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# COMPARATIVE ANALYSIS OF INNOVATIVENESS OF THE BUSINESS SECTOR IN THE REPUBLIC OF MACEDONIA WITH THE SELECTED COUNTRIES IN THE REGION

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## **Abstract**

*In this paper, on the basis of the widely used methodology for measuring of innovations - Oslo Manuel, for the reference period 2012 – 2014, was made comparative analyses of the innovativeness of the business sectors in the Republic of Macedonia and other selected countries in the region such as Republic of Bulgaria, Republic of Serbia and Republic of Slovenia. The results of the analysis indicate the following: the most innovative is the Slovenian business sector and the lowest results are shown in the Bulgarian business sector; in terms of the four types of innovations, in the region the dominant part falls back on the non-technological innovations; the degree of innovativeness of the businesses is directly connected to the size of the enterprises; besides Slovenia, in the other selected countries in the region, there is no coincidence between the indicator for R&D intensity and the degree of innovativeness of the business sector etc.*

**Keywords:** innovation, business sector, entrepreneurship, R&D, Oslo Manuel, CIS.

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## **Introduction**

The research done on this paper concerns the innovative activity of the businesses in the Republic of Macedonia and other preselected countries in the region such as Republic of Bulgaria, Republic of Serbia and Republic of Slovenia. In addition, innovativeness, i.e. innovative business is being treated whilst having in mind its broader sense of the word, in accordance with the already comprehended meaning of innovation

as perceived by scholarly papers on economy and in the area of entrepreneurship and Eurostat methodology for innovative businesses. An enterprise is considered innovative if it has introduced one of four types of innovation: product innovation, process innovation, organizational innovation and marketing innovation. The research is being constructed as it follows: First, a brief theoretical retrospective on relationships between innovation and economic dynamism (economic growth and development) is given; Second, basics on methodology on measurement and interpretation of innovations based on the Oslo Manual – developed jointly by Eurostat and OECD is given; Third, an analysis on the degree of innovativeness of enterprises (businesses) in the four countries: Republic of Macedonia, Republic of Bulgaria, Republic of Serbia and Republic of Slovenia had been conducted; Fourth, a comparative analysis had been made, based on this basis about the innovativeness of the business sector in the selected countries.

## Theoretical background

The economic theory and practice have already shown that entrepreneurship, as a separate, fourth development factor (which puts together and coordinates the other factors in the economic process) has a distinguishing role in stimulating economic growth and development (Baumol, 2011). This is understandable, considering the fact that innovation is an essential characteristic and specificity of entrepreneurship, and the implementation of innovations contributes to increasing productivity and accelerating the economic growth of economies. When it comes to the sole meaning of innovation and its basic attributes, there are a number of definitions. Thus, in the word of Christensen & Overdorf (2000) „Innovation is the key to future success of the business“. According to Maryville (1992), innovation often means application of better solutions leading up to fulfillment of demands or, meeting the existing market requirements. The term “innovation” can be defined as something new, original and more efficient, and also as a result of the new “impulses” on the market or in society in general (Frankelius, 2009) etc.

The contribution of innovations and entrepreneurship for the economic dynamism is also in the focus of papers by many prominent theoreticians of entrepreneurship. Even the representatives of the so called canonical literature on entrepreneurship, primarily Joseph Schumpeter and Jean Baptist Say, in their works point to the close bond between innovation and economic dynamism. The most distinguished entrepreneurial theoretician, Schumpeter emphasizes Say’s contribution for treatment of the entrepreneur as a person who performs the combination and recombination of production factors, their displacement from less productive towards higher productivity sectors, i.e. as a person who introduces innovations. Still, the correlation between innovations – economic growth is best depicted in Schumpeter’s work.

According to Schumpeter’s model, entrepreneurs regularly disrupt economic equilibrium i.e., they constantly push the economy out of its permanent circular movement – a movement that implies there are no economic (above average) profits. Entrepreneurs do this by introducing various types of innovations: they supply a new product or an existing product with superior quality; or they introduce a new production method; or they open a new market segment; or they discover new sources of raw materials; or, finally, they introduce a new organization in the sector (Schumpeter, 1934).

According to Schumpeter, innovations are first undertaken by the bravest, the most energetic entrepreneurs, who, as a consequence, achieve above average profits (economic profits), as temporary incomes (for example, as long as they enjoy patent protection). That will motivate other entrepreneurs to follow their example, and the previous equilibrium will be completely destroyed. Hence, according to Schumpeter, innovation itself can best explain the cyclical movement of the market economies. In this sense, Peter Draker stresses out that the entrepreneur maximizes the opportunities through the introduction of innovation and that the entrepreneur manifests dissidence, while at the same time upsets and disorganizes (Draker, 2012, p.36). According to Izrael Kirzner, the entrepreneur is a person who, in an environment of limited knowledge and asymmetric information, is always on alert and is able to discover and use some new opportunities, opportunities which other economic agents have not discovered yet – but, such entrepreneurial actions finally get the economy to an another equilibrium. In this context, Kirzner (1973) points out that where there is equilib-

rium, there is no place for action for the entrepreneur, which is a confirmation that the economic dynamism is directly connected to the activity of the entrepreneur and innovations introduced.

