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Commentary

The Big Mac Index and the Scientific Productivity in Brazil

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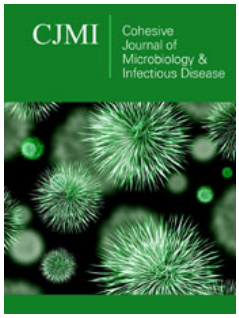

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Abstract

It must be considered that most of the equipment and reagents used in Brazil are purchased in the USA. The objective of the present work was to verify, if the rate of US-Dollar-Brazilian Real does have any influence on the scientific output of Brazil. As parameter, the Big Mac index was chosen. The correlation between Brazilians Big Mac index and its scientific production is, at least in parts, significant. The Big Mac index for the time of research has proven to be a strong indicator-unluckily not a predictor-for the scientific production in Brazil.

Introduction

Is higher education dependent on familiar wealth? International literature about the subject seems to be rare. National publications, however, report about a strong dependence between the two subjects [1-9]. Is success in higher education dependent on genetics? The Nobel-prize laureate James Watson, the one who, along with Crick described the DNA as genetic material. It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material [10]. In his later life, James Watson said Africans are less intelligent than Westerners. The scientific world reacted accordingly. The damage has been done, lending succor and comfort to racists around the globe. [8]. As a reaction to Watson's statement, the Cold Spring Harbor Laboratory revoked honorary titles and cut all remaining ties with him [3].

Is higher education and its quality dependent of national wealth? A study of Messerli [7] demonstrated impressively that scientific success per country is strongly dependent of its wealth. The reading of this paper is strongly recommended. How can a study prove that scientific success in terms of scientific publications depends on the wealth of a country? A study of King [5] analyzed economic and scientific wealth per country. The study revealed that 31 countries (Australia, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, Germany, Greece, India, Iran, Ireland, Israel, Italy, Japan, Luxembourg, the Netherlands, Poland, Portugal, Russia, Singapore, Spain, South Africa, South Korea, Sweden, Switzerland, Taiwan, the United Kingdom, and the United States) accounted for more than 98% of the world's highly cited papers. According to the study, among the cited countries, each one is part of G8, and 15 of the cited countries are members of the European Union. The world's remaining 162 countries contributed less than 2% in total. As proven by King [5], the scientific output in terms of quantity and citations, is dependent of the countries´ wealth. It must be considered that the majority of equipment and reagents used in Brazil are purchased in the USA. The objective of the present work was therefore to verify, if the rate of US-Dollar-Brazilian Real does have any influence on the scientific output of Brazil. The analyzed time frame is from 2011 until 2019.

The authors of the present study were aware of the fact that a national scientific output is dependent of many other factors than the current value of a given currency in comparison

with the USD. But based on the hypothesis, that the main factor is the exchange rate to the USD is the main influencer of a countries scientific output, the authors stumbled over a certain parameter: the Big Mac index (BMI). The BMI is a parameter firstly published by The economist in order to quantify the purchasing power of a given currency in comparison to the USD, hypothesizing that for the same product the same price should be paid all over the world. It is calculated by dividing the price for a Big Mac in the currency of a given country, divided by its price in USD. The objective of the present study was to compare the Brazilian scientific production over time with its BMI.

Methodology

The data about the quantity of Brazilians academic publications in different disciplines from 2011 until 2019 were gathered from United Nations Educational Scientific and Cultural Organization (UNESCO) [9]. Points of measurement were 2011, 2015, and 2019. Respective rates of the USD and the BRL were gathered from the website https://www.exchangerates.org. The Brazilian BMI (2011, 2015, and 2019) was calculated by dividing the price for a Big Mac in BRL divided by the respective price in USD. Calculations and figures were performed using Microsoft excel (2013).

Results

The correlation between Brazilians BMI and its scientific production is, at least in parts, significant. The r^2 values are 0.95 in the field of nanotechnologies, followed by materials (r^2=0.93), robotics (r^2=0.77), and energy (r^2=0.64). Surprisingly low correlation values between Brazilians BMI and its scientific production were found for the field of biotechnology (r^2=0.39) and photonics (r^2=0,039).

Discussion

The BMI for the time of research (2011 until 2019) has proven to be a strong indicator-unluckily not a predictor-for the scientific production in Brazil. The BMI may sound trivial for scientists, especially when it is about comparing it with the scientific output of a given country, Brazil, in this case. Nevertheless, even among economists, where the BMI is a famous and common parameter to inform about purchasing power, its limitations are known: An entire continent (Africa) is not sufficiently represented due to a not sufficient number of restaurants. Furthermore, the BMI does not deliver any information about the average work time necessary to afford a Big Mac. As of 2015, people in the USA worked 35 minutes to earn the money to buy a Big Mac, it took 282 minutes in Mexico, 347 minutes in India, 156 minutes in Russia and-173 minutes in Brazil. That said, the BMI does not include the payment of included workers per time, which supposedly is a substantial influence of different BMI´s in different countries. The less the salary of the workers, the cheaper the product can be sold in a given country.

Nevertheless, the BMI has proven to be an indicator or equivalent to the scientific output of Brazil. Messerli [7] showed that chocolate consumption per country strongly correlates with its amount of Nobel prices. Surely, a correlation may or not be causative, and this is what the author cited above wanted to prove. There is more non-causative but strong correlations: does an elevated sale of sunglasses cause a highly elevated sale of ice cream? No. But the BMI, one of the most used indicators of a country's purchasing power, independent of other indicators (money invested in science and education, current government, current economical situation), may be seen as an indicator for the scientific potency of a given country. Unluckily it looks as if the BMI cannot be identified as a predictor of the scientific potency of a given country, it looks like as if the two parameters move similarly.

Another fact is that countries with the highest scientific production have a BMI close to 1. The present study may prove another thing. Science is international, and if it is not international it is not science. Furthermore, as proven, the USA are the most productive country in terms of scientific output. The BMI may be seen as a strong indicator for a countries scientific output. As the utmost number of reagents and equipment is purchased in the USA, the purchasing power of a given currency must substantially influence the quality and quantity of the scientific output It can be shown.

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