., those with a low relatedness level)[1] face the risk of gradually fading and disappearing.

Rigby [*Rigby*, 2015] also analyzed the dynamics of various technologies' development in major US agglomerations and their relation to the cities' current technological specialization. He concluded that in most cases the available competencies tend to fall within a limited range of related technologies. Further, these competencies determine future knowledge creation paths. "Core" cities tend to be highly inertial: radical changes in their technological specialization occur rarely, and if they do, the process is likely to be quite slow.

Understanding regions' and cities' specialization can also be useful for predicting the risks of "technological crises", that is, long periods of decline in inventive and, as a consequence, patenting activity caused by various external shocks or internal factors. A number of studies in the field of regional and urban technological resilience (e.g., [*Balland, et al.*, 2015b; *Boschma*, 2015]) showed that cities where technological "despecialization" is taking place, those that develop a whole range of technologies unrelated to each other, are less likely to experience technological crises, tend to recover from them faster, and on the whole perform "technological updates" more efficiently. On the contrary, cities with a narrow specialization tend to experience more pronounced periods of technological decline (with a deeper drop in patenting activity level), which happen more often and last longer.

Thus, the results of previous studies indicate that assessing Russian cities' technological portfolios and identifying priority technology areas for them would be quite useful. This will help, firstly, to determine the "core" competencies of the territorial units that currently drive the country's technological development and more accurately describe the Russian technological landscape. Secondly, predicting future technology development paths in Russian urban agglomerations will become possible, along with assessing their potential for diversifying current technology portfolios. Finally, analyzing the specialization structure will help predict the onset of technological crises in Russian technocities and the latter's recovery potential. The novelty of the proposed approach is confirmed by the lack of such studies based on domestic material.

The Empirical Basis and Methodology of the Study

Assessments of technological specialization are traditionally based on analyzing patenting activity and studying its thematic structure and dynamics [*Grilliches*, 1990; *Gokhberg*, 2003]. Patenting is the most common way of protecting the results of innovative activity in most technology areas, which makes patent documentation an important source of information on new technical solutions [*Gokhberg*, 2003]. Patent documents contain detailed information such as the inventor and patent holder, the country and the patent office, the date of filing the application, and the actual issuing of patent. Patent data is a valuable empirical material which allows one to accomplish numerous research objectives. In particular, each such document specifies the technology groups in which the patented object belongs [*Fleming, Sorenson*, 2001]. In most countries including Russia, the International Patent Classification (IPC)[2] is used for these purposes, whose codes, along with alternative classifications' identifiers, allow one to assess the thematic structure of patenting activity and the rate of technological development. Our distribution of patent documents by specialization area is based on the Technology Concordance Table [*Schmoch*, 2008] which serves as a tool for comparing the IPC with 35 technology areas including computer technology and digital communications, pharmaceuticals and biotechnologies, microstructural and nanotechnologies, and so on.

Though patent analysis procedures on the whole are standardized and well-known, measuring cities' patenting activity and technological specialization remains a very challenging task. The existing open and commercial patent databases are not sufficient for an unbiased and detailed analysis of the aforementioned territorial units[3]. So, for the purposes of our study a method for working with patent documentation was

[1] In this context relatedness is measured in terms of the International Patent Classification codes. See [*Rigby*, 2015] for a patent and citation analysis conducted specifically for these purposes.

[2] Access mode: http://www1.fips.ru/wps/portal/IPC/IPC2016_extended_XML/, last accessed on: 14.06.2019.

[3] The only exception is the US where residents' patent applications and patents are reflected in certain commercial databases (e.g. Orbit) which have search-by-state functionality. However, even they have serious technical drawbacks.

Table 1. **Algorithm for Building the Empirical Basis of the Study and Steps Taken during the Process**

Stage	Steps Undertaken
Searching for, and exporting all patent applications for inventions filed in Russia by residents *	Due to the technical limitations of the open RF Registry of Inventions** (the key source of data for our analysis), the objective was accomplished using the PatStat Global database which aggregates data from most of the world's patent offices including the largest ones, such as the US Patent and Trademark Office (USPTO), the European Patent Office (EPO), and the Japan Patent Office (JPO). The period between 2008-2016 was chosen for analysis***, which allowed us to assess emerging trends and avoid random short-term patenting activity fluctuations. A total of 180,000 patent applications were downloaded into our own PostgreSQL-based database.
Building a registry of applicants	Building a list of unique names of organizations (for legal entities) and personal names (for individuals) by exporting data from relevant fields of the downloaded patent applications. After applying logical control and removing erroneous lines, the registry contained 55,000 units. To make the results unbiased, two applicants (individuals) were excluded from the registry because of their unprecedently high patent activity values which distorted the picture not only for a particular city but also for the whole country.
Automated search for applicants' addresses in the RF Registry of Inventions	For each unique applicant in the registry, a search was made for the single application linked to the document number (or a random one if there were several); then the address indicated in the document was added into our own database and applied to all applications filed by the applicant. This approach is potentially fraught with certain limitations: firstly, it links all applications by the applicant to a single place of residence (registration), though it may have changed (e.g., in the case that the applicant moved); secondly, it automatically considers the mailing address indicated in the patent application as the applicant's (as opposed to, e.g., the patent attorney or the organization providing such services); finally, thirdly, it ignores the possibility that applicants living in different regions may have exactly the same name. However, the risk of error remains quite low: the selective data control procedures did not reveal any such cases.
Breaking down patent applications by city	The automatic processing of postal codes indicated in the address field of the document allowed us to link each patent application to a specific city. Accordingly, applications filed by applicants residing in the territories now incorporated into New Moscow before 2016 were not linked to the capital city: though the administrative boundaries were changed in 2011-2012, the postal codes were updated only in 2016.

Notes:

* Due to technical difficulties with obtaining relevant data, patent applications filed by Russian applicants abroad were not taken into account. However, since the share of such applications over the past five years has averaged at 14% and their thematic structure generally matched the structure of applications filed in Russia, their exclusion from the sample does not significantly affect the results of the analysis.

** It was not possible to search for documents by applicant status (resident/non-resident) or divide them by technology area; restrictions on downloading, etc.

*** A 10-year period was initially considered (2008-2017), but it has turned out that data for 2017 was included in the database we have been using only partially (a significant time lag in updating the data is a common feature, and limitation, of all databases containing primary patent information). As a result, it was decided to shorten the period by limiting it to 2016. Among other things this allowed us to calculate indicators for equal three-year periods. The practice of evaluating the averages calculated for 2-3 years is generally accepted and guarantees the objectivity of conclusions since it eliminates the effect of patent activity outliers in certain years.

Source: composed by the authors.

designed, which allowed us to overcome the existing technical limitations.

At the first (preparatory) stage we created the empirical basis for the study in line with the algorithm presented in Table 1: a registry of patent applications for inventions filed in Russia by residents and grouped by the city of their residence, technology area, and year of filing. Next, the cities were ranked by the number of domestic applications filed in 2008–2016. For high-ranking cities, the following key indicators were calculated:

- Total number of applications for inventions filed in Russia (by year);
- Average annual growth rate;
- Shares of each of the 35 technology areas in the total number of applications for inventions filed by residents in the city (technology weight);
- The city's share in the total number of applications for inventions filed in Russia in each of the 35 technology areas (city weight);
- Concentration indices and, calculated as sums of weights of 5 and 10 largest technology areas, respectively, in the city's patent portfolio, which measure its specialization level (or, conversely, diversification);
- Technological specialization index (TSI) which serves as a conventional metric for accomplishing our objective[4].

The TSI is calculated by comparing the structure of patent applications for inventions filed by residents in a specific city with the general structure of applications filed in Russia by residents. We have only considered the areas with a TSI value higher than 1.1 as cities' technological specialization areas, those represented in cities' patenting activity structure much better than the national average. The main results of our analysis, including descriptions of Russian technocities' technology portfolios and specialization, are presented below.

Results of the Study

Moscow and, far behind it, St. Petersburg were the expected leaders in the ranking of Russian cities by the number of patent applications filed in 2008–2016. Another nine agglomerations (Voronezh, Ufa, Kazan,

[4] See [*Gokhberg*, 2003; *Khramova et al.*, 2013] for more about the TSI and its interpretation.

Novosibirsk, Yekaterinburg, Krasnodar, Perm, Samara, and Tomsk) made a quite homogeneous group, significantly behind the leaders but ahead of the second ten cities. It is the leaders identified in the course of this study that we call "technocities" to emphasize the importance of their contribution to the country's technological development: technocities account for more than half of all patent applications for inventions filed by residents in Russia.

Not all technocities are among the largest Russian urban areas. For example, according to Rosstat, Voronezh, Ufa, Krasnodar, and Perm are in the second ten cities in terms of population, while Tomsk is even in 28th place. On the other hand, Nizhny Novgorod, Chelyabinsk, Omsk, and Rostov-on-Don do belong in the ten largest cities in Russia, but they did not make it into the group of patenting activity leaders. However, the existing statistical limitations do not allow one to analyze the correlation between cities' patenting activity and their R&D potential (in terms of expenditures, personnel, etc.). Still, the simplest comparison of the number of patented inventions with the size of the population shows that cities manage their resources differently.

On the whole, our results coincide with the conclusions of other studies in that the majority of inventions are created in large urban agglomerations, though certain small towns also have a chance to succeed [*O'hUallachain*, 1999]. An important factor is having a successful university or a federal-level R&D center.

The group of leaders practically did not change over the course of ten years, indicating no patenting activity peaks in other regions and confirming the stable status-quo on the Russian IP market.

"Core" Technology Cities: Specialization vs. Diversification

In the first, theoretical section of the paper we noted that the broader the city's technological specialization area, the higher its potential for developing new technologies and for post-crisis recovery. Our analysis indicates that in these terms, two Russian technocities, Moscow and Novosibirsk, have the highest potential, due to their diversified technology portfolios (Figure 1).

In the capital, the five largest technology areas account only for about a third of all patented inventions. The highest concentration indices are noted in Perm (51.6%), Tomsk (53.1%), and Krasnodar (61.1%), indicating the clear prevalence of a narrow range of technology areas in their portfolios. Furthermore,

Figure 1. **The Dynamics of Technocities' Concentration Index (C_5)**

Source: composed by the authors.

Krasnodar's index significantly increased in 2008-2016, contrary to the diversification trend that is common for Russian technocities.

Technocities' Technological Specialization Areas

The main results are presented in Table 2. Technocities' technological specialization areas are marked in red. Reading the table horizontally, you can see the cities with potential to develop certain technologies. Reading the table by column, you can get an idea of the cities' technological portfolios and the areas of their current specialization.

Our analysis allows us to break technocities down into three groups, on the basis of the characteristics of the technology areas they specialize in[5]. The first group comprises cities primarily focused on innovative technology areas, with high technologies dominating their portfolios. We included Moscow, St. Petersburg, and Tomsk in this group.

Moscow's technological specialization includes several information and communication technology areas. The metropolitan region is a key developer of new information technologies, home to domestic IT companies actively patenting their inventions in Russia and abroad, such as Kaspersky Lab, Yandex, and ABBYY. In the computer technology field, Moscow accounts for about half of all patent applications filed by residents in Russia in 2014–2016. Other high-tech specialization areas in Moscow include biotechnology and micro-

[4] The International Patent Classification (IPC) and OKVED provided the methodological basis for the suggested typology of technocities [*Van Looy et al.*, 2014] along with the classification of economic activities [*Galindo-Rueda, Verger*, 2016].

Table 2. **Technocities' Technological Specialization Areas: 2014–2016**

		Moscow	St. Petersburg	Voronezh	Ufa	Kazan	Novosibirsk	Yekaterinburg	Krasnodar	Perm	Samara	Tomsk
Electrical engineering												
1	Electrical equipment, equipment for the generation, transmission, and distribution of electricity	*	*		*		1.50	1.63	*		1.14	2.27
2	Audio-visual technologies	1.15	1.45					1.30				
3	Telecommunication		1.67	2.37								1.98
4	Digital communication	1.16	3.42								1.21	
5	Basic communication systems		1.30	3.86								
6	Computer technologies	1.85	1.52									
7	Management information technologies	1.73	1.16			2.71		1.85			1.15	
8	Semiconductors	1.44	1.22	1.23			1.67					1.55
Instruments												
9	Optics		1.63			2.59	4.09					
10	Measurement technologies	*	1.77	*	*	*	1.43	*	*	*	*	1.73
11	Biomaterial analysis							1.19		2.66	1.27	2.33
12	Instrumentation		1.33			1.27					1.12	
13	Medical technologies	1.12	1.31	*	1.10	1.11	*	1.26	*	*	1.78	1.60
Chemical engineering												
14	Fine and organic chemistry				6.44	1.32	1.96	1.14	1.35	2.35		1.24
15	Biotechnology	1.87					2.18					
16	Pharmaceuticals	1.10	*		1.94	1.11	1.25	*	*	*	*	1.71
17	Macromolecular chemistry, polymers	1.11		1.18	1.32	2.02						1.43
18	Food chemistry	*		4.01				*	6.21			
19	Basic materials chemistry	*			3.04	2.92			1.72	1.41		1.13
20	Materials, metallurgy	*	*			*	*	2.66		1.58	1.43	1.67
21	Surface treatment, coating			1.14	1.53	1.28	1.14	1.39		1.22		
22	Microstructural and nanotechnologies	1.16					2.01	1.69		1.32		1.57
23	Chemical engineering	*	*	*	1.87	*	1.96	*	1.95			1.15
24	Environmental protection technologies				1.96							
Mechanical engineering												
25	Processing		1.52	1.46				1.65		1.26		
26	Machine tools							1.13			1.34	
27	Engines, pumps and turbines	*	*	1.33	*	1.80		*		2.27	2.07	
28	Paper and textile machines		1.37			1.26				1.47		
29	Other special-purpose machinery	*	*	1.47		*	*		2.07	*	*	
30	Thermal processes and heating devices			2.02	1.29		1.97	1.16				
31	Mechanical components	*			*	*					1.26	
32	Transport	*	1.45			*		*			1.14	
Others												
33	Furniture, games			2.30				3.33		1.78	1.13	
34	Other consumer products	1.65							1.42			
35	Civil construction	*	*	*	1.13	1.42	*	*		2.67	1.16	*

Note: cities' technological specialisation areas (ITS) are marked in red; other major technology areas (whose share in the total number of patent applications filed in the city exceeds the national average) are marked with asterisks.

Source: composed by the authors.

structural and nanotechnologies. In the first case, the city accounts for almost 50% of all patent applications and in the second for about a third of them. Over the past decade, areas such as semiconductors, materials chemistry, surface treatment, and coating technologies have also been actively developing in the capital city. On the whole, the technocity of Moscow's technology portfolio is highly diversified and includes impressive groundwork results in many industries, which increases the likelihood of new technologies' emergence.

St. Petersburg specializes in developing electrical engineering technologies almost across their entire range, including audio-visual, telecommunication, and computer technology. In terms of quantitative indicators, the best results so far have been achieved in digital communication (26% of all patent applications filed by residents in Russia in 2014–2016). The city's technological specialization also traditionally includes optics, instrumentation, medical technologies, and biotechnology.

Tomsk displays an appreciable lead in measurement technologies (the largest area in the city's patent portfolio), fine and organic chemistry, pharmaceuticals, microstructural and nanotechnologies. Notably, none of the technologies in the last two classification groups (Mechanical engineering and Other) is present.

The second group of technocities comprises cities mostly focused on developing less research-intensive, or low technologies: Krasnodar and Perm.

Krasnodar specializes in a range of chemical areas such as food chemistry, materials chemistry, chemical engineering, and fine and organic chemistry. In some of them, the city displays very impressive performance. For example, Krasnodar accounts for over 13% of food chemistry-related patent applications filed by residents in Russia in 2014–2016. More than a quarter of all inventions patented by applicants from this city belong in this field. The "Other special-purpose machinery" group also has a strong position in the city's portfolio (it mainly comprises agricultural machinery).

Perm's technological specialization includes a number of areas related to chemical and mechanical engineering including engines, pumps, turbines, materials, metallurgy, machinery for making paper and textiles, and basic materials chemistry. In the first one, applicants from Perm filed almost 4% of all Russian patent applications for inventions in 2014–2016 — a significant contribution, given that the city's average share in all technology areas does not exceed 1.5%. Certain areas traditionally included in the high-technology group are also being developed in Perm, such as fine and organic chemistry, microstructural and nanotechnologies. Nanotechnology only recently became part of the city's technological specialization (in 2014–2016). Previously there was either no patenting activity in this area at all (in 2008–2010), or it was insignificant (in 2011–2013). Perm can be considered a borderline case: the more traditional areas which obviously dominate the current technological specialization structure with time may be replaced by a number of new areas whose high growth rate could "shake up" the existing model.

Finally, the third and most numerous group comprises technocities specializing in a whole range of areas, regardless of their technological level or research intensity. We included Voronezh, Ufa, Kazan, Novosibirsk, Yekaterinburg, and Samara in this group.

Voronezh specializes in developing a wide range of technologies from digital communications to special-purpose machinery. The mix of technology areas where the city's contribution to Russian applicants' patenting activity is most apparent also highlights the diversified nature of its technological development. Food chemistry is the leader here (Voronezh's share is 11.5%, while the city's average in all areas is 3.1%), along with basic communication processes (11.0%). Several high technology areas fell out of the city's technological specialization during the period under consideration, among them audio-visual and digital communication technologies.

Ufa is clearly focused on developing chemical technologies: they account for half of all patent applications filed by applicants from this city in Russia, with numerous relevant areas falling within the scope of its specialization. Ufa makes a special contribution to the development of fine and organic chemistry on the national scale: more than 14% of patent applications (while the city's overall share is just about 2.5%). This is mainly due to the activities of a key developer in this field, the Institute of Petrochemistry and Catalysis of the RAS.

Kazan's specialization includes the development of new semiconductors and polymers, fine and organic chemical technologies, and basic materials chemistry. Optics has a special position in the technological portfolio of *Novosibirsk*: about 9% of domestic inventions in this field in 2014–2016 were made in this city. Novosibirsk's potential in biotechnology is also noteworthy: in technocities' ranking by the number of patent applications filed in Russia in this field during the past decade, the city has invariably remained third (after Moscow and St. Petersburg). The credit largely goes to the Institute of Chemical Biology and Fundamental Medicine of the SB RAS, the city's most active applicant in this area.

The calculated concentration indices indicate a gradual diversification of *Yekaterinburg's* and *Samara's* technological portfolios over the last decade. As a result, to-

day both these technocities specialize in developing a whole range of new areas, high- and low-tech alike. The first segment comprises management IT, biomaterial analysis, medical technologies for Yekaterinburg, plus audio-visual, microstructural and nanotechnologies, while the second comprises materials, metallurgy, furniture, and games.

Conclusion

Large cities act as drivers of technological development in Russia and most countries of the world. Due to the geographical concentration and access to resources (financial, human, and technical), new technologies are developed most proficiently there, which among other things is expressed in patenting activity. Over the last decade the group of technology leaders in the country remained virtually unchanged. Such stability on the one hand may indicate that other players on the domestic technology market made no significant breakthroughs, but on the other confirm the high potential and sustainability of leading agglomerations. The latter's strategies and competencies are highly diversified, which is quite predictable given the differences in their location, access to natural resources, well-being, and the presence of major R&D and educational centers. The practical importance of our study is not only in providing an empirical confirmation of this intuitively reliable hypothesis, but also in a comprehensive assessment of the patent portfolios and technological specializations of Russian technocities, which may help governments make decisions and promote technological development at the regional and even municipal levels.

The study also allowed us to identify the areas all Russian technocities are involved in, which thus can be considered as a reliable basis for the further development of the country's technological potential. In particular, such a field is measurement technologies (St. Petersburg, Novosibirsk, and Tomsk specialize in them, but all technocities are actively involved as well: in almost all of them this is one the largest areas in terms of the number of patent applications). Thanks to the innovative productivity of developers from various regions, Russia currently is the 8th in the world in terms of patenting activity in the measurement technologies area, while in the overall patenting ranking it holds 11th place[6]. A similar situation is observed in medical technologies, civil engineering, and, in recent years, in pharmaceuticals.

Despite the limitations of the study mentioned in the introductory part of the paper, it paves the way for further analysis of cities' technological development, offering a methodology for processing patent data at the level of specific administrative territorial units. In this regard, a comprehensive study of particular technologies' development in major cities appears to be a promising research area. Further research will contribute not only to identifying technocities' sustainable competencies, but also discovering emerging trends and weak signals which can affect cities' future technological development paths.

The paper was written in the scope of research on the topic "Approaches to building statistical indicators of current state and dynamics of scientific and technological development" conducted by the HSE in 2019.

References

Gokhberg L. (2003) *Statistika nauki* [Statistics of Science], Moscow: TEIS.

Rospatent (2018) *Ezhegodnyi otchet o deyatel'nosti* [Annual Report 2017], Moscow: Rospatent (in Russian).

Andersson R., Quigley J.M., Wilhelmsson M. (2005) Agglomeration and the special distribution of creativity. *Regional Science*, vol. 84, no 3, pp. 445–464.

Archibugi D., Pianta M. (1992) Specialization and size of technological activities in industrial countries: The analysis of patent data. *Research Policy*, vol. 21, no 1, pp. 79–93.

Balland P.-A., Boschma R., Frenken K. (2015a) Proximity and Innovation: From Statics to Dynamics. *Regional Studies*, vol. 49, no 6, pp. 907–920.

Balland P.-A., Rigby D., Boschma R. (2015b) The technological resilience of US cities. *Cambridge Journal of Regions, Economy and Society*, vol. 9, pp. 167–184.

Boschma R. (2015) Towards an Evolutionary Perspective on Regional Resilience. *Regional Studies*, vol. 49, no 5, pp. 733–751.

Boschma R., Balland P.-A., Kogler D.F. (2014) Relatedness and technological change in cities: The rise and fall of technological knowledge in US metropolitan areas from 1981 to 2010. *Industrial and Corporate Change*, vol. 24, no 1, pp. 223–250.

Cantwell J., Vertova G. (2004) Historical evolution of technological diversification. *Research Policy*, vol. 33, pp. 511–529.

[6] The authors' calculations based on the WIPO data for 2017 (see WIPO IP Statistics Data Center, access mode: https://www3.wipo.int/ipstats/index.htm?tab=patent, last accessed on: 20.11.2018).

Carlino G., Kerr W. (2014) *Agglomeration and Innovation* (Working Paper 15-007), Boston, MA: Harvard Business School. Available at: http://real.wharton.upenn.edu/~duranton/Duranton_Papers/Handbook/Agglomeration_and_innovation.pdf, accessed 15.11.2018.

Cortright J., Mayer H. (2001) *High Tech Specialization: A Comparison of High Technology Centers*. Washington, D.C.: The Brookings Institution, Center on Urban and Metropolitan Policy. Available at: https://www.brookings.edu/wp-content/uploads/2016/06/specialization.pdf, accessed15.11.2018.

Dachs B., Mahlich J., Zahradnik G. (2007) The Technological Competencies of Korea's Firms: A Patent Analysis. *Innovation and Technology in Korea: Challenges of a Newly Advanced Economy* (eds. J. Mahlich, W. Pascha), Heidelberg, NY: Physica-Verlag, pp. 127–146.

Ejermo O. (2005) Technological diversity and Jacob's externality hypothesis revisited. *Growth and Change*, vol. 36, no 2, pp. 167–195.

Fleming L., Sorenson O. (2001) Technology as a complex adaptive system: Evidence from patent data. *Research Policy*, vol. 30, pp. 117–132.

Galindo-Rueda F., Verger F. (2016) *OECD Taxonomy of Economic Activities Based on R&D Intensity* (OECD Science, Technology and Industry Working Paper 2016/04), Paris: OECD.

Giannitsis T., Kager M. (2009) *Technology and Specialization: Dilemmas, Options, Risks?,* Brussels: European Commission.

Glaeser E., Kallal H., Scheinkman J., Shleifer A. (1992) Growth in Cities. *The Journal of Political Economy*, vol. 100, no 6, pp. 1126–1152.

Grilliches Z. (1990) Patent statistics as economic indicators: A survey. *Journal of Economic Literature*, vol. 28, pp. 1661–1707.

Ha S.H., Liu W., Cho H., Kim S.H. (2015) Technological advances in the fuel cell vehicle: Patent portfolio management. *Technological Forecasting and Social Change*, vol. 100, pp. 277–289.

Jacobs J. (1969) *The Economy of Cities*, New York: Random House.

Jacobs J. (1984) *Cities and the Wealth of Nations: Principles of Economic Life*, New York: Random House.

Jaffe A., Trajtenberg M., Henderson R. (1993) Geographical localization of knowledge spillovers as evidenced by patent citations. *The Quarterly Journal of Economics*, vol. 108, no 3, pp. 577–598.

Khramova E., Meissner D., Sagieva G. (2013) *Statistical patent analysis indicators as a means of determining country technological specialization* (HSE Working Paper. Series: Science, Technology and Innovation, WP BRP 09/STI/2013), Moscow: HSE. Available at: https://www.hse.ru/data/2013/04/10/1297571825/09STI2013.pdf, accessed10.11.2018.

Kogler D.F., Heimeriks G., Leydesdorff L. (2018) Patent portfolio analysis of cities: Statistics and maps of technological inventiveness. *European Planning Studies*, vol. 26, no 11, pp. 2256–2278.

Kogler D.F., Rigby D., Tucker I. (2013) Mapping Knowledge Space and Technological Relatedness in US Cities. *European Planning Studies*, vol. 21, no 9, pp. 1374–1391.

O'hUallachain B. (1999) Patent places: Size matters. *Journal of Regional Science*, vol. 39, no 4, pp. 613–636.

