THE IMPACT OF INNOVATION ON THE GROWTH OF REAL WAGES IN THE WESTERN BALKAN COUNTRIES

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ABSTRACT
The high degree of innovation of a country's economy has a stimulating effect on the growth of its productivity levels, which are vital for the profitability of its companies. In this way, ampler innovation backs the organic growth of companies and outlines their long-term competitiveness, including competitiveness at the macro level. Furthermore, having a higher profit level, companies could pay higher net salaries to their employees. It plainly indicates the connection between the innovative processes in the companies themselves and their employees' income levels. This paper aims to test whether this relationship has a proper stronghold in the business practice of The Western Balkans countries: Bosnia and Herzegovina, Serbia, Montenegro, North Macedonia and Albania. Various benchmarks taken from relevant international reports are used as analysis tools.
The obtained results will serve as a starting point for considering and conceiving a future efficient platform of public policies supporting the expansion of innovation and technological capacities of companies in the economies of the countries included in this analysis.

Keywords:*Innovation, Productivity, Profit, Earnings, Western Balkans*

JEL classification: *C33,D24,E60*

1. INTRODUCTION

In a dynamic business environment of an open and globalized market, where the imperative of competitiveness of the economy and its companies is in the foreground, innovations are becoming an increasingly important tool for achieving economic growth and competitiveness, both in developed and developing countries. Many authors emphasize a particular evolution in the innovation concept in the last two decades, emphasizing that it can be viewed multi-dimensionally. It can be creating an entirely new or significant improvement of an existing product, a new technological process, a new approach to marketing and a new organizational method in daily business. In basic economic theory, as one of the most crucial

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principles, it is stated that the standard of living of a society depends on its ability to produce goods and services (Mankiw, 1997). That ability is directly dependent on factor productivity. It is necessary to fulfil a whole series of prerequisites, such as infrastructure, legal order, the efficiency of administration, organization of goods and factor markets, etc., to raise the productivity of labour, capital and other factors of production to a high level. From a company's point of view, the two most important factors that contribute to productivity, and competitiveness at the micro level, are a sophisticated way of doing business and innovation, where both factors interact with each other.

Considering the potentially powerful role innovation has on every economy, it is essential to examine whether this theoretical point of view has its foothold in the practice of the countries included in this analysis. In other words, it is necessary to consider whether changes in innovation potential in the analysed countries have a significant statistical effect on the income growth of their population. The leading motivation for this research is the belief that the Western Balkans countries will significantly boost the productivity and competitiveness of their economies by improving their innovation inputs with a stimulating business environment and stable macroeconomic conditions. It will ultimately result in more excellent added value in production and the growth of employees' incomes.The results of such research not only support theoretical considerations but also have a powerful, pragmatic purpose aimed at the well-being of the economy of Bosnia and Herzegovina and other countries that are the subject of analysis.This paper consists of five sections. After the introduction, section 2 presents the theoretical background on innovation, which includes the Literature review and the theoretical consideration of Indicators of Innovation. A summary of the methodology used in preparing this paper is given in section 3, while the research results are presented in section 4. The conclusion and References are given at the end.

2. THEORETICAL BACKGROUND ON INNOVATION

Before starting the analysis itself, it is necessary to look into the results of previous research and consider the basic theoretical postulates of the innovation issue.

2.1. Literature Review

Research that attempted to determine the interdependence and the direction of influence between innovation and the income level movement are grouped according to several dominant research directions. The largest group is research on the implications of decisions on the level of minimum wages on the rate of innovation itself. In one of the more comprehensive research efforts, Dutch authors Fase and Tieman investigated the relationship between earnings growth and the level of innovation in the Netherlands. Namely, as a country with an agreement on moderate wage growth reached between the trade unions and the employers' union in 1982, the Netherlands tried to reduce unemployment as a critical problem burdening the Dutch macro-economy by controlling wage growth. The research showed that in the period that ensued, the Netherlands was more successful in reducing the unemployment rate than other EU countries. However, the growth rates it achieved in the same period were lower than in other countries of the European Union. The reasons for such macroeconomic movements were diverse. Lower wages influenced the structure of activities, which shifted from capital-intensive to labour-intensive. This structure of factor costs discouraged the abandonment of old technologies because a cheap workforce compensated for the loss of income due to their lower productivity compared to new technologies. It had the effect of hindering Schumpeterian "creative destruction". The absence of innovation was also a consequence of the structure of demand, which was not the driving force behind the demand for products of a higher technological level and prices due to lower average income.

