LABOUR PRODUCTIVITY AS INDICATOR OF NATIONAL COMPETITIVENESS IN EUROPEAN UNION AND IN ASIAN BELT AND ROAD INITIATIVE COUNTRIES

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Abstract

The main objective of our contribution is to compare the level of competitiveness as measured by the labour productivity of the 27 European Union (EU), and the Pacific and Asian Belt and Road Initiative (BRI) countries. Using correlation analysis, we assess the impact of selected qualitative indicators on the labour productivity value of these two groups. We see national competitiveness in the context of Michael Porter's classic work, namely labour productivity. We used descriptive and correlation analysis, which also included variables such as the Human Capital Index, the Global Innovation Index, and the Heritage Foundation Economic Freedom Index. EU countries are more homogeneous than selected BRI countries and achieve much higher labour productivity values. Surveyed European countries with higher Global Innovation Index achieve higher labour productivity values, but countries with a better Index of Economic Freedom have a more moderate decline (alternatively growth) in labour productivity during the Covid-19 pandemic. The group of selected BRI did not confirm the link between labour productivity growth between 2019 and 2020, but countries with higher Human Capital Index, Global Innovation Index, and the Index of Economic Freedom have higher labour productivity values and thus national competitiveness.

Key words: labour productivity, Human Capital Index, Global Innovation Index, The Heritage Index of Economic Freedom, competitiveness

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Introduction

Belt and Road Initiative (BRI) consists of two projects announced by Chinese President Xi Jinping in autumn 2013. Specifically, these programs are the Silk Road Economic Belt and the 21st Century Maritime Silk Road (Jin, Shen, and Jiang, 2021). From the perspective of the European Union, BRI can be seen as an opportunity, but also as a threat. In our view, the healthiest approach is to see the initiative as a challenge (stimulation) and an incentive to

improve one's own competitiveness. We perceive competitiveness by the classical approach of M. Porter (1990) and P. Krugman (1994). Although these authors differ in many ways, they agree that national competitiveness must be seen in the light of productivity.

The main objective of our contribution is to compare the level of competitiveness as measured by the labour productivity of the 27 European Union (EU), and the Pacific and Asian Belt and Road Initiative (BRI) countries. Using correlation analysis, we assess the impact of selected qualitative indicators on the labour productivity value of these two analysed groups. It should be noted that many EU Member States are also part of the BRI, but in our methodology, we have only included them in the EU group. D. Sacks (2021) lists 139 BRI members worldwide as of March 2021. Interestingly, G. Jin, K. Shen, and Y. Jiang (2021) have found that Chinese investment is more likely to fail in countries that are part of the BRI, and this is especially true of European countries and Chinese state-owned enterprises as investors. Authors claim that European countries see state-owned Chinese companies as political instruments to promote Chinese interests abroad. On the other hand, there are available studies on the positive impact of Chinese investment, especially in developing countries. Y. Zhang, Z. Cheng, and Q. He (2019) dealt with the effect of Chinese investments (China's outward foreign development investment – OFDI) in developing countries as well as BRI member states (BRDCs) in the period from 2003 to 2017: "*China's OFDI impacts the technical efficiency, human capital quality and institutional quality of the host country, and further affects its economic growth. Among these three channels, human capital has the most explanatory power for the economic growth of BRDCs. Second, technical efficiency improvements and institutional changes can improve human capital in the host country through the coupling effects*." Unlike these articles, we will not explicitly focus on the quality and performance of investments, but on the quality of the environment, which we can also call the institutional environment (e.g., Kittová, Steinhauser, 2017).

M. Simionescu et al. (2021) addressed the relationship between various factors such as expenditure on research and development, Education or Innovation Index and competitiveness as real gross domestic product per capita growth rate and Global Competitiveness Index: "*Human capital plays a crucial role in economic development due to the skills of innovative individuals which improve productivity. Moreover, human capital may determine the adoption of external technology by absorbing new equipment and ideas*." The question of human capital was also elaborated by Londar et al. (2020) who examined the relationship between the mentioned human capital and the creative economy with a focus on Eastern and Central Europe: "*In the creative economy, the main determinants of production and economic development are*

innovation and creative human capital. Human capital has its own peculiarities of functioning. In turn, the basis of any innovation is unique, extraordinary ideas, and knowledge, which are a function of the relevant competencies of creative people, whose ability to think and produce new, original ideas is called creativity."

