

# “European smart specialization for Ukrainian regional development: path from creation to implementation”

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# EUROPEAN SMART SPECIALIZATION FOR UKRAINIAN REGIONAL DEVELOPMENT: PATH FROM CREATION TO IMPLEMENTATION

## Abstract

The focus of the research is to develop recommendations of smart specialization (SS) for Ukrainian policymakers using European approaches. The authors revealed that the main SS projects are presented in such sectors as agri-food, industrial modernization and energy. More than 12 EU countries were the plot for conducted analysis of SS, as a result of which the level of activity of each country was determined. The creation of consortiums, including SMEs, associations, universities and other participants, disclosed the successful way of SS realization. The structure of SME's innovative potential in Ukraine was identified underlining their main characteristic features like types of innovations and innovative activity, differentiation according to enterprise size, their regional distribution. The authors explored lack of innovations on regional and national level and significant territorial disparities, which could be eliminated through policy implementation of regional SS. The existing legislative norms for possibility of SS implementation in Ukraine were analyzed due to correspondence with the EU ones. The analysis provides the opportunity to consider them only as general framework documents without any action plans and sectoral prioritization at all. The weak points of these law documents are emphasized. As a result of research, the authors developed recommendations presented by direct action plan for Ukrainian policymakers, which include such activities as underlining key priorities (especially ICT applicability in every SS project) and their correspondence with the EU ones; eliminating regional imbalances by focusing on innovation development and reorientation of some regions according to SS priorities; respecting regional existing capacities; providing organizational mechanism for cooperation of stakeholders and financial mechanism for SS support through the EU structural funds.

## Keywords

SME, innovations, smart specialization, R&D, regional policy, regional development

## JEL Classification

E22, F20, G28, G30

## INTRODUCTION

SMEs development, in particular innovative ones, plays the pivotal role in regional and national economic growth of every country. Moreover, innovation activity is one of the key priorities of the majority of strategies all over the world. Though, smart specialization (SS) presupposes complex approach based on such principle as assessment of existing assets and resources aimed at identification of challenges in order to focus on competitive strengths and realistic growth potentials, encourage unique opportunities for development and growth, attract investments, support technological, as well as practice-based and social innovations, etc.

Nowadays, regional policy of developed countries, the EU countries in particular, mostly focuses on fostering growth and development of

SMEs. Shift from advocacy of large-scale infrastructure to promotion of local entrepreneurial processes, aimed at technological upgrading of existing regional industrial capacities, is among central tenets of the new regional development policies in the EU. Though, in Ukrainian reality, SS should be the central element of regional policy reformation as the final part of decentralization process.

Though, the objective of the article is to give recommendations for policymakers concerned to SS, based on the EU cases, in order to promote regional development in Ukraine. Due to the aim of the study, a set of research questions were designed: 1) to develop theoretical model of regional SS strategy development, 2) to analyze SS process in the EU countries in order to identify its specifics in the considered regions, 3) to reveal the main sources of finance of SS projects and which of them can be applied in Ukraine, 4) to analyze tendencies of innovative development in Ukraine and the main legislative documents, which proved SS to be there in order to assess the willingness of its economy for SS implementation, 5) to develop an action plan for further SS for policymakers. The aim and the research questions determined the structure of the study.

## 1. LITERATURE REVIEW

In the EU countries, SS approach to forming policy process has been implemented recently. Therefore, research on SS does not have long history. Despite this fact, a great deal of previous research into SS exists.

The generalizability of much published research on this issue is problematic. It is possible to divide the analyzed literature into several groups. First group of scholars studies the theoretical aspects of SS. Valdaliso et al. (2016) tried to apply the basics of institutional theory using “the path dependence theoretical framework” in the innovation policies designing process for SS in the EU. Heimeriks et al. (2015) identify scientific background of SS and studied the regional specialization models of knowledge production in the EU regions. Carayannis (2014) scrutinizes the concept of multi-helix systems within SS, where he revealed the difference between two main types of relationships: firstly, collaboration and, secondly, conflict moderation and substitution. There was outlined the importance of balance of innovative development and nature protection as well, which is based on co-evolution of knowledge economy and knowledge society.

Next group of papers is concentrated on applied aspects of the EU cohesion policy. In the paper of McCann and Ortega-Argilés (2014), the regional entrepreneurship promotion and innovation promotion agenda was studied as a key element of the place-based reforms to the EU cohesion pol-

icy. In addition, it was shown on real examples of regional policy initiatives in the EU countries, the types of regional development problems and SS implementation.

Later, the next comparative study of McCann and Ortega-Argilés (2016) demonstrated the features of SME and entrepreneurship policy assessment. In this paper, there is a lot of examples and measurement methodologies according to innovation program type.

In their study, Badii et al. (2018) used a practical situation with SS implementation as a basis of research strategy. They demonstrate the results of collaboration in regions and countries, which are in different parts of the EU. Also, they showed possible ways of partnership between developed and developing regions and how to evaluate the efficiency of the research and innovation strategies (RIS) for SS at the local level.

Other type of related literature has emphasized the importance of innovative SMEs as a driver of economic growth therefore national and regional policies also pay attention to it. For instance, Radosevic and Stancova (2015) call SS in their article “the largest innovation policy experiment in the world”, highlighting in such a way the significant role of it in regional development.

At the same time, there is quite controversial SS approach to positive effects of Reid, Leon, and Muscio (2015). In their opinion, the paradox is that “the greater need of lagging regions to invest

in innovation and their relatively lower capacity to absorb funding compared to more advanced regions". Foray (2018) affirms that the main aim of modernizing the traditional sectors is not new and the SS principles are a new way of its implementation. In addition, Marques and Morgan (2018) say that the idea of modern SS emerged in the 1990s, and it was built on the previous concept of national systems of innovation. Asheim and Gertler (2005), Cooke (1992), Cooke et al. (2004), Doloreux and Gomez (2017) have the same point of view.