Finally, they concluded that the considerable presence of multinational companies does not guarantee significant innovation growth. (Fase, Tieman, 2000) Chu and his associates examined the impact of minimum wages on the Schumpeterian model in economies with an endogenous market structure.Their quantitative analyses established that minimum wage growth initially generates benefits for low-skilled workers but that they may suffer slower wage growth in the future. The increase in minimum wages leads to a decline in the employment of lower-skilled workers with a corresponding decrease in the economic growth rate. (Chu et al., 2020) Chu and another group of authors analysed the implications of union power on the level of innovation in the context of the minimum wage setting mechanism. Their research revealed that the more significant influence of trade unions, which manifests itself in an increase in minimum wages, affects the reduction of the innovation rate. It also causes further directing of innovation towards the foreign economy, which in turn hurts domestic wages in regard to foreign wages in the long run. (Chu et al., 2016)

A few papers have studied the direct relationship between the type of innovation and the level of wages. Cirillo examined the influence of the innovation pattern on the distribution of earnings. He found a positive impact of product innovation on wages for all occupational groups except for unskilled manual workers. He also concluded that only innovations in marketing still provide a salary premium earned by highly qualified workers. (Cirillo, 2014)

A significant number of papers focused on wage polarization induced by innovations. Angelini and other authors examined the impact of innovation on the distribution of earnings in Europe (Angelini et al., 2009), while Aghion et al. tried to determine the relationship between income inequality and the level of innovation at the firm level. (Aghion et al., 2017)

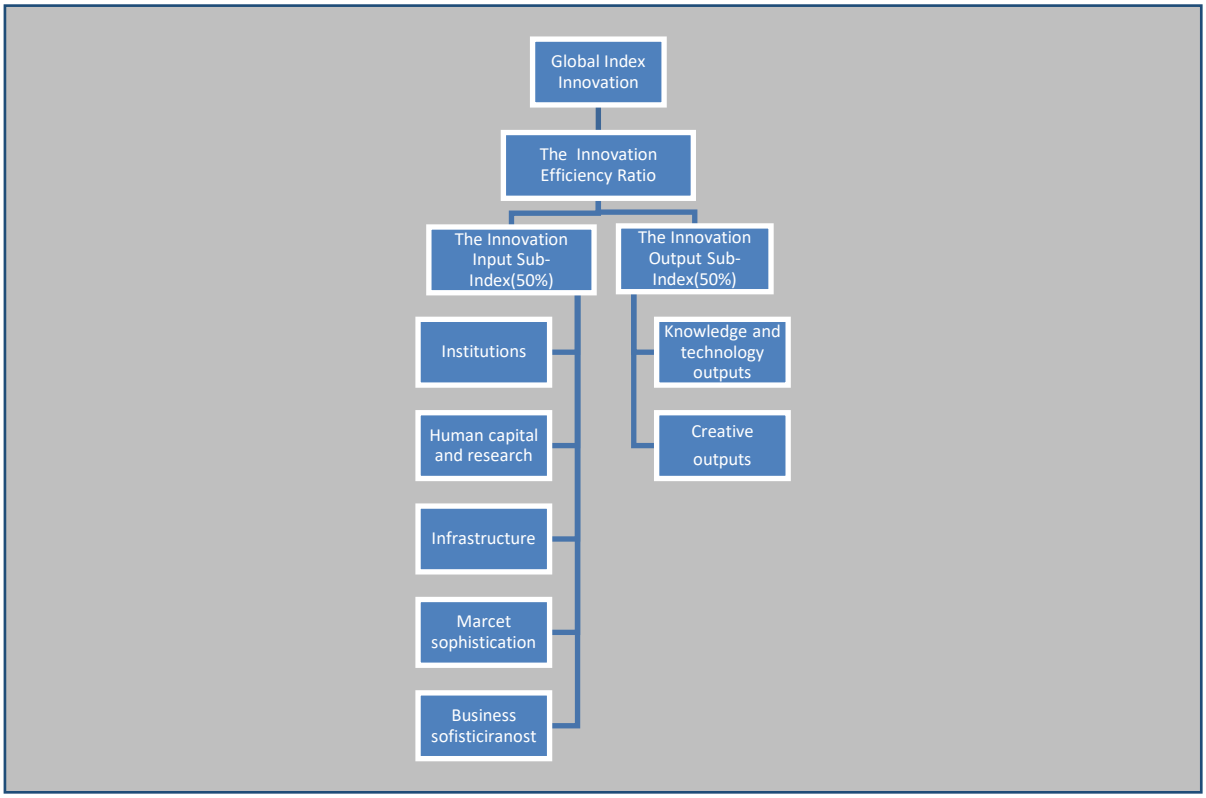
The issue of the connection between innovation and earnings dynamics in the Western Balkan region has not been dealt with by domestic and foreign authors so far, so this research represents an academic and scientific basis for further research.