A. J. Urdaneta-Montiel, E. V. Borgucci-Garcia, and B. Jaramillo-Escobar (2021) used The Heritage Foundation Index of Economic Freedom to verify the hypothesis on a background of the Austrian dynamic efficiency theory: "*that greater economic freedom translates into greater competitiveness and economic growth.* […] *Likewise, the bidirectional causality relationship between the index of economic freedom and the GDP per capita was verified for each of the economies studied in the panel; such as the significant degree of long-term cointegration between competitiveness, economic freedom, and GDP per capita*." From a brief review of the literature, we can deduce that our selected variables, exactly Human Capital Index, Global Innovation Index, and the Index of Economic Freedom are statistically and factually relevant and can quantify the quality of the institutional environment of selected countries about labour productivity as national competitiveness.

1 Methodology

To fulfil the main goal, we employed descriptive and correlation analysis of cross-sectional data, while we selected a suitable correlation coefficient based on the test of normal distribution of variables (Hanák, 2016). We used Microsoft Excel and PAST software (Hammer et al., 2001). Specifically, we analysed selected variables, the description of which can be found in table 1.

Tab. 1: Description of variables

Variable	Description	Source
LP_2020_g	Annual growth rate 2020/2019 of labour productivity	Own processing from ILOSTAT Database in WBG (2021)
LP_2020	Labour productivity from the year 2020	ILOSTAT Database in WBG (2021)
LP_2019	Labour productivity from the year 2019	ILOSTAT Database in WBG (2021)
HCI_2018	Human Capital Index from the year 2018	WBG (2021)
GII_2018	Overall score of Global Innovation Index from the year 2018	WIPO (2018)
IEF_2019	Overall score of Index of Economic Freedom from the year 2018	The Heritage Foundation (2019)

Source: Own processing from WBG (2021); WIPO (2018); The Heritage Foundation (2019).

Labour productivity is an indicator of national competitiveness (Porter, 1990; Krugman, 1994). We used this variable in nominal values and as an annual growth rate to verify the assumption that countries with a better institutional environment had a lower decline in labour productivity during the Covid-19 pandemic in 2020. Labour productivity we understood as the share of gross domestic product and number of employed persons (ILO, 2021):

$$Labour\ productivity = \frac{GDP\ at\ constant\ price}{Number\ of\ employed\ persons} \quad (1)$$

Human Capital Index, Global Innovation Index, and The Heritage Foundation Index of Economic Freedom represent the quality of the institutional environment of selected countries. In all three cases, these indicators are recognized composite indexes developed by multinational organizations. We expect that countries with a better institutional environment will achieve a higher level of labour productivity and thus competitiveness. A higher value of all our variables means higher institutional environment quality or better state of competitiveness.

We focused therefore on two groups of countries, the 27 EU member states and 34 BRI countries from the Asian and the Pacific region (Sacks, 2021; The Heritage Foundation, 2019), of which we analysed 19 countries with complete data observations. Precisely, we examined the following BRI members:

1. Azerbaijan,
2. Bangladesh,
3. Cambodia,
4. China,
5. Indonesia,
6. Kazakhstan,
7. Korea, Republic,
8. Kyrgyz Republic,
9. Malaysia,
10. Mongolia,
11. Nepal,
12. New Zealand,
13. Pakistan,
14. Philippines,
15. Singapore,
16. Sri Lanka,
17. Tajikistan,
18. Thailand,
19. Vietnam.

2 Results

As mentioned in chapter 1, Methodology, we verified two assumptions: countries with a qualitative-better institutional environment achieve a milder decline in labour productivity, and countries with a qualitative-better institutional environment are achieving a higher value of labour productivity in nominal terms and thus of national competitiveness. To verify these assumptions, we worked with descriptive and correlation analysis.

2.1 Descriptive statistics

Table 2 contains descriptive statistics of selected variables of the 27 EU countries and table 3 Asian and Pacific BRI countries. We will characterize the variables from right to left based on the order of the columns in the tables. The lowest value of the Index of Economic Freedom (IEF) in 2019 was achieved by Greece with a score of 57.70 (respectively Nepal 53.8), while the highest value of the score was achieved by Ireland with a score of 80.50. Among the selected BRI members, the highest IEF score was achieved by Singapore (89.40). Initiator of BRI China reached an IEF score of 58.40. The average value of IEF was at the level of 69.68 in EU countries with a standard deviation of 5.66 and BRI countries of 63.92 with a standard deviation of 10.17. Based on this comparison, we can say that the BRI countries achieve only a slightly worse average IEF score, but in this group, there is higher heterogeneity than in the EU countries. This is also illustrated by the tests of the normal distribution, EU countries based on all four tests, such as Shapiro-Wilk W, Anderson-Darling A, Lilliefors L, and Jarque-Bera JB confirm the normal distribution of IEF. The opposite situation occurred in the BRI group (normal distribution was confirmed only by Lilliefors L and Jarque-Bera JB). According to R. Hanák (2016), the negative values of the skewness coefficient represent a skewed distribution on the right, i.e., in a dataset are larger values than smaller ones and vice versa. Also, in this case, we recorded a different skewness for the examined groups. There are more EU countries with a higher IEF score and more BRI countries with a lower IEF score.

