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# Ready, Steady, Go!?? – A V4 country comparison of readiness for the future of production

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**Abstract**

Technological changes have been addressing universal and global challenges in production, i.e. in producing and marketing goods and services since less than a decade. The ongoing phenomenon of technological changes has several names, like Industry 4.0, and Fourth Industrial Revolution. The paper provides an overview on this phenomenon first. Some initiatives for assessing the resilience of the industry for preparing and managing them will be also discussed. World Economic Forum is among the global institutions, which has been working on uncovering, and grapping the evolving phenomenon and articulating, and formulating suggestions for key stakeholders. A report was published recently by them, which is taken as a base for comparison of the V4 countries. Two of the V4 countries, Czech Republic and Poland among the leading group of the 100 assessed countries, and the other two, Hungary and Slovakia are left behind by the report. By comparing the data, which underpin these positions, the paper provides some insights into the fields, where the two lagging behind countries signal underperformance. The first results are divers. They suggest that the over-performing fields have underperforming subfields and vica versa. Comparisons like this may support not only future discussions on where and how to move on but also may give orientation for businesses and policy makers.

**Keywords:** V4 countries; industry 4.0; fourth industrial revolution; production;

competitiveness; world economic forum

**JEL codes:** D24

## INTRODUCTION

Currently we are living in the Fourth Industrial Revolution. The spreading of the emerging technologies through industries has set major challenges for decision makers both in the private and public sectors. Therefore in the recent years consultancy companies and international organisations both started to develop methods, which measure the future potential of countries to capitalize on this new industrial era. The Roland Berger consultancy company created the Industry 4.0 Readiness Index for the key industrial countries of the EU (RB 2015). We will present the main outcomes and results of the Readiness Assessment, which are based on the Readiness for the Future of Production Report from the World Economic Forum, and introduce their country archetypes. In Section 4 we will compare the countries from the Visegrad Group (V4), of whom two belongs to the Leading archetype (the Czech Republic, and Poland) and two to the Legacy archetype (Hungary and the Slovak Republic). We analysed these Legacy countries along the drivers of production and identified the main over- and underperformed indicators compared to the Czech Republic.

## WHAT SHOULD YOU BE READY FOR? – INDUSTRY 4.0 AND THE FOURTH INDUSTRIAL REVOLUTION

### AN INTERNATIONAL READINESS ASSESSMENT – THE WEF READINESS REPORT, 2018

In February 2018 the World Economic Forum (from now on WEF) published its newest paper, the Readiness for the Future of Production (from now on FoP) Report as a part of the series named World Economic Forum's System Initiative Shaping on the Future. The aim of the paper is to provide information for the decision makers both from the private and public sectors to ensure cooperation between the two sides in connection with modern industrial strategies and policies at a national, regional, and global level. The World Economic Forum's System Initiative Shaping on the Future of Production seeks direction to ensure a sustainable production system, which has four objectives:

1. It has to be solution-driven, so the technology can handle and solve previously overwhelming challenges.
2. It is human-centric, where innovation, creativity and production will be unleashed by the technology.
3. The technology has to be sustainable to minimize the negative effects on the environment and enable carbon neutrality and save energy and resources.
4. It has to be inclusive, which means "employees, companies and countries at different stages of development benefit from Fourth Industrial Revolution technologies and the transformation of production systems." (WEF 2018 p. v.)

The Readiness for the Future of Production Report primarily focuses on the fourth objective: inclusive transformation and growth, as production systems will face a technologi-

cal revolution. It is important to deal with the effect of this change, try to take advantage of the emerging opportunities and to prepare for the challenges through collaborations.

### Measuring the Readiness for the FoP

The Readiness for the FoP shows us which countries will possibly 1.) capitalize future advanced production opportunities, 2.) mitigate the risks and challenges and 3.) be resilient to future shocks. However, this does not give us information about the current production performance of each country. It is assumed that, if the countries are prepared today, they could be agile, competitive and resilient in the future. To enhance this readiness and be prepared, the decision-makers "need to assess their current capabilities, identify new capabilities required to benefit from and succeed in a new production paradigm, and develop collaborative and customized solutions to facilitate transformation." (WEF 2018 p.3.)