2.2. Indicators of Innovation

It was necessary to create a unique global indicator to observe and measure the innovation potential of a country objectively and systematically. So, in 2007, in cooperation with Cornell University (Cornell SC Johnson College of Business) from the USA, the international business school INSEAD (InstitutEuropéend'Administration des Affaires), the World Intellectual Property Organization (WIPO) and global consulting firm A. T. Kearney created a global innovation index. From then until today, based on regular annual reports, we find out in which direction the world, Europe, and each country included in this report is moving in the innovation field. At the same time, critical shortcomings are identified, which should serve as a reference point for the necessary interventions and reforms for economic policymakers in each country. The Global Innovation Index (GII) is a kind of system for evaluating the innovation of society through a set of various criteria such as institutions (political environment, regulatory environment - legislation and business environment), human capital and research (education, tertiary education and research and development), infrastructure (ICT, general infrastructure, environmental sustainability), market sophistication (lending, investment, competition and market size), business sophistication (employee knowledge and skills, innovation networking, knowledge absorption), knowledge and technology output (creation, influence and diffusion of knowledge), as well as creative output (intangible assets, inventive goods and services, online creativity).Each of the seven pillars consists of three sub-pillars, which include more sub-pillars themselves, so, in the end the Index consists of a total of 81 indicators. The country is evaluated separately for each criterion, and a global Index is formed based on 81 indicators. It serves as a cross-section of the country's performance in the mentioned areas and a precise innovation performance

indicator in each of the 127 world countries. The *figure 1* illustrates the structure and content of this Index.

Figure 1: Structure of Global Index Innovation



(Source: Wipo.int)

The Global Innovation Index is the overall rating of innovation, obtained as the average value of two equally weighted values - innovation of input and output. The so-called innovation efficiency ratio is obtained when output and input innovation ratings are compared. It shows how much innovative output a particular country gets for its available innovative inputs. A higher value of raids indicates a higher innovation efficiency and vice versa. The input innovation sub-index includes five elements (pillars) of the national economy that enable innovative activities. Those are:

Institutions (1)This indicator refers to the country's institutional framework, viewed and evaluated from the political, regulatory and business environment point of view. The political environment includes two indicators, one reflecting the perception that the government could be destabilized and the other reflecting the quality of public and state services, i.e. formulated and implemented public policies. The regulatory environment is based on three indicators: the ability of the government to draft and implement a coherent policy, which supports the development of the private sector, the rule of law (in aspects such as contract enforcement, property rights, police and judiciary) and redundancy costs. The business environment evaluation is based on the following aspects: ease of starting a business, resolving insolvency and paying taxes.

