

AN ANALYSIS OF THE EFFECT OF PURCHASING POWER PARITY ON NATIONAL COMPETITIVENESS AND HUMAN DEVELOPMENT IN 21 EUROPEAN COUNTRIES

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Abstract. *The purchasing power parity is an indicator that facilitates the analysis of price differences between national economies, enabling comparisons in terms of level of development. In order to test this scientific hypothesis, we used the Big Mac Index to assess the purchasing power of the national currencies of 21 European countries between 2011 and 2017. We used statistical correlation to analyse the relationship between the strength of the national currency and the competitiveness of the national economy, on one hand, and the relationship between the strength of the national currency and the level of human development achieved by the countries included in the study, on the other hand. The two statistical correlations generated positive results, thus validating the initial hypothesis. All the correlation indices recorded positive values, higher than 0,5, throughout the entire period of analysis, supporting the idea that the strength of the national currency does influence the competitiveness and level of human development of the studied countries.*

Keywords: *Purchasing Power Parity, The Big Mac Index, The Global Competitiveness Index, The Human Development Index, European Union.*

JEL Classification: *E31, O15, O52.*

1. Introduction

Purchasing Power Parity (PPP) is a concept with a rich history in scholarly economic research.

First introduced by Cassel and used to develop the exchange rate determination model, the PPP theory states that changes in the nominal exchange rate between a pair of currencies should be equal to the inflation differential between the two countries (Cassel, 1918). In other words, purchasing power parity helps express the number of foreign currency units required to buy the same volume of goods and services that a unit of the country's currency used as a basis for comparison can purchase.

Purchasing power parities are helpful tools used internationally to study the differences in prices between countries, which help analyse the level of development of countries. They work like currency conversion rates to express costs defined in national currencies, analysed in an artificial common currency, thus eliminating the impact of price differences between countries (Eurostat, 2014).

Therefore, the general idea behind purchasing power parity is that a unit of currency should be able to buy the same basket of goods in one country as the equivalent amount of foreign currency can buy in another country, at the current exchange rate, so that there is parity in the purchasing power of the unit of currency across the two economies.

On these bases, The Economist calculated and published The Big Mac Index, which is an assessment of the price of a uniform basket of goods, McDonald's Big Mac burger, in a specific country compared to the USA price. This involves using the price of a Big Mac hamburger at home and abroad as the price ratio that reflects the underlying value of the currency. When compared to the actual exchange rate, the BMI purports to give an

indication of the extent to which a currency is over or undervalued according to the law of one price (Clements, et al., 2007, p. 1).

Based on the idea that the power of the national currency determines the level of economic development of a country, we used statistical correlation to analyse how the strength of the national currency against the US dollar, expressed through The Big Mac Index, influences the competitiveness of the country's economy, expressed through the Global Competitiveness Index, as well as the human development level of that country, expressed through The Human Development Index between 2011-2017.

The results we obtained on a sample of 21 European countries supported the initial assumption, all the correlation indices recording positive values, higher than 0,5, throughout the entire period of analysis.

2. The purchasing power parity

The Purchasing power parity (PPP) hypothesis, a highly explored topic in international macroeconomics research, postulates that the nominal exchange rate between two national currencies should adjust to changes in the price levels of the two countries, keeping the real exchange rate unchanged, because exchange rates are “anchored” by price levels. In other words, while the exchange rate meanders around the price ratio, over time it has a tendency to revert to this trend value, so the ratio can be thought of as the “underlying value” of the currency (Clements, et al., 2007, p.1).

The general idea behind purchasing power parity is the law of one price (LOOP). LOOP states that a unit of currency should be able to buy the same basket of goods in one country as the equivalent amount of foreign currency, at the going exchange rate, can buy in a foreign country, so that there is parity in the purchasing power of the unit of currency across the two economies. If the same goods enter each country's market basket used to construct the aggregate price level, and with the same weight, then the Law of One Price implies that a PPP exchange rate should hold between the concerned countries (Taylor and Taylor, 2004).