Basically, innovation is the bearer of change, the creator of new opportunities, new products and services, the key to new markets and, in its core, it is a basis for product differentiation and services, and ultimately a movement that enables companies to gain competitive advantage. At the same time, innovation bring economic profit. In standard microeconomics, economic profit appears when the price is higher than the average total costs, including the opportunity costs, which effectively means that the economic profit is an excess profit over some average, normal profit. Certainly, it is the above average profit that provides the basic incentive for action of innovative entrepreneurs and is the driver of economic dynamism and growth. In this sense, Acs (2008) emphasizes that the innovations of the small entrepreneurial firms and the entrepreneurial activity in general, have been the decisive contributing factors of the good performance of the US economy, particularly during the 1980s, and its significantly lower natural rate of unemployment compared to EU member states.

A big part of the innovations (which may be considered as positive externalities) are under patent law protection, they provide the entrepreneurs who introduce them with a temporary monopolistic power, and consequently, with very high rewards (Fiti et al. 2007).

Having in mind that innovation is one of the key determinants in dimensioning economic growth and development, whose main characteristics constitute of the continued dynamism and permanent change, and the process itself i.e. the model of innovations is based on constant change.

Analyses of some prominent entrepreneurship theoreticians (Kirzner, Baumol, Casson and others) tend to conclude that it is difficult for entrepreneurship, considered as a separate production factor, to be incorporated in the framework of the economic process offered by classical microeconomics. As a consequence, the entrepreneurship has been neglected by the mainstream modern economics. All those authors start from the fact that the classical microeconomic model has been designed for an analysis of the static equilibrium (in the case of a profit-maximizing firm, equilibrium being achieved when marginal cost equals marginal revenue), whereas entrepreneurship (or the entrepreneurial process) is essentially related to constantly challenging and upsetting the achieved equilibrium through permanent innovations. (Fiti and Filipovski, 2012)

Probably one of the most significant sources of the power of innovation is the fact that it is not only a technological phenomenon but also, and in many cases, a social, market and demographic phenomenon, which brings it closer to a broader use (Fiti et al., 2007).

In this context, Birch (1987, p. 70) ascertains that innovation can be done even with poor technology, even without technology and that in the USA there are many innovations in the classical sectors (steel and steel products, bicycles, textile, leather, paper, etc.) with the actions of so called animators of trends, i.e., contrarians – entrepreneurs that enter sectors others run from.

Also, according to Draker's opinion, innovation is more of an economic, market, social and demographic phenomenon that it is technological (Draker, 2012). Such an understanding and treatment of innovation, must have greatly contributed in its measurement for it to be treated in a broader sense. So, according to the criteria of Eurostat, a business is considered innovative if it implements one of the four types of innovations: product innovation, process innovation, organizational innovation and marketing innovation (Fiti et al., 2017).

In fact, it is innovation that brings upon changes, creates new opportunities, new products and services, opens new markets, and is a basis for differentiation of products and services, thus enabling enterprises to gain competitive advantages.

In the past few decades, the troublesome question linked to research and development, creating and spreading new information and knowledge, and also the introduction of innovation is becoming a field of special interest, that has been an inspiration for many scholarly studies and empirical analyses. In addition, many literary breakthroughs explicitly state that innovations are not only important to individual enterprises, but to economies in general, because innovations make room for establishing competitive economies based on knowledge, something that is definitely leading towards enabling an accelerated economic growth and

improvement of the competitive abilities of different national economies present on the global market. Hence, it becomes clear that one of the key priorities of every modern market economy that strives to entice the economic growth should be to strengthen the competitiveness in the business sector – through knowledge and innovation. Thus, questions linked to establishing the determinants of innovations and consequential effects of their implementation become massively important and lure the interest of the economic research echelon on a worldly level.

### **Methodology for measuring and interpretation of data on innovation**

Innovation has central role in the process for output and productivity growth, so there is a need innovation to be appropriate followed and measured. Internationally guideline for collecting, measuring and usage of data on innovation is Oslo Manual. Innovation data are widely used by different data users and for different purposes, because of that the Manual is designed to meet the various user needs.

Oslo Manual is developed jointly by Eurostat and OECD. Oslo is the widely used methodology for measuring of innovations. The main goal of the Manual is to be internationally used guideline for collection of data on innovation and proper interpretation of the data. It is used not only in European countries but also among other countries in the world. Oslo Manual is used as a methodological background for conducting of Community Innovation Survey (CIS), which one is conducted among European countries.

The wide usage of this methodology allows international comparison of data on innovation and provides indicators on innovation for benchmarking national performances. Also, with the continued usage of the Manual as methodology for collection of data on innovation, are provided comparable indicators over time.

Innovation is dynamic process, because enterprises are continuously implementing different kinds of changes and innovations in their work. Dynamics processes, including innovations, are more difficult to be followed and measured than the static one.

Oslo Manual refers to collection of data on innovation at enterprise level and it does not cover industry or economy-wide innovations. Estimation of industry or economy innovations and changes it is possible to be measured only by the aggregation of enterprise level data. An enterprise can make a lot of changes and implement innovation in different aspects of its work, such as in the process of production, business practices, inputs used in order to improve its performance.