Patel P., Pavitt K. (1997) The technological competencies in the world's largest firms: Complex and path dependent, but not too much variety. *Research Policy*, vol. 26, pp. 141–156.

Pianta M., Meliciani V. (1996) Technological specialization and economic performance in OECD countries. *Technology Analysis & Strategic Management*, vol. 8, no 2, pp. 157–174.

Rigby D. (2015) Technological relatedness and knowledge space: Entry and exit of US cities from patent classes. *Regional Studies*, vol. 29, no 11, pp. 1922–1937.

Schmoch U. (2008*) Concept of a technology classification for country comparisons. Final Report to the World Intellectual Property Organization (WIPO)*, Karlsruhe: Fraunhofer Institute for Systems and Innovation Research.

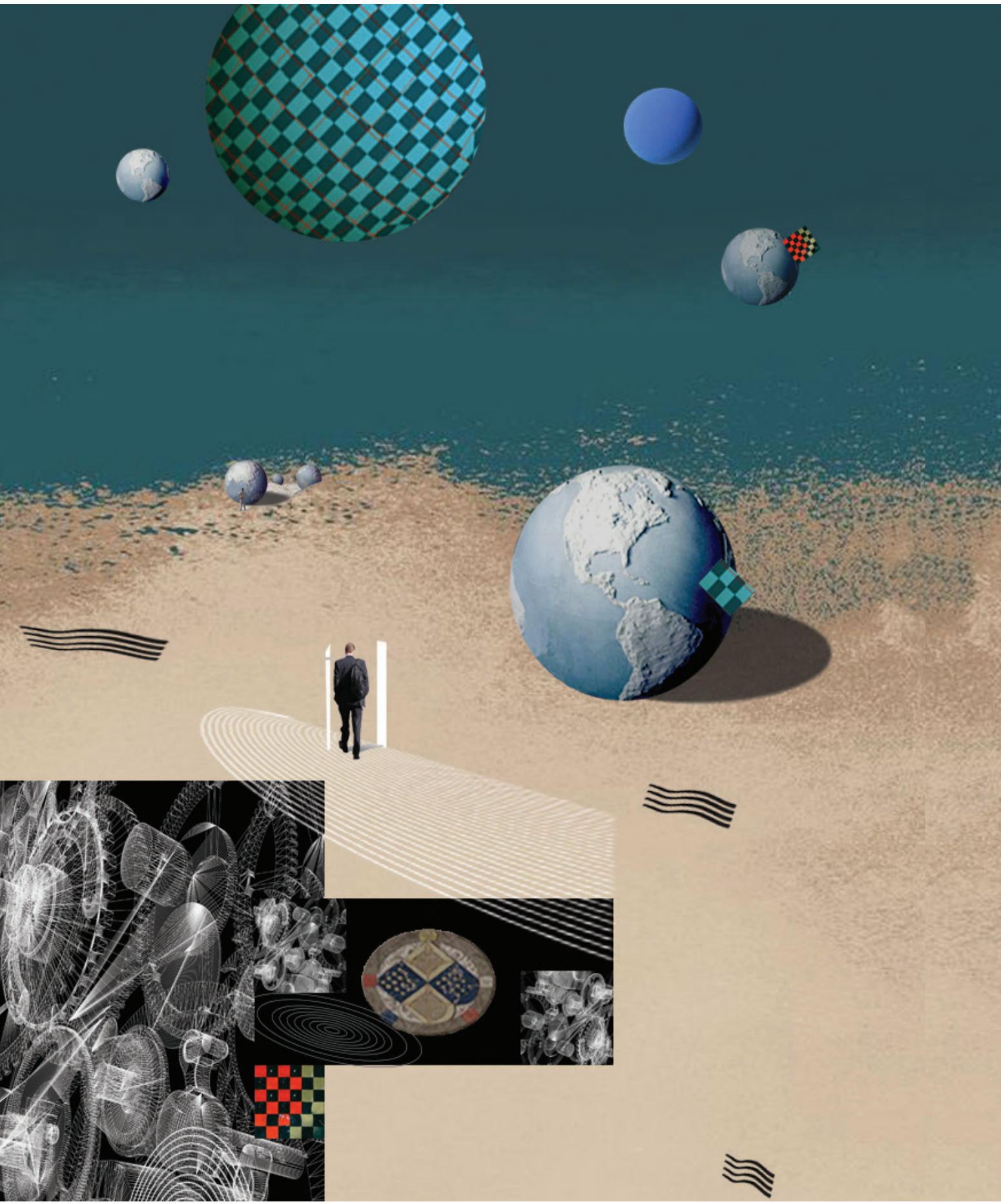
Strumsky D., Lobo J., van der Leeuw S. (2012) Using patent technology codes to study technological change. *Economics of Innovation and New Technology*, vol. 21, no 3, pp. 267–286.

van Looy B., Vereyen C., Schmoch U. (2014) *Patent Statistics: Concordance IPC V8 P. NACE Rev.2*, Paris: Eurostat.

Vlckova J., Kasprikova N., Vlckova M. (2018) Technological relatedness, knowledge space and smart specialization: The case of Germany. *Moravian Geographical Reports*, vol. 26, no 2, pp. 95–108.

Xia L., Hu J.-Y. (2014) Analysis of the relationship between specialization and innovation of technology in Chinese cities. *Applied Mechanics and Materials*, vol. 522–524, pp. 1577–1580.

SCIENCE



Patterns of Investing into Business R&D in South Africa

Neo Molotja
Senior Research Specialist, Centre for Science, Technology and Innovation Indicators (CeSTII), nmolotja@hsrc.ac.za

Saahier Parker
Senior Research Specialist, Research Use and Impact Assessment (RIA), sparker@hsrc.ac.za

Precious Mudavanhu
Statistician, CeSTII, pmudavanhu@hsrc.ac.za

Human Sciences Research Council (HSRC), 116-118 Buitengracht Street, Cape Town, 8001, South Africa

Abstract

The paper explores the patterns of business investment in research and development (R&D) using evidence from companies in South Africa in comparison with indicators for a number of other countries. This study covers the period 2006–2016, the studied companies were grouped by the amount of R&D expenditures (BERD), the number of reports on research performance for the first and last years of monitoring. A typical characteristic of private sector R&D activities is the uneven distribution of resources in space and time. The major financial and other assets are concentrated within few large companies from a limited number of industries, while the majority of small and medium-sized enterprises invest in R&D projects only sporadically, for a period of no more than two consequential years. Firms that perform R&D for longer periods invest in R&D incrementally and remain more persistent than enterprises performing less R&D for shorter time periods. In view of the common nature of a number of several patterns, these observations suggest different approaches to policies supporting R&D performance in the business sector not only in South Africa, but also in other countries.

Keywords: R&D performance; BERD; concentration; persistence; volatility; business sector; policy; South Africa

Citation: Molotja N., Parker S., Mudavanhu P. (2019) Patterns of Investing into Business R&D in South Africa. *Foresight and STI Governance*, vol. 13, no 3, pp. 51–60. DOI: 10.17323/2500-2597.2019.3.51.60

Introduction

R&D performance is increasing worldwide and more so in the developed countries where R&D is driven mostly by the business sector. The increasing dependence on service-orientated sectors across the globe, the rise of knowledge-driven industries, and the emergence of knowledge economies over the preceding decades has radically transformed the way business and economies operate and support growth within countries. The influence of these incrementally transformative shifts in the nature of production has similarly influenced the performance of R&D. These shifts have also influenced R&D policy within these countries to account for the rapid changes over the last few years.

The impacts of these changes have however been unequal and have not been equally transformative within the *Global South*. This is particularly evident within developing countries, where most R&D is performed in the public sector and funded by the government. In developed and developing countries however, R&D performance in the business sector is concentrated in a few industries and at a relatively small number of firms. In addition to concentration as a characteristic of R&D performance, a significant number of firms are persistent in their performance of R&D year after year while a larger number exhibit volatility, appearing for one or two years only and spending little on R&D performance.

Large firms are more likely to be performers of R&D than the small and medium size enterprises (SMEs). There are several reasons for this: large firms have the financial and human resources to pursue large multi-year R&D projects, which may take years to yield commercial outcomes. Furthermore, they have the capacity to protect their intellectual property. They possess the infrastructure needed to support the projects and they are able to employ and retain experienced personnel with relevant skills [*Antonelli et al.,* 2013]. This is in contrast with SMEs where many of these conditions are not always possible to meet or initiate.

It has been argued that concentration is a result of smaller firms abandoning their R&D activities [*Rammer, Schubert,* 2016]. Rammer and Schubert further argue that their research shows the decline in the number of small R&D performers is not a result of economic downturns. The number of smaller firms performing R&D continued to decline after the 2008–2010 economic recession while the larger persistent R&D performers continued R&D efforts during and following this period. The point is that persistence and concentration cannot be explained by business cycles, both are a permanent phenomena. However, it also known that business enterprise R&D (BERD) is affected by economic conditions, that is the availability of funding and aggregate demand [OECD, 2017]. This may further be influenced by the very nature of R&D, as defined in the *Frascati Manual* [OECD, 2015]. This definition maintains that the nature of R&D must include a level of uncertainty, novelty as well as systematic approaches toward the creative work undertaken. The uncertainty aspect often limits the scope and willingness to initiate R&D projects, when the commitment of time, human, and financial investment required to achieve these project goals is considered.

The concentration and persistence of R&D have value in terms of policy and economic contributions. Path-dependency, the likelihood that a firm will repeat its R&D activities given its past performances, is an example [*Máñez et al.*, 2010]. Management capacity and the performance of R&D increase through learning by doing over time. Learning from R&D performance may influence the R&D persistence of firms [*Máñez et al.*, 2010; *Rosa, Mohnen,* 2013] and their absorptive capacity [*Cohen, Levinthal,* 2006].

Performing R&D infrequently leaves the firm in a far less capable state to resume R&D operations at a later stage. This is a result of the technologies and facilities for R&D becoming obsolete, together with the loss of human resources required to perform R&D.

A decision not to perform R&D is not easy to reverse, the firm loses its skills and capabilities to undertake R&D, and market opportunities erode with time [*Rammer, Schubert,* 2016]. Máñez et al. [*Máñez et al.,* 2009] support these arguments that sunk costs make it difficult for firms to re-enter and exit the R&D landscape [*Máñez et al.*, 2009]. Nevertheless, there is still significant volatility where there is a large number of one-off R&D performers and those that abandon their R&D activities after a few years. The reasons may differ from country to country, but the phenomenon is common and may have an impact upon system-wide R&D investment.

This paper draws on the trends of R&D performance of South African firms in the ten-year period of 2006/2007 to 2015/2016. The concentration of R&D performance, persistence in the performance of R&D, volatility of R&D performers, and dominant industries are examined. This approach follows similar work performed elsewhere [*Schellings, Gault,* 2002; *Rammer, Schubert,* 2016]. Based on the empirical evidence, policies for promoting R&D in South Africa are considered. While the paper deals with South African firms, the findings and recommendations may be broadly applicable across the continent and the developing world.

Methodology

The national R&D survey team at the Human Sciences Research Council (HSRC) has developed its in-house database of R&D performers among firms in South Africa over the past 18 years.

This paper uses business sector R&D expenditure data collected in the ten-year period between 2006/2007 and 2015/2016. The firms were divided into six R&D expenditure groups, which are based on the amount of money spent on R&D performance in South Africa. The R&D expenditure groups were created based on either the last year of the appearance of the firm in

Table 1. **R&D Expenditure Groups**

Expenditure Group	ZAR
Massive R&D	40 million or more
Large R&D	20 million – 39 999 999
Medium Upper R&D	10 million – 19 999 999
Medium Lower R&D	5 000 000 – 9 999 999
Small Upper R&D	1 000 000 – 4 999 999
Small Lower R&D	less than 1 000 000

Note: all R&D expenditure in this paper is in current Rands (ZAR).
Source: authors.

the survey or the first year of its appearance (Table 1). Firms were also classified according to the number of times they reported R&D performance in the ten-year period being studied.

Findings

The business sector is the largest performer of R&D in South Africa. Despite its dominance regarding gross domestic expenditure on R&D (GERD), business expenditure on R&D (BERD) declined in nominal terms between 2008/2009 and 2010/2011 and began picking up from 2011/2012 (Figure 1). On the contrary, the ratio of BERD to GERD has been declining since 2009/2010 to below 50.0% and it looks set to approach the 40% mark unless there is an upswing of BERD in the following survey periods. The reasons are many, but the one that stands out for this series is the decline in BERD due to the impact of a policy decision during this period. Other R&D performers that ceased R&D over the same period may have exacerbated the decline.

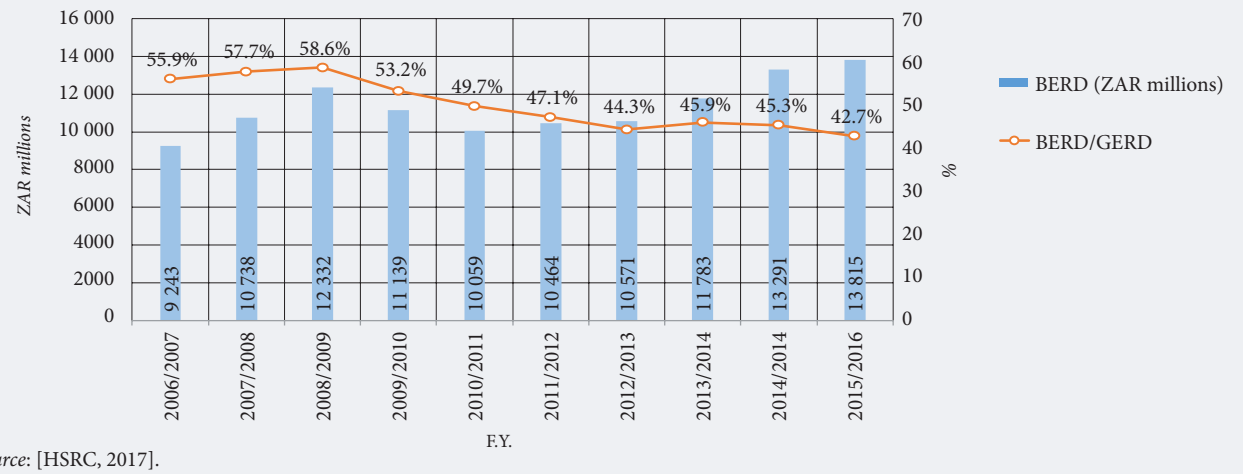
This trend however, is not unique to the South African R&D system nor to developing countries. When reviewing BERD/GERD data from the OECD *Main Science and Technology Indicators* (MSTI) [OECD, 2019], it emerged that a large number of countries exhibit a similar decline in BERD/GERD ratios across the recent reference period. Figure 2 shows that Mexico, Argentina, Greece, and Portugal[1] have recorded general decreases in the BERD/GERD ratio within the ten-year reference period (2006-2015), in which most had a BERD/GERD ratio below 50%. Declining BERD/GERD ratios are key indicators pointing to possible changes in domestic R&D systems. These changes may be related to turbulent economic conditions, declining private investment, changes to the political and policy environment, and minimal Foreign Direct Investment (FDI).

The analysis of the results begins with a review of the distribution of firms, according to expenditure group, in each of the ten years examined in this paper.

Metadata from the National R&D survey series provides information on the total number of firms returning survey questionnaires (containing R&D information) each year across the ten-year reference period (Table 2). The R&D survey on average covers approximately 500 firms, despite larger numbers being requested to participate annually. The impact of the 2008 financial crisis on the number of South African R&D performing firms can be observed within the data in Table 2, however, it appears from 2014/2015 that the number of R&D performing firms are increasing.

The business enterprise sector in South Africa consists of large and small R&D performing firms. The firms represented in the South African survey are not representative of all domestic businesses, but a purposive sample of R&D performing firms within the domestic

Figure 1. **South African BERD and the BERD/GERD Ratio (2006–2016)**



Source: [HSRC, 2017].

[1] The BERD/GERD ratio for Portugal has since increased to 50.5% in 2017 [OECD, 2019].

Table 2. **Number of Firms Present in Annual South African R&D Surveys by R&D Expenditure Groups (2006/2007 – 2015/2016)**

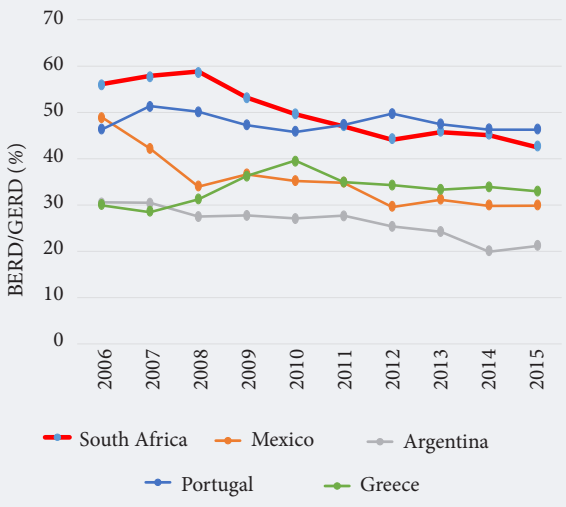
Expenditures (*ZAR millions*)	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	Total
More than 40	53	59	59	58	54	53	53	55	61	60	565
20–40	51	51	51	59	47	50	37	38	36	34	454
10–20	49	59	65	53	47	47	46	52	52	52	522
5–10	63	59	64	60	57	48	58	50	58	54	571
1–5	248	262	282	255	106	114	127	115	152	133	1794
Less than 1	213	233	241	162	64	68	81	68	78	132	1340
Total	677	723	762	647	375	380	402	378	437	465	

Source: [HSRC, 2017].

private sector. This sample consists of R&D performing units whose investment in R&D activities covers a broad range of expenditure values. The segments within these investment profiles have been further disaggregated to best reflect the size and nature of R&D investment across the private sector (see Table 1 above).

Understanding the profiles of R&D performing firms within the South African economy relates not only to the relative size of annual R&D investments but also to the regularity of this investment across a given time period. This relates to the concept of persistence of R&D investment, which is the individual enterprises' continued annual investment in R&D activity as reflected within subsequent R&D survey measures. At the opposite end of this spectrum, is the notion of volatility where firms appear less frequently in annual R&D statistics as a result of less persistent investments or investment strategies as they relate to internal R&D programs [*Rumbelow, Blankley,* 2012]. Understanding R&D persistence and volatility allows researchers and policy makers to devise instruments that will support various actors in any R&D system that will move one toward adopting strategies that advance a strategic advantage that propel knowledge generation, and ensure adequate knowledge transfer and human capital development. Kang et al. (2017) argue that acquiring knowledge consistently through R&D investment across a longer period is more efficient than investing a similar total value in half of the original time period [*Kang et al.,* 2017].

Figure 2. **BERD/GERD Ratio, South Africa and Selected Countries (2006–2015)**



Sources: [OECD, 2019; HSRC, 2017].

Between the concepts of R&D persistence and volatility rests a similar concept of R&D concentration. This relates to a large amount of R&D performance emanating from a relatively small number of R&D performing firms. While there will always be some level of R&D concentration in an economy, at a general level or within particular industrial sectors, the concentration of R&D indicates a large amount of R&D expenditure originating from a small number of firms.

R&D performing firms were classified using the groupings indicated, based on their annual R&D investment profile. As expected, firms investing larger annual R&D budgets contributed significantly more to total BERD, when compared to firms committing to smaller BERD investments. When reviewing the South African data, it is clear that the number of firms investing larger amounts in the performance of R&D represent a smaller portion of the total number of firms surveyed. Figure 3 above demonstrates this finding, wherein 61.0% of total BERD in South Africa across a ten-year period, was invested by only 5.0% of companies that performed R&D within this period.

At the opposite end of Figure 3, it remains clear that the largest number of firms (71.0% in the two smallest classes) contribute a significantly smaller share to total R&D performance (8.0% of funding spent).

This pattern is indicative of highly concentrated of R&D in South Africa and may highlight the need for strategic policies to best address the relative persistence, volatility, and concentration of R&D activity.

Alternatively, the concentration phenomenon can be assessed using the number of firms as illustrated

Table 3. **BERD Concentration by the Largest R&D Performing Units**

Reporting period	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016
Number of observations	677	723	762	647	375	380	398	374	437	403
BERD (ZAR millions)	9243.2	10 738.5	12332	11 139.2	10 059.0	10 464.0	10 570.7	11 782.8	13 291.0	13 815.0
Top 300 (%)	95.9	95.7	95.7	96.1	99.5	99.5	99.4	99.6	99.0	99.4
Top 200 (%)	91.7	91.6	91.9	92.0	96.7	96.9	96.8	97.3	96.5	97.2
Top 100 (%)	79.2	79.3	80.8	79.5	85.9	86.4	87.7	88.9	88.6	89.8
Top 75 (%)	72.7	73.4	75.7	73.5	79.9	80.4	82.6	84.0	83.9	85.6
Top 50 (%)	63.8	64.8	68.0	64.8	71.3	71.9	74.3	76.2	76.5	78.6
Top 25 (%)	48.4	50.3	55.5	50.0	53.9	55.9	59.7	62.3	63.0	64.8
Top 10 (%)	32.7	35.1	42.0	33.5	35.7	37.0	43.3	45.1	46.7	47.4

Source: [HSRC, 2017].

in Table 3. From 2013/2014 to 2015/2016, the top 10 firms made up almost half of BERD. In 2014/2015 and 2015/2016, the top 100 firms contributed 88.6% and 88.9% of BERD, respectively, while the remaining ~10% of BERD per each year was from the rest of the firms, consisting of about 337 firms.

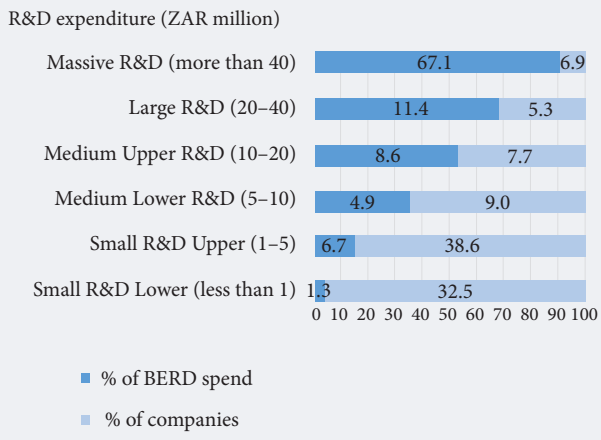
In this regard, it may be difficult to make confident conclusions about the composition of the rest of firms ("the tail"). Although there is no evidence of causality, one can assume though that the rest of the tail is a combination of firms with small R&D expenditures as well as the contribution of small firms that naturally spend less on R&D. The former and the latter may just as well be the firms that quit after one or two years. Similarly, they may well be persistent but contributing little to BERD every survey cycle (see Table 2, number of firms spending less than ZAR 1 million over the ten-year period).

The phenomenon described above is not unique to South Africa. For instance, the OECD STI Scoreboard 2017 indicated that the 50 largest domestic R&D performers account for 40% of BERD in Canada and the United States, 55% in Germany and Japan, and 70% in Denmark and New Zealand. However, the interpretation of the results should take account of the size of the country and number of business R&D performers [OECD, 2017].

South Africa's R&D investment is not only concentrated within a group of large firms; it is also concentrated within particular sectors of the economy. Among the largest business R&D performers (> ZAR 40 million), 73.6% of total expenditure on R&D performance was performed within the financial intermediation, real estate, business services, and manufacturing sectors (Figure 4).

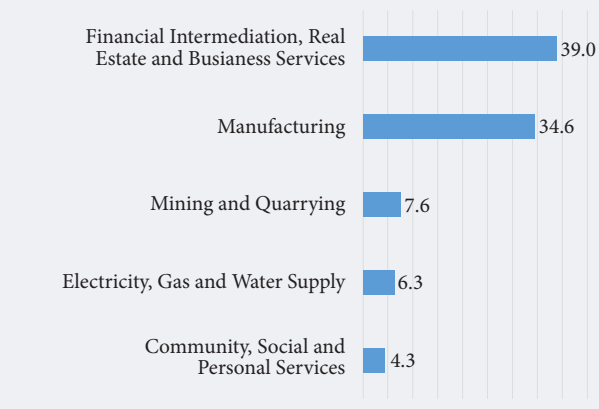
The remaining sectors within this group of R&D actors include the mining and quarrying, electricity, gas, and water supply, and community, social, and personal services sectors. As already discussed, this group of massive R&D performers accounts for 61.0% of total

Figure 3. **Distribution of R&D in South Africa by Groups of Companies** (%)



Source: [HSRC, 2017].

Figure 4. **Concentration of R&D Activity in the South African Private Sector** (%)



Source: [HSRC, 2017].

Table 4. **State-Owned Firms' R&D Investment - Profile**

Group	Average R&D Spendings, ZAR	Year Count
Electricity, Gas and Water Supply	812 966 410	9
Transport, Storage and Communication	421 702 588	8
Manufacturing	322 429 639	7
Agriculture, Hunting, Forestry and Fishing	13 817 443	4

Source: [HSRC, 2017].

business R&D within this period. The five sectors included in the above figure account for 92.0% of these segments' total R&D investment, indicating a highly concentrated focus around the services and manufacturing sectors. This trend is similarly visible in other industrialized economies around the world including the US, the UK, Germany, and multiple others.

The concentration of R&D is further visible through government support and expenditure on the R&D activities of the public business firms, the state-owned enterprises (SOEs). The SOEs are classified and measured along with private sector enterprises in the R&D survey. These firms contribute significantly to numerous classifications of R&D performers, however, in the cohort of massive R&D performers they appear to be highly persistent within this reference period (2006/2007 – 2016/2017). This investment in R&D on an annual basis is aligned with the mandate of SOEs in South Africa, which is geared toward achieving various socioeconomic goals set by government.