In the case of the Global Innovation Index (GII) 2018 variable, we found larger differences between the examined groups. Romania (37.60) and Bangladesh (23.10) are the countries with the worst results in the index. At the other end of the spectrum are the Netherlands (63.30) and Singapore (59.80). It should be noted that China's rank (53.10) is the third in terms of quality of innovation among the examined BRI countries, preceded by the Republic of Korea (56.60) and the mentioned Singapore. The EU average GII score is 49.22 (BRI 35.76) with a standard deviation of 7.31 (BRI 11.63). Skewness is positive in both groups, so there are more smaller values in the dataset. Normal distribution tests for the EU have shown a normal distribution of the variable and the results of the non-normal distribution of the variable GII predominate in the BRI group. From all these findings, we can say that the EU as a whole is more innovative than the BRI group, which is an important finding about competitiveness in the future. The EU country with the lowest GII rate still achieves a higher value than the country in the BRI group, and the country with the highest GII index value among the EU members also achieves a higher value than the BRI country with the highest value. The set of EU countries is more homogeneous, as evidenced by the tests of normal distribution.

The Human Capital Index (HCI) from the year 2018 shows similar characteristics as the IEF variable. Exceptions are tests of normal distribution, where we can deduce that both groups have a normally distributed HCI variable (abstracted from the marginal non-normal distribution result of Jarque-Bera JB test of EU countries). Romania (0.59) and Pakistan (ca. 0.40) have the lowest HCl, the highest have Finland (0.81) and Singapore (0.89). China reached an HCI value of 0.65. In this case, it is interesting that the country in the BRI group with the highest HCI value achieves a higher value than the country with the highest value in the EU group.

Tab. 2: Descriptive statistics – EU members

	LP_2020_g	**LP_2020**	**LP_2019**	**HCI_2018**	**GII_2018**	**IEF_2019**
N	27	27	27	27	27	27
Min	-10.68	50 764.24	50 015.81	0.59	37.60	57.70
Max	4.59	234 006.20	238 946.40	0.81	63.30	80.50
Mean	-3.42	92 992.97	96 058.23	0.74	49.22	69.68
Stand. Dev.	3.27	40 232.58	39 884.39	0.05	7.31	5.66
Median	-3.17	79 151.73	82 707.40	0.76	48.70	68.60
Skewness	0.20	2.33	2.23	-1.07	0.39	-0.06
Kurtosis	0.62	6.21	6.17	1.76	-0.76	-0.70
Shapiro-Wilk W - p(normal)	0.77	**0.00**	**0.00**	0.07	0.34	0.65
Anderson-Darling A - p(normal)	0.52	**0.00**	**0.00**	0.17	0.45	0.42
Lilliefors L - p(normal)	0.29	**0.00**	**0.01**	0.08	0.73	0.39
Jarque-Bera JB - p(normal)	0.88	**0.00**	**0.00**	**0.04**	0.49	0.70

Source: Own processing from WBG (2021); WIPO (2018); The Heritage Foundation (2019).

Lastly, we can characterize the labour productivity (LP) variable from 2020, which reflected the effects of the global crisis caused by the Covid-19 pandemic. Bulgaria is an EU member state with the lowest value of labour productivity of 50,764 USD (Nepal 7,233 USD) and the highest value achieves Luxembourg with the value of 234,006 USD (respectively Singapore 161,287 USD). China achieves a value of 31,416 USD and, in this group, it is preceded by countries such as Kazakhstan (57,620 USD), New Zealand (79,299 USD), Korea (80,438 USD), and others. Other statistical indicators also show greater heterogeneity of the BRI group and a better position of EU countries in labour productivity and thus in national competitiveness. EU countries have labour productivity with a mean value of 92,993 USD (standard deviation 40,233) and BRI countries achieve an average value of 37,961 USD with a standard deviation of 37,163. Skewness is in both cases positive, and datasets have non-normal distribution. This fact determines the use of another correlation coefficient, such as the Pearson correlation coefficient. We opted for Kendall's tau. Information on the year-on-year

dynamics of labour productivity can be obtained from the average value of LP_2020_g. EU countries achieved a decrease in average labour productivity at 3.42, BRI countries only 0.03. Both datasets have a normal distribution of this variable.