In the Manual are defined for types of innovation: product innovation, process innovation, marketing innovation and organizational innovation. Product and process innovations are known as technological innovations, marketing and organizational innovations as non-technological innovations.

According to the Manual product innovation is defined as “...*the introduction of a good or service that is a new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. Product innovations include both the introduction of new goods and services and significant improvements in the functional or user characteristics of existing goods and services*” (Oslo Manual, 3th edition, pp: 48).

The second type of innovation defined with the Manual is process innovation “... *process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software*” (Oslo Manual, 3th edition, pp: 49).

Innovation on process can be implemented with different aims for example to reduce unit production or delivery costs, to increase the quality of product or production process, or to produce or delivery new or significantly improved products. (Oslo Manual, 3th edition)

Marketing innovation is defined as a “...*implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing*” (Oslo Manual, 3th edition, pp: 49).

Enterprises may invest big amount of resources for market research. Implementation of marketing innovation can lead to increasing of enterprise performance. Also enterprises implement marketing innovations with aim for better meeting of costumers needs, opening of new markets, research of the market can lead to product or process development through demand-lead innovation, or increasing the enterprise's sales. (Oslo Manual, 3th edition)

The second type of non-technological innovation is organizational innovation, in the Manual organizational innovation is defined as “.....*the implementation of a new organizational method in the firm's business practices, workplace organization or external relations*” (Oslo Manual, 3th edition, pp: 51).

Enterprises implement organizational innovations to improve workplace satisfaction, quality and labor productivity, or reduction of supply costs. (Oslo Manual, 3th edition)

One enterprise to be identified as innovative one should “.....*had innovation activities during the period under review, including those with ongoing and abandoned activities. In other words, firms that have had innovation activities during the period under review, regardless of whether the activity resulted in the implementation of an innovation, are innovation-active*” (Oslo Manual, 3th edition, pp: 59).

For the implementation of innovation, enterprises take on different innovation activities such as technological, scientific, organizational, finance or commercial which lead or are intended to lead to the implementation of innovation (Oslo Manual, 3th edition).

According to the Manual under innovation activities are included “...*all scientific, technological, organizational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. Some innovation activities are themselves innovative, others are not novel activities but are necessary for the implementation of innovations. Innovation activities also include R&D that is not directly related to the development of a specific innovation*” (Oslo Manual, 3th edition, pp: 47).

Because Oslo Manual refers to the data collection on enterprise level the innovative enterprise is defined as enterprise that has implemented an innovation (product, process, organizational or marketing) during the period under review. (Oslo Manual, 3th edition)

All presented data in this paper are collected with the standard Community Innovation Survey (CIS) and as a methodological background it has been used the Oslo Manual. Because the collection instruments and methodology are same for all countries, the data are internationally comparable.

CIS it is conducted every two years and is covering three year period. The survey is designed to provide data by types of innovations, economic activities, size classes, expenditures on innovation, turnover form innovation, public funding, co-operation. It is conducted in industry and service enterprises. The survey is currently carried across the EU, EFTA countries and in EU candidate countries, but also a lot non-European countries are conduction CIS for measuring of innovations.

## **Innovativeness of the business sectors in Republic of Macedonia, Republic of Bulgaria, Republic of Serbia and Republic of Slovenia**

### ***Republic of Macedonia***

The analyzed data on innovations, shows that third country in terms of introducing innovations in the region is Macedonia. In business section in Macedonia, in the observed period, 2012 – 2014, 36% of the enterprises reported some form of innovation activity.<sup>1</sup> Hence, the indicator for R&D Intensity (participating in research and development of the GDP) relating to Macedonia is 0.22% (Erawatch, 2013), and the participation of the business sector in investment for research and development turns out to be in the range of 18 to 20%.

1) As a data source for all presented data on innovation for Macedonia is State Statistical Office of Republic of Macedonia and EUROSTAT.

<http://www.stat.gov.mk/pdf/2016/2.1.16.20.pdf>

<http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>

Only technological innovative are almost 20% of all innovative active enterprises, only non-technological innovative are almost one quarter, 24.8%, of all innovative enterprises and both types of innovations, technological and non-technological are introduced by 55.6% of the innovative enterprises. The data shows that among enterprises in business section in Macedonia as in business section of Slovenia, most of the reporting enterprises have introduced both, technological and non-technological innovations at the same time.

Considering the four types of innovations, the enterprises mostly introduce process innovations, 22.8%, and marketing innovations, 22.3%. The share of those two types of innovations is almost the same, process and marketing innovations simultaneously exist in enterprises. The next most common type is organizational innovations, 20%. Enterprises at least introduce product innovations (innovation that encompasses new or significantly improved goods or services), only 17.1%.

In the business section in Macedonia, the largest enterprises are the most innovative, 65.2%. The lowest share of innovative enterprises is among small enterprises, only 33.2%. Compared to the small enterprises, medium sized enterprises are more innovative. Almost 42% of the medium sized enterprises are innovative. This trend was observed among all four types of innovations. The most common reason for this situation, cited by the enterprises, was the lack of financial resources for innovation, especially in the small one. <sup>2</sup>

In the case of Macedonia, industry section is more innovative compared to services sector. More than a half of the enterprises in industry are innovation active, 52% and less than half of the services sector enterprises, 48%. The most common types of innovations which take place in industry as well as in service sector are the process and marketing innovations. <sup>3</sup>

Enterprises may introduce innovation on their own or with active co-operation with other enterprises or public research institutions. 22% from the technological innovative enterprises, co-operate during the process of developing innovations. From the number of technological innovative enterprises, mostly of them reported that co-operate with the suppliers of equipment, materials, component or software, 25.4%.