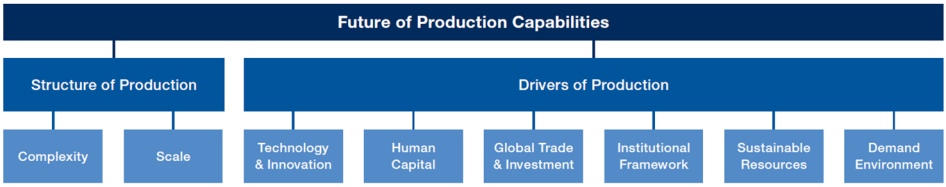


**Figure 1. Readiness Diagnostic Framework**
Source: WEF (2018) p. 5.

For this assessment the WEF created a so-called Readiness Diagnostic Framework, where production means a broad spectrum of economic activity related to the manufacturing of products and goods. The framework (see Figure 1) has two main dimensions. The first one is the **structure of production,** which means that a country that already has a developed production system is more ready for the challenges of the future of production, because it has an existing system to build on. It has two main drivers, Complexity and Scale. The Complexity is assessed by The Economic Complexity Index, which "is a measure of the knowledge embedded in a society expressed by the products it makes". (WEF 2018, p.6.) The Readiness Assessment 2018 uses values from the Atlas of Economic Complexity 2016 Global Rankings. The Scale is calculated by WEF, and builds upon two indicators, the Manufacturing value added and the Significance of manufacturing to the economy. In the assessment the complexity factor weighs 60%, while scale has a 40% weight. (left-hand side of Figure 2).

The second dimension is the **drivers of production** (right-hand side of Figure 2), which means the utilization of the emerging technologies in relation to the future of production. This dimension has six main drivers. In Figure 3 there is an overview of these drivers and of the main concepts they cover. For detailed definitions with all the indicators of the drivers, see Appendix 1. These dimensions and main drivers will be the basis for the comparative analysis of the V4 countries.

The sources of these indicators are international organizations, such as the World Bank, International Labour Organization (ILO), United Nations Industrial Development Organization etc. These statistical data are internationally comparable, therefore they are applicable to be a basis for further analysis.

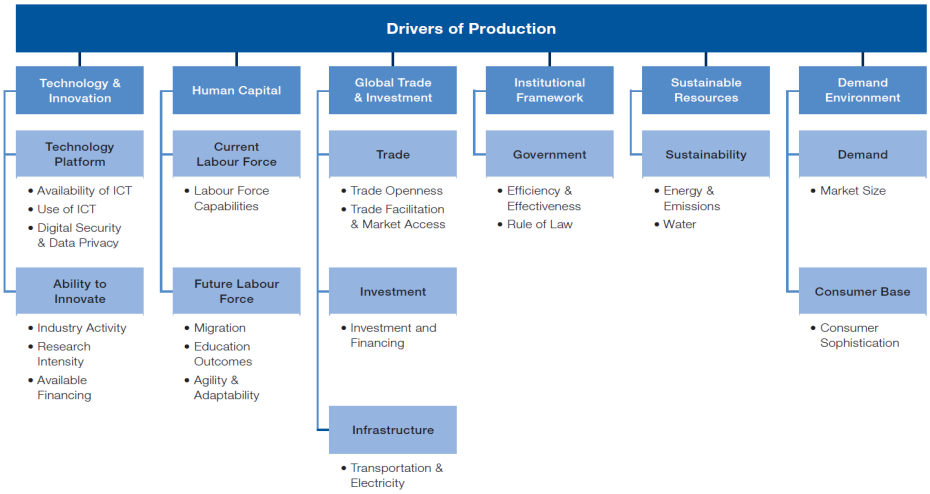


**Figure 2. Drivers of Production**
Source: WEF (2018) p.7.

The assessment comes with challenges and limitations as well, mainly because of three important factors. (WEF 2018 p.9.)

1. Difficulty to measure the uncertainties in relation to the future, and there is a lack of evidence about the topic, because we are only at the beginning of the transformation of production systems globally;
2. Lack of data for some key concepts;
3. It is hard to identify the strengths and weaknesses of manufacturing in a holistic assessment. Each country needed to examine its own sectoral strategy and make implications accordingly.

The assessment was made for 100 countries from all over the world. Every main driver was calculated from normalized indicators at a scale value between 0-10, where 0 is the worst and 10 is the ideal outcome.