As an indicator, human capital and research (2) starts from the fact that the education level and standard and the quality of research activities in a country are essential determinants of the innovative capacity of that nation, which should contribute to increasing the value chain beyond the simple product production sphere. This pillar consists of three sub-pillars:

primary and secondary education, tertiary (higher) education and research and development (R&D).

As an indicator, infrastructure (3) is based on the initial idea that adequate communication and quality and ecologically advanced infrastructure contribute to the creation and exchange of ideas, services and goods, promoting higher productivity, greater efficiency, lower transaction costs, better access to markets and sustainable growth. This indicator is evaluated based on three sub-pillars: information and communication technology (ICT), general infrastructure and environmental sustainability.

Market sophistication (4). The loan availability, an environment that supports investments, access to the international market, and competition and the market size are essential factors for the advancement of companies, which at the same time support the development of innovations. The first sub-pillar examines and evaluates lending from the ease of taking loans point of view, the share of domestic loans in the total lending of the private sector, and the total share of microfinance institutions' loans. The second sub-pillar evaluates investments based on assessing the level of protection of minority investors and market capitalization. The third sub-pillar, competition and market size, is reviewed and evaluated based on three indicators: average customs rate, the intensity of local competition and domestic market size.

Business sophistication (5). Business sophistication measures how suitable companies are for innovative activities based on workers' knowledge and skills, innovation linkages and knowledge absorption. The first sub-pillar of knowledge workers evaluates the frequency of employment in knowledge-intensive activities based on the percentage representation of companies in which training and development of employees are carried out, the companies' expenditures on research and development, and the participation of the female labour force. As the second sub-pillar, innovation linkages measure and value the presence of public-private networks and partnerships that are essential for innovation and are most often reflected through industrial or technological clusters. Knowledge absorption includes indicators such as expenditure on intellectual property, net import of high-tech products (% of total import), net import of ICT services and products, net inflow of foreign direct investments and percentage representation of research talents in the business.

The Innovation Output Sub-Index has two pillars representing the measure of the achieved results of innovative activities within an economy. Those are:

Knowledge and technological output (6). This pillar includes three sub-pillars - knowledge creation, impact and diffusion. Knowledge creation has a set of indicators resulting from inventive and innovative activity: patents registered in national and international patent offices, useful applications and programs, and scientific and professional articles in peer-reviewed journals, including the number of cited articles. The second sub-pillar, the knowledge impact, includes statistical measurements of the innovative activities impact, at the micro and macro level, on labour productivity, as well as on the start-up of new companies, the spending on software programs, the number of certificates confirming the quality management system - ISO 9001, the participation of high - and medium-tech industrial outputs in total production. Diffusion of knowledge is the "mirror reflection" of knowledge absorption from the fifth pillar.It includes the following indicators: intellectual property receipts, net high-tech exports (% of total export), ICT services and products exports, and a net outflow of foreign direct investments.

Creative output (7). The final seventh pillar, the creative output, includes three sub-pillars: intangible assets, creative goods and services and online creativity. Intangible assets are evaluated based on the number of registered trademarks, protected industrial designs, and business and organizational models based on the use of ICT. Creative goods and services are the common denominators for all creative industry products (creative services, culture, films, publishing, entertainment, information services, advertising, market research, etc.), including

their percentage in total exports. The third sub-pillar is online creativity, which evaluates creativity using various internet platforms and social networks.
According to the 2021 report, the Western Balkans countries are in the middle of the global list but also at the bottom of the European countries list, with Montenegro being the best rated in position 50 and the worst rated Albania in position 84.