Because enterprises are making different kind of current and capital expenditures for innovation activities, in the business section in Macedonia, 44.1% of all expenditures for innovation activities are intended for training of the staff for innovative activities, research and introduction on the market of innovations, design, preparing of feasibility studies, testing of the innovations etc..

The empirical research for many countries confirms that there are typically positive correlations between innovations and productivity, i.e. that innovations lead to improvement of the overall economic and financial performance of firms.

In this paper, with the help of the most used model for assessment of connections between innovation and their performance (CDM), we confirm such conclusions in the case of the Republic of Macedonia (see Appendix 1).

## Republic of Bulgaria

Last innovative country in the region is Bulgaria. According to the latest data in business section in Bulgaria, in the period 2012 – 2014, 26.1% of the enterprises have introduce product, process, marketing or organizational innovation.<sup>4</sup> The indicator for R&D Intensity (participating in research and development of the GDP) in Bulgaria is 0.57%, and the participation of the business sector in investment for research and development turns is somewhere around 50% (European Union, 2013).

2) Small enterprises: 10 – 49 employees; Medium enterprises: 50 – 249 employees and Large enterprises; 250 and more employees.

3) In the survey are included sections B, C, D, E, H, J, K and divisions 46, 71, 72, 73 belonging to Nacional Classification of activity (NACE Rev.2) and are obligatory according to Regulation No. 995/2012 of European Commission.

4) As a data source for all presented data on innovation for Bulgaria is National Statistical Institute of Republic of Bulgaria and EUROSTAT [http://www.nsi.bg/sites/default/files/files/pressreleases/NIRD\\_Innovation2014\\_en\\_R518U7.pdf](http://www.nsi.bg/sites/default/files/files/pressreleases/NIRD_Innovation2014_en_R518U7.pdf)

<http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>



Bulgaria is the only country in the Region where enterprises are introducing more technological innovations than non-technological innovations. Almost 38% of the innovative enterprises introduce innovation on product or process only. As regard to the non-technological innovations, only marketing or organizational innovations introduce 34.6% of the innovative enterprises in Bulgaria. And at the same time both types of innovations, technological and non-technological are introduced by 27.7% of the innovative enterprises.

Marketing innovations prevail in business section in Bulgaria. 11.7% from the total enterprises has introduced marketing innovation. Product and organizational innovations are equally introduced by the enterprises. Almost 11% of the total enterprises have introduced those two types of innovations. On the other hand, process innovation is the least prominent type of innovation, it is introduced by 9.2% from the total enterprises.

Traditionally as in the other countries in the Region, the innovation activity in business section in Bulgaria depends on the enterprise size. The highest share of innovative enterprises is among large one, 78.3%, followed by the share of innovative enterprises among medium sized, 38.8%. Last innovative are the small enterprises, almost 21%. Because finance is one of the main determining factors for implementation of innovations, the lack of funds in small and medium sized can be stated as a reason for the smaller share of small and medium innovative enterprises compared to the large one.<sup>5</sup>

The data shows that as in the previous country, in Bulgaria, enterprises in industry are more innovative compared with the service section. 29.7% of the enterprises in the industry introduce any kind of innovation, while only 21.9% of the enterprises in service section are innovative. In service section the most innovative are enterprises in "Scientific research and development (R&D) division", in which one all enterprises are innovative as a fact that R&D is a kind of innovation.<sup>6</sup>

Innovative active enterprises in Bulgaria that co-operate with enterprises or public research institutions on the implementation of innovations, identified the co-operation with the suppliers of equipment, materials, component or software as most useful for the implementation of innovation. 31.5% from the technological innovative enterprises, co-operate with the suppliers.

According to the data obtained by national survey on innovation in Bulgaria, a lot of innovation active enterprises are not R&D performers. The evidence shows that enterprises implement innovations without engaging in R&D activities. Data shows that more than a 60% of the total expenditures are done for purchase of machinery, equipment and software.

## Republic of Serbia

According to the data obtained by the statistical survey on innovation, for the reference period 2012 – 2014, the share of enterprises that have introduced innovation on product, process, marketing or in organization in business section in Serbia is 40.5%.<sup>7</sup> In this case, the indicator for R&D Intensity (participating in research and development of the GDP) relating to Serbia is 0.79%, and the participation of the business sector in investment for research and development is only 8% (Vasić et al., 2016).

In the structure of innovative enterprises in Serbia, during the period 2012 – 2014, almost 29% of the enterprises have introduced only technological innovation (innovation on product or process), only non-technological innovation (innovation on marketing or organization) have introduced almost 33% of the innovative enterprises. At the same time technological and non-technological innovations have introduced 21.2% of the inno-

5) Small enterprises: 10 – 49 employees; Medium enterprises: 50 – 249 employees and Large enterprises; 250 and more employees.