### Country archetypes and visualisation

Since every country has its own strategy and policy in relation to production, they did not get an overall global ranking. Instead, four clusters were identified based on the assessment by the Diagnostic Framework (Figure 1): the High-Potential, the Leading, the Nascent, and the Legacy countries to show their relative position to each other (Figure 3). The **Leading** countries have a strong current production system, which means a great basis for future production systems and they have favourable positions regarding the Drivers of Production. This means that their capabilities are good to capitalize the emerging technologies and their effects. The **High-Potential** countries have only limited current production base, but they have the opportunities to increase their capacity regarding the national strategy. The **Legacy** countries have a strong current production base, but they have a disadvantage in the future of production, because of the weaker performance in

the Drivers of Production. The **Nascent** countries have a weak performance in the Drivers of Production and a limited production base as well.

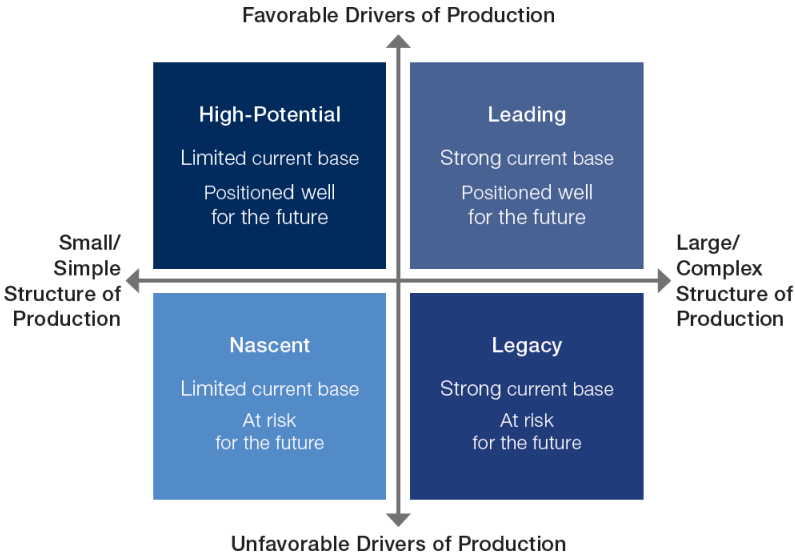


**Figure 3. Country Archetypes**
Source: WEF (2018) p.9.

The exact division line for each of the quadrants is the same, at the value of 5.7. Therefore those countries, which have a higher performance than 5.7 in Drivers of Production, could belong to the High-Potential or the Leading countries. Similarly, if the value of the Structure of Production is higher than 5.7, then those countries could belong to the Leading or the Legacy archetypes.

### General claims of the Readiness for the Futures of Production

Next to classifying countries by their readiness, eight key general findings were also formulated (WEF 2018, p.viii.-x.):

#### Global transformation of production systems will be a challenge, and the future of production could become increasingly polarized in a two-speed world

The 25 Leading countries are responsible for the 77.57% of the world global manufacturing value, the 10 Legacy countries have 10.52% in total, the 58 Nascent countries are responsible only for the 9.97% of the global manufacturing value, and the 7 High-Potential ones have only the remaining 1.94% as it is on Figure 4. All of the Legacy countries are originated from Europe, North America, and East Asia, and approx. 90% of the Nascent countries come from Latin America, the Middle East, Africa, and Eurasia.

Based on Figure 4 Visegrad Group (V4) countries belong to the quadrants on the right side of the map, therefore their position in the structure of production dimension is high. Hence a further comparative analysis is based on the main and sub-drivers of production.