Possible objections to this line of reasoning are immediate. For example, the presence of transactions costs—perhaps arising from transport costs, taxes, tariffs and duties and nontariff barriers—would induce a violation of the Law of One Price. Moreover, not all goods are traded between all countries, and the weight attached to similar goods in aggregate price indices will differ across countries. In addition, different countries tend to produce goods that are differentiated rather than perfectly substitutable, because they reflect differences in tastes, traditions and cultures. Some of these problems could be addressed, at least in principle, with better data. Also, since PPP is based on traded goods, it might be more usefully tested with producer price indices that tend to contain the prices of more manufactured tradable elements, rather than consumer price indices, which tend to reflect the prices of relatively more non-tradable elements, such as many services. Recent theoretical and empirical literature discussed below has attempted to allow for short-run deviations from PPP arising from sources such as these, while retaining PPP in some form as a long-run average or equilibrium point (Taylor and Taylor, 2004).

Thus, due to factors like transaction costs, imperfect competition, taxation, subsidies and trade barriers, PPP might not hold in the short-run. However, given that international goods market arbitrage should be traded away over time, PPP is expected to hold in the end. This implies that the real exchange rate is expected to return to a constant equilibrium value in the end (Yildirim, 2017, pp. 39-45).

The purchasing power parity at European level is the result of the European Comparison Programme (ECP) launched in 1979 as part of the International Comparison Program. The ICP is an international statistics initiative designed to collect comparative

prices and estimations of conventional currencies to use instead of the exchange rates existing on the market, thus allowing a comparison in real terms of economies and of the inhabitants' well-being.

According to the Eurostat (2014), two different methodologies are used in purchasing power parity calculation:

A. The expression of macroeconomic aggregates in comparable volume aggregates. In particular, purchasing power parities are used to compare the gross domestic product (GDP), one of the most important macroeconomic aggregates, in different countries, without distorting the price levels in these countries.

B. The analysis of relative price levels between countries. In this regard, PPP is divided by the nominal exchange rate to achieve a price level index. This expresses the price level of a country in relation to the other countries.

The purchasing power parities are calculated both at product level and at product group level, and for every level of aggregation up to GDP. The Eurostat method of calculating purchasing power parity does not reflect the actual growth recorded in the analysed economies, as it only works as an instrument of comparison to a reference system (EU with 28 countries included representing the basis of comparison = 100).

In international macroeconomics, purchasing power parity is employed to predict the exchange rate and specify whether a currency is over or undervalued (Holmes, 2001; Sarno, 2005), set exchange rate parities, compare national income levels and establish the degree of misalignment of the nominal exchange rate. Also, PPP has been viewed as an equilibrium condition, as an exchange rate determination tool and as a basis for international comparison of income (Sideris, 2006). Moreover, PPP is a useful tool for converting analysed macroeconomic indicators of analysed countries expressed in a currency, so comparisons between countries become relevant. Comparisons of results are in volumes, removing the price component. The implementation of this calculation tool helps compare information on the price level between countries, having in the same time, the disadvantage of being unable to provide an effective measure of the price level nationwide (Vilcu, 2015). Finally, purchasing power parity is a vital structure block of numerous macroeconomic models so that the PPP hypothesis is important for policy makers of central banks, multinational firms and exchange rate market participants (Rogoff, 1996; Taylor, 2009).

The PPP hypothesis is one of the most tested theories in international economics literature. The different types of empirical studies on PPP can be categorised as follows: correlation studies, unit root tests studies, and co-integration studies (Acaravci and Acaravci, 2007). However, the empirical findings of these researches are mixed and contemporary researchers do not yet agree on the validity of the PPP. The PPP hypothesis existing in empirical literature and the inconsistent results can be explained by the fact that past studies indirectly accept that exchange rate behaviour is naturally linear. Thus, most of these studies suggest that, although the PPP theory has uncertainty in the short run, it holds in the long-run, since the price differentials between two countries are unsustainable in the long-run.

On the other hand, one must take into consideration that, although the PPP hypothesis has been extensively tested for developed economies and is abundant in developing countries (Taylor 1988, 2003, 2009; Taylor and Taylor 2004), some authors consider that the validity of PPP in transition economies remains an unsolved issue (Acaravci and Ozturk, 2010).

In Romania, several researchers tested the PPP hypothesis, also with mixed results. Thus, Barlow and Rădulescu (2002), analysed Purchasing Power Parity by comparing the Romanian Leu against the US Dollar, but found no evidence to sustain their hypothesis.