European Commission also conducts research related to SS in different regions. For instance, a technical report on revealing evidence-based scientific support to the policy-making process in European countries. The answers which were given on research question demonstrate positive effects of SS. The majority of responders affirm the increasing collaboration between business and science, however, the obstacles also exist (lack of awareness, insufficient political commitment, lack of involved people at regional level).

Extremely topical research for some European regions is the case, which was studied by Sörvik et al. (2018). Their research interest was related to the problem of increasing innovative activities in sparsely populated areas (SPA). They also showed on the examples of 5 SPA in different corners of Europe, how SS can changed the perception of SPA from weak regions to strong innovative areas.

In the comprehensive study of SS strategies, different consequences of SS were discovered in the different countries' context: Germany and France (Muller et al., 2017), Romania (Rusu, 2013), Lithuania (Paliokaitė, Martinaitis, & Sarpong, 2016). Their critical research demonstrates the problems, which can occur in the regions staying on the SS way. In this frame, the lessons from these regions should be taken into account in Ukrainian case.

Overall, these studies highlight the need of SS support for all stakeholders who are involved in the process of SS. Almost all the analyzed papers show that first steps on the way to SS have difficulties at the first phases, therefore, there is a need to continue research in the context of challenges for newcomers' regions such as Ukrainian regions.

## 2. METHODS AND DATA DESCRIPTION

The research strategy included mostly qualitative methods. The use of qualitative methods in case studies is a well-established approach in SS research of different scholars. Qualitative methods offer an effective way of studying SS in the lack of generalized statistics about SS as well. Obviously, in these terms, the potential of quantitative methods is limited. Firstly, context analysis was used in order to develop recommendations for regional SS strategy development and cross-country analysis to reveal which countries are more or less "smart-specialized" regions in the EU. Secondly, comparative analysis was used in order to demonstrate the level of readiness of different Ukrainian regions for further SS. This analysis was based on data of State Statistics Service of Ukraine. Also this method was used in order to compare amounts of funding for SS by European Structural and Investment Funds (ESIF) in the EU.

Thirdly, we tried to work with focus groups of Ukrainian public authorities, but a major problem with this method was extremely limited number of representatives who were ready to answer the questions related to SS. Therefore, it was decided to use Nvivo 10 software in order to make the content analysis of texts, videos, posts in social networks, interviews of representatives of different levels of public authorities in order to show: 1) main points of innovation regional policies in the EU countries, 2) financial insights on SS. Nvivo 10 software was also used to reveal institutional willingness to implement SS in Ukraine and to answer the next research questions: What are the perspectives of SS in Ukraine? Is it Ukraine ready for SS? What are the problems with SS implementation?

The research is based on data, collected from European Commission reports and factsheets about SS projects in different corners of the EU (more than 12 countries: Belgium, Finland, France, Germany, Denmark, United Kingdom, Macedonia, Italy, Spain, Portugal, Poland, Czech Republic, Slovenia, Slovakia, Sweden, etc.) in the period from 2013 up to now. Collected data were divided into the following groups: 1) type of the SS project, 2) start date of the project, 3) main goal of the SS partnership; 4) working areas within the

projects, 5) leading country/region, 6) other participants (non-leaders), 7) total number of participants in SS consortium.

### 3. THEORETICAL BACKGROUND OF SMART SPECIALIZATION

Result-oriented policy driver of SMEs' development is the key element in regional policy prioritization framework, which foremost presupposes SS. It means the strategic approach to economic development through support of innovative activity (innovation is understood not only as pure R&D, but also as non-technological, social and service innovation) of business structures, specifically SMEs.

The SS concept is based on the idea of economic specialization and the ability of country/region to build a competitive advantage on unique, locally based expertise that can be applied in a new and innovative manner. Two aspects of this concept make it novel and "smart". Firstly, a new way of combining the efforts of the business and R&D communities to achieve the socio-economic transformation is proposed, i.e. a process of entrepreneurial discovery is favored. Secondly, the country/region is encouraged to look beyond its borders – competition on international markets is crucial to boost growth, in other words, local resources have to be tuned to the broader market to generate the highest possible return on investment for the country/region. The existence of Research and innovation strategies (RIS) for SS can be considered as one of the key mechanisms of SS implementation.

The main foundations of successful SS strategy features are shown in Figure 1.

Though, from Figure 1, the necessity of complex approach through interaction of the mentioned elements, namely correlation of all stakeholders' aims with their actions and policies, existence of essential support service, schemes and infrastructure for innovation transformation, can be observed.

Therefore, one of the main goals of SS strategies is to identify local potential and prioritize investment in key sectors by such main players as research community, business, universities, public authorities and civil society with the aim to identify strengths in their region and direct support to where local potential and market opportunities can best be realized.

So, regional policy of SS can be considered as the most comprehensive decentralized, innovation and industrial policy, which is directed to support local potential and market opportunities.

### 4. EUROPEAN FACE OF SS

The theme area of SS projects is concentrated on such directions as agri-food, industrial modernization and energy. As factsheets and report on SS in agri-food area analysis showed, five SS projects started in the period 2016–2018. Regions from such countries as Italy, Belgium and the Netherlands took a leadership, while others preferred to be partners. It should be underlined that not all the EU countries are active in agri-food SS. The most active were Spain, France, Italy, the Netherlands and Macedonia, however, other countries (mostly representatives from Central, Eastern and Southern Europe) were less active. Most of consortiums included such participants as SMEs, associations, universities and other representatives.

From the table in appendix, it can be seen that SS at industrial modernization has own particularities, presented by 18 specialized projects. Although Italy and Spain remain leaders in SS projects, these countries are extremely active as secondary participants as well. In addition, Germany, Sweden, Finland, France and the Netherlands demonstrate high impact in SS movement across the EU as secondary participants. The earliest starting date of SS project in this area is 2013, while the majority began in the period 2016–2018. The average number of regions involved in different SS project is 14 (non-leaders), while maximal number is 43 (SS on sustainable buildings) and minimum – 3 (SS on safe and sustainable mobility).