6) In the survey are included sections B, C, D, E, H, J, K and divisions 46, 71, 72, 73 belonging to National Classification of activity (NACE Rev.2) and are obligatory according to Regulation No. 995/2012 of European Commission.

7) As a data source for all presented data on innovation for Serbia is Statistical Office of the Republic of Serbia and EUROSTAT

[http://www.stat.gov.rs/WebSite/repository/documents/00/01/89/79/IA01\\_276\\_eng.pdf](http://www.stat.gov.rs/WebSite/repository/documents/00/01/89/79/IA01_276_eng.pdf)

<http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>

vative enterprises. This means that in business section in Serbia is dominating the introduction of non-technological innovations only.

An analyze based on the four types of innovations shows that in Serbia the most common type of innovation concerned organizational innovation, which take place in almost 25% of all enterprises. The second most common type is marketing innovation. Almost 24% of the enterprises introduce marketing innovations. Those two types are followed by product and process innovations. Those two types of innovation simultaneously exist in enterprises in Serbia. 20% of the enterprises introduce product innovations (innovation that encompasses new or significantly improved goods or services) and also 20% of the enterprises have introduce process innovations.

The data obtained by the statistical survey shows that the size of the enterprises is a key factor for implementing an innovation in business section in Serbia. Regarding the size of the enterprises, more than 68% of the large enterprises are innovative. More than a half of the medium sized enterprises 52.7% and at least innovative are the small enterprises with more than 37% innovative enterprises.<sup>8</sup>

As seen by section of economic activity, Serbia is the only country in the region where the share of innovative enterprises in those two sections is equal. 40% of the enterprises in industry and service section have introduced innovations.<sup>9</sup>

For the reference period 2012 – 2014, from the technological innovative enterprises, 17.5% have reported that collaborate with other enterprises or institution during the process of implementing innovations. As a most useful partner for co-operation, enterprises in Serbia have indicate the collaboration with faculties and other science and education institutions, 23% of the enterprises have reported this kind of partnership.

Regarding the expenditures on innovation activities, as in the previous period in business section in Serbia, enterprises are making highest expenditures for innovation activities for purchase of machinery, equipment and software. Approximately 64% from the total expenditures are intended for this kind of expenditures.

## Republic of Slovenia

Most recent data on innovation activity shows that almost 46% of the enterprises in Slovenia, in the reference period 2012 – 2014, introduce new or significantly improved products on the market, introduce new or significantly improved processes, new or improved organizational or marketing methods. Those enterprises are innovative enterprises.<sup>10</sup> The indicator for R&D Intensity (participating in research and development of the GDP) relating to Slovenia is 2.47%, and the participation of the business sector in investment for research and development turns out to be in the range of about 60% (European Union, 2013).

Regarding the type of innovation, only technological innovations (product or process innovation) introduce almost 24% of all innovation active enterprises. Only non-technological (marketing or organizational) innovators are 28% of all innovative enterprises. Both types of innovations, technological and non-technological, are introduced by 48% of the innovative enterprises. Among business section of Slovenia, most innovation active enterprises have introduced at the same time technological and non-technological innovations.

An analyze based on the four types of innovation (product, process, marketing and organizational) shows that the most common type of innovation in business section in Slovenia are product and marketing innova-

8) Small enterprises: 10 – 49 employees; Medium enterprises: 50 – 249 employees and Large enterprises; 250 and more employees.

9) In the survey in Serbia despite the obligatory sections and divisions according to Regulation No. 995/2012 of European Commission, are included additional sections A, F, I, L, N, Q, R and divisions 45, 47, 69, 70, 74, 75, belonging to Nacional Classification of activity (NACE Rev.2), that according to the same Regulation can be included on voluntary base.

10) As a data source for all presented data on innovation for Slovenia is Statistical Office of Republic of Slovenia and EUROSTAT.

<http://www.stat.si/StatWeb/en/News/Index/5899>

<http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>



tions. Those two types of innovation are equally introduced among enterprises in Slovenia, 25%. Less than one quarter of the enterprises have introduced organizational innovations, 24.4%. The last presented are the process innovations (new or significantly improved production process, distribution method or supporting activity), which one takes place in 22.6% of all enterprises.

In Slovenia the share of innovation enterprises grows with the enterprise size. The highest share is observed among larger enterprises, 87.2%. Small enterprises are the last engaged in innovation activities, almost 40% of the small enterprises are innovative. A higher share compared to the small enterprises is observed among medium-sized enterprises, 63.1%. This observation held consistently among all four types of innovations.<sup>11</sup>

In the survey are included manufacturing and service enterprises. Manufacturing enterprises are at the forefront of the innovation with almost 50% share of innovative enterprise, whereas services enterprises just over 42% are innovation active.<sup>12</sup>

During the process of implementation of technological innovations, business enterprises may have active cooperation with other enterprises or institutions. The innovative enterprises in Slovenia mostly co-operate with suppliers of equipment, materials, component or software, approximately 31.5% of the technological innovative enterprises.