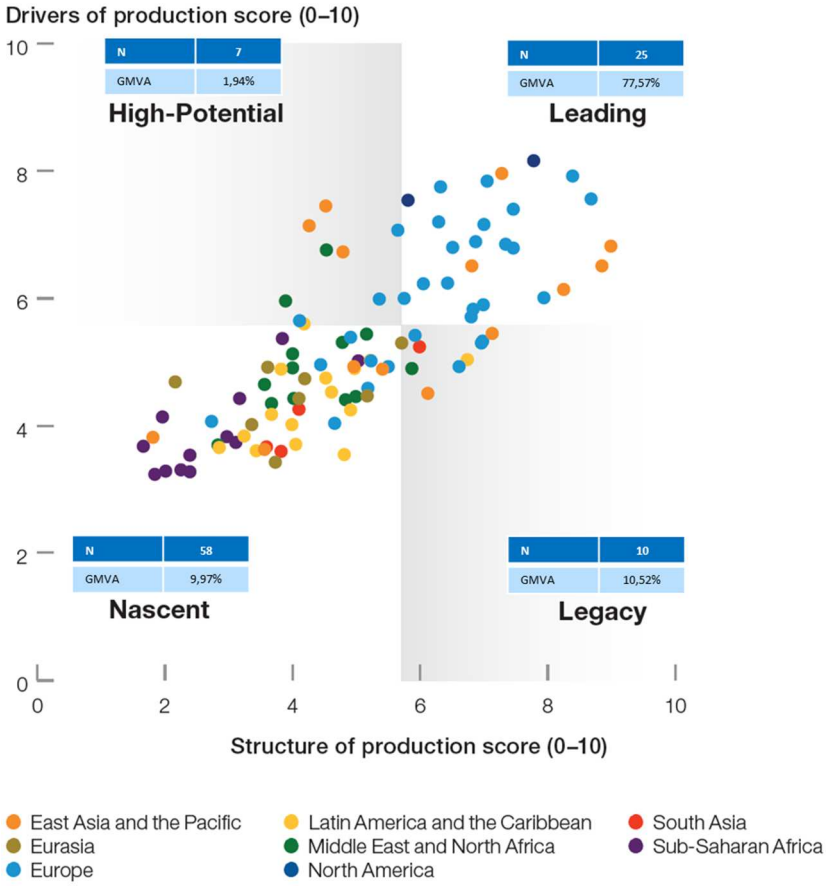


**Figure 4. Global Map of the Results**
Source: WEF (2018) p.9.

**Different pathways will emerge as countries navigate the transformation of production systems**

They identified three different ways:

- Focus on advanced manufacturing: Mainly advanced countries.
- Focus on traditional manufacturing: These countries are mainly low cost labor destinations, or simply prioritize other sectors over production.
- Focus on a dual approach: In some areas or industries these countries focus on an advanced approach, while in others they choose the traditional one.

**All countries have room for improvement**

None of the countries reached its full potential in any of the dimensions. There are early leaders such as China, Germany, Japan, the Republic of Korea, Singapore, and the United States, who can serve as role models for others, but even for them there is room for improvement. Furthermore, every country has an industry specific footprint, which determines the most developed industries within a nation.

**There are common challenges within each archetype**

Leading countries have to find a way to successfully convert readiness into transformation. The Legacy countries have the risk to be squeezed between Leading and Nascent countries, so they have to improve their institutional framework by investing into human capital and boosting the technological platform and the innovation capacity. The key challenge for High-Potential countries will be to find the balance between sectors. The Nascent countries need to determine whether they want to equip the advanced or the traditional manufacturing. Beside that, they have to improve their performance across all Drivers of Production and need to attract global investment.

**As the new technological paradigm brings forth a cluster of new industries, there is potential for leapfrogging, but only a handful of countries are positioned to capitalize**

The High-Potential countries, which are the closest to the quadrant border have the best position to capitalize on leapfrogging opportunities and achieve this new technology paradigm.

**The Fourth Industrial Revolution will trigger selective reshoring, nearshoring and other structural changes to global value chains**

It is important to enhance readiness and develop unique capabilities that make countries attractive production destinations within the global value chain.

**Readiness for the future of production requires global and regional, not just national solutions**

To achieve the full potential of the future of production, there are some enablers that have to be improved, but some cannot be done in isolation. Also, regional co-operations can help the participant countries to compete on a global scale.

**New and innovative approaches to public-private collaboration are needed to accelerate transformation**

Legacy and Nascent countries can accelerate readiness and transformation with the help of the private sector, and the Leading countries can involve them into the development and implementation of strategies like Industry 4.0. Even for stimulating further researches and discussions with the stakeholders of the ongoing processes in the production.

Two other assumptions have also been formulated, based on the assessment:

- The most important drivers of readiness for the future are Technology & Innovation, Human Capital, Institutional Framework and Global Trade & Investment.
- Scale is not a prerequisite for readiness for the future.

