



## Vladislav Pavlát

University of Finance and Administration  
Prague, Czech Republic  
Faculty of Economics  
Department of Finance  
vladislav.pavlat@vsfs.cz

# THE IMPACT OF GLOBALIZATION TRENDS ON INDUSTRY 4.0 IN THE CZECH REPUBLIC

**Summary:** The paper studied potential impact of the expected globalization trends of the Czech Industry 4.0. The specifics of the Czech Republic economy – as of a typical open export-oriented small European country – are characterized and analyzed in the international context of the EU and the world economy. Indexes of globalization and digitalization are used to highlight the current state of the 4<sup>th</sup> industrial revolution and its development in future. The paper demonstrated the necessity of a holistic approach to the research of globalization and of the Industry 4.0 research (based on interdisciplinary research in country case studies). It is expected that the speed of digitalization in the Czech Republic will be higher than the speed of the overall transition to Industry 4.0.

**Keywords:** globalization, Industry 4.0, digitalization, Single Digital EU Market, the Czech Republic ranking.

**JEL Classification:** F62, 014, 033, 057.

## Introduction

The Czech Republic belongs among the industrially developed countries in Central Europe. It has existed as an independent state since the split of Czechoslovakia (as of January 1, 1993) into two countries – the Czech Republic (capital Prague) and the Slovak Republic (capital Bratislava). The Czech Republic is a democratic state headed by the President elected by parliament and has no significant natural resources (except for uranium ore and residual coal deposits). Its greatest asset is a skilled and qualified labor. If a potential or a probable impact of the world globalization trends on the Industry 4.0 in a given country is analyzed, it is necessary to identify the purpose, scope and methodology of such

analysis. In this paper, the world-wide globalization is understood generally as a long-term process of internationalization, based primarily on the economic advantages of a free market of goods, capital flows and services. The measuring of globalization processes is currently performed by plenty of globalization indexes. These indexes allow for measuring the level, rate, depth, speed and other elements of the world-wide globalization process and, at the same time, the international comparison of the countries according to specific criteria.

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The globalization paradigm is based on the assumption that the world-wide globalization (i.e., the economic, social and political globalization) is expected to be beneficial to states, population and individuals. However, the practice does not correspond to the theory. The research of the globalization impacts has to help the international community to mitigate the negative impact and to multiply the beneficial impact of globalization. Before the WW Crisis, the economic effects were emphasized; after the Crisis, social effects were taken in consideration. Nowadays political factors evidently are playing a primary role (Brexit, US international policy, the fight against international terrorism and other urgent issues). A partial revision of the theoretical globalization paradigm is not excluded in future.

The Industry 4.0 is understood as one of the most significant components of the Fourth Industrial Revolution. It's content was characterized by Klaus Schwab as ubiquitous, mobile supercomputing, intelligent robots, self-driving cars, neuro-technological brain enhancements, genetic editing [World Economic Forum 2016]. The word 'industry 4.0' invokes the idea that manufacturing is playing the main role in the process of transition from 'three to four'. This concept reflects only the 'enterprise' (mainly micro-economic) level of an all-embracing process of a revolutionary change of the society. In this paper, the

‘macro-economic’ aspect of the ‘transition period’ is understood as a long-term process, not as question of one or two next decades.

The measuring of processes of the on-going transition to a formation of a new society based on a new economic structure and on a new concept of social and political organization is currently performed by plenty of indexes. These indexes try to measure the economic, social and political aspects of the ‘transition process’ in a complex way. International ranking of countries is an important element for understanding of mechanism of transition in its complexity.

The digitalization is understood in this paper as a process of “the way in which many domains of social life are restructured around digital communication and media infrastructures” [Brennen & Kreis, 2014]. It is measured by means of global and special indexes (international ranking included). These indexes are used for strategic planning on the business and government levels.

The references in the paper were selected from a vast literature on globalization and the fourth industrial revolution published in the past 3-4 years.