Solakoglu (2006) found strong evidence to sustain the purchasing power parity hypothesis for transition economies, including Romania, by using the panel approach. By using nonlinear panel unit root test, Chang et al. (2011) also found strong evidence for the long-run purchasing power parity in Central and Eastern European countries. Oguz Ocal (2013) applied the Zivot-Andrews unit root test to re-examine the validity of PPP for Romania 1991-2012, and his results proved that PPP doesn't hold in Romania. Finally, in 2015, Vîlcu Roxana Cristina analysed the purchasing power parities in Romania in the context of EU integration.

In conclusion, although international studies do not fully support the validity of the method, the purchasing power parity theory reinforces the idea that on long-term and very long-term international exchange through exports/ imports is supported. This idea leads to the conclusion of price levelling worldwide, with the expansion of trade between countries.

3. The Big Mac Index

The Big Mac Index (BMI) was invented by *The Economist* in 1986 as a light-hearted guide to whether currencies are at their “correct” level. It is based on the theory of purchasing-power parity (PPP), the notion that in the long-run exchange rates should move towards the rate that would equalize the prices of an identical basket of goods and services (in this case, a burger) in any two countries (The Economist, 2017).

Applications and empirical tests of PPP often refer to a broad “market basket” of goods that is intended to be representative of consumer spending patterns. The attractive feature of the Big Mac as an indicator of PPP is its uniform composition. With few exceptions, the component ingredients of the Big Mac are the same everywhere around the globe.

Moreover, though just a single good, a McDonald's Big Mac hamburger has a variety of tradable ingredients such as ground beef, cheese, lettuce, onions, bread, etc., and non-tradable ingredients such as labour, rent, and electricity, as well as other ingredients such as cooking oil, pickles and sesame seeds (Clements, et al., 2007, p. 7). Therefore, it can account for a sound good basket of goods and services.

The calculation method requires that a country's Big Mac hamburger native currency price is divided by the Big Mac hamburger native currency price of the other country, and then the quotient and the actual exchange rate between the two countries are compared. The deviation of this price ratio from the nominal exchange rate of the two currencies gives an approximation of the over/undervaluation of that currency. If the quotient is lower than the actual exchange rate, it means that the exchange rate of the former country is undervalued; on the contrary, if it is higher than the actual exchange rate, the exchange rate of the former country is overvalued (He, 2013, pp. 83-86).

Recently, The Economist introduced the Adjusted Big Mac Index, which considers GDP in currency valuation. This adjusted index addresses the criticism according to which you would expect average burger prices to be lower in poor countries than in rich ones because labour costs are lower. PPP signals where exchange rates should be heading in the end, as a country like China gets richer, but it says little about today's equilibrium rate. The relationship between prices and GDP per person may be a better guide to the current fair value of a currency. The adjusted index uses the “line of best fit” between Big Mac prices and GDP per person for 48 countries (plus the euro area). The difference between the price predicted by the red line for each country, given its income per person, and its actual price gives a supersized measure of currency under and overvaluation (The Economist, 2017).

As a measure of absolute PPP, The Big Mac Index has been praised for its advantages and criticized for its limitations.

Advantages of The Big Mac Index:

- In order to measure the purchasing power of a currency, you need a product that is homogenous and widely available. Since McDonald's market presence extends to over 120 countries around the world and standards are rigorously regulated, the Big Mac seems to be a great product to use. Even though the burger itself can't be shipped between countries, its components are internationally traded. Subsequently, under the law of one price, the composition of these traded goods should tend towards parity in the end (Roj, 2014);
- The index is also simple to compile due to the data required being readily available. McDonald's prices are easy to access because of its global presence. The company is a leader in global market share so its data will therefore always be up to date and trustworthy. The BMI as a tool is thus reliable, based on the data it crunches, and can be regularly updated to depict timely trends. This makes it a good indicator of shifts in PPP over short periods, especially in response to short-run price changes (Clements et al., 2007, p.10);
- As a measure of absolute PPP, where prices of the same composition of goods are compared, the index does relatively well. Mac prices reflect a well-known empirical regularity according to which exchange rates are more volatile than prices (Clements, et al., 2007, p.11);
- Although the index suffers from a substantial bias, once the bias is allowed for, the index tracks exchange rates reasonably well over the medium to longer term in accordance with relative purchasing power parity theory. The index is at least as good as the industry standard, the random walk model, in predicting future currency values for all but short-term horizons (Clements et al., 2007, p.1);
- Even though the Burgernomics field was never intended as a precise gauge of currency misalignment, The Big Mac Index has done well to predict some currency movements, notably forecasting that the euro, initially overvalued, would eventually depreciate (The Economist, 2017);
- Also, the adjusted Big Mac estimates of intrinsic foreign exchange rates have been better forecasts of actual foreign exchange changes than those of the original "raw" Big Mac index (O'Brien and de Vargas, 2017, pp.70-85);
- Because it is simple and easy to understand, The Big Mac Index has become a global standard. It has been widely used in academia, it has been included in several economic textbooks and has been considered the main index to evaluate the exchange rate of each country at present (He, 2013; Mazumder, 2016).