SS on energy projects is very important in the context of sustainable development, therefore, they

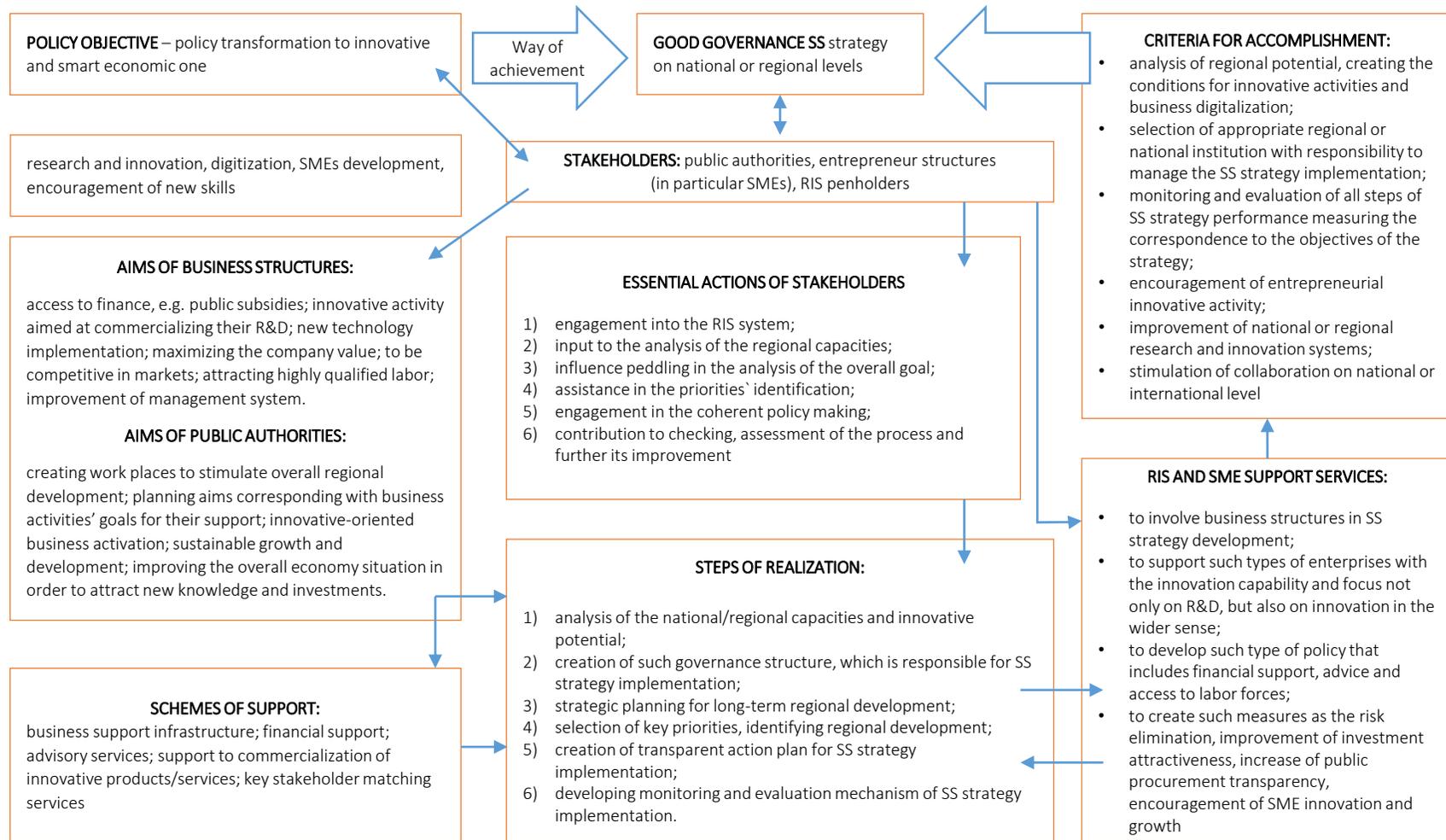


Figure 1. Model of regional SS strategy development

are excluded from separate group. More than 100 regions were involved in SS for 5 projects execution. The partnership covers such energy types as marine, solar, bio, wind. Also these projects provide energy infrastructure. Spain is an initiator of all energy partnership projects.

Unquestioningly, Spain and Italy are the most smart-specialized countries, while countries from South Central, Eastern and Southern Europe are the least ones. Remarkably, if Spain or Italy are leading regions in SS projects, then other regions from these countries are in the list of other participants.

What is interesting about the data in this table in appendix? If we look at the map, it is possible to see very amazing picture – on the first sign, regions which are far from each other become closer and they are joint by common problem. Absence of borders, development of ICT and other innovation make SS to be real.

As Table A1 in Appendix A shows, the goals of the SS partnership sound rather ambitiously. For instance, projects are concentrated on developing collaborative framework, encouraging regional development, making some areas as a leader, fostering adoption, building strong system, activating interregional collaboration, reinforcing strategic positions, etc. Nevertheless, the global aim of mentioned collaborations is to keep up the highest positions of the competitiveness of the EU economy on the world map. In order to achieve of these objectives, there should be strong financial support, which is accessible for almost all stakeholders and such aid exists in different forms.

## 5. FINANCIAL INSIGHTS ON SMART SPECIALIZATION

Since SS policy implementation, over 120 SS strategies have been adopted, which can be supported through the European Structural and Investment Funds, Horizon 2020, COSME and European Fund for Strategic Investments (EFSI).

Such European funds as the ERDF (European Regional Development Fund) and EAFRD (European Agricultural Fund for Rural Development) are ready

to allocate 65,8 billion euros to support these strategies, in addition to national and regional funding.

European Commission manages within cohesion policy framework through the ERDF, where 277 bln euros are planned to finance regional development for the period 2014–2020. The cohesion policy's general goal is to reduce regional differences and foster growth across Europe.

The main priorities of cohesion policy for regions are research and innovation, ICT, SME technology developments, as well as advocating for low carbon economy.