The author of the paper is well aware that there is a gap between the academic theoretical research of globalization (understood as a world-wide process), and the research of individual countries level of globalization which serves for strategic planning. As far as the research of the Industry 4.0 (in other words: the 4<sup>th</sup> industrial revolution) is concerned, a similar question exists. However, if the theoretical results of academic research are used as a starting-point of the ‘practical’ country research, it is possible to bridge the above gap. The presented paper is based on the assumption that the process of globalization has an impact on Industry 4.0 in the Czech Republic (i.e., on the evolution of the 4th Industrial Revolution), and on the assumption of some (unknown) feed-back. (The potential feed-back is not the objective of the paper.) Hypothetically, (a) a potential impact on a given country depends on the general trend of globalization (the upward, downward or zero trends) and its speed, (b) on the geographic region, and (c) the character of the impact (positive or negative for the population). This is, of course, a simplified approach. In the paper, a static approach – for technical reasons – has been applied (the next step would be a dynamic approach). The analysis is based on the description of composite and/or specific (special) indexes used for the Czech Republic ranking (in the world and/or in the EU). The number of indexes was limited, only selected indexes were commented on. The paper is based on the description of selected elements of the state of digitalization in the CR and on the qualitative comparative analysis.

## **1. Impact of globalization trends on Industry 4.0 development in the Czech Republic**

The analysis is based on the basic concepts of the KOF globalization index [KOF Globalization Index, 2018; Table 1. Human Development Index, 2018]; and on the special indexes issued by different organizations, institutions and companies; selected special indexes on digitization and digitalization. Up to 2017, there was a tendency to analyze the potential impact of the Industry 4.0 on the worldwide globalization; current analyzes try to identify the much broader impact of both processes and their feedback.

### **1.1. The background of index-based research**

By the **KOFI Index of Globalization** the rates (degree) of globalization in 188 countries are measured. According to Wolfgang Lehmacher [2017], “KOFI is an acronym for the German word ‘Konjunkturforschungsstelle’ meaning: Economic cycle research institute. The KOF Index of Globalisation is an index of the degree of globalisation of countries. It was conceived by Axel Dreher at the Konjunkturforschungsstelle of ETH Zurich, Switzerland”. Data used to construct the 2018 edition of the index was from 2015.

The KOF index is presented in a scale from 1 to 100, where greater number represents a more advanced globalization. The index is based on three dimensions or core sets of indicators: economic, social, and political globalization (each of components has the weight of 33.3%). The KOF Index is a composite index. “The KOF index is most widely accorded but also very controversial. It has a great range of 23 variables and data collected from 187 countries across the globe. The intensity, extensity and velocity are measured to a great extent with transparent methodology. However, some argued that KOF index does not exactly measure globalization but rather internalization, because one of the fundamental ideas, ‘supra-territoriality’, is not included”. The KOF index allegedly (according to the views of critics) over-values the globalization degree of small export oriented countries.

The KOF index is based on the paradigm that countries that are perceived as more economically globalized are those with low tariffs on imports, more free-trade agreements, regulation that accommodates foreign investment and lower non-tariff barriers to trade such as safety regulations on imports.

**The Human Development Index (HDI)** is a statistical tool used to measure a country's overall achievement in its social and economic dimensions [“Economic Times”, s.a.]. It is used by the UN Human Development Program [2016]. This index is composed of 5 main indicators: Life expectancy at birth, Expected years of schooling, Mean years of schooling, Gross national income (GNI) per capita, and GNI per capita rank minus HD. The UNDP issues its country rating every year. The Human developments data is available from 1990 to 2015 [UN Human Development Program, 2016].