Regarding the expenditures for innovation activities, enterprises in business section in Slovenia mostly invest in R&D activities. The share of R&D expenditures in total expenditures for innovation activities is more than 58%. Slovenia is leader country in the Region regarding the R&D expenditures of the business section.<sup>13</sup>

### Comparative analysis

Analyzed data on innovativeness of the business sector in the Republic of Macedonia and the other three countries in the region, Republic of Bulgaria, Republic of Serbia and the Republic of Slovenia in the reference period 2012-2014, shows that the most innovative is the Slovenian business sector where almost 46% of enterprises are innovative, and the lowest results are shown in the Bulgarian business sector with only 26.1% innovative enterprises. In total, innovative enterprises in Macedonia add up to 36%, and the Serbian entrepreneurs contribute with 40.5%. At the same time, data shows that the business sectors in the four analyzed countries have significantly lower innovation spread compared to most innovative countries in the EU-28, Germany (67%), Luxembourg (65.1%) and Belgium (64.2), but particularly higher innovation compared to the business sectors of the least innovative countries in the EU-28, such as Latvia (25.5%), Poland (21%) and Romania (12.8%).

Regarding the type of innovation, Bulgaria is the only country in the region where enterprises are introducing more technological than non-technological innovations.

Namely, 38% of innovative enterprises in the Bulgarian business sector in the analyzed period have introduced technological innovation (innovation of product or process), and 34.6% non-technological innovation (organizational or marketing innovation)

This situation related with the distribution between technological and non-technological innovations, coincides the EU average, where also in the period 2012-2014 in innovative enterprises, technological domination was as high as 27%, leading the way before the non-technological innovations that participate with 25% in total. In the other three analyzed countries, Macedonia, Serbia and Slovenia, the dominant innovation is the non-technological before the technological innovation.

11) Small enterprises: 10 – 49 employees; Medium enterprises: 50 – 249 employees and Large enterprises: 250 and more employees.

12) In the survey are included sections B, C, D, E, H, J, K and divisions 46, 71, 72, 73 belonging to Nacional Classification of activity (NACE Rev.2) and are obligatory according to Regulation No. 995/2012 of European Commission.

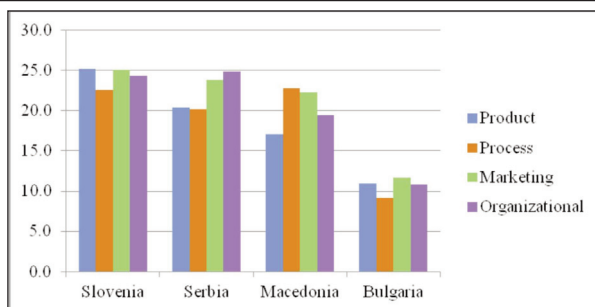
13) In the R&D expenditures are included In-house and External R&D expenditures.

The analysis based on four types of innovation (product, process, marketing and organizational innovation) shows that, in Macedonia dominate process innovations, which contribute with 22.8% of total innovation. After the process innovations follow marketing innovation (22.3%), organizational innovation (20%) and product innovation (17.1%).

In Bulgaria dominate marketing innovations, in Serbia organizational innovations and in Slovenia marketing innovations and product innovations with a share of 11.7%, 25% and 25% in the total innovations, respectively.

**Figure 1.**  
Share of the four types of innovations in the countries in the Region, in the period 2012 – 2014

Source: Web pages of Statistical Offices of the countries



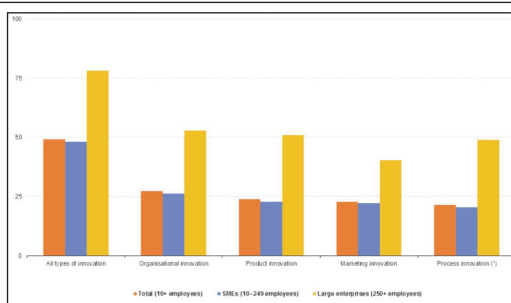
Macedonia, where in the analyzed period were dominant in the process innovations, in the other three analyzed countries, Bulgaria, Serbia and Slovenia, process innovations recorded the smallest share in the total innovations.

Among the EU-28 during the analyzed period most common type of innovation concerned organizational innovations, which took place in 27% of all enterprises. The second most common type is product innovations, which took about 24% of all enterprises and it is followed by marketing innovations, which are introduced by 23% of the enterprises. The last type is the process innovations, introduced by 22% of the all enterprises among EU countries.

An analysis based on the size of the enterprises, shows that among EU countries as well as in the four analyzed countries, most innovative are large enterprises. At the second place are medium-sized enterprises and lastly, there are the least innovative, small enterprises.

**Figure 2.**  
Share of the innovative enterprises by size of the enterprises among EU Member States

Source: Eurostat Database (data codes: inn\_cis9\_type and inn\_cis9\_bas)



This situation is largely understandable especially considering the far more powerful financial position and availability of necessary human resources of large enterprises in terms of the average and particularly in relation to small enterprises.

Analyzed data in Macedonia, Bulgaria and Slovenia shows higher innovativeness of the enterprises located in the industry section, where 52%, 29.7% and 50% of the enterprises are innovative, respectively by countries. In the same time, Serbia is only one of the analyzed countries where the percentage of the innovative enterprises in the both sections is equal (40 %).