Within the reference period, 13 of these SOEs have been present in the R&D survey for four or more years (Table 4). The majority of these SOEs are within the massive R&D performer cohort and had been present in the South African National R&D survey for seven or more years investing an average of ZAR 400 million annually.

How Concentration, Persistence, and Volatility Manifest Themselves in the South African R&D Surveys

The review of the R&D performers within the stipulated ten-year period shows that 1,437 R&D performers participated in the survey and provided information on national R&D statistics. The data shows that the largest portion of firms investing in R&D activity do so for shorter, rather than longer periods.

Table 5 shows the presence of two expenditure categories where the year 1 population (537) exceeds that in year 10 (144). Of the 1,437 firms in the survey, 537 (37.4%) firms were present for just one year while just under 50% of all firms surveyed within a ten-year period engage in R&D activity for two years or less. Conversely, only 10.0% of the total sample were continuously performing R&D for 10 years, accounting for only 144 of the 1,437 companies surveyed within this period. Fewer firms were persistently active beyond four consecutive years. This may be because of private R&D funding or R&D project-specific time scales. Furthermore, this may be indicative of a defined timescale for public funds to be invested in R&D at SOEs and funding of private R&D by the South African government. Among these 1,437 firms, the largest number of firms invested less than ZAR 5 million in R&D activities (1,055 or 73.4%), while very few firms (93 or 6.5%) invested ZAR 40 million or more in R&D activity during the ten-year period.

Table 6 presents total BERD in the most recent year of firms' appearance in the survey. These data paint a different picture when looked simultaneously with data presented in Table 5, which is related to the proportional representation of R&D performing firms across the reference period. Notwithstanding the larger numbers of firms represented in the smaller R&D investment value groups (Table 6), the largest R&D investment value was derived from among the smaller group of enterprises, investing ZAR 40 million or more annually in R&D across the ten-year period. This analysis confirms that the 39 firms represented in the ZAR 40 million+ group, which had persistently invested in R&D for 10 or more years, account for 40.6% of total R&D expenditure across the ten–year period. Counter to

Table 5. **Number of Firms by Years Invested in R&D and BERD Values**

Expenditure group (*ZAR millions*)	Years of R&D survey coverage										Total
	1	2	3	4	5	6	7	8	9	10	
More than 40	6	7	11	9	1	4	6	5	5	39	93
20–40	9	6	4	12	6	4	3	5	5	22	75
10–20	19	13	9	8	10	6	4	5	5	27	106
5–10	19	17	9	19	5	2	5	4	6	22	108
1–5	192	72	46	105	27	15	25	13	11	22	528
Less than 1	292	45	41	74	18	17	11	8	9	12	527
Total	**537**	**160**	**120**	**227**	**67**	**48**	**54**	**40**	**40**	**144**	**1437**
	37.4%	**11.1%**	**8.4%**	**15.8%**	**4.7%**	**3.3%**	**3.8%**	**2.8%**	**2.8%**	**10.0%**	

Source: [HSRC, 2017].

Table 6. **ZAR Value of Firms' R&D Investment by Years Invested and BERD Value Group**

Expenditure group (*ZAR millions*)	Years of R&D survey coverage										Total
	1	2	3	4	5	6	7	8	9	10	
More than 40	4.1%	2.7%	4.7%	3.5%	0.5%	1.6%	2.6%	5.6%	3.8%	40.6%	13799.36
20–40	1.3%	0.9%	0.6%	1.8%	0.8%	0.6%	0.4%	0.8%	0.6%	3.3%	2193.63
10–20	1.4%	1.0%	0.7%	0.6%	0.8%	0.4%	0.3%	0.4%	0.3%	2.0%	1545.68
5–10	0.7%	0.6%	0.3%	0.7%	0.2%	0.1%	0.2%	0.1%	0.2%	0.8%	769.50
1–5	2.0%	0.9%	0.5%	1.3%	0.3%	0.2%	0.4%	0.2%	0.2%	0.3%	1241.39
Less than 1	0.5%	0.1%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	226.31
Total	10.0%	6.2%	6.9%	8.1%	2.6%	2.9%	3.9%	7.2%	5.1%	47.0%	100.0%
	1984.47	1229.32	1367.23	1601.37	526.38	580.92	786.16	1428.02	1017.48	9309.54	19775.88

Source: [HSRC, 2017].

the representativeness of enterprises in Table 5, firms present in the R&D survey for fewer than two years at any level of investment value only account for 16.0% of total R&D investment (Table 6).

The findings in Tables 5 and 6 are similar to those found in a Canadian study where there is a large number of firms with less than $100,000 (top spending in Canada was $10 million or more) and present for only one year [*Schellings, Gault,* 2002]. The pattern of concentration, persistence, and volatility is similar in these countries despite the differences in the structure of the firms.[2]

The findings raise questions about why some firms spend little on R&D performance and why they do not continue to perform R&D beyond two years. The relatively larger number of smaller R&D performers can contribute significantly to increasing the stock of knowledge as well as encouraging specialization within the specific sectors. These firms may further contribute to knowledge transfer, human capital development and economic growth within their industries. All these activities have an impact upon social development and policy-specific considerations that may be considered toward best supporting small, micro, and medium sized enterprises (SMMEs) and start-up companies investing in smaller R&D projects [*Berry et al.*, 2002].

Another observation that adds to the questions raised in the previous paragraph is from comparing the annual average salary of an engineer or scientist in the private sector to the BERD of the firm employing them. The average salary for an engineer in South Africa is about ZAR 500,000 [Average Salary Survey, 2019]. This amount may be equal to or less than the R&D expenditures of firms in the lower spending category.

Given this scenario, there is the possibility that there are employees earning more than the BERD of the firm which employs them. This further adds to the questions raised above as to are why these firms performing such R&D in the first place. What are the implications and the costs thereof? This makes sense if the R&D performed in-house is being purchased by others (outsourced by other firms). However, this does not fully explain how the R&D performing firm maintains its R&D competencies over the years.

At the opposite end of this spectrum, it is evident that despite the smaller number of firms investing ZAR 40 million or more (annually) in R&D, this group of firms contributes a larger share of total BERD. This concentration of larger R&D investment from a smaller group of R&D performing business enterprises further points to the significant concentration of R&D performance, annually and across the ten-year reference period of this study. Despite being a smaller group of firms in the private sector, these companies, their associated projects, staff, potential outputs, and products are often highly visible and may attract increased media coverage and form the basis of corporate expansion and growth strategies

Over and above the benefits accrued by the individual firm, these larger R&D projects and their outputs further promote South Africa as a research destination, attracting critical S&T workers, foreign direct investment, and collaborative opportunities into the domestic R&D system. The questions to ask in this instance are what drives R&D at a relatively small number of firms and what are the potential spill-overs to stimulate R&D at other firms and in other sectors of the economy?

The results so far indicate that presence of a higher degree of concentration, in terms of both firm numbers and the value of R&D investment. Turning one's attention to the notion of persistence of R&D investment, a similar yet somewhat different picture of the South African business sector emerges. The term persistence often goes with the concept of volatility in R&D investment. While persistence refers to the propensity of an enterprise to continue its R&D activity year-on-year,

[2] It is also interesting to observe that there has been the Scientific Research and Experimental Development (SR&ED) tax credit program in place for decades along with other support programs available through the Industrial Research Assistance Program (IRAP) [Government of Canada, 2019; NRC, 2019]. South Africa has a R&D Tax Incentive program, Support Program for Industrial Innovation (SPII), Technology and Human Resources for Industry Program (THRIP), and other instruments designed to boost R&D and innovation across the South African firms.

volatility refers to the opposite practice, where enterprises engage in R&D activity following intervals of reduced or a complete shutdown of R&D operations. Much of this R&D persistence and volatility can be observed through individual firm submissions to the national R&D survey series, as firms continually indicate the start or temporary cessation of R&D activity within a given reference period.

Understanding how the R&D investment behavior and its resultant longitudinal patterns manifest within the South African business sector remains an important research opportunity emerging from this analysis. One element of this complex series of interrelated patterns determining R&D investment strategies manifests itself within the individual firm levels of R&D persistence and volatility over time.

The data demonstrates that a larger number of firms enter the South African R&D statistics with a very low level of R&D investment and only perform R&D for two years or less. These firms usually invest less than ZAR 5 million annually and account for 48.5% of all R&D performing firms within this ten-year reference period. This may mean that the individual firm may re-engage in R&D activities some years into the future or in relation to a different product, however, in terms of R&D investment, the data series does tend to show interruptions that are more frequent within this level of R&D investment.

As discussed in an earlier section, only 10.0% of firms within this analysis continually invested in R&D across a ten-year reference period. Investment in R&D performance is highly concentrated in this smaller subset of R&D performing firms in South Africa. Among the 1,437 firms, 144 (Table 5) were present in each survey year within this analysis. This smaller sub-set represents the most persistent R&D enterprises in South Africa. Among these 144 firms, 61 account for the largest contributions to BERD across the ten-year period. The 61 firms have had an average R&D investment value exceeding ZAR 20 million for 10 or more consecutive years since 2006. This persistence of large BERD contributors is evident, with 42.0% of companies who invested ZAR 40 million or more per annum being consistently in the R&D survey for 10 or more years (Table 7). This trend continues with a minimum of 25.0% of all large BERD contributors (greater than ZAR 5 million) similarly remaining active for nine or more consecutive years in the survey series.

Persistence in R&D activity at firms across multiple consecutive measurement periods remains important as it ensures a stable and productive R&D system and effective outflow of skills and knowledge. The data in Table 7 highlights the third major finding of this analysis, that firms committing BERD for an increased number of consecutive years tend to demonstrate larger annual investments over a longer periods compared to the majority of smaller BERD investments that generally span two years or less.

This trend is demonstrated in Table 7, wherein the 61 firms, investing more than ZAR 20 million in BERD for a period of 10 or more years contribute more to BERD than all firms investing any value of BERD for four or fewer years (1,044 enterprises). The BERD within the top two expenditure categories in the 10-year plus group (> ZAR 20 million) accounts for 87.0% of the total BERD investment for this highly persistent group of firms. Similarly, the 144 highly persistent firms (irrespective of BERD value) measured in the R&D survey for ten or more years account for 35.0% of total national GERD inputs.

The value and importance of this group of firms is significant and underlines the contribution that a holistic awareness of the importance of R&D persistence and volatility can illuminate over time.

The above analysis indicates that 30.0% of all BERD across the ten-year reference period is committed to R&D from within a very small group of firms investing ZAR 20 million or more in annual R&D activity.

In their 2017 paper, Kang et al. similarly note that firms investing in R&D performance generally create greater "consistency over the long run and is more efficient than the same total investment over a shorter period" of time [*Kang et al.,* 2017]. This trend is similarly visible in the South African R&D survey data. Table 8 illustrates the influence of persistence and concentration on BERD over the ten-year reference period.

The above data illustrates how the natural attrition or volatility of firms entering and leaving the R&D survey

Table 7. **BERD Investment Group and the Persistence of Firms (%)**

Expenditure group (*ZAR millions*)	**Years in R&D survey coverage**										Total
	1	2	3	4	5	6	7	8	9	10	
More than 40	6.45	7.53	11.83	9.68	1.08	4.30	6.45	5.38	5.38	41.94	100
20–40	12.00	8.00	5.33	16.00	8.00	5.33	4.00	6.67	5.33	29.33	100
10–20	17.92	12.26	8.49	7.55	9.43	5.66	3.77	4.72	4.72	25.47	100
5–10	17.59	15.74	8.33	17.59	4.63	1.85	4.63	3.70	5.56	20.37	100
1–5	36.36	13.64	8.71	19.89	5.11	2.84	4.73	2.46	2.08	4.17	100
Less than 1	55.41	8.54	7.78	14.04	3.42	3.23	2.09	1.52	1.71	2.28	100
Total	**37.4**	**11.1**	**8.4**	**15.8**	**4.7**	**3.3**	**3.8**	**2.8**	**2.8**	**10.0**	**100**

Source: [HSRC, 2017].

Table 8. **Concentration, Persistence and Volatility in BERD Investments**

Expenditure group (*ZAR millions*)	Year 1 units	Year 10 units	Unit change (%)	Year 1 BERD (*ZAR*)	Year 10 BERD (*ZAR*)	BERD change (%)
More than 40	53	29	**-45.3**	6 028 129 000.00	7 088 438 834.00	**17.6**
20–40	51	25	**-51.0**	1 378 556 000.00	1 845 183 319.80	**33.8**
10–20	49	23	**-53.1**	711 302 000.00	1 034 283 083.50	**45.4**
5–10	63	22	**-65.1**	447 218 000.00	391 577 884.00	**-12.4**
1–5	248	50	**-79.8**	578 502 000.00	550 327 890.00	**-4.9**
Less than 1	213	25	**-88.3**	106 454 000.00	118 264 755.40	**11.1**

*not adjusted for inflation.

Sources: [HSRC, 2017].

shows an average loss of 60.0% across all BERD investments within the period. These losses are greatest within the smaller BERD investment groupings and appear 50.0% lower in the highest BERD grouping. Among the 213 enterprises that featured in the R&D survey in Year 1, which committed less than ZAR 1 million in BERD, only 25 still reported ongoing R&D in year 10, indicating an attrition rate of 88.3%. Converse to that, when studying the data for firms entering the survey in Year 1, committing ZAR 40 million or more in BERD, 55.0% of those units still appeared in the R&D survey following Year 10. Similarly, when appraising financial investment in R&D over the period, enterprises investing smaller amounts of BERD in Year 1 tend to show a reduction in R&D expenditure in Year 10.

However, similarly to the appraisal of unit count data, firms investing ZAR 10 million or more in Year 1 have generally demonstrated an increase in BERD commitment in Year 10 of between 17.0% and 45.0%. The data in Table 8 further illustrates the fourth important finding from within this study that business enterprises that remain active in R&D for longer periods begin to invest increased BERD values and remain more persistent than enterprises committing less BERD for shorter periods (two years or less).

Given the results above and notwithstanding the fact that firms do not perform R&D for the sake of it, there is still a need for instruments that can be used to incentivize firms to perform R&D on a continual basis.

Conclusion

There are four key findings from the data. The South African business sector does not differ from that of developed countries in terms of persistence, concentration, and volatility of R&D performance. Firstly, there is a large number of firms participating in the survey for one or two years and spending less than ZAR 1 million. Secondly, South Africa's business sector's R&D performance is concentrated in a few firms that spend large amounts of money on R&D performance. They are the largest contributors to BERD. South Africa's business sector R&D investment is also concentrated within particular sectors of the economy. The two main ones are the financial intermediation, real estate, and business services sector and the manufacturing sector. Thirdly, firms that remain engaged in R&D performance for longer periods tend to invest more in R&D performance and remain more persistent than enterprises committing less for shorter times.

The large number of firms reporting R&D expenditure of less than ZAR 1 million and participating in the survey for one year only should be further scrutinized as this study can only assume it is largely smaller firms making up the "tail" of BERD. Firms that spend more than ZAR 40 million drive R&D spending in South Africa.

The policy question raised by these figures is how firms can be encouraged to increase their R&D spending and continue such spending over an extended period in a way that supports other government policies such as those dealing with sustainable development and inclusion. Public support of private R&D is usually through R&D tax subsidies, direct government grants, contracts and other instruments. While government support of the business sector is desirable, it can have unintended consequences. There are different opinions regarding this. Rosenberg (1976) argues that policy makers should devote resources to those firms with a higher probability of continuing to perform R&D because the cumulative nature of the learning process may cause persistence [*Rosenberg*, 1976]. He further argues that the generation of knowledge is based on previous knowledge and affects future research. Other schools of thought suggest that the allocation of resources to high performers of R&D may lead to the exclusion of small firms and newcomers [*Rammer, Schubert,* 2016]. They also argue that allocation funds to persistent firms may be efficient because the expected output is maximized.

Persistence also boosts the probability of receiving funding if a firm has a proven record of successful performance over the years. However, the allocation of funds to known performers may also lead to dependence on a small amount of industries. Other approaches to funding which have been used in a number of countries is the voucher scheme [OECD, 2010] which allows a small firm to apply for a voucher which can be used to pay for assistance from a university, polytechnic, or government research organization.

The empirical findings from this study have raised questions about the appropriate policies for persistent large R&D performers, smaller R&D performers, and firms that spend little time performing R&D. The firms, especially large performers, include the state-owned enterprises (SOEs) which require a different policy approach from that for private firms. Similarly, any policy intervention may lead to either the intended outcome or may have negative impact that affects the R&D performance of firms.

Finally, an understanding of the concentration of business R&D may assist in distinguishing other policies such as innovation policy from R&D and S&T policies.

The authors wish to acknowledge Professor Fred Gault for his invaluable and unwavering support on the production of this manuscript. The authors also acknowledge Mr Sibusiso Siqubu for his help in availing the data, Ms Natalie Vlotman in proofreading parts of the document and checking the data, figures, and tables.

References

Antonelli C., Crespi F., Scellato G. (2013) Internal and external factors in innovation persistence. *Economics of Innovation and New Technology*, vol. 22, no 3, pp. 256–280.

Average Salary Survey (2019) *South Africa — 2018/19*. Available at: https://www.averagesalarysurvey.com/south-africa, accessed 22.06.2019.

Berry A., von Blottnitz M., Cassim R., Kesper A., Rajaratnam B., Ernst van Seventer D. (2002) *TIPS - The Economics Of SMMES In South Africa*. Available at: http://www.tips.org.za/research-archive/trade-and-industry/item/204-the-economics-of-smmes-in-south-africa, accessed 12.05.2019.

Cohen W.M., Levinthal D.A. (2006) Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, vol. 35, no 1, pp. 128–152.

Government of Canada (2019) *SR&ED Tax Incentives*. Available at: https://www.canada.ca/en/revenue-agency/services/scientific-research-experimental-development-tax-incentive-program/claim-sred-tax-incentive-what-tax-incentive.html, accessed 27.05.2019.

HSRC (2017) *South African National Survey of Research and Experimental Development: Main Report 2016/17*, Pretoria: Human Sciences Research Council.

Kang T., Baek C., Lee J.-D. (2017) The persistency and volatility of the firm R&D investment. *Research Policy*, vol. 46, no 9, pp. 1570–1579.

Máñez J., Rochina-Barrachina M, Sanchis-Llopis A., Sanchis-Llopis J. (2009) The role of sunk costs in the decision to invest in R&D. *Journal of Industrial Economics*, vol. 57, no 4, pp. 712–735.

Máñez J., Rochina-Barrachina M., Sanchis-Llopis A., Sanchis-Llopis J. (2010) *The Role of Learning in Firm R&D Persistence* (FUNCAS Working Paper 500), Madrid: FUNCAS.

NRC (2019) About the NRC Industrial Research Assistance Program. Available at: https://nrc.canada.ca/en/support-technology-innovation/about-nrc-industrial-research-assistance-program, accessed 22.06.2019.

OECD (2010) *Innovation Vouchers*, Paris: OECD. Available at: https://www.oecd.org/innovation/policyplatform/48135973.pdf, accessed 19.05.2019.

OECD (2015) *Frascati Manual 2015. Guidelines for Collecting and Reporting Data on Research and Experimental Development*, Paris: OECD.

OECD (2017) *OECD Science, Technology and Industry Scoreboard 2017*, Paris: OECD. Available at: https://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-industry-scoreboard-2017_9789264268821-en, accessed 22.06.2019.

OECD (2019) *OECD Main Science and Technology Indicators 2018*, Paris: OECD.

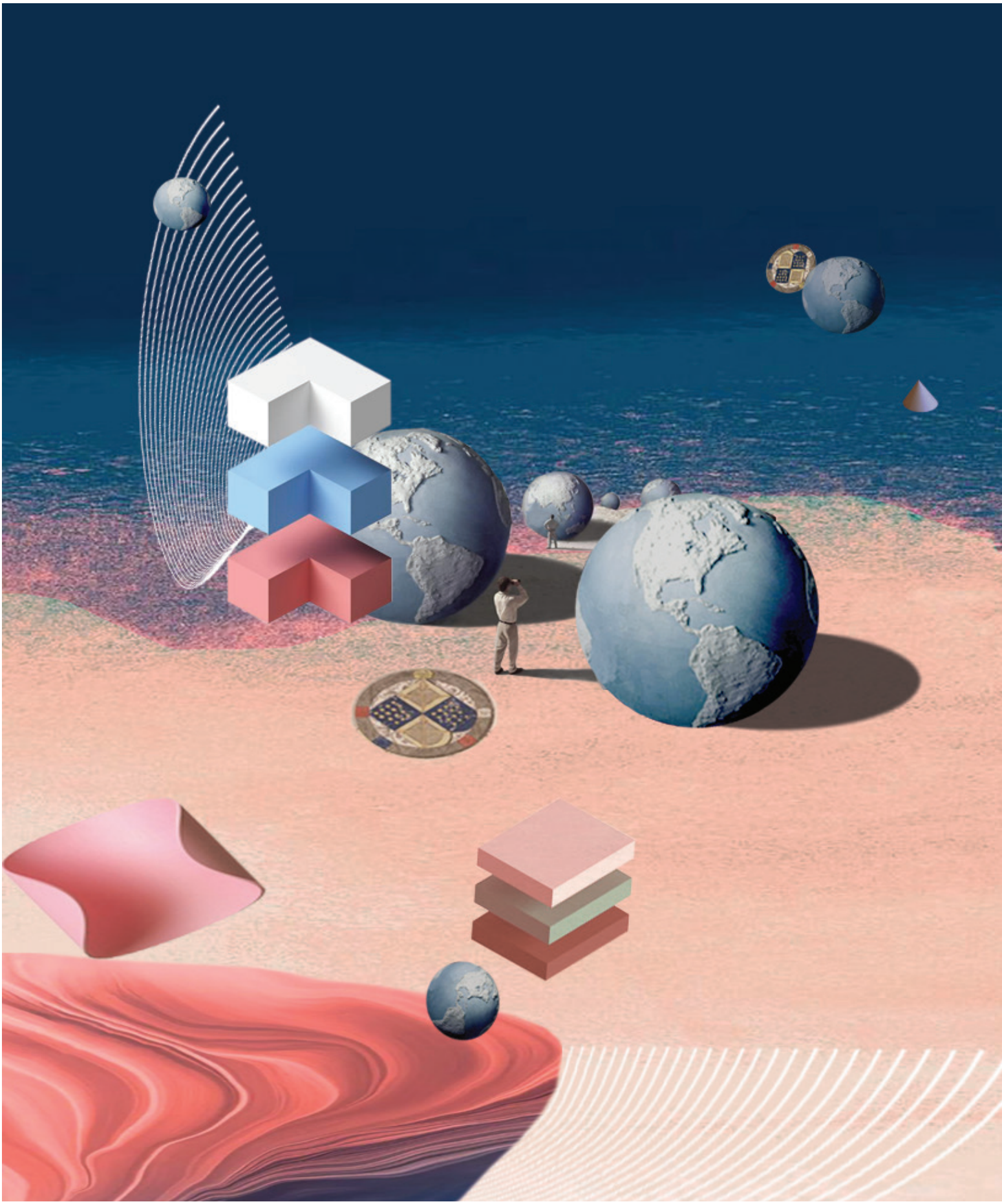
Rammer C., Schubert T. (2016) *Concentration on the Few? R&D and Innovation in German Firms 2001 to 2013* (ZEW Discussion Paper No. 16-005), Karlsruhe: Centre for Economic European Research. Available at: http://ftp.zew.de/pub/zew-docs/dp/dp16005.pdf, accessed 13.03.2019.

Rosa J.M., Mohnen P. (2013) *Doing R&D in a Closed or Open Mode: Dynamics and Impacts on Productivity* (MERIT Working Paper 060), Maastricht: United Nations University – Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT).

Rosenberg N. (1976) On Technological Expectations. *The Economic Journal*, no 86(343), pp. 523–535.

Rumbelow J., Blankley W. (2012) *Concentration , persistence and volatility of R&D performing businesses in South Africa from 2001 /02 to 2008 /09 with implications for measurement excellence and policy impact*. Paper presented at the MEIDE (Micro Evidence on Innovation and Development) Conference, 21-23 November 2012, Cape Town, South Africa.

Schellings R., Gault F. (2002) *Size and Persistence of R&D Performance in Canadian Firms 1994 to 2002* (Catalogue 88F0006XIE, no 008), Ottawa: Statistics Canad



Strategic Entrepreneurship in Russia during Economic Crisis

Galina Shirokova

Professor [a]; Research Fellow [b], shirokova@gsom.pu.ru

Liudmila Ivvonen

Doctoral Student [a], ivvonen@gmail.com

Elena Gafforova

Professor [b], gafforova.eb@dvfu.ru

[a] St. Petersburg University, Graduate School of Management, 3 Volkhovsky ln, St. Petersburg 199004, Russian Federation

[b] Far Eastern Federal University, School of Economics and Management, 8 Sukhanova str., Vladivostok 690091, Russian Federation

Abstract

This paper aims to explore the relationship between different components of strategic entrepreneurship (particularly, entrepreneurial mindset, innovation, managing resources strategically, and competitive advantage) and SME performance during the economic crisis. To test the theoretical model, we utilize data collected through a survey of Russian SMEs during the period of economic crisis and subsequent stagnation in 2015–2016. The findings suggest that the entrepreneurial component of strategic entrepreneurship is positively related to SME performance during the economic crisis; moreover, a significant negative link was found between SME performance of firms outside the Central Federal Region and an interaction term of Entrepreneurial Component and Competitive Advantage that suggests the need to choose only one type of action and not to perform both simultaneously.