Limitations of the Big Mac Index:

- There are three versions of PPP: (i) absolute PPP; (ii) relative PPP; and (iii) stochastic deviations from relative PPP. The Big Mac Index (BMI) uses absolute parity, which ignores barriers to international trade, such as tax or business competition, in the context of a single-good basket (Clements et al., 2007, p.7);
- Some researchers argue that the Big Mac index cannot seriously be a test of PPP, since we consume far more goods and services than just Big Macs (Mazumder, 2016), while others highlight the fact that there are substantial, sustained and significant deviations of exchange rates from the BMI. In this context, the under and overvaluations of currencies based on the Big Mac Index published by The Economist cannot be accepted as a reliable measure of mispricing and The Big Mac Index needs to be enhanced before it has substantial practical power (Clements, et al., 2007, p.7);
- PPP is based on relative prices of tradable components, which is where a lot of shortcomings become apparent. Tradable goods such as bread, beef and sesame

seeds form only part of the Big Mac price. McDonald's has to employ workers, pay rent, utility bills and serve customers. All these are part of the non-tradable component of a Big Mac, which influences price. Ong (1997) states that non-tradable goods account for 94% of the price of a Big Mac while Clements, et al. (2012) estimate that in developed economies, non-traded goods constitute around 70% of GDP. These weights vary worldwide. Wages in Asia are much lower than in the West and this may have a big impact on how Big Macs are priced in the East. Productivity differentials may also drive a wedge between prices and thus distort PPP values that the BMI yields (Pakko and Pollard, 2003, pp. 9-28);

- A further weakness of the BMI is that it examines a market where competition is clearly imperfect. According to Pakko (2003), a key assumption for PPP to hold is that markets are perfectly competitive. Due to the size and prestige of McDonald's as a global business, it is likely to have a degree of price making power wherever it sets up. Also, since fast-food culture is seen as more of a norm in the West, McDonald's will clearly be a bigger player there. The firm will be able to take advantage of their larger market power in the West and price their goods accordingly. With a larger market share, they will inevitably be able to foster the relatively inelastic demand for their products and charge higher prices (Roj, 2014);
- Although the theory of PPP serves as a useful benchmark for thinking about long-term equilibrium in foreign exchange markets, it generally does poorly as a predictive tool. A great deal of research effort has been put into testing PPP and in constructing price measures for consistent bundles of commodities across countries. It is interesting to find that a simple collection of items including the Big Mac sandwich does just as well (or just as poorly) at demonstrating the principles and pitfalls of PPP as do more sophisticated measures (Pakko and Pollard, 2003, pp. 9-28).

4. Research methodology and results

Purchasing power parity (PPP) is a useful tool for the international comparison of prices between countries, used to analyse economic development. Purchasing power parities are indicators that express the main macroeconomic aggregates in a common currency for all the countries subject to international comparisons.

The hypothesis of this paper is that the power of the national currency directly influences the degree of competitiveness and the level of human development of a country. We therefore used the statistical correlation method to analyse the relationship between the power of the national currency and competitiveness on one hand, and, on the other hand, the relationship between the power of the national currency and the level of human development in the countries of the European Union over a period of seven years, between 2011 and 2017.

