
AN EMPIRICAL INVESTIGATION OF SELECTED FACTORS DETERMINING THE LABOUR PRODUCTIVITY IN MACEDONIA

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Abstract: Labor productivity is a crucial determinant of one economy's competitiveness, and it varies across different countries and areas. Productivity growth is important because it contributes to growth in output, income and living standards. There are only two measures which can be used for increasing the level of economic output: one is by applying more labor effort in the production process (such as more jobs) and the second through increases in the productivity of the workforce. Or in other words, it means bringing additional inputs into production; or increase productivity. As labor force growth slows and unemployment remains at relatively low levels, economies increasingly have to enhance productivity in order to maintain the high rates of output and income growth that have become common place over the past few decades. Although there are several reasons for differences in the level of economic development among countries, generally, we can start from the assumption that differences in economic development results from the differences in productivity. At the national level, higher productivity increases living standards as more real income improves people's ability to consume and demand more goods and services whether they are necessities or luxuries, enjoy leisure, improve housing and education and contribute to social and environmental programs. Despite the significant productivity growth from 2002 to 2008, and again from 2014 to 2017, Macedonia still lags behind the EU average. Macedonia's labour productivity has negative growth rate from 2017 upwards. It drops by 4.4% in the first quarter compared with a drop of 2.1% in the previous quarter. There are various countries specific case studies and various literature that are exploring the determinants of labour productivity growth in a particular country. This study intends to identify the potential determinants of labour productivity in Macedonia. Based on an extensive literature review, we identify several factors that determine Macedonia's labour productivity. We quantify the relationship between the productivity growth and physical capital through gross capital formation, human capital through educational structure of employees, foreign direct investments and real wages. On the side of methodology, correlation and regression analysis for testing the relationship between the dependent variable and independent variables are used. The fundamental assumption for a clear econometric analysis is the stationarity of data time series and the regression analysis is followed by studying the stationarity of time series using Unit root test. The study is based on time series and the data on empirical analysis is taken from State Office of the Republic of Macedonia and World Bank. The sources of productivity are complex and they differ from country to country. While growth in productivity and in labour utilization are both sources of improvement in living standards, productivity growth can make a major contribution over the long term.

Keywords: foreign direct investments, gross capital formation, labor productivity, Macedonia, human capital, real wages

1. INTRODUCTION

Labour productivity is a central problem for the understanding of economic evolution as many economists argue. Economists also argue that there are only two ways by which economies can increase their level of economic output: either through more labor effort applied in the production process or through increases in the productivity of the workforce. Or in other words, it means bringing additional inputs into production or increase productivity. As labor force growth slows and unemployment remains at relatively low levels, countries increasingly must look to enhance the productivity in order to maintain high rates of output and income growth that have become common place over the past few decades. Although there are several reasons for differences in the level of economic development among countries, generally, we can start from the assumption that differences in economic development results from the differences in productivity. Labour productivity and economic growth are key factors in any economy. Productivity provides a simple, but powerful indicator of the ability of a country, sector or company to optimally use its resources for having growth, either short term or long term growth. In the long run, the only way to increase economic growth and raise living standards is through increased productivity. Labor productivity is one of the

indicators that show how efficiently labor force is performing. A productive labor force possesses obligatory as well as additional dexterity and has the ability to improve the overall economic growth of a nation.

Economists recognize the importance of the difference in productivity growth rate of 1% or 2% very well, while the non-economists, even people from the business sphere may seem these rates approximately as same. How important is the rate of productivity growth can be seen from the famous “mathematical rule 70”? According to this rule, if the number 70 is divided by the productivity growth rate, it will be derived years needed for real output per worker to be doubled. Hence, if the productivity growth rate is 1%, it would take 70 years for real output and, hence, real income per worker to double. If the rate of productivity growth is 2%, then the required period halves at 35 years and with a growth rate of 3%, the period is 23.3 years.

Labour productivity is one of the driving forces of the economic growth. Economic recovery strongly depends on productivity increase during the crisis and after a period of time it results in economic growth. If the level of productivity stagnates or declines during the crisis, it results in a longer and deeper crisis and slower recovery. From a broader perspective, increased productivity increases the power of an economy through driving economic growth and satisfying more human needs with the same resources. Increased gross domestic product (GDP) and overall economic output will drive economic growth, improving the economy and the participants within the economy.