Table 1: Global Index Innovation 2021

COUNTRY	**GII RANK**	SCORE
Montenegro	50	35,4
Serbia	54	35
North Macedonia	59	34,1
Bosnia and Herzegovina	75	29,6
Albania	84	28

(Source: Wipo.int)

3. METHODOLOGY

3.1. Sample and Data

Considering their similar business and broader political environment, including the similar historical background, this research sample includes data on five Western Balkans countries: Bosnia and Herzegovina, Serbia, Montenegro, North Macedonia and Albania. The data used in the analysis refer to the indicators taken from the report on global innovation: Global Index Innovation, Innovation Input Sub-Index and Innovation Output Sub-Index, which are also available on their official website. Data on gross earnings downloaded from the World Bank website will be used as a dependent variable in the paper.
Considering the limited data on real earnings in the countries included in the analysis, the time span of the research stretches from 2011 to 2020. Therefore, these panel data enclose observations about the analysed countries over a decade.

3.2. Statistical methodology

Since the data, i.e. panel data, have been collected, the methodology of econometric analysis of panel data is briefly explained below. To find a model that can represent the influence of the mentioned independent variables on the dependent variable, it is necessary to determine which of the panel models is adequate for further use.Econometric modelling predicts that the model evaluation starts with the simplest one to examine the validity for further analysis. The first model, the POLS, was used to evaluate the parameters of the panel model, which aggregately observes all data on time and space units. This analysis method represents the easiest way of estimating the parameters of the panel model. It simply combines the data of all units throughout the entire examined period to estimate the parameters. It functions on the principle of the classic ONK model. If there are no individual effects in the collected panel data, it is considered that the parameter estimates obtained by the method of least squares are precise and accurate. The characteristic of the parameters obtained by this method is that they have a constant value, i.e. that the random error includes all variations in the analysed units over time. The basic form of this model can be represented by the following equation:
The model with fixed individual effects implies that the regression parameters along with the independent variables (β) are constant, i.e. the slope of the regression line is constant for all units during the observed period, while we have differences in the free members by

observation units. Respectively the fixed-effects model includes individual effects as fixed parameters through the unknown, variable, and free members. According to this model, individual effects are correlated with independent variables, all observation units have the same slope parameter and different values of the free term, and there is no correlation between random error and independent variables. If certain assumptions are met, the model of individual effects can be evaluated using ONK methods, and the evaluations will be neutral.(Đalović, 2020.)

The random effects model presumes that the individual effect α_i is a random (stochastic) variable, i.e. part of the random error. Unlike the fixed-effects model, the random effects one does not allow individual effects to be correlated with the independent variables, $Cov\ (\alpha_i\ ,\ X_{K,it}) = 0$, so the errors contain a time-invariant component α_i so that the OLS estimator is not efficient. The solution is the generalized least squares (GLS) method that eliminates the correlation between the errors of the same observation unit.

4.THE RESEARCH RESULTS

This research started from three hypotheses:

(1) the growth of the overall innovativeness rating of the Western Balkans countries has a statistically significant positive impact on the real growth of gross wages in those countries.

(2) the increase in the assessment of the innovativeness of the inputs of the Western Balkans countries has a statistically significant positive impact on the real growth of gross wages in those countries.

(3) the increase in the innovation rating of the output of the Western Balkans countries has a statistically significant positive impact on the real growth of gross earnings in those countries.

The following tables display the evaluation results of all three models. Two cases were considered: the first where the independent variable is GII and the second with two independent Input and Output variables. Namely, the aim was to agree on how the total innovation index affects the movement of average earnings and its components related to input and output innovation. The coefficient values are given in the tables, while the standard error is in parentheses.

Table 2: The influence of the total innovation index on the average wages movement

	Pooled model	**Fixed**	**Random**
GII	1,839547***	-10,5254***	-9,626719***
	(5,250371)	(2,972535)	(3,035323)
Constant	-60,71804	926,5164***	900,1969***
	(180,2054)	(101,6235)	(121,1814)

*** significant at 1% risk level

(Source: authors)

All three models indicate statistical significance of the parameter with the independent variable GII. Further tests were conducted to select an acceptable panel model. The Hausman test was performed, and the value obtained was 3.84 (p value is 0.0494). Based on the p value, the test's null hypothesis is rejected, i.e. there is a correlation between the error term and the independent variables in the panel data model, and the fixed effect model would be preferred over the random effect one. The F test (0.8356, p value 0.5618) was also conducted, and the conclusion was that the model with fixed effects was the most suitable for the observed data.