Keywords: strategic entrepreneurship; innovation; entrepreneurial mindset; managing resources strategically; competitive advantage; small and medium enterprise; performance; economic crisis; Russia.

Citation: Shirokova G., Ivvonen L., Gafforova E. (2019) Strategic Entrepreneurship in Russia during Economic Crisis. *Foresight and STI Governance*, vol. 13, no 3, pp. 62–76. DOI: 10.17323/2500-2597.2019.3.62.76

The negative impact of economic crises on businesses, especially small and medium ones, manifests itself in reduced growth rates and an increased number of bankruptcies. The introduction of economic and political sanctions against Russia in mid-March 2014 resulted in the reduction of trade between Russian companies and international partners and created the need to substitute imports with similar domestic products. The crisis has led to the simultaneous decline of a whole range of macroeconomic indicators affecting various industries, regions, and companies in different ways. In particular, according to Rosstat,[1] the GDP growth rate declined by 3.7 percentage points in 2015 and subsequently stagnated at 0.3% in 2016. The national currency depreciated by almost 50%, against the background of halving oil prices. Inflation soared to 12.9% in 2015 (5.38% in 2016) and unemployment rose to 5.6 % in 2015 (5.4% in 2016), which led to a major decline in investments and people's income. The crisis has significantly changed the needs for organizational competencies, and the overall competitive environment.

Managing small and medium enterprises (SMEs) becomes a serious challenge during crisis periods, since companies doing business on a much smaller scale than large firms face problems with attracting financial and human resources [*Carreira, Silva*, 2010; *Schmitt et al*., 2010]. SMEs' share in Russian GDP is just 21.9% while the average figure for Europe ranges between 50–60%[2]. However, even under stable conditions, Russian SMEs tend to experience a serious shortage of the resources they need to accomplish their objectives [*Chepurenko*, 2015], so the recession has only aggravated the situation further.

Finding new approaches to managing companies in a turbulent economic situation therefore becomes critically important. A possible option is advancing strategic entrepreneurship (SE) by "integrating the entrepreneurial (identifying business opportunities) and strategic (identifying competitive advantages) perspectives to plan and implement value creation actions" [*Hitt et al.,* 2001, p. 481]. SE implies combining advantage-seeking and opportunity-seeking [*Ireland et al*., 2003]. The issue of coordinating entrepreneurial actions (which create new opportunities) with strategic actions aimed at strengthening competitive advantages at the individual firm level has been little studied [*Hitt et al.,* 2007].

The goal of this study is to identify and assess the connections between various SE components (such as entrepreneurial mindset, innovation, strategic management of resources, and competitive advantages) and the activities of Russian SMEs during economic crises. A configurational approach [*Wiklund, Shepherd,* 2005] was applied for this purpose, which helps one understand which combination of the above components increases SE benefits for a company. The objectives of the study included the following: 1) analyze the conceptual basics of SE and approaches to their operationalization; 2) propose and theoretically substantiate hypotheses on the nature of the relationship between various SE components and companies' performance during economic crises; 3) describe the methods of the study; 4) empirically test the hypotheses; 5) describe and analyze the obtained results. Data collected through a survey of SMEs conducted between September 2015 and February 2016 was used to empirically test the suggested hypotheses. A total of 614 firms operating in various industries and various Russian Federal Districts were included in the final sample.

The Theoretical Model and Hypotheses of the Study

The Role of SE in Company Operations

The SE concept originates in both economics [*Knight,* 1921; *Schumpeter*, 1942] and management theory [*Hitt et al*., 2001]. A number of studies were devoted to analyzing the relationship between strategic management and entrepreneurship. It was mentioned in the special issue of the *Strategic Management Journal* for the first time in 2001, where this concept was defined as a scientific theory at the junction of entrepreneurship and strategic management [*Hitt et al.,* 2001; *Ivvonen, Shirokova,* 2016]. The entrepreneurial aspect of SE is aimed at identifying business opportunities and the potential for implementing them, while the strategic one is identifying and making use of the opportunities most likely to create sustainable competitive advantages [*Hitt et al*., 2001]. The basic SE-related studies, and recent bibliometric research show that SE fosters mutual support and interdependence between entrepreneurship and strategic management [*Hitt et al*., 2002]. This includes studying the sources of opportunities, the processes of identifying, assessing, and making use of opportunities, and the circle of people who identify, assess, and make use of them [*Shane, Venkataraman,* 2000, p. 218].

At the initial stages of venture creation and launch, entrepreneurs often have to do more with less and use what abilities and resources they have at their disposal with a minimum of capital and a maximum of ingenuity and improvisation [*Harrison et al.,* 2004; *Miner et al.,* 2001].

Strategy is often likened to a process of planning that places the emphasis on improved decision-making brought about by managing resources within a framework of structures, systems and processes. Strategy provides the main advantage that differentiates firms

[1] For the details see: www.gks.ru, accessed 18.04.2019.

[2] For the details see: http://ec.europa.eu/eurostat, accessed 18.04.2019.

and gives them organizational superiority [*Darling et al.,* 2007]. It creates a context where firms can make use of the identified opportunities thus contributing to enhanced specialization and obtaining a competitive advantage. However, entrepreneurial firms risk focusing excessively on opportunity recognition and risk-taking activities; finding new opportunities frequently involves serious riskslacking a balanced strategic focus can undermine the benefits and value entrepreneurial initiatives might generate. Excessive formalization of companies' organizational activities is also fraught with undesirable consequences. This limits the scope for rapid adaptation to changes and sensitivity to revolutionary ideas [*DeSimone, Hatsopoulos,* 1995], that is, it ultimately hinders one from reaping the full benefits of entrepreneurial activities. Balancing entrepreneurship and strategic management then can help firms avoid the trap of excessive risk-taking activities, while preventing inertia caused by iteratively adding to present advantages.

Earlier studies have also noted the interconnections between strategic management and entrepreneurship. Covin and Slevin (1989), following Miller's (1983) conception of an entrepreneurial firm, define strategic posture as a firm's competitive orientation on a spectrum from conservative to entrepreneurial. For example, the "entrepreneurial firm" theory [*Miller,* 1983] defines strategic position as a competitive orientation ranging from conservative to entrepreneurial [*Covin, Slevin*, 1989]. Lumpkin and Dess [*Lumpkin, Dess*, 1996] subsequently developed the construct of entrepreneurial orientation. The concept of entrepreneurial orientation describes companies' behaviour in terms of their innovation, proactivity, and willingness to take risks. More recent studies suggested the term "entrepreneurial strategy" [*Meyer, Heppard,* 2000], while strategic management was seen as providing the context for entrepreneurial activities [*Ireland et al.,* 2001]. An analysis of the relationship between the intensity of entrepreneurship and five specific strategic management techniques revealed that the former was positively affected by focusing on the searching, flexibility, and planning locus, combined with strategic control [*Barringer, Bluedorn,* 1999]. Therefore the relationship between strategic management and entrepreneurial activity has emerged in an interrelated way over many years, but has only now been crystallised into a construct of SE.

Strategic management theory, epitomised by the RBV, emphasises the creation of a unique resource position for the firm to create advantages that allow it to compete effectively into the long term (*Barney*, 1991; *Wernerfelt*, 198?). The first empirical studies which have directly analysed the correlation between SE and companies' performance were published in 2009. Only a relatively small number of such studies exist (Table 1), which can be explained, among other things, by the problems with operationalizing the SE concept. Most of the studies are quantitative, based on SME statistics from various countries. The relationship between SE and companies' productivity is often seen through the prism of external and internal conditions, and specific features of their activities. In particular, studies focusing on the role of the external environment consider factors such as national culture [*Yu, Hu,* 2015] and the level of the country's institutional development [*Awang et al.,* 2015; *Bjørnskov, Foss*, 2013; *Obeng et al.,* 2014; *Shirokova et al.,* 2013]. For example, the cultural traits of Malaysian entrepreneurs, in particular, their willingness to take risks, positively affect the successful performance of the country's SMEs [*Yu, Hu,* 2015]. The results of a Ghanaian study [*Obeng et al.,* 2014] confirm that SE contributes to businesses' productivity in developing economies. Data on Russian SMEs [*Shirokova et al.,* 2013] does not show a statistically significant correlation of this kind, but still confirms that certain components of SE do play a positive role. Interactions with other firms over the course of joint innovation activities was also considered among the relevant external factors [*Löfgren,* 2014; *Meuleman et al.,* 2009].

A few studies were specifically focused on the role internal factors play in the relationship between SE and business productivity [*Sirén et al.,* 2012; *Steffens et al.,* 2009]. It was established that strategic training directly affects this relationship [*Sirén et al.,* 2012]. Knowledge spillovers, that is, its unintended dissemination caused by the specific qualities of this economic benefit and resource, promotes the development of SE (companies' innovation activity) and contributes to the even more efficient use of their current advantages, which leads to improved performance indicators [*Kotha,* 2010].

Also, the correlation between SE and companies' performance was analyzed in various sectors of the economy [*Luke et al.,* 2011; *Patzelt, Shepherd,* 2009]. A positive correlation was discovered in the public [*Luke et al.,* 2011], education [*Patzelt, Shepherd,* 2009], and tourism [*Carlbäck,* 2012] sectors. The main results of the relevant studies are summarized in Table 1.

Thus, SE implies simultaneously taking entrepreneurial and strategic actions to create value. Kyrgidou and Petridou [Kyrgidou, *Petridou,* 2011] include an entrepreneurial mindset and innovation in the entrepreneurial component of SE and the strategic management of resources and competitive advantage in the strategic one. *Entrepreneurial mindset* suggests focusing on creativity and modernization, the conscious effort to find, identify, and implement new opportunities [*Benedict, Venter*, 2010; *Ireland et al.,* 2003]. *Innovation* allows companies use the identified opportunities in radically new, revolutionary ways, thus significantly changing the very competitive environment in the industry [*Danneels,* 2002; *Kumaraswamy et al.,* 2018]. The above means that we use the term "innovation" broadly, referring to product and organizational innovations alike. *The strategic management of resources* means structuring, grouping, and reallocating the resources available to the company [*Kyrgidou, Petridou,*

Table 1. **Empirical Studies of Correlation between SE and Company Performance**

Authors	SE components	Method	Context	Main results
[*Meuleman et al.,* 2009]	Identifying opportunities for growth to create and maintain competitive advantages.	Survey	238 companies, UK	The more actively a company works with private investors, the more rapidly it grows.
[*Steffens et al.,* 2009]	Finding new areas, advancing existing ones.	Survey	2,662 companies, Australia	Though young companies do find growth opportunities, it is hard for them to identify and make full use of the ones most relevant for their businesses.
[*Patzelt, Shepherd,* 2009]	Identifying and making use of opportunities by developing new products and services, taking strategic action to accomplish development objectives.	Survey	98 academic entrepreneurs, Germany	Combining internal business policies, among other things to secure financial support, improves expected SE results at universities.
[*Kotha,* 2010]	Identifying opportunities and advantages.	Case study	Four aviation companies, US	Knowledge exchanges increase the awareness of new opportunities, the potential to develop competitive advantages, and to ultimately improve company performance.
[*Luke et al.,* 2011]	Combining innovations, finding opportunities for growth.	Case study	12 state-owned companies, New Zealand	Advancing SE in state-owned companies increases their profits.
[*Sirén et al.,* 2012]	Finding new areas, advancing existing ones.	Survey	206 IT companies, Finland	Making use of existing opportunities and finding new ones does not directly affect companies' performance, strategic training fully promotes the above correlation.
[*Carlbäck,* 2012]	Finding new areas, advancing the existing ones.	Case study	12 private hotels, Sweden	The companies value their independence, but at the same time it does not allow the hotels to apply advanced technological solutions and loyalty schemes. Membership in major hotel chains is a way to overcome these limitations, i.e., it increases the hotels' efficiency and revenues.
[*Bjørnskov, Foss,* 2013]	R&D, process, management, and organizational innovations, mobilizing and coordinating resources.	Survey	140 entrepreneurs, OECD member states	SE positively affects overall productivity. Institutions weaken this correlation since they increase uncertainty and transaction costs entrepreneurs face.
[*Shirokova et al.* 2013]	Identifying new opportunities (entrepreneurial focus and culture), making use of existing ones (investing in internal resources and knowledge-based assets, organizational changes, training).	Survey	500 SMEs, Russia	Identifying new opportunities and making use of existing ones positively affects companies' performance. The latter's correlation with SE turned out to be insignificant.
[*Löfgren,* 2014]	Making use of existing competitive advantages, identifying potential opportunities.	Survey	188 SMEs, Sweden	Joint innovation promotes and strengthens the correlation between SE and companies' international growth.
[*Obeng et al.*, 2014]	Identifying and making use of value creation opportunities.	Survey	441 entrepreneurs, Ghana	There is a positive correlation between SE and small companies' growth.
[*Yu, Hu,* 2015]	Finding new areas, advancing existing ones.	Case study	One hospitality SME (HoReCa), Taiwan	Cognitive entrepreneurial processes (decision-making, opportunity assessment) help identify opportunities and promote growth.
[*Sun,* 2015]	Sensitivity to new opportunities, finding resources, strategic training.	Case study	Four railway companies and affiliates, China	The effect of "entrepreneurial state" on the emergence of SE is manifested in the creation of technological innovations (as opposed to imitating them), which improves businesses' performance.
[*Awang et al.*, 2015]	Entrepreneurial mindset, combining the search for new opportunities with the use of existing ones, ongoing innovation.	Survey	46 SMEs, Malaysia	Malaysian entrepreneurs' traits, such as risk tolerance, striving for success, the ability to efficiently deal with problems, and the willingness to learn positively affect the correlation between SE and companies' performance.
[*Kantur,* 2016]	Sustainable regeneration, organizational rejuvenation, strategic modernization, redefining domains.	Survey	114 production (automotive and food industry) and service companies (telecommunications, banking), Turkey	SE is positively connected with company performance.

Source: composed by the authors.

2011]. Finally, *competitive advantages* allow companies to secure a market position protected from action by the competition by using their existing advantages in combination with newly found opportunities [*Ireland et al.,* 2003; *Maury*, 2018].

The Entrepreneurial Component of SE and SMEs' Performance during Economic Crises

Most of the empirical studies on SE were based on data for developed (i.e. sustainable) or emerging markets [*Boone et al.,* 2013; *Dhliwayo,* 2014; *Ireland, Webb,* 2007; *Ketchen et al.,* 2007; *Löfgren,* 2014; *Meuleman et al.,* 2009; *Mihalache et al.,* 2014], which puts into doubt this concept's applicability to developing markets during economic crises [*Knudsen, Lien,* 2016].

A crisis is frequently defined as a situation of an uncertain external environment which poses a serious threat to the organization's survival [*Kunc, Bhandari,* 2011; *Pearson, Clair,* 1998], while the reasons for and consequences of this situation remain unpredictable [*Dutton,* 1986]. The time for finding an adequate response is limited and the results of the decisions made may turn out to be favorable or unfavorable [*Grewal, Tansuhaj,* 2001; *Marcus, Goodman,* 1991]. Economic crises stand out among various others such as those caused by political developments, anthropogenic disasters, or mismanagement. They are manifested in the acutely negative dynamics of a whole range of economic indicators, from gross domestic product, inflation, and unemployment to financial market indices, currency rates, and so on. Economic crises affect various industries, regions, and companies differently [*Connaughton, Madsen,* 2009]. They radically change the requirements for organizational competencies and the very competitive environment [*Knudsen, Lien,* 2016]. Along with a sharp decline in demand and the growth rate [*Pearson, Clair,* 1998], companies frequently encounter risks and uncertainty in their strategic planning, which is fraught with reduced market share and profit margins. Successfully managing a company during a crisis period, which is a serious challenge for any company [*Schmitt et al.,* 2010], requires particular skills from SMEs whose situation is further aggravated by the "liability of smallness" effect [*Aldrich, Auster,* 1986] which makes it harder for such firms to survive, and increases the likelihood of their bankruptcy [*Aldrich, Auster,* 1986; *Mellahi, Wilkinson,* 2004]. In particular, they face problems with attracting financial capital [*Carreira, Silva,* 2010], have to compete for workers with large companies, and face high administrative costs [*Aldrich, Auster*, 1986]. Plus, SMEs are more dependent on external resources [*Baum, Oliver,* 1996] and become hostages to the modest scale of their operations [*Audretsch, Mahmood,* 1994].

However, crises also open potential opportunities for SMEs [*Beliaeva et al.*, 2018; *Soininen et al.,* 2012]. During crisis periods small companies may find it easier to operate, offer new products and services due to their inherent maneuvrability and find they can rapidly react to the emergence of new opportunities [*Alonso-Almeida et al.,* 2015; *Hodorogel,* 2009; *Laskovaia et al.*, 2019]. Such firms have the flexibility that allows them to quickly reallocate resources, restructure processes, adjust prices, and adapt products to the crisis conditions [*Reid,* 2007]. They are more willing to take risks and invest to improve their performance since they are aware that all their current achievements are temporary by default. A survey of US software companies conducted during the crisis of 2001-2003 revealed that in such a situation, young small firms chose a new product development strategy over cost-cutting much more often than larger companies did [*Latham,* 2009]. A study of small companies' behavior in the Italian Emilia-Romagna region showed that during a period of economic recession they tended to be more innovative than larger players [*Antonioli et al.,* 2010]. Those who focused on developing new products and finding new markets in most cases dealt with crises better than others. A survey of 172 Turkish companies [*Köksal, Özgül,* 2007] yielded similar results: firms focused on product development to secure new market niches tended to be more productive during periods of recession than their competitors. All this allows one to suggest the first hypothesis:

Hypothesis 1*: During an economic crisis, a positive correlation is observed between the entrepreneurial component of SE and SME performance.*

The Strategic Component of SE and SME Performance during Economic Crises

The strategic component of SE is focused on making use of competitive advantages and on the strategic management of available resources [*Kyrgidou, Petridou,* 2011]. Effective strategic action is seen as the key to making the company competitive [*Makadok, Coff,* 2002; *Luke et al.,* 2011], while maintaining competitiveness (and the profit margins) requires the efficient management of corporate resources. In a situation of severe limitations SMEs have to improvise to find new or allocate available resources, which makes them less transparent to potential competitors [*De Oliveira Teixeira, Werther,* 2013]. The consequences of economic crises that threaten companies at the same time increase their motivation to take strategic action, which smooths over the fluctuations of companies' revenue by optimizing their operations and helping them to better adapt to the current situation [*March,* 1991; *Uotila et al.,* 2009].

Economic crises primarily manifest themselves in the significantly reduced availability of resources for companies since customers cut their spending, creditors cut lending, while pressure from the competition increases [*Pearce, Michael,* 2006]. In such circumstances, many players focus on strategic action which provides short-term visible results [*Schmitt et al.,* 2010] and secures more predictable and more immediate profits [*He, Wong,* 2004; *Levinthal, March,* 1993; *March,* 1991]. Focusing on the strategic management of resources

and making use of competitive advantages increases SMEs' chances of maintaining profit margins despite the falling sales and financial instability. Though most companies see economic crises as a threat, some, especially those in the SME group, use them to take advantage of newly emerging opportunities and expand their operations [*Beliaeva et al.*, 2018; *Kunc, Bhandari,* 2011]. They see turbulence as a source of new business opportunities, including maintaining their competitiveness or identifying new sources of competitive advantages, for example, by procuring their competitors or suppliers [*Wan, Yiu,* 2009]. This allows us to suggest a second hypothesis:

Hypothesis 2*: During an economic crisis a positive correlation exists between the strategic component of SE and SME performance.*

The Synergy between the Entrepreneurial and Strategic Components of SE

Entrepreneurship involves applying new solutions on the market [*Zahra et al.,* 2006]. Strategy, in its turn, amounts to applying structured, calculated approaches to efficiently using resources in order to obtain competitive advantages and create value [*Eisenhardt, Martin,* 2000]. Entrepreneurship and strategy are conceptually inseparable: as two sides of the same coin, they are complementary in nature [*Luke et al.,* 2011] and combining them creates synergy [*Dhliwayo,* 2014]. Placing one's chips on just one behavior type turns out to be less productive than simultaneously taking entrepreneurial and strategic action, which helps SMEs deal with a wider range of unforeseen circumstances emerging during economic crises [*Dhliwayo,* 2014; *Smolka et al.,* 2016].

Previous empirical studies confirm that a positive correlation exists between simultaneously taking entrepreneurial and strategic action and companies' performance [*Gibson, Birkinshaw,* 2004; *He, Wong,* 2004; *Lubatkin et al.,* 2006]. Some researchers believe that during a recession the need for combining these approaches only increases [*Jansen et al.,* 2006]. To promote further growth, companies should combine taking steps to increase productivity with creating innovations. During economic crises such "ambidexterity" frequently ensures the business's survival [*Raisch et al.,* 2009]. Combining entrepreneurial and strategic behavior positively affects performance in a volatile environment [*McGrath,* 2001; *Siggelkow, Levinthal,* 2003]. Companies capable of simultaneously increasing productivity and finding new business opportunities have a better chance of improving their positions during a recession. Both these strategies help one remain flexible in an uncertain situation [*Volberda,* 1996], alleviate the consequences of economic shocks to businesses, maintain development potential, and market transparency. This allows us to suggest the third hypothesis:

Hypothesis 3*: During an economic crisis, the combination of the entrepreneurial and strategic components of SE positively affects SME performance.*

The theoretical model of the study is presented in Figure 1.

Methodology of the Study

Context of the Study and the Sample Description

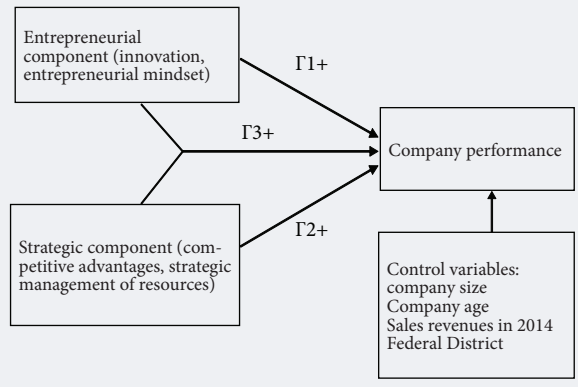
To test the hypotheses of the study, we have used data collected through a survey of *representatives* of Russian SMEs conducted during the economic crisis and political sanctions between September 2015 and February 2016. The survey was conducted by the Entrepreneurship Centre of the St. Petersburg State University Graduate School of Management jointly with the School of Economics and Management of the Far-Eastern Federal University.

The sample of private Russian companies was randomly generated using main state registration numbers (MSRN). The MSRN codes were subsequently uploaded into the Professional Market and Company Analysis System (SPARK-Interfax) to verify their accuracy, collect information about the companies and their key financial indicators, and filter out data not meeting the selection criteria adopted for the study. The final sample included 10,359 firms.

A standardized questionnaire was used to conduct the survey. The methodology combined online survey tools and telephone interviews. A total of 656 returned questionnaires out of 2,583 sent out mean that the effective response rate was 25.2%. After clearing the data of missing values, 614 Russian companies were included in the final sample.

The predominant share of the companies in the sample were classified as small businesses (less than 100 employees). Most of them specialize in wholesale trade (21.82%), services (21.50%), and retail (17.43%). Somewhat fewer companies operate in the manufacturing (16.94%) and construction (11.56%) industries. The companies in the sample are distributed throughout the country, but mainly concentrated in

Figure 1. **Theoretical Model of the Study**



Source: compiled by the authors.

the Central (27.85%), Volga (19.54%), and Siberian (18.08%) Federal Districts, followed by the North-West (11.89%) and Urals (11.73%) Federal Districts.

Measurements of the Variables

Dependent Variable

The "*Company performance*" variable is a subjective indicator *measured* using an adapted 7-point Likert scale described in [*Stam, Elfring*, 2008]. Its Cronbach's alpha value is 0.9021 and the final values were calculated as the average of all components of this multivariable.

Independent Variable

The *entrepreneurial component* of SE was calculated as the average value of the indicators "*Entrepreneurial mindset*" and "*Innovation*". Both these indicators were measured using the adapted 7-point Likert scale described in [*Kyrgidou, Petridou*, 2011] with Cronbach's alpha value at 0.8504 for the first, and 0.8797 for the second. Cronbach's alpha for the whole entrepreneurial component was 0.9024.

The *strategic component* of SE was calculated as the average of the "*Strategic management of resources*" and "*Competitive advantage*" indicator values. Both were measured using the same 7-point Likert scale as in the previous case. Cronbach's alpha in the first case was 0.7099, and in the second 0.5844. Cronbach's alpha for the whole *strategic component* was 0.6694.

The following control variables were applied to ensure internal validity: company size, company age, location (federal district), industry, and sales revenue in 2014.

The regression models applied in the study, with the interpretation of the main variables, are presented in Table. 2.

Descriptive statistics and the correlation matrix are presented in Tables 3 and 4, respectively. The average age of the companies in the sample is 12.65 years, the average number of full-time employees is 41, the average sales revenues in 2014 amounted to 9.093 million rubles. The average indicator values measured using the Likert scale were as follows: company performance — 4.35, entrepreneurial mindset — 4.377, innovation — 4.929, strategic management of resources — 4.2, and competitive advantage — 5.185.