The significance and importance of a high growth in labor productivity is enhanced by a number of key processes and with the phenomenon economic development. Current economic studies see labor productivity as a central problem of understanding the economic development. By definition, labor productivity is a ratio of real GDP and the number of employed persons, or the number of worked hours. Hence, the growth in productivity is also driven by the only macroeconomic variable – real GDP per capita or the change in the specific age population (Kitov and Kitov, 2008).

It is related to the fact that labour productivity depends on the availability and quality of labour resources and applied technologies. Hence, labour productivity is highly correlated with entrepreneurship and economic activity in the economy, specialization, unemployment, competitive advantage etc. The most frequent answer for achieving productivity gains is about providing better technology to employees so that job operations become more efficient. Some evidences have shown that labor force, as a whole, cannot adapt to the changes in the economies and therefore it is resulting in low-skilled workers. Our focus is not on the role of technology and labor force for labor productivity growth but also on other socio economic indicators which are essential for labor productivity growth. Based on an extensive literature review, we identify several factors that determine Macedonia's labour productivity such as physical capital through gross capital formation, foreign direct investments, human capital through employees with secondary school and employees with university degree and real wages. With the same amount of inputs, including physical capital and labor, some countries or sectors produce more and others less. This difference depends on how efficient they are in allocating and using resources to achieve high output. Physical capital provides environments and policies that lead to economic development and its quality is generally associated with productivity. The productivity of a worker will obviously be related to the quantity and quality of capital with which he or she works. More capital and more modern technology should translate to greater output.

Foreign direct investments (FDI) is considered beneficial not only because it is expected to yield potential benefits including employment opportunities, capital and foreign exchange, but the most cited reasons for promoting FDI is the prospect of acquiring new technology and other intangible assets, which may spillover to the host country and allow domestic firms to improve their performance (Mebratie, 2010). FDI are related to the increase of labour productivity of the host country through technological transfer and management that enables technological progress and economic growth on long term. Some differences in productivity based on location cannot be directly explained by the standard factors such as wages and education levels.

According to this issues and based on the literature review and theoretical background, the paper is organized in sections which are focused to answer the research questions: do labour productivity in Macedonia and selected factors that determine it have a strong relationship and what is the direction of their interdependence.

First part includes a current knowledge about labour productivity and the selected determinants, i.e. theoretical contributions through literature review. The second section covers the methodological approach applied to the research in this paper. The analysis of labour productivity in Macedonia within results of the impact of the selected determinants (physical capital through gross capital formation, foreign direct investments, human capital through employees with secondary school and employees with university degree and real wages) on the labour productivity are presented and explained in the third part, and the last section covers the conclusion of the research, with some recommendations for improving the analyzed issue.

2. LITERATURE REVIEW

Despite the significant productivity growth from 2002 to 2008, and again from 2014 to 2017, Macedonia still lags behind the EU average. Macedonia's labour productivity has negative growth rate from 2017 upwards. It drops by 4.4% in the first quarter compared with a drop of 2.1% in the previous quarter. Examining the relationship between labour productivity and GDP growth in Macedonia, Trpeski and Cvetanoska (2016) indicated that the relation between labour productivity and economic growth significantly differs and it is not a constant or stable relation over the periods of time. By definition, labour productivity is the ratio between the real gross domestic product and the number of employees, or the number of working hours. Hence, Kitov and Kitov (2008) showed that productivity growth is also driven by the only macroeconomic variable - GDP per capita or change in a certain age of the population. Polyzos and Arabatzis (2015) showed that labour productivity plays an important role in shaping the competitiveness of a particular sector or the whole economy and helps in creating the necessary conditions for economic development. The relationship between wages and labor productivity is important since the standard of living and distribution of incomes between labor and capital depend upon it. Feldstein (2008) answers the question whether wage growth reflects an increase in productivity. He noted that the level of productivity in the United States doubled in the period 1970-2006 in non- agricultural sector. Wages in the same period, annually grew of approximately the same rate. Kajzer et al., (2007) examine the relationship between real wages and productivity in Slovenia and, among other things, they concluded that in the period from the second half of the nineties of the last century until the publication of the paper, the real growth of average gross wage per worker lags behind productivity growth. Trpeski et al., (2016) found that during and the period after the crisis, quantitative relationship between labor productivity and real net wages is very low, and even that their relationships are with the opposite sign.