The SS strategy is a precondition for regions to receive funding from the EU structural funds. The structural funds can be considered as a key tool for European regions to overcome the economic crisis, thus linking SS strategies to the concept of resilience.

Along with these financial funds, other European Structural and Investment Funds (ESIF) also finance regional policy of SS, mostly funding such key priority areas as higher education, research, technological development and innovation.

The diversification of funding is considered in Figure 2.

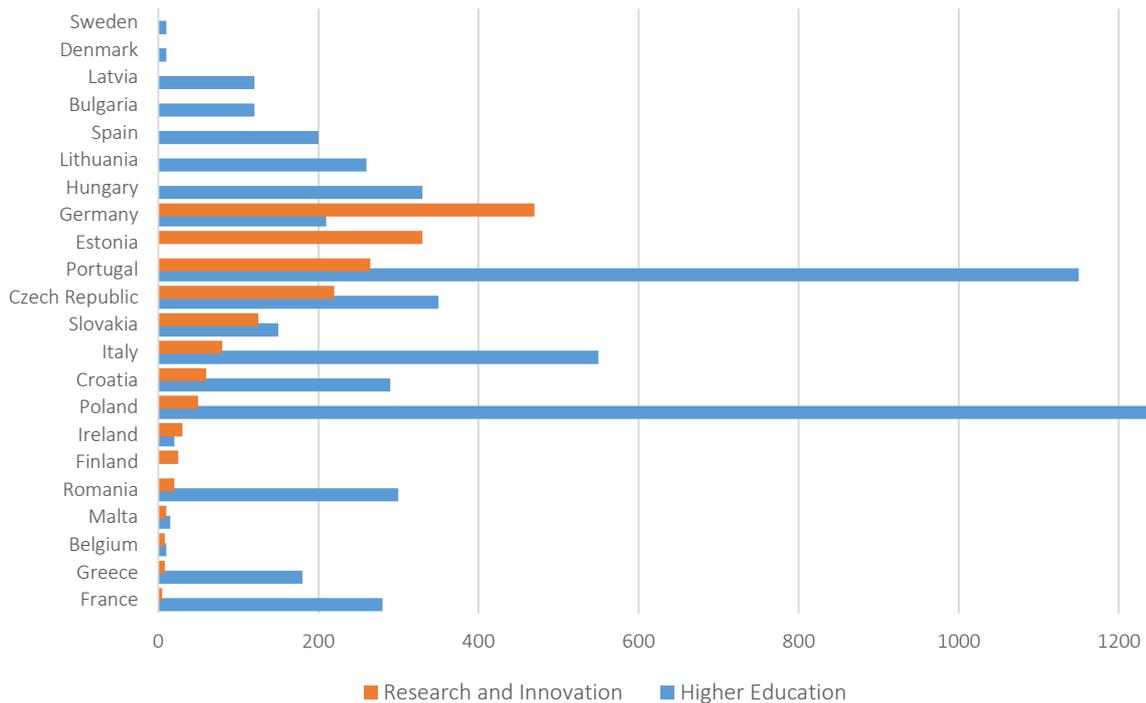
From Figure 2, it can be observed that the large share of funding for higher education is directed to Poland and Portugal, at that time, low level of financing from European funds is typical for Denmark, Belgium and Sweden (less than 10 mln euros).

In the area of research and innovation, the large share of financing is directed to Estonia and Germany, and the smallest share of investment belongs to France, Belgium and Greece.

Though, European structural funds allocate financial means to SS policy in addition to local and national budgets that has impact on innovation and research encouragement, SMEs development, technology development, ICT, etc.

Ukraine has access to mentioned funding sources of SS, for instance, Horizon 2020 and COSME. It

Source: Formed by the authors on the basis of European Commission report 2017.



**Figure 2.** Funding by ESIFs in areas connected to SS

means that financial support for organizing SS in Ukraine is accessible.

## 6. THE WILLINGNESS OF UKRAINIAN ECONOMY FOR SS IMPLEMENTATION

One of the essential steps for analysis of the current condition of Ukrainian economy in terms of SS is its innovation component.

Further, it is expedient to consider the state of innovation activity in Ukraine in general, namely by type of innovative activity (Figure 3) and innovative activity of enterprises depending on their size (Figure 4).

The data from Figure 3 show that the main part of Ukrainian enterprises is not innovative (more than 80%) in the period 2010–2016. In addition, there is a negative tendency of reduction of enterprises number across all types of innovation activities in 2016 compared to 2010, namely marketing or organizational innovations, process innovations and product innovations.

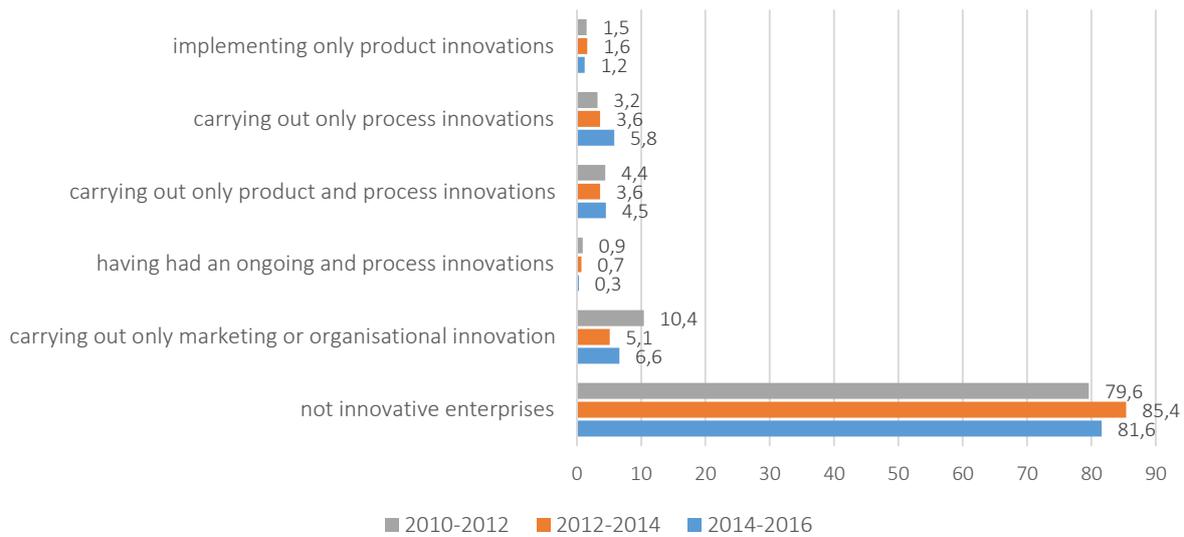
Small growth rate is typical for such types of innovations as product and process innovations and only product innovations that equal 1.02 and 1.8 percentage points. The analyzed data can be considered as insufficient level of innovativeness of Ukrainian enterprises. The next reasonable step for the mentioned analysis is innovative activity assessment of the enterprises depending on their size (Figure 4).