## POSITION OF THE V4 COUNTRIES

One of the main aims of the WEF 2018 report was to provide a basis for further researches using its dataset. The profiles of the 100 assessed countries give us an opportunity to examine and compare specific countries. In this paper the V4 countries are in the focus. These countries are the Czech Republic, Hungary, Poland, and the Slovak Republic. The V4 is a political, economic and cultural co-operation between four Central-European countries. (Visegrad Group 2011)

We analysed the position of the V4 countries regarding their main drivers and therefore their classification. (Figure 5) (For the detailed data please see Appendix 2)

| Main Drivers | HU | SK | CZ | PL |
|---|---|---|---|---|
| **Structure of Production** | **7** | **7** | **7,9** | **6.8** |
| Economic complexity | 8 | 7.9 | 8.7 | 7.5 |
| Scale | 5.3 | 5.6 | 6.8 | 5.9 |
| **Drivers of Production** | **5.3** | **5.3** | **6** | **5.8** |
| Technology & Innovation | 4.4 | 4.2 | 5.1 | 4.8 |
| Human Capital | 5.5 | 5.3 | 6.5 | 5.7 |
| Global Trade & Investment | 5.6 | 5.9 | 6.2 | 6.4 |
| Institutional Framework | 5.7 | 5.9 | 6.7 | 6.1 |
| Sustainable Resources | 8 | 8.3 | 7.6 | 7.1 |
| Demand Environment | 4.5 | 4.3 | 5 | 5.9 |
| **Classification** | Legacy | Legacy | Leading | Leading |

**Figure 5. The value of the main drivers of the V4 countries**
Source: WEF (2018).

Based on the Readiness Diagnostic Framework, two of the V4 countries belong to the Legacy archetype (Hungary and the Slovak Republic) and two to the Leading (Czech Republic, Poland). The Drivers of Production in the case of Poland is just barely higher than the 5.7 value, which is the division line of the classification. The values of the Structure of Production are slightly higher for Hungary and the Slovak Republic than Poland. Nonetheless, being in the Legacy archetype means higher performance in the Structure of Production, therefore this difference is reasonable. To move from the Legacy cluster into the Leading one means that the countries have to perform higher in the case of the Drivers of Production. The values between Hungary and the Slovak Republic are quite similar to each other, only minor differences can be found. Sustainable Resources is the only driver, where Hungary and the Slovak Republic are higher than the Czech Republic and Poland. The value of the Institutional Framework is exactly on the division line in case of Hungary and slightly higher in the Slovak Republic. The biggest difference between these Legacy and Leading countries in the Drivers of Production of the V4 can be found in the Demand Environment (it could be distorting because of the size of the

economy of Poland), Technology & Innovation, and Human Capital, therefore these main drivers will be the focus of our analysis, and needed to unfold their sub-drivers and take a closer look on their associated indicators.

**Comparison of the Legacy and Leading countries of the V4**

Being in a Legacy cluster means the given country has a good production basis, which they can build upon the future production system. Therefore, if the Legacy countries want to belong to the Leading countries, they need to have developed indicators from the Drivers of Production dimension. Hungary and the Slovak Republic have a lag behind in every main driver from that dimension except the Sustainable Resources.

In our comparative analysis we chose the Czech Republic as a benchmark, because it has higher performance, than Poland and its economy is closer in size both to Hungary and to the Slovak Republic.

During the analysis we use the percent deviations between the countries to make our calculations more transparent. In the introduction of negative deviations we only present the lowest indicators in the main part of this paper, because we would like to highlight the priorities. Therefore we unfold the main drivers and made our analysis on the level of the sub-drivers and its indicators. In the last column we calculated the percent deviation for every indicator, sub and main driver. For the better visualisation of our results we left the indicators grouped under its sub and main drivers.

**Hungary and the Czech Republic**

On Figure 6 we can see the lowest indicators in the case of Hungary compared to the Czech Republic. For the full list of indicators, please see the Appendix 3. These indicators are belongs to three of the main drivers. The first two indicators are related to the level of the Venture Capital. This means, that not only the absolute value of the Venture Capital is very low but it is low even compared to the size of the economy, which is only 26% compared to the Czech Republic. There is another innovation-related indicator which underperformed, namely the patent applications, with the value of 15.76 applications per million population. Five of these indicators are related to the Human Capital. In the case of the current labor force sub-driver the digital skills among population are the lowest. In the case of the future labor force we can find, that the migration rate and the quality of vocational training are too low. Furthermore, the Pupil to teacher ratio is only 11, which is 7.9 lower than in the Czech Republic, and the country capacity to attract and retain talents is 68% of the Czech level. In the case of the Investment sub-driver, the value of the domestic credit to private sector is only 67% compared to the Czech Republic.