Evidence is found to support a positive relationship with physical capital. Schreyer and Pilat (2001) identify capital as one of the required variables for measuring productivity and (Kurre and Eiben, 2013) found that capital is crucial to productivity regardless of industry. According to Xu and Sheng (2012), FDI has a significant positive impact on productivity of domestic firms that purchase high-quality intermediate goods with lower input prices, or equipment from firms receiving FDI in the upstream industry. Foreign enterprises may play their own role in human capital development in general and labour productivity in particular. When multinational companies decide to invest in developing countries, it is expected that they will bring capital and other intangible assets (Aitken and Harrison, 1999). In addition, the productivity of workers of the host country is expected to increase when they receive training or accumulate experience while working for multinationals (Mebratie, 2010). Miller and Upadhyay (2000) show that education attainment has a positive relationship with TFP in general, but for low-income countries, the effect of education on TFP is negative until trade openness is sufficiently large. Bronzini and Piselli (2009) examined the importance of research and development spending in regional productivity. Their study found a positive relationship between research and development and regional productivity in Italian sub-national regions. Choudhry (2009) found that process of urbanization impacts the labor productivity growth significantly and positively in lower and lower middle income group economies and that negative impact of increased labor force participation is high in lower and lower middle income economies compared to high income and upper middle income economies.

3. METHODOLOGY OF THE RESEARCH

One of the basic issues in the examination of the links between labour productivity and factors that determined it is setting the methodological concept of productivity. Therefore, for the purposes of the study, there will be distinguished several different concepts of productivity, such as: partial vs. total factor productivity; output per worker vs. output per working hour; the level of productivity vs. productivity growth rates and cyclical behavior of productivity. Essential for this paper is to make a difference between partial productivity and total factor productivity. Partial productivity refers to the productivity of the individual factors of production, or it is defined as the ratio between output that is obtained by engaging the appropriate factor of production and the amount of involved units of that factor. Best known partial measure of productivity is labor productivity. The aim of this paper is analyzing the partial productivity, i.e. which is the labor productivity.

But in the calculation of productivity it should be clearly define how the labor as an input is measured. It is important because growth rates in output per worker and per working hour can be quite different depending on how many overtime hours are there in the economy. For the purposes of this paper, the output per worker will be taken as an input for calculating the labor productivity because it is simple to calculate the productivity for a longer period of time, which is quite important for the paper because for our research longer series of movement in labor productivity are needed and because the overtime work or overtime working hours in the past period in Macedonia are quite rarely and incompletely registered.

Labour productivity is the dependent variable. Factors that are selected regarding literature review as determinants of labour productivity in Macedonia are chosen as follows:

- physical capital which is measured by gross capital formation;
- human capital which is measured through employees with secondary and university education;
- foreign direct investments (FDI);
- real wages.

Because there are not enough data for creating urbanization and innovation time series, these variables are not included in our model. Therefore, the regression model is based only on economic variables, non-economic variables are excluded. To find out the direction and the impact of physical capital, human capital and real wages on labor productivity in Macedonia, the following regression model is formulated:

$$\ln LP_t = \beta_0 + \beta_1 \ln K_t + \beta_2 \ln H_t + \beta_3 \ln FDI_t + \beta_4 \ln W_t + U_t$$

where

- LP_t : labour productivity
- K_t : physical capital per capita
- H_t : human capital:
 - employees with secondary school
 - employees with university degree
- FDI_t : foreign direct investments per capita
- W_t : real wages.

The research is based on time series and for analyzing the relationship between labor productivity in Macedonia and the selected factors, official data of the State Statistical Office, National Bank of Macedonia and World Bank Data is used.

4. EMPIRICAL RESULTS AND DISCUSSION

The basic assumption for a sound econometric analysis is the stationarity of the time series of data. Therefore, before the regression analysis is made, the stationarity of the variables involved in the regression model is checked. Testing is done by applying the Unit Root test using the Augmented Dickey - Fuller test. The ADF test showed that the variables are non-stationary at the basic level, so that the first and second level differentials are made and the results of the test are shown in Table 1 as follows: gross fixed capital per capita, foreign direct investments per capita and employees with secondary education are stationary after the first level of differencing, while employees with university degree and real wages are stationary at the second differential. After the differentiations, all variables are stationary.