From Figure 4, it can be considered that the bulk of all types of businesses in Ukraine are not innovative active (in the range 60–85%), which indicates insufficient level of innovation activity of Ukrainian enterprises. In general, it can be observed that the share of innovation-active companies among small, medium and large business in Ukraine in 2014–2016 amounts only 15%, 25% and 40%, respectively.

The differentiation of business innovative activities according to type of innovation aimed at determination of business innovativeness is considered in Figure 5.

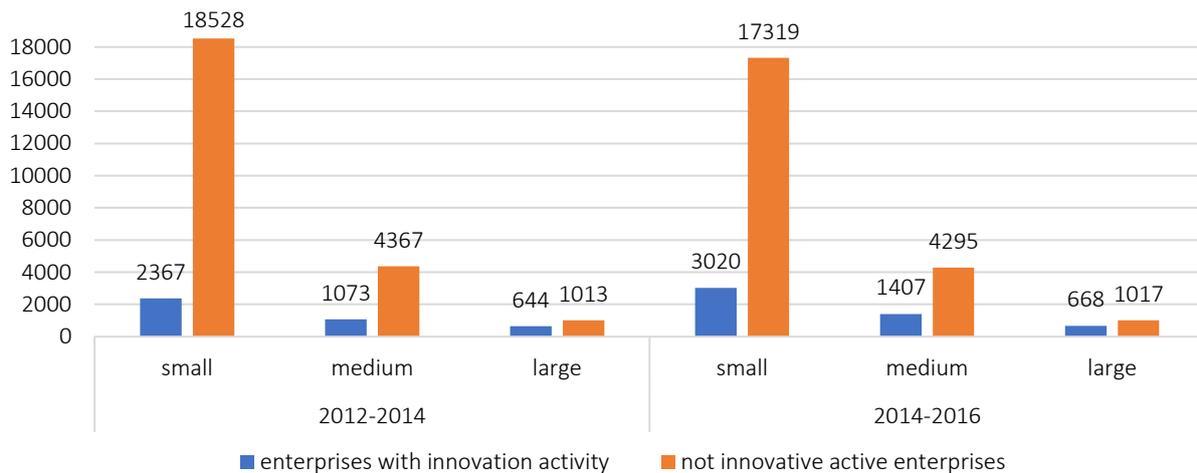
So, from Figure 5, it can be observed that innovation-active enterprises are mainly represented by

Source: Formed by the authors based on data of State Statistics Service of Ukraine.



**Figure 3.** Ukrainian enterprises by types of innovation activities, %

Source: Formed by the authors based on data of State Statistics Service of Ukraine.



**Figure 4.** Innovation activity of Ukrainian enterprises for 2012–2016, units

enterprises with non-technological innovations that include marketing and/or organizational innovation (36%) and enterprises with process innovations (31%) during the period 2014–2016. This analysis proves the fact that basic implemented innovations are connected with changes in production methods, creation and marketing of goods or services and to a small degree of change in existing or production of new goods or services.

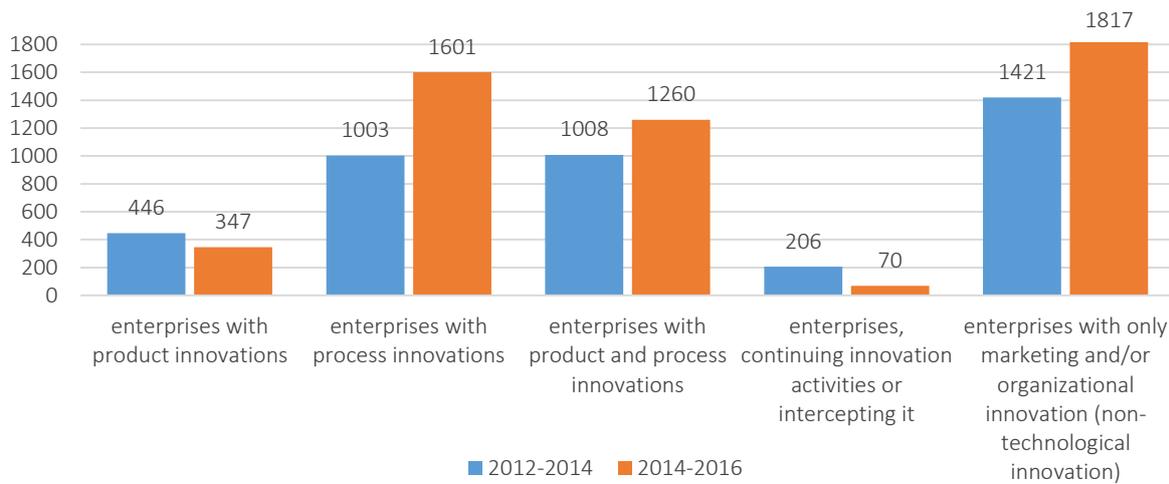
The essence of SS presupposes the creation of regional policy for business development, in particular its innovative activity. Figure 6 shows the re-

gional distribution of enterprises with innovative activity and the innovation rate for every region.