Data Analysis Results

The results of testing the hypotheses using regression analysis (which was carried out in several stages) are presented in Table 4. The first model includes only control variables. In the second model the independent variables "*Entrepreneurial component*" and "*Strategic component*" were added, whose combined indicator is reflected in the third model. The variables (except for the binary and dependent ones) were standardized to exclude multicollinearity, which can distort statistically significant indicators to the point of changing coefficients' signs [*Dawson*, 2014]. Dispersion inflation factors do not exceed 2. Although [*Neter et al.*, 1990] suggest the maximum allowable value should be 10, we rely on a more conservative threshold value [*O'Brien*, 2007]. Also, the possibility that a corre-

Table 2. **Regression Models**

Models	Regression equation
Model 1	$Y_i = b_0 + b_1 \times SIZE_i + b_2 \times AGE_i + b_3 \times REV_i + b_4 \times IND_i + b_5 \times SFO_i + b_6 \times NFO_i + b_7 \times FFO_i + b_8 \times SibFO_i + b_9 \times UFO_i + b_{10} \times VFO_i + b_{11} \times NCFO_i + b_{12} \times CRIMEA_i$
Model 2	$Y_i = b_0 + b_1 \times SIZE_i + b_2 \times AGE_i + b_3 \times REV_i + b_4 \times IND_i + b_5 \times SFO_i + b_6 \times NFO_i + b_7 \times FFO_i + b_8 \times SibFO_i + b_9 \times UFO_i + b_{10} \times VFO_i + b_{11} \times NCFO_i + b_{12} \times CRIMEA_i + b_{13} \times STR_i + b_{14} \times ENT_i$
Model 3	$Y_i = b_0 + b_1 \times SIZE_i + b_2 \times AGE_i + b_3 \times REV_i + b_4 \times IND_i + b_5 \times SFO_i + b_6 \times NFO_i + b_7 \times FFO_i + b_8 \times SibFO_i + b_9 \times UFO_i + b_{10} \times VFO_i + b_{11} \times NCFO_i + b_{12} \times CRIMEA_i + b_{13} \times STR_i + b_{14} \times ENT_i + b_{13} \times b_{14} \times STR_i \times ENT_i$
Model 4	$Y_i = b_0 + b_1 \times SIZE_i + b_2 \times AGE_i + b_3 \times REV_i + b_4 \times IND_i + b_5 \times SFO_i + b_6 \times NFO_i + b_7 \times FFO_i + b_8 \times SibFO_i + b_9 \times UFO_i + b_{10} \times VFO_i + b_{11} \times NCFO_i + b_{12} \times CRIMEA_i + b_{14} \times ENT_i + b_{15} \times CA_i + b_{14} \times b_{15} \times ENT_i \times CA_i$
Model 5	$Y_i = b_0 + b_1 \times SIZE_i + b_2 \times AGE_i + b_3 \times REV_i + b_4 \times IND_i + b_5 \times SFO_i + b_6 \times NFO_i + b_7 \times FFO_i + b_8 \times SibFO_i + b_9 \times UFO_i + b_{10} \times VFO_i + b_{11} \times NCFO_i + b_{12} \times CRIMEA_i + b_{14} \times ENT_i + b_{16} \times RS_i + b_{14} \times b_{16} \times ENT_i \times RS_i$
Model 6	$Y_i = b_0 + b_1 \times SIZE_i + b_2 \times AGE_i + b_3 \times REV_i + b_4 \times IND_i + b_5 \times SFO_i + b_6 \times NFO_i + b_7 \times FFO_i + b_8 \times SibFO_i + b_9 \times UFO_i + b_{10} \times VFO_i + b_{11} \times NCFO_i + b_{12} \times CRIMEA_i + b_{13} \times STR_i + b_{17} \times I_i + b_{13} \times b_{17} \times STR_i \times I_i$
Model 7	$Y_i = b_0 + b_1 \times SIZE_i + b_2 \times AGE_i + b_3 \times REV_i + b_4 \times IND_i + b_5 \times SFO_i + b_6 \times NFO_i + b_7 \times FFO_i + b_8 \times SibFO_i + b_9 \times UFO_i + b_{10} \times VFO_i + b_{11} \times NCFO_i + b_{12} \times CRIMEA_i + b_{13} \times STR_i + b_{18} \times EM_i + b_{13} \times b_{18} \times STR_i \times EM_i$

Legend:
Y_i — performance; $b_0 \ldots b_{18}$ — regression coefficients; ENT_i — entrepreneurial component; STR_i — strategic component; EM_i — entrepreneurial mindset; I_i — innovation; RS_i — strategic management of resources; CA_i — competitive advantage; $SIZE_i$ — company size; AGE_i — company age; REV_i — sales revenue in 2014; IND_i — high-technology industries and services; CFO_i — Central Federal District; SFO_i — Southern Federal District; NFO_i — North-Western Federal District; FFO_i — Far-Eastern Federal District; $SibFO_i$ — Siberian Federal District; UFO_i — Urals Federal District; VFO_i — Volga Federal District; $NCFO_i$ — North Caucasus Federal District; $CRIMEA_i$ — Crimea Federal District

Source: compiled by the authors.

Table 3. **Descriptive Statistics**

Variable	Average	Standard deviation	Minimum	Maximum
Dependent variable				
Performance (Y_i)	4.350	1.017	1	7
Independent variables				
Entrepreneurial component (ENT_i)	4.653	1.414	1	7
Strategic component (STR_i)	4.692	1.181	1	7
Entrepreneurial mindset (EM_i)	4.377	1.533	1	7
Innovation (I_i)	4.929	1.528	1	7
Strategic management of resources (RS_i)	4.200	1.511	1	7
Competitive advantage (CA_i)	5.185	1.358	1	7
Control variables				
Company size (number of full-time employees) ($SIZE_i$)	41	62	3	426
Company age, years(AGE_i)	12.653	14.469	0	122
Sales revenue in 2014, thousand roubles (REV_i)	9.093	1.973	1.791	16.714
High-technology industries and services (IND_i)	—	—	0	1
Federal Districts				
Central Federal District (CFO_i)	—	—	0	1
Southern Federal District (SFO_i)	—	—	0	1
North-Western Federal District (NFO_i)	—	—	0	1
Far-Eastern Federal District (FFO_i)	—	—	0	1
Siberian Federal District ($SibFO_i$)	—	—	0	1
Urals Federal District (UFO_i)	—	—	0	1
Volga Federal District (VFO_i)	—	—	0	1
North Caucasus Federal District ($NCFO_i$)	—	—	0	1
Crimea Federal District ($CRIMEA_i$)	—	—	0	1

Source: compiled by the authors.

lation value ranging from low to moderate (Table 5) indicates a distortion of the results due to multicollinearity is unlikely. The results of the Ramsey test for erroneous specification of the regression model confirm the absence of missing variables in all models applied [*Ramsey*, 1969]. The results of the Breush-Pagan heteroskedasticity test indicate constant random error variance in all applied models [*Breusch, Pagan*, 1979].

All regression models are statistically significant. The control variables (Model 1) demonstrate a positive correlation between company size and their performance (b=0.104, p<0.05) and a negative correlation between performance and company age (b= –0.206, p<0.5). The industry variable is insignificant (b= –0.043, p=0.697). In the *Urals* and *Crimea Federal Districts,* a negative correlation with companies' performance was discovered.

In Model 2, the SE entrepreneurial component's coefficient turned out to be positive and significant (b = 0.107, p <0.05), which allows one to reject the zero hypothesis and accept the alternative, in line with working hypothesis 1: during economic crises a positive correlation exists between the *entrepreneurial component* of SE and SME performance. This component remains significant and its coefficient remains positive even when a combined indicator with the *strategic component* is included in the model (b = 0.269, p <0.05; model 3).

Hypothesis 2 was also tested in Model 2. The coefficient of the *strategic component* of SE turned out to be positive but statistically insignificant (b = 0.037, p = 0.494), that is, this hypothesis has not been confirmed.

In Model 3, the coefficient of the combined *strategic and entrepreneurial components* of SE indicator turned out to be negative and insignificant (b = –0.036, p = 0.233; model 3), accordingly, the "working" hypothesis 3 about the positive synergy between the *entrepreneurial* and *strategic components* in relation to SME performance was not confirmed in a statistically significant way. However, to analyze the matter more comprehensively, the combined indicators of the *strategic component* of SE and disaggregated parts of the *entrepreneurial component* (entrepreneurial mindset and innovation) were tested in the Models 4 and 5, respectively, while the *entrepreneurial component* and disaggregated parts of the *strategic component* (competitive advantage and strategic management of resources) were tested in the Models 6 and 7, respectively. It was found that the combined application of the *entrepreneurial component* and *competitive advantage* negatively affected companies' performance (b = –0.035, p <0.1; Model 4), and so did the combined use of the *strategic component* and *innovation* (b = –0.052, p <0.05; Model 6). The remaining combined indicators turned out to be statistically insignificant.

Table 4. **Correlation Matrix**

№	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1																			
2	0.4678	1																		
3	0.5227	0.6355	1																	
4	0.3931	0.9241	0.5339	1																
5	0.4713	0.9236	0.6404	0.7070	1															
6	0.4544	0.6038	0.8430	0.5391	0.5766	1														
7	0.4036	0.4335	0.8013	0.3288	0.4723	0.3537	1													
8	–0.0162	0.0265	–0.0338	0.0258	0.0231	0.0013	–0.0602	1												
9	–0.0525	0.0325	0.0445	0.0083	0.0518	0.0723	–0.0024	0.0021	1											
10	0.0979	0.0772	0.0557	0.0888	0.0538	0.0935	–0.0071	0.0360	0.3451	1										
11	0.0569	0.0016	–0.0077	0.0194	–0.0164	–0.0067	–0.0059	–0.1352	0.1866	0.5559	1									
12	–0.0498	–0.0110	–0.0265	0.0134	–0.0337	–0.0105	–0.0344	0.0374	0.0232	0.0205	–0.0418	1								
13	–0.0236	0.0012	–0.0152	–0.0126	0.0148	0.0179	–0.0463	0.0328	0.1279	0.0067	0.0939	–0.1726	1							
14	0.1236	0.0396	0.0884	0.0245	0.0488	0.0516	0.0963	–0.0507	–0.0652	–0.0498	–0.1035	–0.2315	–0.1810	1						
15	0.0180	–0.0500	–0.0429	–0.0300	–0.0624	–0.0386	–0.0316	–0.0178	0.0418	–0.0387	–0.0178	–0.0573	–0.0448	–0.0601	1					
16	0.0362	0.0514	0.0071	0.0433	0.0517	–0.0199	0.0345	–0.0344	0.0008	–0.0125	0.0595	–0.2919	–0.2282	–0.3062	–0.0758	1				
17	0.0041	0.0594	–0.0116	0.0674	0.0423	–0.0017	–0.0182	0.0015	0.0245	0.0506	0.0792	–0.0947	–0.0741	–0.0994	–0.0246	–0.1253	1			
18	0.0273	–0.0241	0.0192	–0.0319	–0.0126	–0.0005	0.0341	–0.0241	–0.0769	0.0729	0.0094	–0.1120	–0.0875	–0.1175	–0.0291	–0.1481	–0.0481	1		
19	–0.1418	–0.1082	–0.0616	–0.1007	–0.0992	–0.0249	–0.0795	0.0474	–0.0612	–0.0267	–0.0499	–0.1712	–0.1339	–0.1796	–0.0445	–0.2264	–0.0735	–0.0869	1	
20	0.0020	–0.0044	–0.0066	–0.0011	–0.0070	–0.0054	–0.0055	0.0635	0.0594	0.0557	0.0196	–0.0190	–0.0148	–0.0199	–0.0049	–0.0251	–0.0081	–0.0096	–0.0147	1

Legend
1 — performance (Y_i)
2 — entrepreneurial component (ENT_i)
3 — strategic component (STR_i)
4 — entrepreneurial mindset (EM_i)
5 — innovation (I_i)
6 — strategic management of resources (RS_i)
7 — competitive advantage (CA_i)
8 — high-technology industries and services (IND_i)
9 — company age* (AGE_i)
10 — company size (number of full-time employees)*($SIZE_i$)
11 — sales revenue in 2014 (REV_i)
12 — Siberian Federal District ($SibFO_i$)
13 — North-Western Federal District (NFO_i)
14 — Volga Federal District (VFO_i)
15 — North Caucasus Federal District ($NCFO_i$)
16 — Central Federal District (CFO_i)
17 — Far-Eastern Federal District (FFO_i)
18 — Southern Federal District (SFO_i)
19 — Urals Federal District (UFO_i)
20 — Crimea Federal District ($CRIMEA_i$)

* natural logarithm

Source: compiled by the authors.

Table 5. **Regression Analysis Results**

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Entrepreneurial component (ENT_i)		0.107** (0.045)	0.269** (0.114)	0.311*** (0.117)	0.179** (0.082)		
Strategic component (STR_i)		0.037 (0.054)	0.190* (0.113)			0.303*** (0.115)	0.116 (0.100)
Entrepreneurial component × Strategic component ($ENT_i \times STR_i$)			–0.036 (0.023)				
Competitive advantage (CA_i)				0.131 (0.092)			
Entrepreneurial component x Competitive advantage ($ENT_i \times CA_i$)				–0.035* (0.021)			
Strategic management of resources (RS_i)					0.150 (0.095)		
Entrepreneurial component x Strategic management of resources ($ENT_i \times RS_i$)					–0.023 (0.019)		
Innovation (I_i)						0.291*** (0.103)	
Strategic component × Innovation ($STR_i \times I_i$)						–0.052** (0.022)	
Entrepreneurial mindset (EM_i)							0.175 (0.114)
Strategic component × Entrepreneurial mindset ($STR_i \times EM_i$)							–0.017 (0.023)
Company age (AGE_i), natural logarithm	–0.206** (0.082)	–0.210*** (0.081)	–0.214*** (0.081)	–0.210*** (0.081)	–0.219*** (0.081)	–0.220*** (0.081)	–0.205** (0.081)
Company size (number of full-time employees) ($SIZE_i$), natural logarithm	0.104** (0.053)	0.088* (0.053)	0.086 (0.053)	0.085 (0.053)	0.083 (0.053)	0.090* (0.052)	0.084 (0.053)
Sales revenue in 2014 (REV_i), natural logarithm	0.040 (0.031)	0.047 (0.031)	0.046 (0.031)	0.046 (0.031)	0.048 (0.031)	0.045 (0.031)	0.046 (0.031)
High-technology industries and services (IND_i)	–0.043 (0.111)	–0.046 (0.110)	–0.039 (0.110)	–0.040 (0.110)	–0.046 (0.110)	–0.029 (0.110)	–0.042 (0.110)
Siberian Federal District ($SibFO_i$)	–0.186 (0.149)	–0.163 (0.147)	–0.154 (0.147)	–0.149 (0.147)	–0.166 (0.147)	–0.147 (0.147)	–0.169 (0.147)
North-Western Federal District (NFO_i)	–0.028 (0.171)	–0.014 (0.170)	–0.012 (0.170)	–0.019 (0.170)	–0.020 (0.170)	–0.018 (0.170)	–0.010 (0.170)
Volga Federal District (VFO_i)	–0.085 (0.145)	–0.090 (0.144)	–0.088 (0.144)	–0.074 (0.144)	–0.095 (0.144)	–0.098 (0.144)	–0.089 (0.144)
North Caucasus Federal District ($NCFO_i$)	–0.510 (0.416)	–0.422 (0.413)	–0.408 (0.412)	–0.406 (0.412)	–0.421 (0.412)	–0.393 (0.413)	–0.444 (0.412)
Far-Eastern Federal District (FFO_i)	–0.042 (0.265)	–0.069 (0.263)	–0.090 (0.263)	–0.088 (0.263)	–0.091 (0.263)	–0.084 (0.263)	–0.083 (0.263)
Southern Federal District (SFO_i)	–0.030 (0.232)	0.001 (0.231)	–0.009 (0.230)	0.012 (0.230)	–0.013 (0.231)	–0.029 (0.230)	–0.001 (0.231)
Urals Federal District (UFO_i)	–0.295* (0.171)	–0.228 (0.171)	–0.211 (0.171)	–0.206 (0.171)	–0.233 (0.171)	–0.219 (0.170)	–0.223 (0.171)
Crimea Federal District ($CRIMEA_i$)	–2.221* (1.222)	–2.154* (1.211)	–2.191* (1.210)	–2.184* (1.210)	–2.175* (1.210)	–2.217* (1.209)	–2.184* (1.211)
Constant (b_0)	3.043*** (0.324)	2.352*** (0.379)	1.725*** (0.555)	1.764*** (0.565)	2.065*** (0.453)	1.460*** (0.550)	2.085*** (0.533)
R-squared	0.039	0.061	0.064	0.064	0.064	0.065	0.063

Note: n = 614; *** p<0.001, ** p<0.05, * p<0.1.
Source: compiled by the authors.

Given that almost 30% of the sample firms are located in the Central Federal District (CFD), we decided to conduct additional analysis using the same regression models but excluding this district. The CFD is far ahead of other Russian districts in terms of most socioeconomic indicators (total gross regional product, the development of production and social infrastructure, etc.), and its economic structure is closer to that of post-industrial economies [Ministry of Economic Development, 2013]. The regression models' results are presented in Table 6. Among the control variables, company age ceases to have a significant correlation with company performance. For independent variables and their interactions, all previous results remained unchanged, but the combined indicator of the *entrepreneurial* and *strategic components* of SE became statistically significant, indicating a negative correlation between their simultaneous application and company performance outside the CFD.

Table 6. **Regression Analysis Results (with companies located in CFD excluded)**

	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
Entrepreneurial component (ENT_i)		0.141*** (0.051)	0.381*** (0.130)	0.472*** (0.130)	0.215** (0.094)		
Strategic component (STR_i)		0.014 (0.061)	0.229* (0.123)			0.388*** (0.126)	0.119 (0.109)
Entrepreneurial component × Strategic component ($ENT_i \times STR_i$)			–0.053** (0.026)				
Competitive advantage (CA_i)				0.214** (0.101)			
Entrepreneurial component × Competitive advantage ($ENT_i \times CA_i$)				–0.060** (0.023)			
Strategic management of resources (RS_i)					0.142 (0.107)		
Entrepreneurial component × Strategic management of resources ($ENT_i \times RS_i$)					–0.024 (0.022)		
Innovation (I_i)						0.416*** (0.117)	
Strategic component × Innovation ($STR_i \times I_i$)						–0.076*** (0.025)	
Entrepreneurial mindset (EM_i)							0.233* (0.128)
Strategic component × Entrepreneurial mindset (STRi × EM_i)							–0.023 (0.025)
Company age (AGE_i), natural logarithm	–0.130 (0.095)	–0.145 (0.094)	–0.147 (0.094)	–0.146 (0.093)	–0.154 (0.094)	–0.148 (0.094)	–0.141 (0.094)
Company size (number of full-time employees) ($SIZE_i$) , natural logarithm	0.133** (0.060)	0.116* (0.059)	0.115* (0.059)	0.110* (0.059)	0.115* (0.059)	0.120** (0.059)	0.113* (0.059)
Sales revenues in 2014 (REV_i) , natural logarithm	0.018 (0.035)	0.025 (0.034)	0.023 (0.034)	0.024 (0.034)	0.024 (0.034)	0.022 (0.034)	0.023 (0.034)
High-technology industries and services (IND_i)	–0.003 (0.125)	–0.003 (0.123)	0.013 (0.123)	0.020 (0.123)	0.002 (0.123)	0.032 (0.123)	0.007 (0.123)
North-Western Federal District (NFO_i)	0.159 (0.180)	0.151 (0.177)	0.141 (0.177)	0.118 (0.177)	0.151 (0.177)	0.122 (0.177)	0.166 (0.177)
Volga Federal District (VFO_i)	0.111 (0.155)	0.084 (0.154)	0.076 (0.153)	0.083 (0.153)	0.079 (0.153)	0.056 (0.153)	0.094 (0.154)
North Caucasus Federal District ($NCFO_i$)	–0.323 (0.409)	–0.245 (0.403)	–0.239 (0.402)	–0.241 (0.401)	–0.237 (0.403)	–0.229 (0.402)	–0.265 (0.403)
Far-Eastern Federal District (FFO_i)	0.155 (0.266)	0.090 (0.263)	0.045 (0.263)	0.044 (0.262)	0.072 (0.264)	0.041 (0.263)	0.080 (0.263)
Southern Federal District (SFO_i)	0.172 (0.235)	0.185 (0.232)	0.160 (0.232)	0.175 (0.231)	0.170 (0.232)	0.126 (0.231)	0.190 (0.233)
Urals Federal District (UFO_i)	–0.098 (0.178)	–0.046 (0.176)	–0.033 (0.176)	–0.038 (0.175)	–0.045 (0.176)	–0.053 (0.175)	–0.032 (0.176)
Crimea Federal District ($CRIMEA_i$)	–2.153* (1.187)	–2.101* (1.170)	–2.175* (1.167)	–2.177* (1.163)	–2.126* (1.169)	–2.235* (1.165)	–2.133* (1.169)
Constant (b_0)	2.791*** (0.359)	2.089*** (0.415)	1.205** (0.604)	1.049* (0.608)	1.745*** (0.504)	0.816 (0.598)	1.738*** (0.580)
R-squared	0.039	0.070	0.079	0.085	0.074	0.081	0.074

Notes: n = 413; *** p<0.001, ** p<0.05, * p<0.1.

Source: compiled by the authors.

Discussion of the Results

An analysis of the relationship between the SE components (in particular, entrepreneurial and strategic ones) and Russian SMEs' performance during the economic crisis allowed us to make the following conclusions. A positive correlation exists between the entrepreneurial component of SE and the performance of Russian SMEs during economic crises. In such periods, entrepreneurs face serious threats that affect their financial situation and, ultimately, their very survival [*Kunc*, *Bhandari*, 2011; *Pal et al.*, 2014]. However, deep economic shocks also create new opportunities [*Beliaeva et al.*, 2018; *Laskovaia et al.*, 2019; *Pearce, Michael,* 2006] and promote the application of new technologies and business models [*Rae-Dupree*, 2008]. Thus, Russian companies that experiment with new products, services, and business models tend to be less affected by crises. Studies based on data about devel-

oped and emerging markets indicate that increased economic pressure often helps a firm make creative decisions that positively affect companies' financial performance [*Beliaeva et al.,* 2018; *Hausman, Johnston*, 2014]. Players who rely on innovation also strengthen their market positions and leadership [*Drickhamer,* 2003; *Guellec, Wunsch-Vincent,* 2009; *Pearce, Michael,* 2006]. Thus, entrepreneurial decisions play a critical role in crisis situations and turn into key success factors for SMEs [*Periz-Ortiz et al.*, 2008]. On the contrary, no statistically significant relationship was discovered between the strategic component of SE and companies' performance, nor between the industry-specific behavior of Russian SMEs during economic crises.

A negative correlation between the combined indicator of the entrepreneurial component and competitive advantage and the performance of Russian SMEs located outside the CFD indicates that companies have a limited resource base during economic crises. In such circumstances, companies located outside the CFD have to choose between entrepreneurial or strategic action since they cannot afford to carry out both at the same time [*Ireland et al.,* 2003]. Including the CFD in the sample eliminates this effect, which serves as another confirmation of the unequal availability of resources in the central and other regions of the country. When this availability is further limited by a crisis, small companies focus on implementing only one SE component, since trying to combine entrepreneurial and strategic efforts can be fatal.

The theoretical originality of the study is in the proposed strategic concept of entrepreneurship in the framework of strategic management theory, with an emphasis placed upon individual SE components (entrepreneurial mindset, innovation, strategic management of resources, and competitive advantage), and in the analysis of small and medium enterprises' activities in the context of economic crises. In particular, we tried to demonstrate that the relationship between SE and SME performance during turbulent periods is notably different from stable economic conditions. For example, analyzing SMEs' strategic behavior in a sustainable context allows one to conclude that to achieve the best results, entrepreneurs should combine several strategic approaches (see, e.g., [*Atuahene-Gima, Ko,* 2001; *Deutscher et al.,* 2016; *Ho et al.,* 2016]). On the other hand, when resources are limited due to a crisis, combining several SE components results in decreased corporate performance indicators for SMEs.

Our study also makes a unique contribution regarding Russian SMEs during the economic crisis of 2014-2016 given the time when it was conducted and the nature of the sample. Studying post-crisis business strategies is fraught with the conclusions being biased and unreliable due to the management's cognitive distortions in the perception of companies' past behavior [*Bao et al.,* 2011]. Furthermore, since the sample of domestic firms was random, the results obtained are applicable to all companies that meet the selection criteria.

The practical importance of this study for top managers, corporate decision makers, and those responsible for developing and implementing strategies lies in the identified approaches to company management that guarantee an organization's best performance during periods of economic crisis. It is important for SME managers to realize that combining specific SE components (which leads to improved performance under stable conditions) can have negative consequences during economic crises. In the latter case, they should focus on advancing entrepreneurial behavior, which normally involves innovation, willingness to take risks in developing new products and services, and the proactive search for and implementation of new business opportunities [*Covin, Slevin,* 1989; *Soininen et al.,* 2012].

Limitations of the Study and Future Directions for Research Areas

These findings should be evaluated with certain provisos. First, the cross-sectional data used reflects short-term company performance. A possible subject for further (longitudinal) research is the long-term impact of SE on SME performance. Second, the main dependent variable used in the study was a subjective indicator of companies' activities, namely their individual perception by managers. Despite the reliability of this approach, clarification of the obtained results requires further research. Third, we considered only the direct effects of specific SE components or their combinations. Authors of subsequent studies may choose to focus on other moderators of the correlation between SE and companies' performance. Replication studies using various samples (e.g., those comprising large firms and state-owned companies) may also be in order.

The study was supported with a grant provided by the Russian Science Foundation (project No. 19-18-00081).