## 1.2. Digitalization indexes

There is a group of new specialized indexes on different aspects of digitalization and/or digitization. Several indexes were selected to demonstrate the broad range of the purpose and practical use of special indexes in the field of digitalization. For example, the McKinsey Digitization Index [Gandhi, Khanna & Ramaswamy, 2016] measures digital progress and a sector survey of digitization. The Euler Hermes Enabling Digitalization Index (EDI) measures the ability of countries to digitalize different industries [EDI, 2018]. The BVVA Digitization Index (DiGiX) assesses the factors, agents' behavior and institutions that enable a country to fully leverage Information and Communication Technologies (ICTs) for increased competitiveness and wellbeing [BVVA Digitalization Index, 2017]. The Digital Acceleration Index – issued by the Boston Consulting Group (BCG) – helps organizations assess their digital maturity [BCG's..., 2018]. The Digital Society Index [2018] claims: “[...] ranks countries across three dimensions of the digital economy: dynamism, inclusion and trust. It contrasts top down, ‘national level’ metrics of digitalization against ‘bottom up’ indicators of consumer sentiment...”. World Digital Competitiveness Rankings 2017 was issued by the IMD business school together with a special report [Chakravorti, Bhalla & Chaturvedi, 2017]. The Global Innovation Index [Global Innovation Report, 2018] measures the innovation performance of 126 countries (80 indicators). In the Table 1 the Czech Republic ranking according to the 10 selected indexes is presented.

**Table 1.** Czech Republic ranking according to the 10 selected indexes

Index of Globalization and selected indexes linked with globalization	Ranking/year of issuance
<i>1</i>	<i>2</i>
KOF Index of Globalization	13. (2015)
HDI – Human Development Index	28. (2015)
Doing Business Index	30. (2017)

**Table 1 cont.**

<i>1</i>	<i>2</i>
Global Innovation Index	27. (2017)
Global Competitiveness Index	31 (2016-2018)
Environmental Performance	33. (2018)
Global Peace Index	07. (2017)
Democracy Index	34. (2017)
Corruption Perception Index	42. (2017)
World Press Freedom Index	27. (2017)

Source: Corruption Perception Index [2017]; Democracy Index [2017]; Doing Business [2017]; Environmental Performance Index [2018]; Global Competitiveness Index [2018]; Global Innovation Index [2017]; Global Peace Index [2017]; World Press Freedom Index [2017]; KOF Index of Globalisation [2018]; Table 1. Human Development Index... [2018].

The ranking based on a one year Global Peace Index, period does not reflect the trend of previous years, and cannot be used for any prognosis. However, the indexes available for a period of more than 10 years could be used as a starting point for strategic planning.

### **1.3. The state of digitalization in the Czech Republic**

In Czech the term ‘digitalization’ is used everywhere when speaking about this process. In Czech, only one word exists for both processes (digitization and digitalization), i.e., no distinction can be made.

#### **1.3.1. Digital Czech Republic**

According to McKinsey Report of January 2017, the productivity level of the Czech Republic has a crucial meaning for productivity growth in industries. The productivity level in the Czech Republic represented 60% of Western European productivity level in 2017. As stated in the cited report, it would be possible to close 19% of this gap by digitization. In course of 10 years, the digitization could contribute to the Czech GNP a yearly growth by 1.0% to 2.1% [McKinsey, 2017]. However, different sectors are motivated to use the digitization in a different way: “[...] digitization is a boom to some sectors and a curse to others” [McKinsey, 2017]. The cited Report discussed the possible digitization levels in 8 key sectors of the Czech economy. The high digital intensity sectors in the CR are telecommunications, media, publishing, IT, and financial and insurance services; low digital intensity industry sectors are small manufacturing, construction, and transport (digital intensity of an industry is measured as

the proportion of companies ranked as having high digital intensity plus 50% of those ranked as medium). Sectors with a high digital intensity are more productive [McKinsey, 2017, p. 22]. The telecommunication services had a digital intensity of 88%, but financial and insurance services only 60% in 2017.

The telecommunication sector is described as one of the lagging sectors in this paper to demonstrate its significance for the ‘Digital Czech Republic’ government strategy. “Czech policy makers need to adopt digital technologies to transform the delivery of public services. The Czech Republic ranks 92<sup>nd</sup> in the provision of online government services – just below Belarus and El Salvador. The government can also help get individuals and businesses online” [McKinsey, 2017, p. 95].