Figure 6 shows the existence of significant territorial disparities among regions in Ukraine for 2014–2016. The majority of Ukrainian innovative-oriented enterprises are located in Kyiv (city), Kharkiv and Dnipropetrovsk regions. The lack of enterprises with innovations is concentrated in Luhansk and Chernivtsi regions.

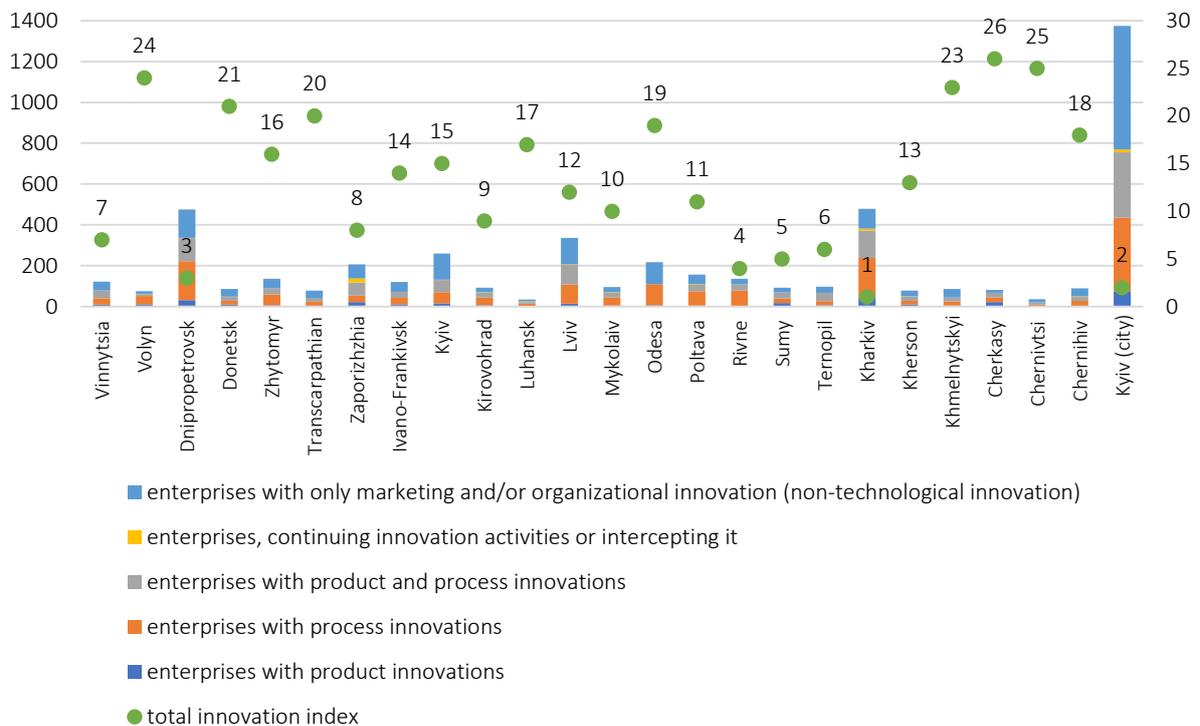
The direct correlation can be observed between total innovative index and the quantity of enterpris-

Source: Formed by the authors based on data of State Statistics Service of Ukraine.



**Figure 5. Innovative activity of small enterprises for 2012–2016**

Source: Formed by the authors based on data of State Statistics Service of Ukraine.



**Figure 6. Regional distribution of business innovative activity and rate of every region in 2014–2016**

es with innovations, which confirms the first rates in total innovation ranking.

The large share of non-technological innovations (about 40%) in enterprises' activity is presented more than in half of all regions. The other side of business innovative activity belongs to process innovations validated by the statistical data for 9 regions of Ukraine.

As it is well known, in 2014, on the initiative of the Ministry of Building Regional Development, and Housing and Communal Services Ukraine, the Government approved the main conceptual document – the Concept of Reforming Local Self-Government and Territorial Organization of Control in Ukraine, the main idea of which is decentralization reform. According to this Concept, the main goal is transfer of powers and financ-

es from state authorities to local government administrations.

The basis of the reform policy does not prioritize innovation development in regions and mainly focuses on eliminating the disproportionality of the administrative-territorial system.

The Strategy of Small and Medium Business Development in Ukraine till 2020 mostly consists of the directions connected with strengthening of SMEs on the local and international scale, but the development of R&D and encouragement of SMEs' innovation activity are among the weaknesses of the Strategy.

The first legislative document where SS is mentioned is the Cabinet of Ministers Decree "Some issues of realization in the years 2018–2020 of the State Strategy for Regional Development for the period until 2020". Here different public au-

thorities have to implement a system of strategic planning of regional development on the basis of SS taking into account world market and technological trends of innovation development, competitive areas of economic activity on data of State Statistics Service of Ukraine.

At the same time, such essential elements as action plan, road map, priority regions or sectors of Ukrainian economy are not contained in the Strategy, which mainly constitutes as the general framework document.

Such lack of innovations at regional and national level confirms by the trends from Figures 3-6, so, due to conducted analysis, it is essential to improve the level of innovativeness of Ukrainian enterprises and eliminate territorial disparities, which can be achieved through policy implementation of regional SS.

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## CONCLUSION

The research demonstrated the lack of legislative documents, which allow to implement principles of SS in Ukrainian regions. Existing law document has frame nature and could not be considered as main providing SS mechanisms. Therefore, there is a need to develop action plan for further SS implementation. The action plan should include the following elements:

- *Actual development priorities.* Ukrainian Government sets up the main priorities of the economic development, however, they do not correspond with the priorities of the EU. Among represented spheres of SS projects in the EU, only agriculture sector is included in the set of the development priorities. Mentioned priorities should be renovated and involve the next ones: energy sector (all types of renewable energy, because its potential in Ukraine is very high), industry modernization (high performance production through 3D printing, artificial intelligence and human machine interface, medical technologies, etc.). The ICT should be intensively implemented into projects of regional development.
- *Eliminating regional disproportions.* The conducted analysis confirmed the existence of significant imbalances of socio-economic development, in particular innovation one, among Ukrainian regions. Therefore, it is feasible to assess the real potential of every region, differentiate the strengths and weaknesses, prioritize the key spheres for further support and encouragement, mostly focus on innovation development and reorientation of some regions according to SS priorities considering their existing capacities.
- *Organizational mechanism of stakeholders' cooperation.* For successful implementation of SS policy in Ukraine, regarding the EU experience, it is reasonable to stimulate cooperation between different groups of stakeholders, namely business, academia, NGOs, policymakers, agencies of regional development at governmental level. The academic sector should not be misjudged due to its innovative potential and willingness to become one of the main drivers of R&D.