In line with the theory of purchasing power parity, to assess the strength of the national currencies of EU countries, we used the percentage of under or overvaluation of the national currency against the US dollar, as calculated by The Economist (2017). The Big Mac Index published by The Economist excluded Bulgaria, Croatia, Cyprus, Luxembourg, Malta, Slovakia and Slovenia, leading to their exclusion from the list of countries analysed in our paper. Although Romania is not included among the Big Mac Index countries, we kept it in the sample as we found data on the evolution of the Big Mac price during the analysed period (Roşca, 2015) and based on this data, we calculated the percentage of under or overvaluation of the national currency (leu) against the US dollar (Tabel 1).

Tabel 1. Percentage of under or overvaluation of the RON against the USD in Romania during 2011-2017

Year Indicator	2011	2012	2013	2014	2015	2016	2017
<i>Big Mac Sandwich Price in Romania (RON)</i>	9	9,3	9,5	9,9	8,7	8,9	9,1
<i>Big Mac Sandwich Price in United States (USD)</i>	4,07	4,33	4,56	4,795	4,79	5	5
<i>Purchasing Power Parity RON/USD (a)</i>	2,21	2,15	2,08	2,06	1,82	1,78	1,82
<i>Exchange rate RON/USD</i>	3,05	3,47	3,33	3,35	4,01	4,06	3,89
<i>Percentage of under or overvaluation of the RON against the USD (aa)</i>	-27,54	-38,04	-37,53	-38,5	-54,6	-56,05	-53,2
<i>Calculation methods</i>	<i>(a) = Big Mac Sandwich Price in Romania (RON) / Big Mac Sandwich Price in United States (USD)</i>						
	<i>(aa) = Purchasing Power Parity RON/USD * 100 / Exchange rate RON/USD</i>						

Source: Created by authors

We also decided to reduce the analysis period to seven years (2011-2017), as a ten-year analysis would have further reduced the group of countries under analysis. Table 2 shows the percentages of under or overvaluation of national currencies relative to the US dollar in 21 countries of the European Union for 2011-2017.

Table 2. Percentage of under or overvaluation of national currencies in 21 European countries during 2011-2017, according to The Big Mac Index

Current number	Country	2011	2012	2013	2014	2015	2016	2017
1	Austria	8,98	-10,63	-4,34	-4,81	-18	-21,4	-26,74
2	Belgium	32,26	6,46	4,4	3,89	-10,05	-13,7	-12,74
3	Czech Republic	0,18	-22,79	-23,4	-27,94	-39,06	-39,4	-38,09
4	Denmark	34,87	7,34	7,83	7,31	12,23	-11,9	-13,09
5	Estonia	-22,41	-42,85	-22,4	-18,57	-29,85	-32,3	-32,13
6	Finland	32,26	5,06	15,69	15,12	-0,83	0,5	-1,75
7	France	23,44	0,85	10,05	9,51	-5,66	-10,04	-11,66
8	Germany	19,91	1,97	2,71	3,05	-11,23	-17,2	-15,97
9	Greece	14,97	-24,84	-26,64	-14,36	-26,22	-26,8	-27,82
10	Hungary	-0,59	-19,49	-17,39	-21,44	-33,84	-37,5	-39,45
11	Ireland	34,02	-2,23	-2,37	-2,01	-15,58	-12,6	-12,31
12	Italy	23,44	0,85	5,81	8,1	-6,87	-8,3	-9,51
13	Latvia	-20,44	-32,01	-32,12	-37,5	-43,96	-49,16	-37,4
14	Lithuania	-25,44	-36,71	-29,72	-27,22	-40,76	-46,26	-35,08
15	Netherlands	14,62	-5,31	-2,65	-3,13	-16,55	-24,6	-22,22
16	Poland	-24,09	-39,23	-40,01	-37,53	-48,18	-52	-48,62
17	Portugal	2,28	38,67	-16,76	-15,77	-27,43	-33,4	-29,97
18	Romania	-27,54	-38,04	-37,53	-38,5	-54,6	-56,05	-53,2
19	Spain	23,44	-1,95	-1,24	2,49	-11,71	-23,5	-18,12
20	Sweeden	87,94	32,38	35,12	24,17	3,73	3,7	9,79
21	United Kingdom	-4,62	-3,82	-11,78	2,71	-8,81	-21,8	-22,43

Source: Created by authors based on data from The Economist, 2018. Interactive currency-comparison tool, Available at <http://www.economist.com/content/big-mac-index>.