Tab. 3: Descriptive statistics – Asian and Pacific BRI members

	LP_2020_g	LP_2020	LP_2019	HCI_2018	GII_2018	IEF_2019
N	19	19	19	19	19	19
Min	-7.43	7 232.93	7 005.81	0.40	23.10	53.80
Max	8.07	161 286.50	164 282.40	0.89	59.80	89.40
Mean	0.03	37 961.29	38 324.98	0.62	35.76	63.92
Stand. Dev.	4.21	37 163.27	37 838.78	0.13	11.63	10.17
Median	-0.68	27 633.78	29 804.97	0.62	31.40	62.30
Skewness	0.01	2.30	2.31	0.50	0.95	1.29
Kurtosis	-0.66	6.24	6.34	-0.11	-0.35	1.19
Shapiro-Wilk W - p(normal)	0.89	**0.00**	**0.00**	0.65	**0.01**	**0.01**
Anderson-Darling A - p(normal)	0.85	**0.00**	**0.00**	0.48	**0.01**	**0.01**
Lilliefors L - p(normal)	0.89	**0.00**	**0.00**	0.30	**0.02**	0.10
Jarque-Bera JB - p(normal)	0.78	**0.00**	**0.00**	0.67	0.26	0.09

Source: Own processing from WBG (2021); WIPO (2018); The Heritage Foundation (2019).

2.2 Correlation analysis

Based on descriptive statistics, we chose Kendall's tau for correlation analysis. Table 4 contains Kendall's correlation coefficients for EU member states and table 5 for selected Asian and Pacific BRI countries with different results for both groups.

We found a moderately strong correlation between labour productivity from 2019 and 2020 and the Global Innovation Index from 2018. This conclusion allows us to assume that there is a dependence between a positive pro-innovation institutional environment and competitiveness. Regarding the Human Capital Index and the Index of Economic Freedom, there is only a weak positive correlation between these variables and labour productivity from 2019 and 2020. Despite this unconvincing result, we make a recommendation to the decision-making sphere to improve the institutional environment in these areas as well, and we leave this empirically to further research. Pearson's correlation coefficient between the Index of Economic Freedom and labour productivity from 2020 reached 0.51.

Another assumption about a quality institutional environment and a more modest decline in productivity was confirmed to us only in the case of the Index of Economic Freedom. Countries with better economic freedom have seen a more modest slump in labour productivity. In other words, they achieved a higher year-on-year labour productivity growth rate.

Tab. 4: Kendall´s tau correlation coefficients – EU members

tau	LP_2020_g	LP_2020	LP_2019
LP_2020_g		0.03	-0.04
LP_2020	0.03		0.93
HCI_2018	0.17	0.37	0.34
GII_2018	0.08	**0.56**	**0.52**
IEF_2019	**0.52**	0.32	0.25

Source: Own processing from WBG (2021); WIPO (2018); The Heritage Foundation (2019).

Medium-strong correlation coefficients in the BRI group were detected between the Human Capital Index of 2018, the Global Innovation Index of 2018, the Index of Economic Freedom of 2019, and labour productivity of 2020. Thus, the importance of the quality of the institutional environment for this group was proven. Another assumption about better coping with the pandemic has not been confirmed for this group of countries.

Tab. 5: Kendall´s correlation coefficients – Asian and Pacific BRI members

tau	LP_2020_g	LP_2020	LP_2019
LP_2020_g		-0.18	-0.22
LP_2020	-0.18		0.96
HCI_2018	-0.11	**0.63**	**0.59**
GII_2018	-0.23	**0.63**	**0.64**
IEF_2019	-0.29	**0.61**	**0.62**

Source: Own processing from WBG (2021); WIPO (2018); The Heritage Foundation (2019).

Conclusion

In this paper, we dealt with the issue of competitiveness and the relationship between competitiveness and the institutional environment of the European Union and selected Belt and Road Initiative countries. We tried to fulfil the main aim (see Introduction) and two assumptions (see chapter 1. Methodology). We found that these two groups achieve approximately comparable results in the Human Capital Index and the Index of Economic Freedom, but the BRI group is more heterogeneous. The EU members achieve qualitatively better results in innovation (Global Innovation Index) and, of course, also in labour productivity itself, which, according to the authors M. Porter (1990) and P. Krugman (1994), we considered to be an indicator of national competitiveness. We also found that there is a positive correlation between the various factors of the institutional environment and labour productivity. In the EU group, we have identified especially the impact of innovation (Global Innovation Index), but countries with better economic freedom, according to The Heritage Foundation, achieved higher annual

growth rates in the pandemic year 2020. In the group of BRI countries, the positive correlation of all three examined determinants of the institutional environment on labour productivity was explicitly proved, namely the Human Capital Index, the Global Innovation Index, and the Index of Economic Freedom. We mentioned in the introduction that, in our view, a healthy EU approach to BRI should be stimulating to improving its own competitiveness. For this reason, we recommend to the decision-making sphere in both groups to focus on the continuous improvement of the institutional environment to maintain and future improve the position in national competitiveness.

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