- *Financial mechanisms.* As the EU cases analysis demonstrates, every SS project is supported by different EU funds. Since Ukraine has the access to some of them, its SMEs, NGOs, universities and other stakeholders have the possibility to use them. Nevertheless, the financial impact of Ukraine in regional innovative development stays rather weak and need to be increased using decentralization funds.

Present research in SS used to consider business as main driver of regional development. At the same time, academic sector's role is underestimated. Therefore, investigation is required to shed light on its participation in SS projects. Moreover, there is a need to design the methodology for regional development strategies and action plans for their implementation on the basis of SS.

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## APPENDIX A

**Table A1.** Examples of SS projects in the EU countries

No.	SS project	Start date	Goals of SS	Working branches	Country/ region leaders	Country/ region number
<b>SS ON AGRI-FOOD PROJECTS</b>						
1.	NUTRITION INGREDIENTS	2018	The partnership's goal is as follows: to develop an interregional partnership between agri-food actors (industries, academics, cluster organizations and relevant research and technology organizations (RTOs), to facilitate the cross-over of innovation in the field of nutritional ingredients, to stimulate of cross-sectoral collaboration, to accelerate of the development and commercialization of novel and/or improved ingredients	Valorization of side streams and bi/co-products, new sourcing for ingredients, designing new technologies and improving the existing ones	Wargalim (BE) and Flanders (BE)	10
2.	CONSUMER INVOLVEMENT IN AGRO-FOOD INNOVATION	2017	The goal of the partnership is the development of methods for consumer involvement in design of agri-food innovation	Joint research and innovation, awareness and public debate, future business model	Reggio Food Valley (NL) and East Central Sweden (SE)	4
3.	TRACEABILITY AND BIG DATA	2016	The aim of the partnership is to encourage the creation of an ecosystem to support innovation and digitization of the agri-food sector in Europe	Lifecycles of the value chain, smart monitoring of the value chain to improve the overall competitiveness of the agri-food sector, incorporating consumer experience and different operators in food chain decision making processes, open data, interoperability, data governance and information security, cybersecurity	Andalusia (ES) and Emilia-Romagna (IT)	20
4.	HIGH TECH FARMING	2016	The goal is the creation of partnership and its development in precision farming technologies	Crops, tree cultivation, livestock and protected cultivation	Tuscany (IT)	27
5.	SMART SENSORS 4 AGRI-FOOD	2017	The goal of the interregional partnership is to prepare EU agri-food companies for Industry 4.0 leap	Creation of awareness, building trust zones, evaluation and validation of new technologies and solutions, leverage, implementation of new technologies and solutions	Waltonia (BE) and Flanders (BE)	12
<b>SS ON ENERGY PROJECTS</b>						
6.	SOLAR ENERGY	2017	The core idea of the partnership is to promote electricity export from solar technologies from Southern to Central and Northern countries	Research (a solar technology research facility, FOAT (a large-scale sustainable energy technology), development cooperation mechanisms for solar energy export, using medium temperature energy in agro industry)	Extremadura (ES) and Alentejo (PT)	11
7.	SUSTAINABLE BUILDINGS	2016	The EU institutions encourage regional cooperation for decarbonizing the energy system in the EU countries	Eco-constructions, bioclimate, insulation of buildings, renewable energy integration of buildings, systems of maximum energy efficiency in buildings and cities	Andalusia (ES) and North Great Plain (HU)	43

**Table A1 (cont.).** Examples of SS projects in the EU countries

No.	SS project	Start date	Goals of SS	Working branches	Country/region leaders	Country/region number
8.	GRIDS	2016	The partnership aim is to bring competitiveness of the partner regions on higher level by fostering opportunities for overall approach to value chain of smart grids	Demand response, cybersecurity, network management, e-mobility	Provence – Alpes – Cote d’Azur (FR) and Basque Country (ES)	11
9.	MARINE RENEWABLE ENERGY	2014	The goal is to strength using marine renewable energy approach in the EU companies	Manufacturing large components, power transfer and conversion, corrosion in water, sensing instrumentation and monitoring, O&M, testing and demonstration in real environments	Basque Country (ES) and Scotland (UK)	16
10.	BIOENERGY	2016	The objective is to build collaborative framework to provide joint business among the EU regions with bioenergy	Biofuels, heating and cooling, knowledge transfer, electricity	Lapland (FI) and Castile and Leon (ES)	22
<b>SS ON INDUSTRIAL MODERNIZATION PROJECTS</b>						
11.	HIGH PERFORMANCE PRODUCTION THROUGH 3D- PRINTING	2014	The objectives of the partnership is to develop 3D printing applications and co-investment in related to 3D printing projects and services	3D printing components, additive-subtractive platforms, machinery, tools and shaping, 3D customized components for orthosis, exoskeleton and exoprosthesis, 3D automotive components	South Netherlands (NL), Flanders (BE), North Portugal (PT)	25
12.	ARTIFICIAL INTELLIGENCE AND HUMAN MACHINE INTERFACE	2018	The objective is to foster adoption of AI driven technologies to improve mechatronics, robotics and human interaction and the acceleration of innovative companies	HMI Evolution, user experience and data analytics, worker centered design, AI enhanced cyber physical automation	Emilia Romagna (IT)	6
13.	SME’s integration to INDUSTRY 4.0	2017	The partnership aims to improve competitiveness of EU regions by developing joint strategic investment projects in Industry 4.0 to facilitate integration of SMEs into international value chain	Production performance monitoring systems, predictive modelling and maintenance, virtual reality and simulation technology, smart logistic and network management, cyber-security, for industry and facilitated and secure access to “cloud”	Tuscany (IT) and Slovenia (SL)	6
14.	CHEMICALS	2018	The goal of cooperation is modernization of chemical industry to sustainable, energy and resource efficient sector for further providing innovative solutions suitable for downstream users	Utilizations of raw materials as a feedstock, waste reinsortation in production cycles, reduction of greenhouse gas emissions and resources consumptions	Lombardy (IT) and Limburg (NL)	13
15.	DIGITALISATION AND SAFETY FOR TOURISM	2017	The aim is to attract investment in tourism sector through interregional and intersectional actions	Access to data, risk management, business safety, accessibility, climate change and green mobility	Slovenia (SI), Lapland (FI), Andalusia (Es)	6
16.	CYBERSECURITY	N/D	The goal of the partnership is to activate interregional collaboration for: synergy creations of the existing specialized regions in cybersecurity, to develop the EU cybersecurity value chain, to increase investment on cybersecurity area.	Market-driven mapping of local ecosystems, interregional acceleration program, network of sellers and resellers, integrators, innovative business model for cybersecurity platform	Brittany (FR)	5