To assess the competitiveness of the analysed European countries between 2011 and 2017 we have employed an indicator that enjoys wide recognition and credibility, namely the Global Competitiveness Index (GCI). Table 3 summarizes the GCI values for the 21 countries surveyed over the six-year period.

The GCI combines 114 indicators capturing concepts that matter for productivity and long-term prosperity. These indicators are grouped into 12 pillars: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation. These pillars are, in turn, organized into three sub-indexes: basic requirements, efficiency enhancers, and innovation and sophistication factors. The three sub-indexes are given different weights in the calculation of the overall index, depending on each economy's stage of development, as shown by its GDP per capita and the share of exports represented by raw materials. The GCI includes statistical data from internationally recognized organizations, notably the International Monetary Fund (IMF), the World Bank and

various United Nations' specialized agencies, including the International Telecommunication Union, UNESCO, and the World Health Organization. The Index also includes indicators derived from the World Economic Forum's Executive Opinion Survey that reflect qualitative aspects of competitiveness, or for which comprehensive and comparable statistical data are not available for a sufficiently large number of economies (Schwab and Sala-i-Martin, 2017, pp. 5-6).

Table 3. The Global Competitiveness Index in 21 European countries in 2011-2017

Current number	Country	2011	2012	2013	2014	2015	2016	2017
1	Austria	5,14	5,22	5,15	5,16	5,12	5,22	5,25
2	Belgium	5,2	5,21	5,13	5,18	5,2	5,25	5,23
3	Czech Republic	4,52	4,51	4,43	4,53	4,69	4,72	4,77
4	Denmark	5,4	5,29	5,18	5,29	5,33	5,35	5,39
5	Estonia	4,62	4,64	4,65	4,71	4,74	4,78	4,85
6	Finland	5,47	5,55	5,54	5,5	5,45	5,44	5,49
7	France	5,14	5,11	5,05	5,08	5,13	5,2	5,18
8	Germany	5,41	5,48	5,51	5,49	5,53	5,57	5,65
9	Greece	3,92	3,86	3,93	4,04	4,02	4	4,02
10	Hungary	4,36	4,3	4,25	4,28	4,25	4,2	4,33
11	Ireland	4,77	4,91	4,92	4,98	5,11	5,18	5,16
12	Italy	4,43	4,46	4,41	4,42	4,46	4,5	4,54
13	Latvia	4,24	4,35	4,4	4,5	4,45	4,45	4,4
14	Lithuania	4,41	4,41	4,41	4,51	4,55	4,6	4,58
15	Netherlands	5,41	5,5	5,42	5,45	5,5	5,57	5,66
16	Poland	4,46	4,46	4,46	4,48	4,49	4,56	4,59
17	Portugal	4,4	4,4	4,4	4,54	4,52	4,48	4,57
18	Romania	4,08	4,07	4,13	4,3	4,32	4,3	4,28
19	Spain	4,54	4,6	4,57	4,55	4,59	4,68	4,7
20	Sweeden	5,61	5,53	5,48	5,41	5,43	5,53	5,52
21	United Kingdom	5,39	5,45	5,37	5,41	5,43	5,49	5,51

Source: Created by authors based on data from Schwab, K. and Sala-i-Martin, X. (2017). *The Global Competitiveness Report 2016-2017*, World Economic Forum, Retrieved September 04, 2017, from www.weforum.org/gcr.

Human development is the development of people through building human capabilities, by the people through active participation in the processes that shape their lives and for the people by improving their lives. It is broader than other approaches, such as the human resources, the basic needs, or the human welfare approaches.

To evaluate the level of human development in the 21 analysed European countries, we used the Human Development Index (HDI) published by the United Nations Development Program, a widely accepted and validated indicator employed in numerous studies and analyses. The composite Human Development Index integrates three basic

dimensions of human development. Life expectancy at birth reflects the ability to lead a long and healthy life. Mean years of schooling and expected years of schooling reflect the ability to acquire knowledge. Gross national income per capita reflects the ability to achieve a decent standard of living (Jahan, 2016, p. 2).