Table3: The influence of the innovation input and output index on the wages movement

	Pooled model	Fixed	Random
Input	35,14834 (7,362703)***	7,361927*** (2,878587)	7,884527*** (2,908523)
Output	2,066062 (3,014841)	-6,62036*** (1,238477)	-6,40894*** (1,250738)
Constant	-982,4702*** (295,0569)	423,835*** (1,327947)	399,8939*** (148,6489)

*** significant at 1% risk level

(Source: authors)

Even in this case, the chosen independent variables are statistically significant and indicate a considerable impact of input and output innovation on wages (except for the variable Output in the pooled model, which only has a different sign in that model). The Hausman test was conducted, and the obtained value was 3.32 (p value is 0.1905), based on which we deduce that the model with random individual effects is more suitable. Also, the Breusch and Pagan Lagrangian multiplier test for random effect was conducted, which compares the random individual effects model with the POLS model. The test value is 111.48, and the p value is 0.0000, which still justifies employing a model with random individual effects.

5. CONCLUSION

Considering the obtained results of the conducted research and using the sample of five Western Balkans countries and the 10-year time series of data, the following can be stated:

Hypothesis 1, claiming that the growth of the overall innovation rating of the Western Balkans countries has a statistically significant positive impact on the real growth of gross earnings in those countries, **IS REJECTED** and replaced by an opposite-meaning hypothesis. Namely, the wages growth in the observed period for the analysed group of countries was not induced by their economies' innovativeness growth but was the result of other factors.

Hypothesis 2, claiming that the increase in the innovativeness rating of the inputs of the Western Balkans countries has a statistically significant positive effect on the real growth of gross wages in those countries, **IS ACCEPTED**. Namely, the wage growth in the observed period for the analysed countries was statistically significantly induced by the inputs innovation growth. Considering that innovation input is viewed as the aggregate value of 5 components, we can conclude that the institutions' quality (political environment, regulatory environment - legislation and business environment), human capital and research (education, tertiary education and research and development), infrastructure (ICT, general infrastructure, environmental sustainability), market sophistication (lending, investments, competition and market size), and business sophistication (workers' knowledge and skills, innovative networking, knowledge absorption) can play a pivotal role in raising the real wages level even in the Western Balkans countries practice.

Hypothesis 3, claiming that the increase in the rating of innovativeness of the output of the Western Balkans countries has a statistically significant positive effect on the real growth of gross earnings in those countries, **IS REJECTED** and replaced by an opposite hypothesis. Namely, the wage growth in the observed period for the included countries was not induced by the growth of innovativeness of their outputs but was the result of other factors' effects. It

is backed by the fact that stagnation of all innovation indicators was recorded in all the Western Balkans countries in the observed period. Therefore, the growth of employees' incomes is not the result of a transition towards more significant production of products with greater participation of knowledge and sophisticated technologies, or a grander representation of creative goods and services in the overall structure of the supply of these economies.

This research has limitations related to the relatively small time series or the small number of countries included in the analysis. Also, the methodology of the Global Innovation Report itself may have shortcomings that may affect the final evaluation of the parameters of any country. This type of research would certainly gain in quality if it were "enhanced" with additional empirical research. Thus, a clearer idea of their innovation potential, business practices and the way in which all this affects the levels of real income of their employees would be formed by using a survey of companies in all five countries. The innovation capacities of the observed countries are at the very bottom of the European scale, and there is a lot of room for improvement. Despite the stagnation of innovation indicators in the observed period in the observed countries, there was an increase in real wages, which we can attribute to the effect of other factors. The analysis results show that the wage growth would have been even higher if, in the observed period, there had been an improvement in all those inputs that encourage the development of innovations, both at the level of the entire economy and at the level of the companies themselves.

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