In Bulgaria only 21.9% of the enterprises in service sector are innovative. In service sector, the most innovative are enterprises in “Scientific research and development (R&D) division”, in which all enterprises are innovative as a fact that R&D is a kind of innovation and an integral part of the process of innovation.

Although enterprises innovations can develop and introduce internally or in collaboration with other enterprises or public research institutions, by building models of open innovation, it is encouraging that enterprises in the region are becoming increasingly aware of the benefits of cooperation with other enterprises and institutions in the processes of the implementation of innovations.

In Macedonia, 22% of technologically innovative enterprises in the analyzed period established cooperation with other enterprises and institutions in the process of innovation.

From the total number of technologically innovative enterprises of Macedonian, Bulgarian and Slovenian business sector in innovation processes in most, or 25.4%, 31.5% and 31.5% respectively, cooperated with its suppliers.

In Serbia in the reference period 2012-2014, 17.5% of the enterprises that have introduced technological innovations have established cooperation with other enterprises or institutions in the process of implementation of innovation. In the Serbian business sector, cooperation of innovative enterprises with universities and other scientific and educational institutions is dominant and it contributes with 23% of the total external cooperation with other companies and institutions.

In terms of expenditures made for innovative activities, between the enterprises from the countries in the region, in the period 2012-2014, the costs for purchase of machinery, equipment and software are dominant.

Specifically, in the business sector in Macedonia, 44.1% of all expenditures for innovation activities are intended for training of the staff for innovative activities, research and introduction on the market of innovations, design, preparing of feasibility studies, testing of the innovations etc.

According to the data obtained by national survey on innovation in Bulgaria, a lot of innovation active enterprises are not R&D performers i.e. enterprises implement innovations without engaging in R&D activities. Data shows that more than a 60% of the total expenditures are done for purchase of machinery, equipment and software.

Regarding the expenditures of innovative activities, very similar is the situation in the Serbian business sector. Even the 64% of the total cost of innovative activities Serbian innovative enterprises made for the purchase of machinery, equipment or software.

Analyzed data related with the expenditures done for innovative activities a different situation shows only in Slovenia, which is a leading country in the region in terms of cost made for innovation activities. The innovative enterprises of Slovenian business sector 58% of the total funds for innovative activities earmarked for the activities of research and development.

## Conclusions

Based on the conducted analysis, we can derive the following relevant conclusions:

**First**, among the analyzed countries with the higher rate of innovativeness, is the Slovenian business sector, where almost 46% of the enterprises are innovative. Next in line is Serbia, with a percent of 40,5% innovative businesses, Macedonia is in the third place with 36% innovative businesses and lastly, Bulgaria with a score of 26,1% innovative businesses. Collected data show that the business sectors in the four selected countries have significantly smaller innovativeness rate compared to the most innovative countries in the EU-28, Germany (67%), Luxembourg (65,1%) and Belgium (64,2%), but also show notably higher innovativeness rate when compared to business sectors of the least innovative countries in the EU-28, Latvia (25,5%), Poland (21%) and Romania (12,8%).

**Second**, in terms of types of innovations, only in Bulgaria (where the level of innovativeness is very low) the technological innovations (process and product innovations) overrun the non-technological innovations (organizational and marketing innovations). Analysis based on the four types of innovations (individually) show that in Macedonia the dominant part falls back on the process innovations, in Bulgaria and Slovenia on the marketing innovations and in Serbia there is the highest level of organizational innovations.

**Third**, the degree of innovation in businesses is directly connected to the size of the enterprises. Hence, in the four analyzed countries, the highest rate of innovation can be spotted in the largest enterprises and after them the medium-sized enterprises while the small ones have the lowest rate for innovativeness. This is a general legitimacy that can also be confirmed by the example of all member countries of the EU (EU-28) and on an even wider territory.

**Fourth**, analysis shows that besides Slovenia, in Bulgaria, Macedonia and Serbia, there is no coincidence between the indicator for R&D intensity (and through that in the participating of the business sector in financing of research and development) and the degree of innovativeness of the business sector. Legitimacy in terms of high correlation in investment in R&D and the dominant positions of the entrepreneurial sector in those investments, along with the whole innovativeness of the business sector, it is almost always confirmed in the highly developed countries, and in this context, in Slovenia as well. As a matter of fact, Slovenia has an indicator of R&D intensity of 2.47% (that is somewhere above the European average), with participation of the entrepreneurial sector in financing of research and development with a mark of 60% (within European average), with a huge number of small and medium-sized businesses and highly sophisticated support measures, has achieved significant results in innovative activities in terms of the whole economy. The aforementioned correlation can in no way be found in the case of Macedonia – the business sector shows relatively high level of innovativeness (36%) in the case of exquisitely low R&D intensity indicator (0.22%) with marginal exceptions in the sphere of businesses financing research and development. There can be a number of different reasons for such outcome - bad (unstable) statistical evidence on investment in R&D intensity, bias of enterprises in conducting surveys about determining their own innovativeness etc. On the other hand, in the past few years in Macedonia, there has been a growth in the number of foreign companies investing in the country (in the technological-industrial development zones), that are highly intense, which has resulted in an increased export of good with higher finalization rate, investing in trainings of employees etc. Be what it may, in the future, the presented disconnection will require a more serious research for determining the actual situation. In the case of Bulgaria, the situation is different. The low level of innovation in business can be as a result of the fact that innovative activity is characterized by dominance of the technological innovations (machines, equipment, software), that absorb relatively high means, but are also focused on relatively small number of big enterprises. This is also that case with Serbia, with about 64% of the cost for innovative activities, the innovative enterprises made purchases for machines, equipment or software.