The human development approach also provided the analytical bedrock of the Millennium Declaration and the Millennium Development Goals — the time bound development objectives and targets agreed on in 2000 by 189 heads of states and governments to reduce basic human poverty by 2015. It also informed and influenced the 2030 Agenda and the Sustainable Development Goals (Jahan, 2016, p. 3).

Table 4 shows the 2011-2016 HDI values for the analysed European countries.

Table 4. The Human Development Index in 21 European countries, in 2011-2016

Current number	Country	2011	2012	2013	2014	2015	2016
1	Austria	0.88	0.884	0.887	0.892	0.892	0.893
2	Belgium	0.884	0.886	0.889	0.89	0.895	0.896
3	Czech Republic	0.861	0.864	0.865	0.871	0.875	0.878
4	Denmark	0.91	0.922	0.924	0.926	0.923	0.925
5	Estonia	0.838	0.85	0.856	0.86	0.863	0.865
6	Finland	0.878	0.884	0.887	0.89	0.893	0.895
7	France	0.882	0.885	0.887	0.89	0.894	0.897
8	Germany	0.912	0.916	0.919	0.92	0.924	0.926
9	Greece	0.86	0.858	0.86	0.862	0.865	0.866
10	Hungary	0.821	0.823	0.824	0.834	0.834	0.836
11	Ireland	0.909	0.895	0.902	0.91	0.92	0.923
12	Italy	0.872	0.877	0.876	0.877	0.881	0.887
13	Latvia	0.81	0.812	0.814	0.822	0.828	0.83
14	Lithuania	0.826	0.83	0.834	0.841	0.846	0.848
15	Netherlands	0.911	0.921	0.922	0.923	0.923	0.924
16	Poland	0.829	0.834	0.838	0.85	0.852	0.855
17	Portugal	0.818	0.824	0.827	0.837	0.841	0.843
18	Romania	0.798	0.797	0.794	0.797	0.798	0.802
19	Spain	0.867	0.871	0.874	0.877	0.882	0.884
20	Sweden	0.901	0.903	0.904	0.906	0.909	0.913
21	United Kingdom	0.902	0.898	0.899	0.904	0.908	0.91

Source: Created by authors based on data from, Jahan, S. (2016). *Human Development Report 2016. Human Development for Everyone*, Published for the United Nations Development Programme (UNDP), Retrieved September 04, 2017, from <http://hdr.undp.org>.

To calculate the correlation index between the under or overvaluation of the national currency and the global competitiveness index and between the under or overvaluation of the national currency and the human development index at national level, we aggregated the 2011-2016/2017 values of the three indicators. To maintain order and relative distance between the scores of different countries included in the analysis, we normalized the values using the min-max method.

We performed data analysis using statistical correlation and the Data Analysis module in MS Excel. Figures 1 and 2 show the results of the two statistical correlations.

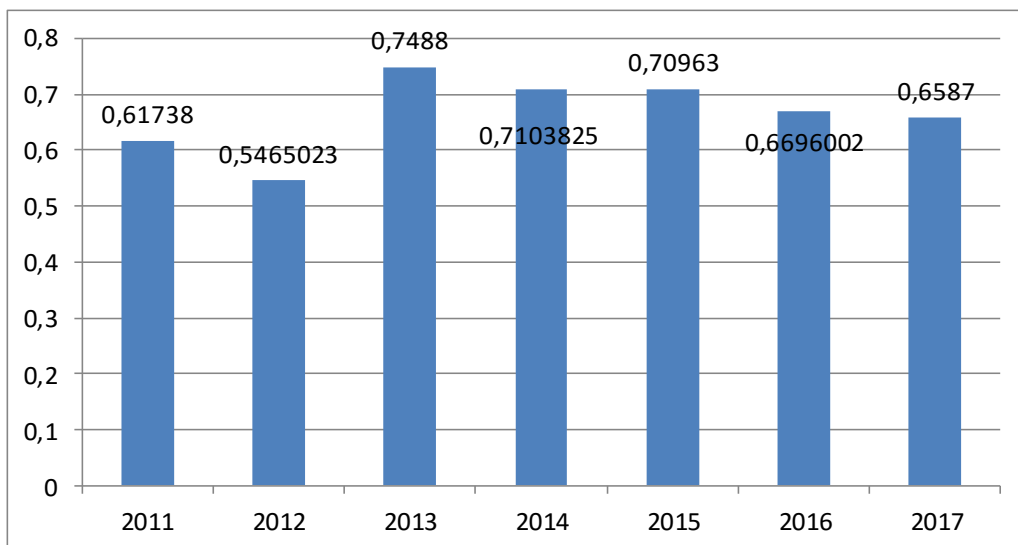


Figure 1. The statistical correlation between the percentage of under or overvaluation of the national currency and the National Competitiveness Index