Table 1. Results from ADF Unit - Root test

Series	t - statistic	Prob.	Level of differencing
D (Gross fixed capital per capita)	-3.241367	0.0375	1
D (Foreign direct investments per capita)	-4.904066	0.0018	1
D (Employees with secondary education)	-3.121098	0.0481	1
D (Employees with university degree)	-3.542104	0.0281	2
D (real wages)	-4.828422	0.0024	2

Source: Authors' calculations (processing in Eviews)

All the variables show a strong extent of correspondence and high coefficients of correlation which are above 0.70. Correlation analysis can be seen from Table 2.

Table 2. Correlation between labour productivity and selected determinants in Macedonia for the period 2000 – 2016

	K_t	FDI_t	LP_t	H_{1t}	H_{2t}	W_t
K_t	1.00	0.967	0.812	0.941	0.892	0.963
FDI_t	0.967	1.00	0.826	0.967	0.956	0.973
LP_t	0.812	0.826	1.00	0.697	0.721	0.787

H_{1t}	0.941	0.967	0.697	1.00	0.935	0.941
H_{2t}	0.892	0.956	0.721	0.935	1.00	0.938
W_t	0.963	0.973	0.787	0.941	0.938	1.00

Source: Authors' calculations (processing in Eviews)

Table 3 shows the results of the regression model which choice was good specification is confirmed by the lower and negative values of Akaike and Schwarz, as well as the higher determination coefficient, which are indicators for choosing a better alternative specification of the model:

Table 3. Relationship between labour productivity and selected determinants in Macedonia for the period 2000 – 2016

Independent variable	Coefficient	Std. Error	Prob.
β_0	18.09765	1.781525	0.0000
$\ln K_t$	-0.102234	0.097087	0.3198
$\ln FDI_t$	0.288161	0.078217	0.0050*
$\ln H_{1t}$ (secondary education)	-0.402641	0.190252	0.0634
$\ln H_{2t}$ (university education)	0.029509	0.097617	0.7693
$\ln W_t$	-0.086064	0.122340	0.4995
R^2	0.874164		
Adjusted R^2	0.804255		
Prob. (F – statistic)	0.000782		

Dependent variable: labour productivity

Note: $p < 0.05^*$

Source: Authors' calculations (processing in Eviews)

The results show that the formation of gross fixed capital, employees with secondary education and real wages have a negative impact on labour productivity in Macedonia compared with the positive impact of foreign direct investments and employees with university degree. The adjusted R^2 is 80%. This shows that over 80% of variations in labour productivity can be explained by the selected independent variables. Also this coefficient shows the good state of regression. F-statistic which is statistically significant, point out that explanatory variables are important factors that determine the labour productivity in Macedonia, i.e. that the model is good specified. While testing the significance, only the effects of foreign direct investments are statistically significant, as evidenced by its probability which is lower than the level of significance of 5%. From the aspect of foreign direct investments per capita, if it rises for one unit, labour productivity will increase by 0.29%. This means that the local economy has many of the FDI benefits such as capital, government tax revenue, job creation for citizens, and technological transfer to local industries. The positive relationship between foreign direct investment and labor productivity shows the important role of foreign direct investments as a major source of private capital flows in Macedonia as a developing country. Education which is presented by employees with secondary and university education has not a statistic significance for the labour productivity in Macedonia. Even the sign of coefficient of employees with secondary education is negative. This determinant in our analysis does not affect labour productivity and one possible explanation for such a result is that the skill of a worker is not always reflected by education. Their combination with physical capital which is also insignificant maybe will contribute positively to labour productivity, which analysis should be made in some further research. Real wages have no effect on productivity and such a relation is found only in limited papers in the literature, so it would be valuable to see more work along this line specifically focusing on developing countries.

5. CONCLUSION

Testing the determinants of labour productivity in specific economies has revealed a number of different and important results. At the national level, higher productivity increases living standards as more real income improves people's ability to consume and demand more goods and services whether they are necessities or luxuries, enjoy leisure, improve housing and education and contribute to social and environmental programs. Despite the significant productivity growth from 2002 to 2008, and again from 2014 to 2017, Macedonia still lags behind the EU average.

Macedonia's labour productivity has negative growth rate from 2017 upwards. It drops by 4.4% in the first quarter compared with a drop of 2.1% in the previous quarter. Based on a literature review in order to analyze the sources of greater productivity, we have selected physical capital through gross capital formation, foreign direct investments, human capital through employees with secondary school and employees with university degree and real wages as main categories of determinants of labour productivity in Macedonia. Our analysis has shown that foreign direct investments are important for Macedonian labour productivity and their increase for one unit will lead to an increase in labour productivity for 0.29%. The positive relationship between foreign direct investment and labor productivity shows the important role of foreign direct investments as a major source of private capital flows in Macedonia as a developing country.