**Fifth**, there should be efforts made in Macedonia, Serbia and Bulgaria for qualitative improvements of statistical data for research and development in general, and by that, to also strengthen the innovative activity of the business sector.

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## Appendix 1

### Econometric model for measuring of determinants of innovation and their impact on the productivity of firms in Republic of Macedonia

The impact of innovation on firm's performance has been a topic of great interest for the economists and policy makers for decades. Although in the literature it is generally accepted that innovation leads to improvement of the competitiveness of firms and their performance, this relationship has not been studied unambiguously by empirical models. The empirical estimation of this relationship is based on an already existing theoretical framework as a starting point for the construction of the models. For the estimation of this relationship are mostly used multi-stage models.

The data used for the empirical analyses presented in this paper are obtained by the Survey on innovation and innovation activities. The survey was conducted by the State Statistical Office of the Republic of Macedonia. The main aim of the survey was to collect data on innovation in manufacture and service firms in the country. Data used in the model refers for the reference period 2010 – 2012. The survey has the same structure as Community Innovation Survey (CIS) and as a methodological background has been used the Oslo Manuel.

The estimated model used is an adaptation of the original CDM model.<sup>14</sup> The model starts with the estimation of innovation input. The input estimation has two phases. In the first phase the firm decides whether or not to invest in innovation and if the firm decides positively, to invest in innovation, than in the second phase the firm should decide how much to invest in innovation.

If  $g^*_i$  presents the unobserved decision variable of whether or not a firm to invests in innovation,  $k^*_i$  is the unobserved level of firm's innovation investment,  $g_i$  and  $k_i$  are their observed counterparts, than the first two equations of the model can be defined in the following way:

$$g^*_i = \beta_0 x^0_i + u^0_i \quad (1)$$

$$g_i = 1 \text{ if } g^*_i > 0 \quad \text{otherwise,} \\ = 0 \text{ if } g^*_i \leq 0 \text{ and}$$

$$k_i | (g_i > 0) = \beta_1 x^1_i + u^1_i \quad (2)$$

$$k_i = k^*_i \text{ if } k^*_i > 0, \text{ otherwise} \\ = 0$$

In this regression  $x^0_i$ ,  $x^1_i$ ,  $\beta_0$ ,  $\beta_1$  are vectors of independent variables and their corresponding unknown parameters, which reflects the impact of certain determinants on the firm's decision to innovate and the level of investment in innovation.  $u^0_i$  and  $u^1_i$  are random error terms with mean zero and constant variance not correlated with the explanatory variables.

The third stage it is represented in the following equation and connects the innovation input with the innovation output:

$$t_i = \alpha_k k_i + \beta_2 x^2_i + u^2_i \quad (3)$$

with  $t_i$  indicating the observed level of innovation output,  $k_i$  representing the innovation input from the previous equation and  $\alpha_k$  it is representing the corresponding unknown parameter.  $x^2_i$  is the vector of other explanatory variables and  $\beta_2$  is the vector of corresponding unknown parameters.  $u^2_i$  is a random error term with mean zero and constant variance not correlated with the explanatory variables.

14) The CDM model is the most used model for the estimation of relationship between innovation and firm's performance. The CDM model has started to be frequently applied by scholars in many countries using the data from Community Innovation Surveys.



The last model equation connects the innovation output with firm's performance.

$$q_i = \alpha_i t_i + \beta_3 x^3_i + u^3_i \quad (4)$$

where  $q_i$  represents firm performance,  $t_i$  and  $\alpha_i$  represents the innovation output from the previous equation and its corresponding unknown parameter,  $x^3_i$  and  $\beta_3$  is vector of independent variables and its corresponding unknown parameters.  $u^3_i$  is an error term.

Model estimation is performed in two parts. In the first part, the decision to innovate and innovation input equations are estimated together by the Heckman two-step estimation procedure. In the second part, both equations, the innovation output and performance equations are estimated jointly using three-stage least square estimation of simultaneous equations. The model estimations are performed in STATA.

The results of the model estimation are in line with the basic postulates of existing theoretical and empirical literature on innovation. The findings indicate that the intensity of domestic and foreign competition motivates firms to innovate and the decision on how much to invest in innovation is under the pressure of domestic and international competition in the case of Republic of Macedonia.

An important conclusion is the confirmation of the relationship between innovation and firm size. According to the results larger firms are investing more in innovation compared with the small ones and medium sized. The results indicate that the usage of market sources related with the introduction of innovation lead to the increase of innovation output. The usage of national and EU financial funds for implementation of innovation has positive effect on the innovation output.

At the end the model results indicates the positive and statistical significance relationship between firm's productivity and innovation output. The finding from the estimated model indicates that in the case of Republic of Macedonia the introduction of innovation improves the firm's performance and competitiveness and on a long term positively reflects on the country economic growth.