References

Aldrich H., Auster E.R. (1986) Even dwarfs started small: Liabilities of age and size and their strategic implications. *Research in Organizational Behavior*, vol. 8, pp. 165–186.

Alonso-Almeida M.D.M., Bremser K., Llach J. (2015) Proactive and reactive strategies deployed by restaurants in times of crisis: Effects on capabilities, organization and competitive advantage. *International Journal of Contemporary Hospitality Management*, vol. 27, no 7, pp. 1641–1661.

Anderson B.S., Eshima Y. (2013) The influence of firm age and intangible resources on the relationship between entrepreneurial orientation and firm growth among Japanese SMEs. *Journal of Business Venturing*, vol. 28, no 3, pp. 413–429.

Antonioli D., Mazzanti M., Pini P. (2010) Productivity, innovation strategies and industrial relations in SMEs. Empirical evidence for a local production system in northern Italy. *International Review of Applied Economics*, vol. 24, no 4, pp. 453–482.

Atuahene-Gima K., Ko A. (2001) An empirical investigation of the effect of market orientation and entrepreneurship orientation alignment on product innovation. *Organization Science*, vol. 12, no 1, pp. 54–74.

Audretsch D.B., Mahmood T. (1994) The rate of hazard confronting new firms and plants in US manufacturing. *Review of Industrial Organization*, vol. 9, no 1, pp. 41–56.

Awang A., Kassim A., Noor A.M., Shukor N., Shaari A.Z., Amran S., Khalid S.A. (2015) Strategic Entrepreneurship Model for Economic Transformation: Malaysian Evidence. *Asian Social Science*, vol. 11, no 7, pp. 19–34.

Bao Y., Olson B., Yuan W. (2011) Defensive and Expansion Responses to Environmental Shocks in China: Interpreting the 2008 Economic Crisis. *Thunderbird International Business Review*, vol. 53, no 2, pp. 225–245.

Barringer B. R., Bluedorn A. C. (1999) The relationship between corporate entrepreneurship and strategic management. *Strategic Management Journal*, vol. 20, no 5, pp. 421–444.

Baum J.A., Oliver C. (1996) Toward an institutional ecology of organizational founding. *Academy of Management Journal*, vol. 39, no 5, pp. 1378–1427.

Beliaeva T., Shirokova G., Wales W., Gafforova E. (2018) Benefiting from economic crisis? Strategic orientation effects, trade-offs, and configurations with resource availability on SME performance. *International Entrepreneurship and Management Journal* (first published online). DOI: 10.1007/s11365-018-0499-2.

Bjørnskov C., Foss N. (2013) How strategic entrepreneurship and the institutional context drive economic growth. *Strategic Entrepreneurship Journal*, vol. 7, no 1, pp. 50–69.

Boone C., Wezel F.C., van Witteloostuijn A. (2013) Joining the pack or going solo? A dynamic theory of new firm positioning. *Journal of Business Venturing*, vol. 28, no 4, pp. 511–527.

Breusch T.S., Pagan A.R. (1979) A Simple Test for Heteroskedasticity and Random Coefficient Variation. *Econometrica,* vol. 47, no 5, pp. 1287–1294.

Carlbäck M. (2012) Strategic entrepreneurship in the hotel industry: The role of chain affiliation. *Scandinavian Journal of Hospitality and Tourism,* vol. 12, no 4, pp. 349–372.

Carreira C., Silva F. (2010) No deep pockets: Some stylized empirical results on firms' financial constraints. *Journal of Economic Surveys*, vol. 24, no 4, pp. 731–753.

Chang S.J., van Witteloostuijn A., Eden L. (2010) From the editors: Common method variance in international business research. *Journal of International Business Studies*, vol. 41, no 2, pp. 178–184.

Chen M.J., Lin H.C., Michel J.G. (2010) Navigating in a hypercompetitive environment: The roles of action aggressiveness and TMT integration. *Strategic Management Journal*, vol. 31, no 13, pp. 1410–1430.

Chepurenko A. (2015) Entrepreneurship Theory: New Challenges and Future Prospects. *Foresight-Russia*, vol. 9, no 2, pp. 44-57. DOI: 10.17323/1995-459x.2015.2.44.57.

Connaughton J.E., Madsen R.A. (2009) Regional implications of the 2001 recession. *The Annals of Regional Science*, vol. 43, no 2, pp. 491–507.

Covin J.G., Slevin D.P. (1989) Strategic management of small firms in hostile and benign environments. *Strategic Management Journal*, vol. 10, no 1, pp. 75–87.

Danneels E. (2002) The dynamics of product innovation and firm competences. *Strategic Management Journal*, vol. 23, no 12, pp. 1095–1121.

Darling J., Gabrielsson M., Seristö H. (2007) Enhancing contemporary entrepreneurship: A focus on management leadership. *European Business Review*, vol. 19, no 1, pp. 4–22.

Dawson J.F. (2014) Moderation in management research: What, why, when, and how. *Journal of Business and Psychology*, vol. 29, no 1, pp. 1–19.

De Oliveira Teixeira E., Werther W.B. (2013) Resilience: Continuous renewal of competitive advantages. *Business Horizons*, vol. 56, no 3, pp. 333–342.

DeSimone L.D., Hatsopoulos G.N. (1995) How can big companies keep the entrepreneurial spirit alive? *Harvard Business Review*, vol. 73, no 6, pp. 183–189.

Dess G.G., Robinson R.B. (1984) Measuring organizational performance in the absence of objective measures: The case of the privately-held firm and conglomerate business unit. *Strategic Management Journal*, vol. 5, no 3, pp. 265–273.

Deutscher F., Zapkau F.B., Schwens C., Baum M., Kabst R. (2016) Strategic orientations and performance: A configurational perspective. *Journal of Business Research*, vol. 69, no 2, pp. 849–861.

Dhliwayo S. (2014) Entrepreneurship and Competitive Strategy: An Integrative Approach. *Journal of Entrepreneurship*, vol. 23, no 1, pp. 115–135.

Drickhamer D. (2003) Short-term gain, long-term pain. *Industry Week*, vol. 252, no 2, pp. 14.

Dutton J.E. (1986) The processing of crisis and non-crisis strategic issues. *Journal of Management Studies*, vol. 23, no 5, pp. 501–517.

Eisenhardt K.M., Martin J.A. (2000) Dynamic capabilities: What are they? *Strategic Management Journal*, vol. 21, no 10/11, pp. 1105–1121.

Gibson C.B., Birkinshaw J. (2004) The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of Management Journal*, vol. 47, no 2, pp. 209–226.

Grewal R., Tansuhaj P. (2001) Building organizational capabilities for managing economic crisis: The role of market orientation and strategic flexibility. *Journal of Marketing*, vol. 65, no 2, pp. 67–80.

Guellec D., Wunsch-Vincent S. (2009) *Policy Responses to the Economic Crisis: Investing in Innovation for Long-Term Growth*, Paris: OECD.

Harrison R.T., Cooper S.Y., Mason C.M. (2004) Entrepreneurial activity and the dynamics of technology-based cluster development: The case of Ottawa. *Urban Studies*, vol. 41, no 5–6, pp. 1045–1070.

Hausman A., Johnston W.J. (2014) The role of innovation in driving the economy: Lessons from the global financial crisis. *Journal of Business Research*, vol. 67, no 1, pp. 2720–2726.

He Z.L., Wong P.K. (2004) Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organization Science*, vol. 15, no 4, pp. 481–494.

Hitt M.A., Beamish P.W., Jackson S.E., Mathieu J.E. (2007) Building theoretical and empirical bridges across levels: Multilevel research in management. *Academy of Management Journal*, vol. 50, no 6, pp. 1385–1399.

Hitt M.A., Ireland R.D., Camp S.M., Sexton D.L. (2001) Strategic entrepreneurship: Entrepreneurial strategies for wealth creation. *Strategic Management Journal*, vol. 22, no 6–7, pp. 479–491.

Ho J., Plewa C., Lu V.N. (2016) Examining strategic orientation complementarity using multiple regression analysis and fuzzy set QCA. *Journal of Business Research*, vol. 69, no 6, pp. 2199–2205.

Hodorogel R.G. (2009) The economic crisis and its effects on SMEs. *Theoretical and Applied Economics*, vol. 5, no 5, pp. 79–88.

Ireland R.D., Hitt M. A., Sirmon D.G. (2003) A model of strategic entrepreneurship: The construct and its dimensions. *Journal of Management*, vol. 29, no 6, pp. 963–989.

Ireland R.D., Hitt M.A., Camp S.M., Sexton D.L. (2001) Integrating entrepreneurship and strategic management actions to create firm wealth. *The Academy of Management Executive*, vol. 15, no 1, pp. 49–63.

Ireland R.D., Webb J.W. (2007) Strategic entrepreneurship: Creating competitive advantage through streams of innovation. *Business Horizons*, vol. 50, no 1, pp. 49–59.

Ivvonen L., Shirokova G. (2016) Strategicheskoe predprinimatel'stvo: sushchnost'i osnovnye napravleniya issledovanii [Strategic entrepreneurship: essence and main research directions]. *Vestnik of Saint Petersburg University. Management,* no 4, pp. 21–53 *(in Russian).*

Jansen J.J., van den Bosch F.A., Volberda H.W. (2006) Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Science*, vol. 52, no 11, pp. 1661–1674.

Kantur D. (2016) Strategic entrepreneurship: Mediating the entrepreneurial orientation-performance link. *Management Decision*, vol. 54, no 1, pp. 24–43.

Ketchen D.J., Ireland R.D., Snow C.C. (2007) Strategic entrepreneurship, collaborative innovation, and wealth creation. *Strategic Entrepreneurship Journal*, vol. 1, no 3–4, pp. 371–385.

Knight F. H. (1921) *Risk, uncertainty and profit,* New York: Hart, Schaffner and Marx.

Knudsen E.S., Lien L.B. (2015) Hire, Fire, or Train: Innovation and Human Capital Responses to Recessions. *Strategic Entrepreneurship Journal*, vol. 9, no 4, pp. 313–330.

Köksal H.M., Özgül E. (2007) The relationship between marketing strategies and performance in an economic crisis. *Marketing Intelligence and Planning,* vol. 25, no 4, pp. 326–342.

Kotha S. (2010) Spillovers, spillins, and strategic entrepreneurship: America's first commercial jet airplane and Boeing's ascendancy in commercial aviation. *Strategic Entrepreneurship Journal*, vol. 4, no 4, pp. 284–306.

Kunc M., Bhandari R. (2011) Strategic development processes during economic and financial crisis. *Management Decision,* vol. 49, no 8, pp. 1343–1353.

Kyrgidou L.P., Petridou E. (2011) The effect of competence exploration and competence exploitation on strategic entrepreneurship. *Technology Analysis and Strategic Management*, vol. 23, no 6, pp. 697–713.

Laskovaia A., Marino L., Shirokova G., Wales W. (2019) Expect the unexpected: Examining the shaping role of entrepreneurial orientation on causal and effectual decision-making logic during economic crisis. *Entrepreneurship & Regional Development*, vol. 31, no 5–6, pp. 456–475. DOI: 10.1080/08985626.2018.1541593.

Latham S. (2009) Contrasting strategic response to economic recession in start-up versus established software firms. *Journal of Small Business Management*, vol. 47, no 2, pp. 180–201.

Levinthal D.A., March J.G. (1993) The myopia of learning. *Strategic Management Journal*, vol. 14, no S2, pp. 95–112.

Li H.H.J., Tan K.H., Hida A. (2011) Sustaining growth in electronic manufacturing sector: Lessons from Japanese mid-size EMS providers. *International Journal of Production Research*, vol. 49, no 18, pp. 5415–5430.

Ling Y., Kellermanns F.W. (2010) The effects of family firm specific sources of TMT diversity: The moderating role of information exchange frequency. *Journal of Management Studies*, vol. 47, no 2, pp. 322–344.

Löfgren A. (2014) International network management for the purpose of host market expansion: The mediating effect of co-innovation in the networks of SMEs. *Journal of International Entrepreneurship*, vol. 12, no 2, pp. 162–182.

Lubatkin M.H., Simsek Z., Ling Y., Veiga J.F. (2006) Ambidexterity and performance in small-to medium-sized firms: The pivotal role of top management team behavioral integration. *Journal of Management,* vol. 32, no 5, pp. 646–672.

Luke B., Kearins K., Verreynne M.L. (2011) Developing a conceptual framework of strategic entrepreneurship. *International Journal of Entrepreneurial Behavior and Research*, vol. 17, no 3, pp. 314–337.

Makadok R., Coff R.W. (2002) Dialogue: The Theory of Value and the Value of Theory: Breaking New Ground versus Reinventing the Wheel. *Academy of Management Review*, vol. 27, pp. 10–13.

March J.G. (1991) Exploration and exploitation in organizational learning. *Organization Science*, vol. 2, no 1, pp. 71–87.

Marcus A.A., Goodman R.S. (1991) Victims and shareholders: The dilemmas of presenting corporate policy during a crisis. *Academy of Management Journal,* vol. 34, no 2, pp. 281–305.

McGrath R.G. (2001) Exploratory learning, innovative capacity, and managerial oversight. *Academy of Management Journal,* vol. 44, no 1, pp. 118–131.

Mellahi K., Wilkinson A. (2004) Organizational failure: A critique of recent research and a proposed integrative framework. *International Journal of Management Reviews,* vol. 5, no 1, pp. 21–41.

Merrifield D.B. (1993) Intrapreneurial corporate renewal. *Journal of Business Venturing,* vol. 8, no 5, pp. 383–389.

Meuleman M., Amess K., Wright M., Scholes L. (2009) Agency, strategic entrepreneurship, and the performance of private equity-backed buyouts. *Entrepreneurship Theory and Practice*, vol. 33, no 1, pp. 213–239.

Meyer G.D., Heppard K.A. (2000) *Entrepreneurship as strategy: Competing on the entrepreneurial edge,* Thousand Oaks, CA: Sage Publications.

Mihalache O.R., Jansen J.J., van den Bosch F.A., Volberda H.W. (2014) Top management team shared leadership and organizational ambidexterity: A moderated mediation framework. *Strategic Entrepreneurship Journal,* vol. 8, no 2, pp. 128–148.

Miller D. (1983) The correlates of entrepreneurship in three types of firms. *Management Science*, vol. 29, no 7, pp. 770–791.

Miner A.S., Bassof P., Moorman C. (2001) Organizational improvisation and learning: A field study. *Administrative Science Quarterly*, vol. 46, no 2, pp. 304–337.

Ministry of Economic Development (2013) Prognoz dolgosrochnogo sotsial'no-ekonomicheskogo razvitiya Rossiiskoi Federatsii na period do 2030 goda, Moscow: RF Ministry of Economic Development (in Russian).

Mosakowski E. (2002) Overcoming resource disadvantages in entrepreneurial firms: When less is more. *Strategic Entrepreneurship: Creating a New Mindset* (eds. M.A. Hitt, R.D. Ireland, S.M. Camp, D. Sexton), Hoboken, NJ: Wiley-Blackwell, pp. 106–126.

Neter J., Wasserman W., Kutner M.H. (1990) *Applied Linear Models, Regression, Analysis of Variance and Experimental Designs*, Boston, MA: RD Irwin.

O'Brien R.M. (2007) A caution regarding rules of thumb for variance inflation factors. *Quality and Quantity*, vol. 41, no 5, pp. 673–690.

Obeng B.A., Robson P., Haugh H. (2014) Strategic entrepreneurship and small firm growth in Ghana. *International Small Business Journal,* vol. 32, no 5, pp. 501–524.

Pal R., Torstensson H., Mattila H. (2014) Antecedents of organizational resilience in economic crises — an empirical study of Swedish textile and clothing SMEs. *International Journal of Production Economics,* vol. 147, part B, pp. 410–428.

Patzelt H., Shepherd D.A. (2009) Strategic entrepreneurship at universities: Academic entrepreneurs' assessment of policy programs. *Entrepreneurship Theory and Practice*, vol. 33, no 1, pp. 319–340.

Pearce J.A., Michael S.C. (2006) Strategies to prevent economic recessions from causing business failure. *Business Horizons,* vol. 49, no 3, pp. 201–209.

Pearson C.M., Clair J.A. (1998) Reframing crisis management. *Academy of Management Review*, vol. 23, no 1, pp. 59–76.

Peris-Ortiz M., de Borja Trujillo-Ruiz F., Hervás-Oliver J.L. (2014) Business Start-ups and Innovation: The Effect of the 2008 Economic Crisis. *Entrepreneurship, Innovation and Economic Crisis* (eds. K. Rüdiger, M. Peris-Ortiz, A. Blanco-González), New York: Springer International Publishing, pp. 41–47.

Podsakoff P.M., Organ D.W. (1986) Self-reports in organizational research: Problems and prospects. *Journal of Management,* vol. 12, no 4, pp. 531–544.

Pollard D., Hotho S. (2006) Crises, scenarios and the strategic management process. *Management Decision*, vol. 44, no 6, pp. 721–736.

Rae-Dupree J. (2008) It's no time to forget about innovation. *New York Times,* 01.08.2008. Available at: https://www.nytimes.com/2008/11/02/business/02unbox.html, accessed 15.02.2019.

Raisch S., Birkinshaw J., Probst G., Tushman M.L. (2009) Organizational ambidexterity: Balancing exploitation and exploration for sustained performance. *Organization Science,* vol. 20, no 4, pp. 685–695.

Ramsey J.B. (1969) Tests for Specification Errors in Classical Linear Least Squares Regression Analysis. Journal of the Royal Statistical Society Series B, vol. 31, no 2, pp. 350–371.

Reid G. (2007) *The Foundations of Small Business Enterprise: An Entrepreneurial Analysis of Small Firm Inception and Growth*, New York: Routledge.

Rhemtulla M., Brosseau-Liard P.É., Savalei V. (2012) When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. *Psychological Methods*, vol. 17, no 3, pp. 354–373.

Schmitt A., Probst G., Tushman M.L. (2010) M@n@gement in times of economic crisis: Insights into organizational ambidexterity. *M@n@gement,* vol. 13, no 3, pp. 128–150.

Schulze W.S., Lubatkin M.H., Dino R.N., Buchholtz A.K. (2001) Agency relationships in family firms: Theory and evidence. *Organization Science,* vol. 12, no 2, pp. 99–116.

Schumpeter J. (1942) *Capitalism, socialism and democracy,* New York: Harper & Brothers.

Shane S., Venkataraman S. (2000) The promise of entrepreneurship as a field of research. *Academy of Management Review,* vol. 25, no 1, pp. 217–226.

Sheffi Y. (2007) Building a resilient organization. *Bridge-Washington-National Academy of Engineering Bulletin*, vol. 37, no 1, pp. 1–30.

Shirokova G., Vega G., Sokolova L. (2013) Performance of Russian SMEs: Exploration, Exploitation and Strategic Entrepreneurship. *Critical Perspectives on International Business*, vol. 9, no 1/2, pp. 173–203.

Siggelkow N., Levinthal D.A. (2003) Temporarily divide to conquer: Centralized, decentralized, and reintegrated organizational approaches to exploration and adaptation. *Organization Science,* vol. 14, no 6, pp. 650–669.

Sirén C.A., Kohtamäki M., Kuckertz A. (2012) Exploration and exploitation strategies, profit performance, and the mediating role of strategic learning: Escaping the exploitation trap. *Strategic Entrepreneurship Journal*, vol. 6, no 1, pp. 18–41.

Smolka K.M., Verheul I., Burmeister-Lamp K., Heugens P.P. (2018) Get It Together! Synergistic Effects of Causal and Effectual Decision-Making Logics on Venture Performance. *Entrepreneurship Theory and Practice*, vol. 42, no 4, pp. 571–604.

Soininen J., Martikainen M., Puumalainen K., Kyläheiko K. (2012) Entrepreneurial orientation: Growth and profitability of Finnish small- and medium-sized enterprises. *International Journal of Production Economics,* vol. 140, no 2, pp. 614–621.

Stam W., Elfring T. (2008) Entrepreneurial orientation and new venture performance: The moderating role of intra-and extra- industry social capital. *Academy of Management Journal,* vol. 51, no 1, pp. 97–111.

Steffens P., Davidsson P., Fitzsimmons J. (2009) Performance configurations over time: Implications for growth-and profit-oriented strategies. *Entrepreneurship Theory and Practice,* vol. 33, no 1, pp. 125–148.

Sun Z. (2015) Technology innovation and entrepreneurial state: The development of China's high-speed rail industry. *Technology Analysis and Strategic Management,* vol. 27, no 6, pp. 646–659.

Tang Z., Hull C. (2012) An investigation of entrepreneurial orientation, perceived environmental hostility, and strategy application among Chinese SMEs. *Journal of Small Business Management,* vol. 50, no 1, pp. 132–158.

Uotila J., Maula M., Keil T., Zahra S.A. (2009) Exploration, exploitation, and financial performance: Analysis of S&P 500 corporations. *Strategic Management Journal,* vol. 30, no 2, pp. 221–231.

Vargo J., Seville, E. (2011) Crisis strategic planning for SMEs: Finding the silver lining. *International Journal of Production Research,* vol. 49, no 18, pp. 5619–5635.

Volberda H.W. (1996) Toward the flexible form: How to remain vital in hypercompetitive environments. *Organization Science,* vol. 7, no 4, pp. 359–374.

Wan W.P., Yiu D.W. (2009) From crisis to opportunity: Environmental jolt, corporate acquisitions, and firm performance. *Strategic Management Journal,* vol. 30, no 7, pp. 791–801.

Wiklund J., Shepherd D. (2005) Entrepreneurial orientation and small business performance: A configurational approach. *Journal of Business Venturing,* vol. 20, no 1, pp. 71–91.

Wooldridge J.M. (2003) *Introductory Econometrics,* Mason, OH: Thomson South-Western.

Yu F.L.T., Hu M.W. (2015) Strategic Entrepreneurship in Taiwan's Food and Catering Industries: The Case of 85° C Café Shop. *Global Business Review,* vol. 16, no 5, pp. 891–902.

Zahra S.A., Sapienza H.J., Davidsson P. (2006) Entrepreneurship and dynamic capabilities: A review, model and research agenda. *Journal of Management Studies,* vol. 43, no 4, pp. 917–955.

Social Entrepreneurship Policy: Evidences from the Italian Reform

Silvia Carnini Pulino

Director, Institute for Entrepreneurship (IFE), spulino@johncabot.edu

Riccardo Maiolini

Chair of the Business Administration Department, rmaiolini@johncabot.edu

John Cabot University, Via della Lungara 233, 00165 Rome, Italy

Paolo Venturi

Director, Associazione Italiana per la Promozione della Cultura della Cooperazione e del Non Profit (AICCON), paolo.venturi7@unibo.it

University of Bologna, Forlì Campus, P. le della Vittoria 15 – 47121 Forlì, Italy

Abstract

Social entrepreneurship (the third sector) is an increasingly important global economic phenomenon that is squarely under the academic lens. Social entrepreneurship represents an interesting opportunity for policy makers to explore new frontiers of economic growth and implement innovation in a potentially growing services sector with possible job opportunities coming from new job creation in the upcoming decades. Based on evidence from Italy, this paper considers the broader picture of this phenomenon. Addressing the need to better understand the drivers of social entrepreneurship policy, we propose a model for interpreting the impact of the recent Italian reform of the third sector at various levels of the ecosystem, which favors innovation, technology adaptation, and greater employability. The presented results contribute to laying the foundation for the further development of a theory of entrepreneurship policy.

Keywords: social entrepreneurship; social enterprises; social entrepreneurs; third sector; entrepreneurial policy; entrepreneurial skills; entrepreneurship education.

Citation: Carnini Pulino S., Maiolini R., Venturi P. (2019) Social Entrepreneurship Policy: Evidences from the Italian Reform. *Foresight and STI Governance*, vol. 13, no 3, pp. 77–88. DOI: 10.17323/2500-2597.2019.3.77.88

Historically, social enterprises have always created economic and social value in under-developed countries and in situations of economic and social hardship. In recent years, the general conditions of welfare systems in economically advanced countries and the development of new affordable technologies have increased the number of social enterprises, giving birth to new forms of enterprises that not only promote useful services for the community, but also represent interesting new forms of employment.

Social entrepreneurship represents an interesting opportunity for policy makers to explore new frontiers of economic growth and implement innovation in a segment with great growth potential and possible job opportunities coming from job creation in upcoming decades. For this reason, the authors provide an in-depth case study of the Italian reform of the third sector, which was introduced in 2017, to demonstrate how entrepreneurial policies can be implemented to favor the development of a field with tremendous growth potential.

The main purpose of this study is to explore the main drivers of social entrepreneurship policy in order to innovate an established field, favor technological adaptation, and provide a greater employability. This paper is structured as follows. The first section offers a background on the definition of social entrepreneurship and related concepts in the academic literature. The second section describes the methodology and research. The third introduces the results of the study; and the final section presents the contributions to academic literature and further research opportunities.

Literature Review on Social Entrepreneurship

Social entrepreneurship, generally defined as "entrepreneurial activity with an embedded social purpose" [*Austin et al.,* 2012], has become an important global economic phenomenon [*Dacin et al*., 2010; *Mair, Marti,* 2006; *Santos*, 2012; *Zahra et al.,* 2008]. Without reproducing a comprehensive analysis of the literature on the definition of social entrepreneurship and its attendant terms, social enterprise and social entrepreneur, we propose a review of the major contributors to this endeavor, which evidences both the areas of consensus and the areas where different definitions might coexist.