This study has some limitations that need to be considered when interpreting the results. When selecting the main determinants of labour productivity, the regression model is based only on economic variables, non-economic variables are excluded. It is because there is not enough data for creating time series for the non-economic variables in Macedonia. Furthermore, output measures for human capital are selected instead of input measures such as school enrollment rates or educational attainment as these indicators are not available in our database and output measures are more appropriate because people are directly related with the labour productivity when they are involved on the labour market.

Going forward, analysis of Macedonian productivity should be more focused on sectoral trends rather than on economy aggregate measures and the combination of determinants which is also significant should be done in some further researches. Future research should seek to expand on these results.

In order to have clear understanding of the labour productivity, some recommendations are necessary. Because there is a positive link between foreign direct investments and labour productivity, the economy has to increase the capability to absorb advanced technologies. Such as many developing countries, Macedonia have an opportunity to increase productivity through efficient budget spending and effective policy implementation with complementary efforts from schools and societies in the long term as it needs to be prepared with an advanced level of human capacity to learn new technologies. The focus of policies should be on making markets more competitive as most productivity gains come from the private sector of the economy. Effective demand-side policies are also needed to sustain a higher level of aggregate demand to keep high the level of productivity.

REFERENCES

- [1] Aitken, B. J., & Harrison, A. E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *American economic review*, 89(3), 605-618.
- [2] Bronzini, R., & Piselli, P. (2009). Determinants of long-run regional productivity with geographical spillovers: the role of R&D, human capital and public infrastructure. *Regional Science and Urban Economics*, 39(2), 187-199. *Regional Science and Urban Economics*, 39, 187.
- [3] Choudhry, M. T. (2009). Determinants of Labor Productivity: An Empirical Investigation of Productivity Divergence, Working paper. University of Groningen, The Netherlands.
- [4] Feldstein, M. (2008). Did wages reflect growth in productivity?. *Journal of Policy Modeling*, 30(4), 591-594.
- [5] Kajzer, A., Jurancic, S., Kovacic, S., Kraigher, T. and Sustepsic, J. (2007), "Wages, productivity and competitiveness", *Economic Issues 2007*, Institute of Macroeconomic Analysis and Development, Slovenia. (pp. 43-72).
- [6] Kurre, J. A., & Eiben, D. F. (2013, October). Determinants of Labor Productivity for Detailed Manufacturing Industries. In *67th Annual Fall Meeting of the Association for University Business and Economic Research*, Richmond, VA.
- [7] Kitov, I. & Kitov, O. (2008). *The driving force of labour productivity*, MPRA Paper 9069, University Library of Munich, Germany.
- [8] Mebratie, A. D. (2010). Foreign Direct Investment and Labour Productivity in South Africa'. *Research Paper, Institute of Social Studies, The Hague*.
- [9] Miller, S. M., & Upadhyay, M. P. (2000). The effects of openness, trade orientation, and human capital on total factor productivity. *Journal of development economics*, 63(2), 399-423.
- [10] Polyzos, S., & Arabatzis, G. (2005). Labour Productivity of the agricultural sector in Greece: Determinant factors and interregional differences analysis. *Development*. Discussion paper series, 11 (12), 209-226.
- [11] Schreyer, P., & Pilat, D. (2001). Measuring productivity. *OECD Economic Studies*, 33(11), 128.
- [12] Trpeski, P., Eftimov, L., & Cvetanoska, M. (2016). Labor Productivity And Real Wages In Macedonia: An Overview Before And After The Global Economic Crisis. *European Scientific Journal, ESJ*, 12(10).

- [13] Trpeski, P., & Cvetanoska, M. (2016). Labour productivity and economic growth in selected SEE countries after the great recession of 2008. *Contemporary Issues in Economics, Business and Management*. Paper presented at the 4th International Scientific Conference, Faculty of Economics in Kragujevac, 09-10 November, 2016 (pp.175-181). Faculty of Economics in Kragujevac, Republic of Serbia
- [14] Xu, X., & Sheng, Y. (2012). Productivity spillovers from foreign direct investment: firm-level evidence from China. *World Development*, 40(1), 62-74.