Source: Created by authors

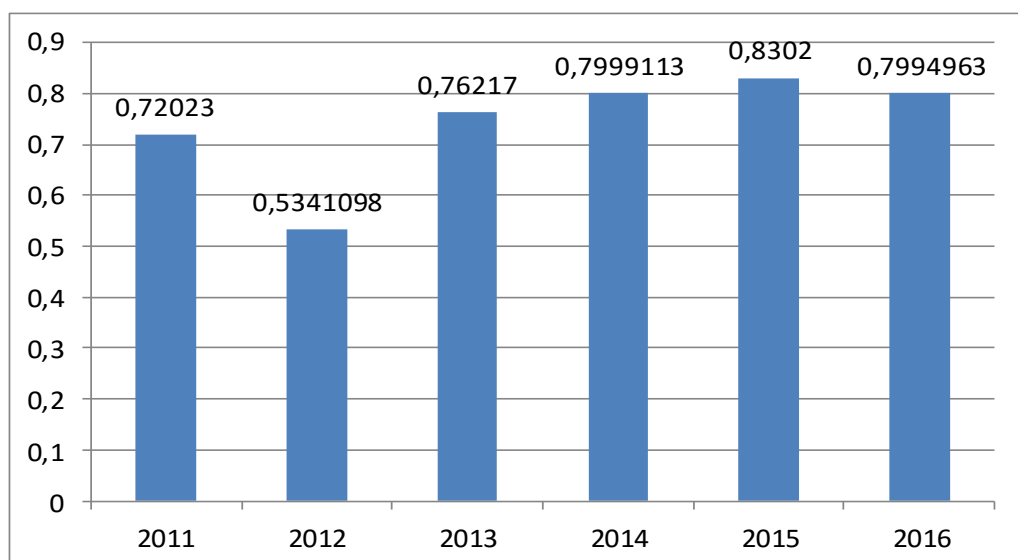


Figure 2. The statistical correlation between the under or overvaluation of the national currency and the National Human Development Index

Source: Created by authors

As shown in the two figures above, all the correlation indices recorded positive values, higher than 0.5, throughout the entire period of analysis, which means that the percentage of under or overvaluation of the national currency in relation to the US dollar moderately influences competitiveness and the level of human development in the analysed countries. Some of the results of the correlation between the under or overvaluation of the national currency and the National Human Development Index are even higher than 0.75, which means that the percentage of under or overvaluation of the national currency in relation to the US dollar strongly influences the level of human

development in the analysed countries. Thus, the results of the two statistical correlations support the initial scientific hypothesis according to which the strength of the national currency against the US dollar is a measure of the competitive capacity of a country's products and services on the international or global market. In addition, a strong national currency will support a higher human development of its citizens.

5. Conclusions

The hypothesis of this paper was that the power of the national currency directly influences the degree of competitiveness and the level of human development of a country. The methodology used to test this assumption required the creation of two statistical correlations between the under or over-assessment of the national currency based on The Big Mac Index, and the Global Competitiveness Index, on the one hand, and the Human Development Index, on the other hand, for 21 selected European countries between 2011 and 2016/2017.

The two statistical correlations support the initial assumption of the survey for the entire period of time, since they recorded moderate positive values (between 0.5 and 0.75), or strong positive values (between 0.75 and 1), which means that the under or overvaluation percentage of the national currency in relation to the US dollar does influence the competitiveness and the level of human development in the analysed countries.

It would be interesting to check if the trend in the values of the correlation indices will persist in the future, thus allowing a ten-year analysis. Such results would support the assumption that a strong national currency relative to the US dollar in any of the 21 European countries under consideration could play a role in increasing national competitiveness and human development in these countries. Also, the methodology of the study could be applied on a larger sample of countries, or even on a worldwide level.

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