Although social entrepreneurship has been squarely under the academic lens for several decades, many researchers find that the field still lacks a comprehensive, universal definition of what social entrepreneurship is [*Weerawardena, Mort,* 2006*; Short et al.,* 2009*; Hoogendoorn et al.,* 2010*; Nicholls,* 2010*; Bacq, Janssen,* 2011*; Abu-Saifan,* 2012]. This is, in part, due to the fact that many definitions were driven by practice rather than theory [*Mair, Marti,* 2006; *Santos*, 2012], and the wide range of interpretations of what both "social" and "entrepreneurship" mean, marked by the differing emphases on the prominence of social goals or the salient features of entrepreneurship [*Martin, Osberg,* 2007; *Peredo, McLean,* 2006]. However, despite the differences in interpretations and approaches, the variety of definitions associated with social entrepreneurship in the literature point to a focus on four key factors: the characteristics of social entrepreneurs, the sector in which they operate, the processes and resources used, and the primary mission and outcomes associated with social entrepreneurship [*Dacin et al.,* 2010]. Seen through this lens, despite differences in focus, a consensus does emerge. Social entrepreneurship can be thought of as an activity that: (a) addresses social problems as its primary objective, (b) uses market mechanisms (e.g. sale of goods and services) to generate the resources needed to accomplish a social goal [*Dees,* 2001*; Johnson,* 2003], even if the goods or services are paid for by a third party [*Thompson, Doherty,* 2006], and (c) there is an element of innovation in the way resources are combined and social issues are addressed [*Mair, Marti,* 2006; *Nicholls,* 2010].

Within these very broad definitions, there is a multiplicity of views on how these terms are interpreted, depending on the researchers' different perspectives. Hoogendoorn et al look at these differences by organizing them along the lines of four distinct schools of thought (Table 1). The authors compare and contrast differences in approaches with regards to the unit of observation in the literature (the individual or the enterprise); the centrality of the link between the mission and goods and services sold, the type of legal structure, the degree to which innovation is a defining feature, the presence of constraints on the distribution of profits, the importance of raising commercial income, and the extent of involvement in the governance of direct and indirect stakeholders [*Hoogendoorn et al.,* 2010].

Some of the differences observed in defining social entrepreneurship spill over to the definition of social enterprise. Again, central to most definitions is the notion that social enterprises seek to solve social problems. However, the national differences in welfare, labor markets, and ideology together with researchers' own worldviews, have led to the creation of many different kinds of enterprise [*Zahra et al.,* 2009*; Chell et al.,* 2010]. While acknowledging the 'untidiness' of social entrepreneurship, Peredo and McLean offer an interesting insight into the loci of social entrepreneurship depending on the place of social goals and the role of commercial exchange in different perspectives [*Peredo, McLean,* 2006]. The authors delineate a continuum in which, at one end, one finds the social goal as the exclusive aim of a social entrepreneur, locating social entrepreneurship firmly within the non-profit domain. At the other end, however, the authors are open to the possibility of including even primarily for profit organizations with some social component to their mission, citing the well-known case of Ben & Jerry's, and concluding that "Indeed, one thing that emerges from a look at the range of uses given to "so-

Table 1. **Schools of Thought in Social Entrepreneurship**

Perspective	School
American	Social Innovation School Enterprise School
European	Emergence of Social Enterprise School, EMES UK approach

Source: compiled by the authors using [*Hoogendoorn et al.,* 2010].

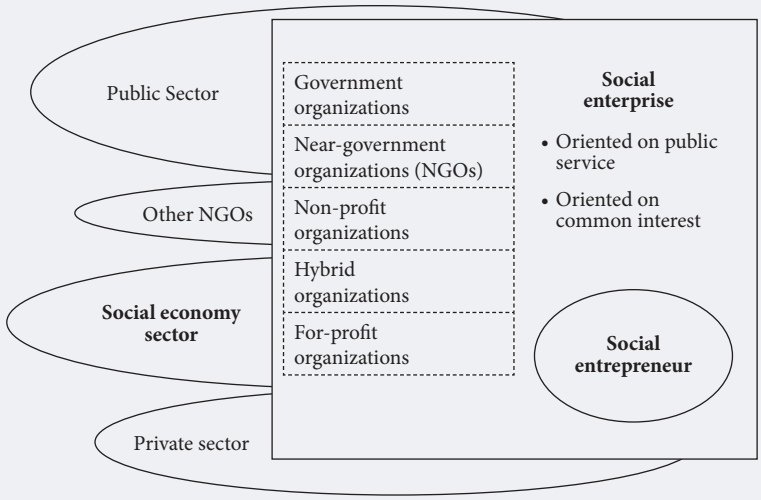
cial entrepreneurship" is the clear suggestion that the distinctions among public, private, and NFP sectors become attenuated" [*Peredo, McLean,* 2006*, p. 64*]. More recently, Abu-Saifan has attempted to put some boundaries around this continuum, which he contains between the confines of non-profit organizations with earned-income strategies to for-profit organizations with mission-driven strategies [*Abu-Saifan,* 2012]. Saebi et al.'s typology of social entrepreneurship is another attempt at bracketing the continuum, focusing on the recipients of both the social and economic missions. The authors see these two dimensions in terms of differentiated/integrated strategy (cross-subsidization or beneficiaries as the paying customers) and in terms of the beneficiaries being passive recipients or active participants in the process [*Saebi et al.*, 2019]. Moreover, several authors have stressed the relationship between context and entrepreneurship [*Shane, Venkataraman*, 2000; *Atamer, Torres*, 2008]. This relationship is further elaborated upon by Mair, who views social entrepreneurship as a context-specific, socially constructed phenomenon [*Mair*, 2010]. For Mair, the purpose of social entrepreneurship is to bring about social change, modifying the social, political and economic reality at the local level. Thus, it is the local context that shapes the strategies and tactics employed by the social entrepreneur, including the choice of for-profit or non-profit models. Even within the geographical boundaries of a single nation, social entrepreneurship can be the outcome of community work, in the form of voluntary associations or public organizations, as well as private firms working towards social objectives alongside profit goals [*Shaw, Carter*, 2007]. Bacq and Janssen have contributed to the definitional issues based on geographical and thematic criteria, stating that "two types of definitions appear in the European literature: conceptual and legal" [*Bacq, Janssen,* 2011, p. 381]. The EMES conceptual definition of "social entrepreneurship", characterized by a distinctive collective aspect, is accompanied by legal definitions given by national governments to provide a clear legal framework. Some of the examples cited include the social cooperatives in Italy, the Community Interest Companies in the UK, and the social purpose company in Belgium [*Bacq, Janssen,* 2011]. The case of Italy is of particular interest, as the economic weight of social enterprises is heavily felt, with thousands of social enterprises that provide a range of social services [*Borzaga, Defourny,* 2001].

A number of prominent scholars highlighted the importance of developing multi-level theories in organizational research [e.g., *House et al.* 1995, *Klein et al.* 1999], especially in social entrepreneurship [*Tracey et al.* 2011]. Traditionally studies have focused on micro- or macro-levels of analysis, ignoring the relationship among those levels or just exploring dynamics within the same level. The complexity of the social entrepreneurship phenomenon requires a multi-level approach, given that social entrepreneurship means different things to different people. It also means different things to people in different places. The field of social entrepreneurship has consequently become a large tent [*Martin, Osberg,* 2007] where different activities find a home under a broad umbrella of "activities and processes to enhance social wealth" [*Zahra* et al. 2009] or "entrepreneurship with a social purpose" [*Austin et al.,* 2012].

This complexity offers space for different actors with multiple functions that can operate within the field of social enterprises. Social venturing, non-profit organizations adopting commercial strategies, social cooperative enterprises, and community entrepreneurship are just some of the distinct phenomena discussed and analyzed under the 'umbrella construct' of social entrepreneurship, which deliberately emphasize 'distinct' phenomena since a great many factors can trigger or facilitate entrepreneurship. Inspired by Painter (2006), Brouard and Larivet provide a framework that throws light on the interconnections between social enterprise, social entrepreneur, and social entrepreneurship (Figure 1). In their model, "the social entrepreneur is the individual or group of individuals who act(s) as social change agent(s) using his (their) entrepreneurial skills for social value creation" [*Brouard, Larivet*, 2010, p. 32].

Social enterprise is defined here as any organization focused on public service or common interest but does not necessarily include the entrepreneurial element. In the central part of the Figure 1, the authors illustrate the various contexts in which social enterprises may be found, and in which social entrepreneurs may operate. The left-hand side of the figure distinguishes the range of sectors that harbor such enterprises, from private to public, with the social economy sector in particular evidence. In this representation, the social economy (also known as the third sector) comprises for profits, non-profits, and hybrid organizations that have a social mission as well as an economic one. Brouard and Larivet's framework maps the relationship among the concepts of social entrepreneur, social enterprise, social economy, and social entrepreneurship, paving the way for a structured interpretation of the impact of the Italian reform under study at various levels — at individual enterprise level, at context, or ecosystem level, and in terms of overall social impact.

Figure 1. **The Three Levels of Analysis: Social Economy, Enterprise, and Entrepreneur**



Source: [*Brouard, Larivet,* 2010].

The multi-level framework proposed by Brouard and Larivet is an important model that serves to build a general reading of social enterprises, trying to tie also the figure of the entrepreneur and the sectors in which social enterprises create social value. The framework proposes an overall view of the phenomenon and therefore becomes a useful tool to build new policies, in particular, to find any structural gaps in a complex sector such as that of social enterprises.

Research Context

The term "third sector" indicates a group of organizations that produce goods/services and manage activities outside the market or, if they operate on the market, act with a non-lucrative purpose (generically defined as non-profit), without distributing profits to any of its members or employees but, on the contrary, they use these profits to increase the quantity and improve the quality of services provided. Such non-profit organizations are characterized by a pursuit of the welfare of the community or a part of it. These organizations can be defined as social solidarity organizations that specialize in the production of goods or services based on altruism, gift, trust, and reciprocity.

The definition of the third sector generically indicates all forms of organization that try to solve social challenges, through a variety of vehicles. Thus, this term embraces a very large reality, which includes, for example, voluntary associations and civil service, non-profit organizations, non-governmental organizations, and social enterprises (in various forms). In other words, all bodies that pursue non-profit solidarity or social purposes. In Italy, the third sector represents an evolving field [*Venturi, Zandonai*, 2014], with many job opportunities offering new roles and new professional figures.

> *"Social enterprise is among the most functional organizational forms for the promotion and creation of new jobs and "good" employment. The motivation and passion towards the social cause together with an efficient business organization model and a vision of work based on precise objectives and economic sustainability are the main ingredients that characterize it."* (CIT Serena Porcari, Chairman Dynamo Academy Social Enterprise)[1]

This is confirmed by the Italian National Institute of Statistics (ISTAT), which in its latest census (2017) showed an 11% increase in non-profit institutions operating in Italy compared to 2011. It also showed a total of 5 million volunteers and 780,000 employees, an increase of 16.2% and 15.8%, respectively, compared to the 2011 census. However, the census also indicates another important issue: the evident lack of technical professional expertise, with 50,000 people expected to retire in the short term, without a clear plan to replace them. Moreover, in the general Italian economic scenario, the third sector currently performs six times better than the rest of the country's economic actors [ISTAT, 201]. We can therefore say that the social economy is solid despite the general crisis that has plagued Italy and the whole of Europe. This is particularly important in the context of a non-profit sector that has the same need for innovation as the for-profit sector, but with fewer resources to invest. Indeed, the third sector emerges as an area within the non-profit sector that particularly values those soft skills that build

[1] Interview Vita Magazine – 2018. http://www.vita.it/it/article/2019/02/18/parte-la-campagna-di-raccolta-fondi-tramite-sms-solidale/150707/, accessed 17.03.2019.

Table 2. **Data Sources**

Data Sources	Number of Documents	Informant
Printed articles	22 journalistic articles 26 academic papers	University professors; researchers; field experts
Interview	25	Italian third sector and social enterprise experts; social entrepreneurs; consultants; investors and bankers
Official Documents (reports released by the Ministry of Labor and Welfare)	10	The Minister of Labor and Welfare and the deputy minister in charge of the reform

Source: authors.

fundamental human capital (and that are unlikely to be replaced by new technologies): interpersonal skills, stakeholder management, medical and personal assistance, fundraising, and so on.

> "*The fact that the technological and digital revolution is destined to have a significant impact on how to produce, work and consume is a subject that is now widely discussed on a global scale. (…) Certainly, this revolution will not only affect individuals, but our own social and human relations, and even in these fields political action will not be limited to assisting but will have to play an active role in adapting to the present concepts and models now outdated: in the way of doing [social] business, in the way of training and educating, and in the way of designing welfare services.*" (CIT Claudio Cominardi, Undersecretary of State for Labor and Social Policies)[2].

Digitalization is an opportunity that plays out in many different aspects, because it can help better define the new identity of social enterprises, increase the impact of internal communication, and develop fundraising in an innovative way, through the use of platforms, direct communication channels and reporting systems as well as provide better services to people with disabilities. It is necessary to affirm the professionalizing elements of the third sector, rethinking the model of collaboration between profit and non-profit organizations, and favoring the sharing of skills. It is also important to think about a governance system that brings together the different actors and embraces the use of technology to enhance impact. Digitalization applied to the third sector is a tool that can be used to plan and improve the possible outcomes of activities, better profiling stakeholders and recipients of such activities. However, it is not always easy to convey the strategic nature of these investments to the actors that operate in the field. In recent years, the third sector has seen rapid evolution, but there is still an important gap in knowledge concerning the potential of digitalization. Hence it is also vital for non-profits to invest in digital technology.

> *"Technological innovation is one of the challenges facing the Third Sector"* (CIT Giuseppe Guzzetti, Chairman of the Association of Foundations and Banks)[3].

Given the limited propensity of single organizations or entrepreneurs to make investments in digitization, in 2017 an important reform of the third sector came into force in Italy, which aims to boost the potential of innovation drivers.

Methodology

Considering the exploratory nature of our study, we adopted an inductive, qualitative approach following the principles of grounded theory [*Glaser, Strauss*, 2017; *Strauss, Corbin*, 1990]. We used an open-ended design, themes and theoretical trajectories emerged from the data [*Corbin, Strauss*, 2008]. In terms of a theoretical sampling strategy, we concentrated on the recent reform of the Italian third sector introduced in 2017. This research is based on a wide database that we developed over the last year of investigation (2018), which covers the reactions to the reform of the main Italian experts in social entrepreneurship and is based on both archival and journalistic interview data (see Table 2).

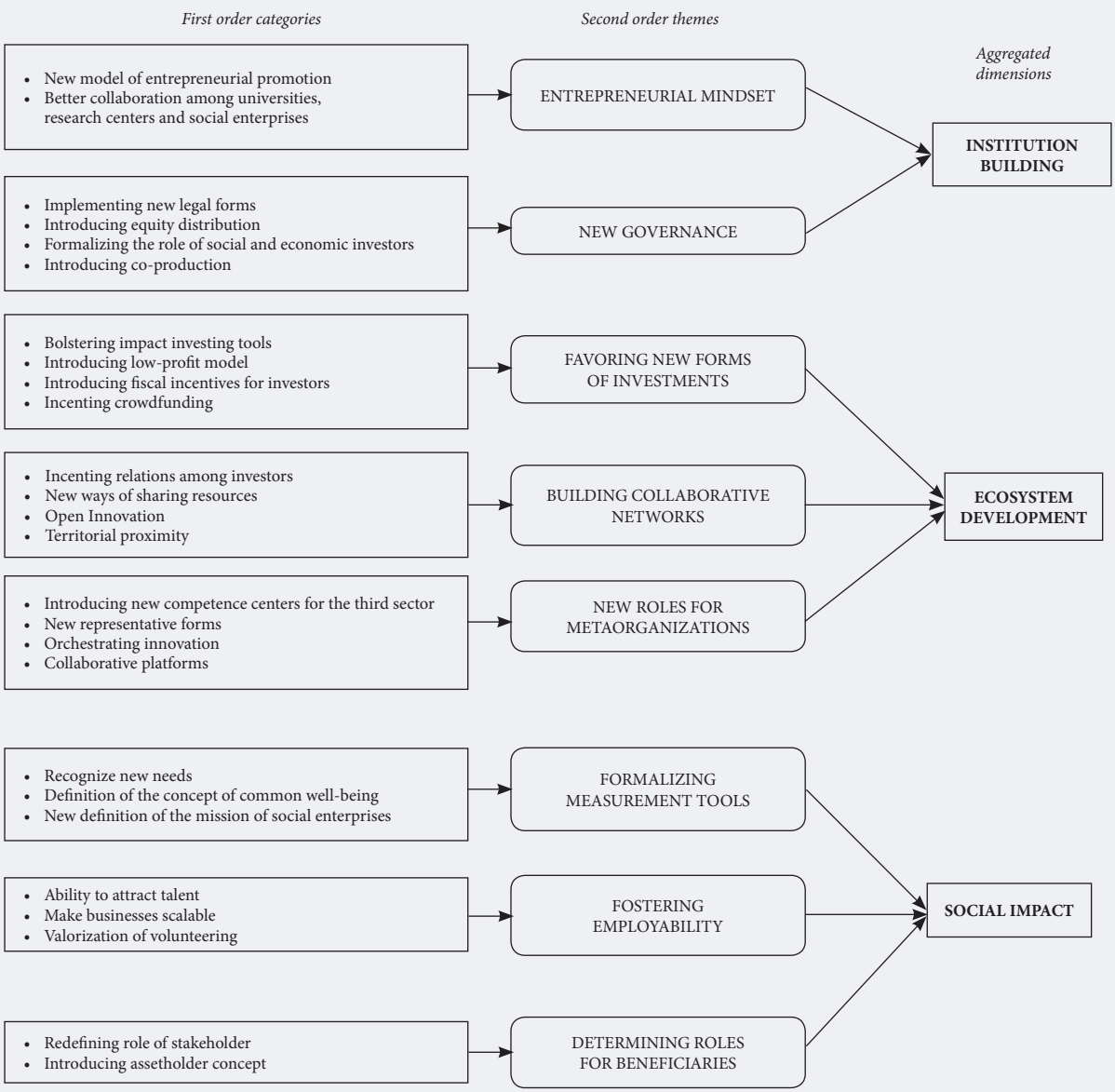
The authors independently codified the data and worked together on the triangulation used to moderate possible biases in understanding the purpose of the reform. One of the authors is an expert on the Italian third sector and actively participated in meetings and conferences relating to the new policy introduced in 2017. The data analysis was conducted following the inductive grounded theory methodology [*Strauss, Corbin*, 1998; *Gioia et al.,* 2013]. The analysis stages are represented at Figure 2.

The first step of data analysis is based upon descriptive and open coding (to identify first-order categories) following [*Gioia et al.,* 2013]. The analysis has been conducted with a qualitative software (NVivo 11) used to codify earlier categories and to visualize relationships

[2] Interview Vita Magazine – 2018. http://www.vita.it/it/article/2018/12/13/2-milioni-in-piu-per-il-dopo-di-noi-ma-ne-avevano-annunciati-89/150099, accessed 17.03.2019.

[3] Interview Vita Magazine – 2018. http://www.vita.it/it/article/2019/04/08/guzzetti-lo-stato-rispetti-i-corpi-intermedi/151191/, accessed 17.03.2019.

Figure 2. **Data Structure**



Source: authors.

between codes. During the second step of analysis, we completed axial coding [*Strauss, Corbin*, 1998], collapsing first order categories into theoretical constructs [*Eisenhardt*, 1989]. During the third and last phase of our analysis, we refined second order categories into aggregate dimensions.

Findings

One of the main drivers introduced with the reform aims to widen the spectrum of action for social enterprises. The explanation of the findings highlights the main points of the reform, which will empower a sector that, in itself, is structurally characterized by an internal transformation process aimed at supporting growing trends in terms of economic growth and future employability. Our coding analysis showed three main drivers of the reform that can be adapted at the individual, organizational, and field levels of analysis introduced by the Brouard and Larivet's framework [*Brouard, Larivet,* 2010].

Institution Building

The introduction of entrepreneurial mechanisms should increase the efficiency and effectiveness of projects with high social impact. When discussing the development of an entrepreneurial mindset, it is important to understand the full potential for social entrepreneurship in Italy. This potential is not limited to the 'pure' social enterprise basin, rather the reform

purposefully broadens the field of observation, including a plurality of legal forms and organizational categories for which the "social" aspect is a strategic asset with respect to operational management [*Venturi, Puccio,* 2018*; Maiolini et al,* 2019]. The mindset is developed by opening up to new business forms (and consequently new business models), such as benefit-corporations or innovative startups with a social vocation. The innovative startups with a social vocation operate exclusively in the sectors indicated by the reform and must implement a social impact methodology in their strategic plan. Interestingly, in addition to traditional sectors such as fair trade, social agriculture, microcredit and so on, the reform expands the reach of social vocation to incorporate new sectors, including social services, first aid and risk prevention, protection of the environment, blood donation, culture, sport and entertainment, philanthropy, education and research, and participation in political and social life. Benefit-corporations, on the other hand, are a new legal form of business introduced by Law No. 208/2015[4] that can distribute profits and simultaneously pursue a common benefit purpose, operating responsibly, sustainably, and transparently within their communities and territories of reference. The new forms of governance and the new social enterprise models have been introduced to encourage the emergence of economically sustainable entrepreneurial forms able to solve complex social problems through market responses.

> *"The reform of the Third Sector will bring considerable risk capital closer to the social world. [The concept of] profit has been clarified and today is embedded into social business, and even the most ideologized Third Sector organizations could have no difficulty accepting the novelty. All this while the uncontrolled flow of immigrants is displacing the European governments that, in order to integrate them and avoid social tensions, will have to acquire skills now absent. Maybe by relying on Third Sector companies."* (Mario Calderini)[5].

The strategy adopted by Italian policymakers is to unlock the economic and growth potential of the Italian third sector giving the opportunity to the new social enterprises to manage investments like for-profit companies and bridging market efficiency with social purpose.

> "*The importance of the reform is to have recognized the Third Sector's ability to produce social and economic utility together.*" (Stefano Zamagni — Professor of Economics at the University of Bologna, a Fellow of the Human Development and Capability Association (HDCA), and President of the Pontifical Academy of Social Sciences)[6].

Ecosystem Development

One of the main obstacles to the growth of social enterprises is linked to the scarce growth and scalability of organizations. It is necessary to favor the construction of networks of organizations that collaborate together with other actors (public administration, citizens, beneficiaries, voluntary organizations, investors, philanthropists) privileging the solution of problems rather than the interests of individual participants. A fundamental element of this is the construction of associative networks of different actors that can collaborate across sectors, as well as the widening of the spectrum of action from a local to national scale.

> "*The social enterprise redesigned by the reform expands the biodiversity of the subjects by introducing some significant innovations: converse with diversity, compete with technology, and incorporate new generations and critical thinking to continue being bottom-up innovators*" (Flaviano Zandonai)[7]

The construction of networks and new partnership models bring into play the extraordinary internal biodiversity of the third sector. The new associative networks go beyond the traditional networks through which similar subjects hold dialogue with institutional "counterparts". These networks reach into communities of people and organizations that include new typologies of actors called asset-holders, in other words, all participants in the creation of economic and social value introduce a new perspective, in which different players identify innovative solutions in different ways, encouraging a harmonious coexistence of cooperative and competitive relationships. Third sector institutions and social enterprises are first and foremost entities that can be used by citizens interested in pursuing the common good. Such citizens are, in logical order, though not necessarily in terms of importance, the first stakeholders of the third sector [*Fici*, 2018]. An ecosystem is therefore formed by many actors who perform different activities, have different objectives, and can make different kinds of contributions. For this reason, it is important to recognize the important role of those actors able to act as mediators and orchestrators [*Giudici et al.*, 2018] in the processes of the identification, production, and implementation of solutions.

Given the complexity of actions collectively put into play, it is necessary to understand the strategic importance of actors who manage the transmission of information and act as the platform or marketplace by

[4] The 2016 Stability Law (Act No. 208/2015). For more details see: https://www.sistemab.org/wp-content/uploads/2016/02/Italian-benefit-corporation-legislation-courtesy-translation.pdf, accessed 17.03.2019.

[5] Interview ilSole24Ore Newspaper – 2017. https://nova.ilsole24ore.com/frontiere/welfare-come-sistema-distribuito-e-connesso/, accessed 17.03.2019.

[6] Interview Vita Magazine – 2017. http://www.vita.it/it/article/2017/07/13/stefano-zamagni-sono-tre-le-ragioni-per-cui-lavventura-di-vita-deve-co/144009/, accessed 17.03.2019

[7] Interview Avvenire Newspaper – 2019. https://www.avvenire.it/opinioni/pagine/tanti-soldi-per-il-sociale-e-un-paradosso-da-gestire, accessed 17.03.2019.

which all the actors interact with each other. So, the how and where open innovation processes and orchestration of resources are selected and distributed within collaborative communities or networks become strategically relevant.

Social Impact

The reform was designed to introduce the concept of social impact, including tools such as methodological guidelines and metrics, to define a new process for identifying the third sector. In order to exploit the results of a social enterprise, it is necessary to associate social outcomes with the measurement of economic efficiency and understand which benefits a particular solution has created in a community. A social enterprise is distinguished from a traditional enterprise by its ability to show the transformation it produces in terms of the creation and distribution of both economic and social value.

> "*We do not know what will happen in the future, but we know with certainty that the social dimension is changing the economy and the way to value is produced, so we must equip ourselves with a new paradigm where cohesion and sustainability will weigh more.*" (Paolo Venturi)[8]

The new models introduced by the reform require innovative startups with a social vocation to simultaneously impact market innovation and show benefits produced for the beneficiaries. The most relevant solution is to measure social impact, defined as the metric that becomes the main tool for qualifying and measuring the sociality of entrepreneurial action.