**Table A1 (cont.).** Examples of SS projects in the EU countries

No.	SS project	Start date	Goals of SS	Working branches	Country/region leaders	Country/region number
17.	MEDICAL TECHNOLOGIES	2017	The purpose of the partnership is to boost funding and collaboration, facilitating, building and structuring value chains of the EU countries in the medical technologies	Connected health, biomaterials and implants, medical devices and imaging	Auvergne-Rhône-Alpes Region (FR) and Lombardy (IT)	25
18.	NEW NANO ENABLED PRODUCTS	2015	The aim is to build an interregional industrial ecosystem in nanotechnologies and to product facilities for products created with nanotechnologies	Nano wires for ICT and energy applications led by Skane, nano enabled microsystem for bioanalysis led by Flanders, nano-enabled printed electronics led by Baden-Wurttemberg	Emilia Romagna (IT) and Skane (SE)	14
19.	PERSONALIZED MEDICINE	2018	The objective of the partnership is to build strong system which include biomedical, technological and data driven expertise	Data challenge, converging technologies, P4 medicine, skills and expertise	East Netherlands (NL), Limburg (NL), Flanders (BE)	4
20.	PHOTONICS	2017	The goal is accelerate wider use of photonic technologies across EU countries between nw and 2030 and to increase number of common interregional projects with photonic technologies	Photonic integrated circuits (PICs), sensing, measuring and imaging, optical fibres for industry, pilot facility for photonics-based manufacturing	South Netherlands (NL)	17
21.	SMART REGIONAL INVESTMENTS IN TEXTILE INNOVATION	2016	The objective is to reinforce strategic position of as a key sector of the European industrial landscape by responding actively to key social, economic, environmental, technology and policy trends	Sustainability (resource efficiency and circular economy, sector diversification technical and smart textiles, design- and creativity-based innovation	North East Romania (RO), Valencia (ES)	17
22.	SOCIAL ECONOMY	2018	The aim is to stimulate operations for social enterprises and social innovation actors for enlarging their activities at interregional level in the EU	Cost saving and improvement access to the social services, new models of innovation products and services, new investment drive for innovations across EU	Navarra (ES)	6
23.	SPORT	2017	The goal is to coordinate performance at this interregional level and to attract investments into this area	ICT4SELF, ICT4ENV, SPORT4VITALITY, TRANSVERSAL	Lapland (FL) and South Netherlands (NL)	10
24.	INNOVATIVE USE OF NON-FOOD BIOMASS	???	The objective is to implement synergy in new bio-based value chains across the EU regions	Lignocellulose refinery, biobased aromatics, biogas beyond energy productions, waste (gas) into value	Lombardy (IT) and Randstad (NL)	20
25.	EFFICIENT AND SUSTAINABLE MANUFACTURING	2013	The goal lays in creation of integrated demo-sites and pilot plants supporting to uptake of advanced technologies activating manufacturing activity and sustainability	De- and remanufacturing, smart and adaptive manufacturing, functional polymers, digital and virtual factory	Lombardy (IT) and Catalonia (ES)	20
26.	ADVANCED MANUFACTURING FOR ENERGY APPLICATIONS	n/d	The goal of the partnership is to make the EU a leader of manufacturing strong high integrity components for marine renewables and offshore energies applications	Offshore oil and gas, ocean energy, offshore winds	Scotland (UK) and Basque Country (ES)	11

**Table A1 (cont.).** Examples of SS projects in the EU countries

No.	SS project	Start date	Goals of SS	Working branches	Country/ region leaders	Country/ region number
27.	ADVANCED MATERIALS FOR BATTERIES FOR ELECTRO-MOBILITY AND STATIONARY ENERGY STORAGE	n/d	The main goal is to develop common R&D&I projects on topics of advanced materials, their characterization, durability suitable for extreme working conditions with the goal to deploy them in the fields of batteries	Secure access to raw materials and support the battery manufacturing, bridging the gap between research and industry application in the area of advanced materials for batteries for electromobility, adoption of clean energy and clean mobility technologies	Slovenia (SL), Andalusia (ES), Castile and Leon (ES)	8
28.	SAFE AND SUSTAINABLE MOBILITY	2018	The purpose of interregional cooperation is to strengthen the regional innovation capacity beyond automotive industry to boost investments based on open innovation infrastructure and new technologies provided by interregional clusters	Smart vehicle, smart infrastructure, safe mobility, sustainable mobility	Aragon (ES), Bavaria (DE), Ile-de-France (FR)	3

Note: Based on data excluded from factsheets allocated on knowledge repository of SS platform.