## 2. Discussion

In my opinion one of the important information on digitalization indexes is the fact that the above described composite indexes cannot give a comprehensive view about the real economic situation of the given country. The indexes are based on a different number of indicators. There are different sources of indicators, i.e., different sets of statistical data will be used. The purpose of different indexes is not the same. Every index has its positive and negative features caused by its purpose. This fact makes the composite indexes incomparable because a re-calculation of indicators (and indexes) would be very expensive. Almost the same is true about the indexes based on one indicator. There is a supplementary question in play: the weights of identical indicators applied in different indexes are different. If the indexes are issued every year, any change of the original index structure brings a necessity of re-calculations. However, the existence of different composite indexes is useful because a group of indexes gives a more precise picture of the reality.

The above statistical data contain selected parameters of the ‘Digital Czech Republic’ by which strengths and weaknesses can be characterized. These data confirm that the Czech Republic digitalization process is lagging behind the developed EU states. However, on one side, its level (rate) of digitalization is lower than level of the leading EU countries; on the other side, its level is higher than the digitalization level of the former socialist states. The data illustrates the fact that the level (rate) of digitalization – as far as individual indicators are concerned – in many cases substantially differ from the EU digitalization average level. On the whole, the ‘Digital Czech Republic’ stands in the middle of the EU.

The ranking based on a one year period does not reflect the trend of previous years, and cannot be used for any prognosis. However, the indexes available for a period of more than 10 years could be used as a starting point for strategic planning.

## **Conclusions**

The survey of indexes in Subsection 1.1 illustrates that the processes of globalization and the fourth industrial revolution are researched from many different aspects. There is a tendency to prefer multi-dimensional and multidisciplinary indexes with the purpose to present a more complex view both of the development of globalization and the all-embracing fourth industrial revolution.

As for the future globalization trends, in my opinion, a de-globalization trend will probably prevail in a middle-term period at least. This trend is caused by Brexit-like events all over the world, by economic sanctions applied in international economic relations, by the ‘business war’, and by the growing uncertainty in the area of international relations. For the time being, it is hardly possible to construct any rational prognosis of the development of international relations.

There is a possibility that the further technical and technological development based on further digitalization will be more and more dependent on the giant SW producers.

The perspective of the future development of digitalization in the Czech Republic is promising. Its speed probably will be high in the next 3-4 years. This expectation is based on the government declaration [Policy Statement of the Government of the Czech Republic, 2018] that declared the high priority of digitalization. In case of de-globalization, the speed of digitalization in the Czech Republic probably will be lower than it is expected.

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#### **WPLYW TENDENCJI GLOBALIZACYJNYCH NA PRZEMYSŁ 4.0 W REPUBLICIE CZESKIEJ**

**Streszczenie:** W artykule rozpatrzono potencjalny wpływ oczekiwanych trendów globalizacyjnych na czeski Przemysł 4.0. Specyfika gospodarki Republiki Czeskiej – jako typowego, otwartego na eksport małego kraju europejskiego – została scharakteryzowana oraz przeanalizowana w międzynarodowym kontekście gospodarki UE i światowej. Indeksy globalizacji i cyfryzacji posłużyły podkreśleniu obecnego stanu czwartej rewolucji przemysłowej oraz jej potencjalnego rozwoju w przyszłości. W artykule wskazano na konieczność holistycznego podejścia do badań nad globalizacją i Przemysłem 4.0 (przy wykorzystaniu interdyscyplinarnych badań studiów przypadków krajowych). Oczekuje się, że tempo cyfryzacji w Czechach będzie wyższe niż tempo ogólnej transformacji do Przemysłu 4.0.

**Słowa kluczowe:** globalizacja, Przemysł 4.0, cyfryzacja, jednolity cyfrowy rynek UE, ranking Republiki Czeskiej.