> "*The social [dimension] enters as a characterizing factor in traditional supply chains producing a new generation of services (social agriculture, social housing, cultural welfare, social tourism, etc.); technology and new skills are significantly modifying the organizational models and the life cycle of new social enterprises; lastly, the social purpose is increasingly measured in terms of impact.*" (Vincenzo Algeri, Offical Report on Impact Investing UBI Banca – 2018) [UBI Banca, 2018].

The reform emphasizes how today it is impossible for any kind of company to omit the identification of social outcomes in the definition of a long-term economic strategy. Efficiency alone is no longer sufficient for building competitiveness and sustainability. The social dimension, understood as the quality of value, sustainability, and care of its stakeholders [*Porter, Kramer,* 2011] is no longer an externality or an effect of economic action, nor an element that can only be used to heal the "failures" of the state and the markets. Thus, it becomes necessary to understand how to measure it and how to aggregate performance measurement systems of economic sustainability and the creation of social value. The social dimension is no longer relegated to being an output of the redistribution process implemented by public institutions, but becomes a generative mechanism, an input, within the model of integral human development [*Venturi*, *Puccio,* 2018]. The social dimension as an input allows one to trigger and accelerate processes of hybridization and convergence, bringing about systemic innovation. In addition, starting from the perimeter of the enterprise, they also modify the external dimension of it, giving life to new forms of participation and territorial democracy better able to respond to requests from communities and territories.

Discussion

The analysis of the data shows how, referring back to Brouard and Larivet's framework mentioned earlier, the Italian reform impacts the social entrepreneur, the social enterprise, and the social economy, effectively supporting the drivers of social entrepreneurship (Table 3). From an individual perspective, the reform aims at encouraging the use of new organizational models that allow social entrepreneurs to use new forms of business as their vehicle for social action [*Mair*, 2010]. The institution building process takes place thanks to the use of governance tools and the development of a new awareness in building a social enterprise (through the development of innovative entrepreneurial mindsets). It favors the implementation of a generative driver of new forms of hybrid organizations, so-called "second generation hybrids" [*Rago, Venturi,* 2014, p.1], such as start-up enterprises with a social purpose, community enterprises, or cooperative platforms. Hybrid organizations bring a transformative systemic innovation [*Mulgan, Leadbeater*, 2013] able to involve other forms of organizations (both profit and non-profit) in a complementary manner.

In terms of ecosystem development, the main need is to encourage the development of partnerships and networks between social enterprises and other ecosystem actors. There are two players that have an important role to play in this: the investors, through the launch of new impact investing tools and new forms of hybrid social media as well as representative organizations (meta-organizations) that must find new tools and services to offer to associated organizations. By encouraging the development of collaborative networks between different actors, it is possible to increase the impact that social enterprises can create. The greater the number of subjects involved, the greater the ability to produce economic and social value [*Brouard, Larivet*, 2010] because this value creation is distributed among a variety of sectors thanks to a process of cross-sector partnership and smart relocation along the entire value chain.

[8] Interview Ernst & Young Foundation. https://www.ey.com/Publication/vwLUAssets/Report_Forum_Fondazione_EY/$FILE/Report_Forum%202018.pdf, accessed 17.03.2019.

Table 3. **Characteristics of the Third Sector Reform**

Drivers of the Reform	Level of the Impact	Activities Required	Expected Outcomes
Institution building	Social Entrepreneur	• Governance initiatives • Instruments to develop a new mindset	• New organizational forms
Ecosystem development	Social Enterprise	• New investment instruments; • New ways to characterize representation with meta-organizations	• Development of alliances and partnerships
Social impact	Social Economy Sector	• Measuring impact; • favoring employability; • organizing new forms of beneficiary involvement.	• Creation of social and economic value; • New job opportunities and new forms of employability

Source: authors.

Last but not least is the impact produced by the new forms of social enterprises. The enlargement of a network of actors allows the system to expand opportunities to create economic value and to involve a greater number of workers. The new forms of welfare in Italy today represents a real "industry" that is worth 109.3 billion euro, equal to 6.5% of GDP. For Italian families, it is now the third item of expenditure after food and housing. On average, family spending on welfare accounts for 14.6% of net income [*Tucci,* 2017]. These elements are important for promoting employability in two ways: on the one hand, the creation of new jobs, thanks to the growth and scaling that social enterprises can do and, on the other hand, the development of networks of companies and ecosystems favors the creation of new professional figures and allows for the allocation of new skills in the world of the third sector. Similarly, new forms of collaboration and networks of companies allow one to innovate the services offered to the beneficiaries, allocating them in a new way in the value chain of the enterprises [*Venturi, Zandonai,* 2014]. In any case, it is also important to find new ways of measuring the outcomes of these innovative forms of job creation. The ability to measure becomes the real challenge to be solved in order to demonstrate the effectiveness and efficiency of this new model of social enterprise.

Directly related to the implications of the reform in terms of job creation are the implications for the skills needed to be effective in a growing and more complex third sector. Without opening a whole new front on a detailed analysis of a broad range of skills, we feel a strong focus should be placed upon the development of entrepreneurial skills, both because they constitute a large subset of the broader range and because it is where, in Italy, there may be the largest gap. An entrepreneurial mindset and the entrepreneurial skills that go with it are essential for social entrepreneurs as they work on building social enterprises and collaborative networks. However, while individuals may be able to chart an educational path that develops entrepreneurial skills, policy makers cannot leave this development to chance. On the contrary, they will have to become experts at entrepreneurial skills and foster their development at all levels.

This will involve, first of all, acknowledging the importance of entrepreneurial skills. The 2019 Global Talent Competitiveness Index (GTCI) clearly establishes the importance of entrepreneurial talent in creating new jobs at startup level, as well the vital role it can play in larger organizations and even governments. It further stresses that entrepreneurial skills should "be fully reflected in the curricula and practices of existing educational institutions, including business schools" [*Lanvin, Monteiro,* 2019, p. 8]. In the GTCI index, Italy ranks 38th overall but 23rd among European countries [*Lanvin, Monteiro,* 2019]. In a study involving 170 entrepreneurs and prospective entrepreneurs, Elmuti et al. find that there are causal linkages between entrepreneurial education and ventures' effectiveness [*Elmuti et al.,* 2012]. The research carried out by Charney and Libecap shows that an entrepreneurial education produces self-sufficient, enterprising individuals, who contribute to growth and wealth creation and become champions of innovation. In particular, they found that "on average, emerging companies that were owned by or employed entrepreneurship graduates had greater than five times the sales and employment growth than those that employed non-entrepreneurship graduates" [*Charney, Libecap,* 2000].

Secondly, it will involve identifying the key entrepreneurial skills to foster. In this regard, the policy maker can rely on the significant work performed by the European Union, which first identified entrepreneurship and a sense of initiative as one of the eight key competences necessary for all citizens to thrive and then developed the EntreComp framework, which proposes a shared definition of entrepreneurship as a competence [*Bacigalupo et al.,* 2016]. The EntreComp framework is articulated into three interrelated competence areas (Ideas and Opportunities, Resources, and Into Action), which in turn consist of five competences each. The framework further outlines an eight-level progression model that can be of great value for curriculum development.

Third, it will involve identifying the multiple areas of intervention, which go beyond a purely academic curriculum. Research shows that the development of entrepreneurial skills stems from a combination of varied experiences, rather than the depth in any spe-

cific type of experience or education [*Stuetzer et al.,* 2013]. This has significant implications for curriculum design and argues for the incorporation of greater flexibility in the activities in which students can to take part. Huq and Gilbert specifically look at the benefits of work-based learning in social entrepreneurship with findings that strongly advocate for the inclusion of work-based learning to develop the mindset and the skills that social entrepreneurs will need [*Huq, Gilbert*, 2013]. Tixier et al provide further guidance by analyzing entrepreneurial education at three different levels: the fostering of a widely spread entrepreneurial mindset, the development of entrepreneurial knowledge and skills that will lead to entrepreneurial action, and creating more exposure to entrepreneurial situations [*Tixier et al.,* 2018]. The policy maker may intervene at all of these levels to foster the culture and the skills needed to support the growth of social entrepreneurship (as well as for profit entrepreneurship).

Conclusions and Directions for Future Research

In this paper we focused our analysis on the innovation introduced by the reform of the Italian third sector introduced in 2017, presenting the first results that demonstrate the drivers of development for Italian social enterprises. The new policies introduced seek to find a way to ensure the greater efficiency of the system of Italian social enterprises. The third sector is expanding and growing. To foster growth, it was necessary to introduce suitable tools: new organizational models, new forms of governance, a multidisciplinary sector, new forms of investment, and the possibility of creating partnerships and effective alliances. Making social enterprises more effective means allowing these organizations to grow and produce greater social and economic value. In this way, it is possible to envisage the greater economic sustainability of companies through the development of new employability and new forms of work (technological and not) that can accompany the development and innovation of social enterprises.

The model presented in this paper further examines the issue of entrepreneurial policy theory as a main driver of innovation for a specific typology of organizations (social enterprises) or a specific field (the third sector or social economy in general). Relying on the Mair and Marti's conceptualization of social enterprises [*Mair, Marti*, 2006], it provides new guidelines to study the evolution of a specific typology of organization that provides tools and policy instruments that favor the adoption of innovation at all organizations. By doing so, our research contributes to setting up foundations for the development of a theory of policy entrepreneurship [*Autio, Rannikko,* 2016] applied to social enterprises and the third sector. The development of this theory is all the more important because it will render social entrepreneurship theory more actionable by explaining how, in some situations, institutions may shape organizations and not the opposite. Finally, considering the three-level model provided by [*Brouard, Larivet,* 2010], this approach aims to explore the interactions that exist between the different levels of analysis and provide empirical evidence of how individuals can use organizations to innovate sectors. Bringing the individual level of analysis together with the organizational and sectoral levels opens up new paths of research on entrepreneurial policy. First of all, our study is an exploratory case study for the purpose of theory building. The validity of the study is solid as it goes into a case of an industry that introduces a reform to build the foundations for the development of innovation within it with a multi-level approach that takes into consideration what happens at the level of individuals, organizations, and the field in general. Future studies will be able to generalize the multi-level approach in other sectors and try to understand whether the dynamics are the same or if there are significant differences or similarities. In addition, further studies should concentrate on the development of a framework that measures the impact of entrepreneurial policy on employability and on the creation of new job opportunities

References

Abu-Saifan S. (2012) Social entrepreneurship: Definition and boundaries. *Technology Innovation Management Review*, vol. 2, no 2, pp. 22–27.

Atamer T., Torres O. (2008) Modèles d'entrepreneuriat et mondialisation. *L'Art d'entreprendre* (ed. A. Fayolle), Paris: Editions Village Mondial, pp. 29–37.

Austin J., Stevenson H., Wei-Skillern J. (2012) Social and commercial entrepreneurship: Same, different, or both? *Revista de Administração*, vol. 47, no 3, pp. 370–384.

Autio E., Rannikko H. (2016) Retaining winners: Can policy boost high-growth entrepreneurship? *Research Policy*, vol. 45, no 1, pp. 42–55.

Bacigalupo M., Kampylis P., Punie Y., van den Brande G. (2016) *EntreComp: The entrepreneurship competence framework*, Luxembourg: Publication Office of the European Union.

Bacq S., Janssen F. (2011) The multiple faces of social entrepreneurship: A review of definitional issues based on geographical and thematic criteria. *Entrepreneurship & Regional Development*, vol. *23,* no 5–6, pp. 373–403.

Borzaga C., Defourny J. (2001) From Third Sector to Social Enterprise. *The Emergence of Social Enterprise* (eds. C. Borzaga, J. Defourny), London; New York: Routledge, pp. 1–28.

Brouard F., Larivet S. (2010) Essay of clarifications and definitions of the related concepts of social enterprise, social entrepreneur and social entrepreneurship. *Handbook of Research on Social Entrepreneurship* (eds. A. Fayolle, H. Matlay), Cheltenham: Edward Elgar, pp. 29–56.

Charney A., Libecap G.D. (2000) *Impact of entrepreneurship education,* Kansas City, MO: Kauffman Center for Entrepreneurial Leadership.

Chell E., Nicolopoulou K., Karataş-Özkan M. (2010) Social entrepreneurship and enterprise: International and innovation perspectives. *Entrepreneurship & Regional Development*, vol. 22, no 6, pp. 485–493. DOI: 10.1080/08985626.2010.488396.

Corbin J., Strauss A.L. (2008) *Basics of qualitative research* (3rd ed.), Thousand Oaks, CA: Sage.

Dacin P.A., Dacin M.T., Matear M. (2010) Social entrepreneurship: Why we don't need a new theory and how we move forward from here. *Academy of Management Perspectives*, vol. 24, no 3, pp. 37–57.

David K., Penaluna K., McCallum E., Usei C. (2018) Embedding Entrepreneurial Skills Development in Teacher Education. *Entrepreneurial Learning City Regions* (eds. J. James, J. Preece, R. Valdés-Cotera), Heidelberg; New York; Dordrecht; London: Springer, pp. 319–340.

Dees J.G. (2001) *The Meaning of Social Entrepreneurship* (working paper), Stanford, CA: Stanford University.

Eisenhardt K.M. (1989) Building theories from case study research. *Academy of Management Review*, vol. 14, no 4, pp. 532–550.

Elmuti D., Khoury G., Omran O. (2012) Does Entrepreneurship Education Have a Role in Developing Entrepreneurial Skills and Ventures' Effectiveness? *Journal of Entrepreneurship Education*, vol. 15, pp. 83–98.

Fayolle A., Matlay H. (2010) *Social entrepreneurship: A multicultural and multidimensional perspective*, Cheltenham: Edward Elgar Publishing.

Fici A. (2018) La nuova disciplina dell'impresa sociale nella prospettiva dei suoi diversi stakeholder. *Rivista Impresa Sociale*, vol. 11, pp. 7–14.

Fowler A. (2000) NGDOs as a moment in history: Beyond aid to social entrepreneurship or civic innovation? *Third World Quarterly*, vol. 21, no 4, pp. 637–654.

Gioia D.A., Corley K.G., Hamilton A.L. (2013) Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods*, vol. 16, no 1, pp. 15–31.

Giudici A., Reinmoeller P., Ravasi D. (2018) Open-system orchestration as a relational source of sensing capabilities: Evidence from a venture association. *Academy of Management Journal*, vol. 61, no 4, pp. 1369–1402.

Glaser B.G., Strauss A.L. (2017) *Discovery of grounded theory: Strategies for qualitative research*, London; New York: Routledge.

Hoogendoorn B., Pennings E., Thurik R. (2010) What do we know about social entrepreneurship: An analysis of empirical research. *International Review of Entrepreneurship*, vol. 8, no 2, pp. 71–112.

House R., Rousseau D.M., Thomashunt M. (1995) The meso paradigm-a framework for the integration of micro and macro organizational-behavior. *Research in Organizational Behavior: An Annual Series of Analytical Essays and Critical Reviews,* vol. 17, pp. 71–114.

Huq A., Gilbert D.H. (2013) Enhancing graduate employability through work-based learning in social entrepreneurship: A case study. *Education + Training*, vol. *55*, no 6, pp. 550–572.

ISTAT (2017) *Primo censimento permanente sulle Istituzioni Non Profit*, Rome: ISTAT.

Johnson S. (2003) Literature Review Of Social Entrepreneurship. *New Academy Review*, vol. 2. Available at: https://www.researchgate.net/publication/246704544_Literature_Review_Of_Social_Entrepreneurship, accessed 11.04.2019.

Klein K.J., Tosi H., Cannella A.A. (1999) Multilevel theory building: Benefits, barriers, and new developments. *Academy of Management Review*, vol. 24, no 2, pp. 248–253.

Lanvin B., Monteiro F. (eds.) (2019) *The Global Talent Competitiveness Index 2019. Entrepreneurial Talent and Global Competitiveness*, Paris: INSEAD; Adecco Group; Tata Communications.

Lyon F., Sepulveda L. (2009) Mapping social enterprises: Past approaches, challenges and future directions. *Social Enterprise Journal*, vol. *5*, no 1, pp. 83–94.

Maiolini R., Giudici A., Venturi P. (2019) Orchestrare l'innovazione per creare valore sociale. *Sviluppo & Organizzazione*, vol. 285, pp. 40-44.

Mair J., Marti I. (2006) Social entrepreneurship research: A source of explanation, prediction, and delight. *Journal of World Business*, vol. 41, no 1, pp. 36–44.

Mair J. (2010) *Social entrepreneurship: Taking stock and looking ahead*, Barcelona: IESE Business School – University of Navarra.

Martin R.L., Osberg S. (2007) Social entrepreneurship: The case for definition. *Stanford Social Innovation Review*, Spring issue, pp. 1–17. Available at: https://www.law.berkeley.edu/php-programs/courses/fileDL.php?fID=7288, accessed 02.03.2019.

Matlay H. (2008) The impact of entrepreneurship education on entrepreneurial outcomes. *Journal of Small Business and Enterprise Development*, vol. 15, no 2, pp. 382–396.

Mulgan G., Leadbeater C. (2013) *Systemic Innovation*, London: NESTA.

Nicholls A. (2010) The Legitimacy of Social Entrepreneurship: Reflexive Isomorphism in a Pre–Paradigmatic Field. *Entrepreneurship Theory and Practice*, vol. 34, no 4, pp. 611–633.

Painter A. (2006) The Social Economy in Canada: Concepts, Data and Measurement. *Horizons,* vol. 8, no 2, pp. 30–34.

Peredo A.M., McLean M. (2006) Social entrepreneurship: A critical review of the concept. *Journal of World Business*, vol. 41, no 1, pp. 56–65.

Porter M.E., Kramer M.R. (2011) Creare valore condiviso. *Harvard Business Review Italia*, vol. 1, no 2, pp. 68–84.

Rago S., Venturi P. (2014) *Hybridization as systemic innovation: Italian social enterprise on the move*. Paper presented at the 5th EMES International Conference on Social Enterprise – Helsinki, June 30th- July 3rd, 2015. Available at: https://emes.net/content/uploads/publications/hybridization-as-systemic-innovation-italian-social-enterprise-on-the-move/ESCP-5EMES-04-Hybridisation_as_Systemic_Innovation_Rago-Venturi.pdf, accessed 15.03.2019.

Saebi T., Foss N.J., Linder S. (2019) Social entrepreneurship research: Past achievements and future promises. *Journal of Management*, vol. 45, no 1, pp. 70–95.

Santos, Filipe M. (2012) A positive theory of social entrepreneurship. *Journal of Business Ethics*, vol. 111, no 3, pp. 335–351.

Shane S., Venkataraman S. (2000) The Promise of Entrepreneurship as a Field of Research. *Academy of Management Review*, vol. 25, no 1, pp. 217–226.

Sharir M., Lerner M. (2006) Gauging the success of social ventures initiated by individual social entrepreneurs. *Journal of World Business*, vol. 41, no 1, pp. 6–20.

Shaw E., Carter S. (2007) Social entrepreneurship: Theoretical antecedents and empirical analysis of entrepreneurial processes and outcomes. *Journal of Small Business and Enterprise Development*, vol. 14, no 3, pp. 418–434.

Short J.C., Moss T.W., Lumpkin G.T. (2009) Research in social entrepreneurship: Past contributions and future opportunities. *Strategic Entrepreneurship Journal*, vol. 3, no 2, pp. 161–194.

Strauss A., Corbin J. (1990) *Basics of qualitative research*, Thousand Oaks, CA: Sage.

Strauss A., Corbin J. (1998) *Basics of qualitative research: Procedures and techniques for developing grounded theory*, Thousand Oaks, CA: Sage.

Stuetzer M., Obschonka M., Davidsson P., Schmitt-Rodermund E. (2013) Where do entrepreneurial skills come from? *Applied Economics Letters*, vol. 20, no 12, pp. 1183–1186.

Thompson J., Doherty B. (2006) The diverse world of social enterprise: A collection of social enterprise stories. *International Journal of Social Economics*, vol. 33, no 5/6, pp. 361–375.

Tixier J., Loi M., Le Pontois S., Tavakoli M., Fayolle A. (2018) Entrepreneurship Education Effectiveness: What We Can Learn from Education and Organizational Psychology Fields. *International Enterprise Education. Perspectives on Theory and Practice* (ed. J.J. Turner, G. Mulholland), New York: Routledge, pp. 69–91.

Tracey P., Phillips N., Jarvis O. (2011) Bridging institutional entrepreneurship and the creation of new organizational forms: A multilevel model. *Organization Science*, vol. 22, no 1, pp. 60–80.

Tucci C. (2017) Il "welfare familiare" vale 109 miliardi, il 6,5% del Pil. *Il Sole 24 Ore*, 07.11.2017. Available at: https://www.ilsole24ore.com/art/notizie/2017-11-07/il-welfare-familiare-vale-109-miliardi-65percento-pil-094250.shtml?uuid=AE4cUN5C, accessed 12.01.2019.

UBI Banca (2018) *Interim financial report as at and for the half year ended 30th June 2018*, Bergamo: UBI Banca. Available at: https://www.ubibanca.it/contenuti/file/UBI%20Banca%20Interim%20Financial%20Report%20as%20at%2030th%20June%202018.pdf, accessed 17.02.2019.

Venturi P., Puccio A. (2018) La sfida organizzativa delle imprese a impatto sociale. *Harward Business Review Italia*, June issue. Available at: https://www.hbritalia.it/giugno-2018/2018/06/04/pdf/la-sfida-organizzativa-delle-imprese-a-impatto-sociale-3507/, accessed 14.03.2019.

Venturi P., Zandonai F. (2014) *Ibridi Organizzativi*, Bologna: Il Mulino.

Wallace S.L. (1999) Social entrepreneurship: The role of social purpose enterprises in facilitating community economic development. *Journal of Developmental Entrepreneurship*, vol. *4*, no 2, pp. 153–174.

Weerawardena J., Mort G.S. (2006) Investigating social entrepreneurship: A multidimensional model. *Journal of World Business*, vol. 41, no 1, pp. 21–35.

Zahra S.A., Rawhouser H.N., Bhawe N., Neubaum D.O., Hayton J.C. (2008) Globalization of social entrepreneurship opportunities. *Strategic Entrepreneurship Journal*, vol. 2, no 2, pp. 117–131.

Zahra S.A., Gedajlovic E., Neubaum D.O., Shulman J.M. (2009) A typology of social entrepreneurs: Motives, search processes and ethical challenges. *Journal of Business Venturing*, vol. 24, no 5, pp. 519–532.

NATIONAL RESEARCH UNIVERSITY

XXI APRIL INTERNATIONAL ACADEMIC CONFERENCE ON ECONOMIC AND SOCIAL DEVELOPMENT

April 6-10 2020, Moscow

On April 6-10, 2020, the National Research University Higher School of Economics (HSE University), with the support of the World Bank, will be hosting the XXI April International Academic Conference on Economic and Social Development in Moscow. The Conference's Programme Committee will be chaired by Professor Evgeny Yasin, HSE University's academic supervisor.

The Conference features a diverse agenda concerning social and economic development in Russia. The Conference programme will include presentations by Russian and international academics, roundtables and plenary sessions with the participation of members of the government of the Russian Federation, officials, business representatives, and leading Russian and foreign experts.

The XXI April International Academic Conference on Economic and Social Development once again invites participants from the international academic and expert community!

Information about previous conferences can be viewed here: https://conf.hse.ru/2019/

PROPOSAL REQUIREMENTS AND SUBMISSION PROCEDURE:

Papers presented at the Conference should contain the **results of original research** based upon an up-to-date research methodology. The Conference Program will be developed based on accepted proposals.

WORKING LANGUAGES of the conference: Russian and English.

TIME LIMITS for presentations and discussions:

- Presentations: 15-20 minutes;
- Roundtable discussions: 5-7 minutes.

DEADLINES for proposals:

➢ Submit the proposal through HSE University's online system from **September 9-November 15, 2019 (the link will be available later).**

The application should include a detailed summary of the proposed presentation in Russian (for Russian-speaking participants) and English (for all participants) in either Word or RTF format. The summary should be between 1-3 pages, 1.5 spacing (up to 7,000 symbols) and should clearly state the problem, research approach used (particularly, if there is a model on which the analysis is based), and the main results. In addition, the abstract should indicate the novelty of the obtained results in comparison with previously published works. Proposals that do not meet these requirements will not be considered.

➢ **A group of authors,** each individually registered in the Conference system, may request permission from the Programme Committee to present their reports in one session. To do so, they must complete the form on the Conference website by **November 15, 2019**.

One author may present one individual paper and no more than two co-authored papers at the Conference. A session should contain no more than two papers submitted by the same organization. A standard session lasts 1.5 hours. Proposals for the formation of sessions will be considered by the Programme Committee when reviewing applications and developing the Conference Programme.

➢ The Programme Committee's decision about the acceptance of the papers will be made by **January 24, 2020**, based on the reviews conducted by independent experts. The preliminary programme will be available on the conference's website.

➢ **Scholars whose papers are included** in the programme must confirm their participation through their personal account in the HSE University's system by **February 10, 2020** (otherwise, their paper will be excluded from the programme) and provide slides for their presentation in English by **March 13, 2020** for publication on the conference's website.

Papers included in the programme after additional reviews by the editorial board will be considered for possible publication in leading Russian journals on economics, sociology, management, public administration, and other fields. These journals are either cited in the Scopus and Web of Science databases or included on the list of peer-reviewed journals of the Russian Higher Attestation Commission.

➢ Online registration to attend the Conference **(without a presentation)** will be open until **March 20, 2020.**

The Conference Organizing Committee
interconf@hse.ru

ISSN 1995-459X

Website

Download on the App Store

GET IT ON Google Play