On Figure 7 we can find the overperformed indicators in the case of Hungary compared to the Czech Republic. These indicators are belongs to five of the main drivers. Five of the indicators (trade, buyer sophistication, internet users, female participation in labor force and mobile cellular telephone subscription) are just slightly over the level of the Czech Republic's. In the case of the Future labor force sub-driver, the hiring and firing practices are higher in Hungary than in the Czech Republic. There are two sustainability indicators with significantly higher value than in the Czech Republic. The highest indicator is the R&D expenditures, which is 280% compared to the Czech Republic.

| Main Drivers | Hun | CZ | HUN/CZ |
|---|---|---|---|
| Drivers of Production | 5.3 | 6 | 88% |
| **Technology & Innovation** | **4.4** | **5.1** | **86%** |
| Ability to innovate | 2.4 | 3.1 | 77% |
| Patent applications (applications per million pop.) | 15.76 | 23.32 | 68% |
| Venture capital deal volume (US $millions) | 943.5 | 5412.7 | 17% |
| Venture capital deal volume per size of economy (US$/GDP) | 7.3 | 27.7 | 26% |
| **Human Capital** | **5.5** | **6.5** | **85%** |
| Current Labour Force | 6.9 | 7.6 | 91% |
| Digital Skills among population (1-7 best) | 3.3 | 4 | 83% |
| Future Labour Force | 4 | 5.4 | 74% |
| Migration (migrants/100000 pop) | 7.6 | 19 | 40% |
| Country capacity to attract and retain talents (1-7 best) | 2.5 | 3.3 | 76% |
| Quality of vocational training (1-7 best) | 3.2 | 4.4 | 73% |
| Pupil-to teacher ratio in primary education (ratio) | 11 | 23.8 | 46% |
| **Global Trade & Investment** | **5.6** | **6.2** | **90%** |
| Investment | 1.2 | 1.8 | 67% |
| Domestic credit to private sector (% GDP) | 34.4 | 51.2 | 67% |

**Figure 6. The main indicators with underperformance: Hungary compared to the Czech Republic**
Source: own calculation based on WEF (2018).

| Main Drivers | HU | CZ | HU/CZ |
|---|---|---|---|
| Drivers of Production | | | |
| **Technology & Innovation** | | | |
| Mobile-cellular telephone subscriptions (/100 pop) | 119,1 | 115,5 | 103% |
| Internet users (% population) | 79,3 | 76,5 | 104% |
| Ability to innovate | | | |
| R&D expenditures (% GDP) | 1,4 | 0,5 | 280% |
| **Human Capital** | | | |
| Current Labour Force | | | |
| Female participation in labor force (ratio) | 0,89 | 0,86 | 103% |
| Future Labour Force | | | |
| Hiring and firing practices (1-7 best) | 4,5 | 3,3 | 136% |
| **Global Trade & Investment** | | | |
| Trade | | | |
| Trade (% GDP) | 174,7 | 153,4 | 114% |
| **Sustainable Resources** | | | |
| Sustainability | | | |
| Baseline water stress (Annual withdrawals, % of annual available blue water) | 0,5 | 1,1 | 220% |
| CO2 intensity level (CO2 emissions in megatons/GDP (US$ billions) | 0,3 | 0,5 | 167% |
| **Demand Environment** | | | |
| Consumer Base | | | |
| Buyer sophistication (1-7 best) | 3,2 | 2,9 | 110% |

**Figure 7. The main indicators with overperformance: Hungary compared to the Czech Republic**
Source: own calculation based on WEF (2018).

### The Slovak Republic and the Czech Republic

On Figure 8 we can see the indicators, with the lowest value in the case of the Slovak Republic compared to the Czech Republic. For the full list of indicators, please see Ap-

pendix 3 again. These indicators belong to three of the main drivers. The innovation side of the Technology and Innovation main driver is far worse than the technological one. The number of the patent applications and the scientific and technical publications is significantly less than in the Czech Republic. The situation with the Venture Capital is the same as in the case of Hungary.

In the case of the Future Labor Force from the Human Capital driver the problems mainly come from the educational side of the indicators. The number of quality universities is exceptionally low (only one). The migration indicator is only 15% compared to the Czech Republic. The problems of the Global Trade & Investment driver come from the Investment sub-driver, namely from the FDI inflows and Greenfield Investments. The FDI inflows are only 10% compared to the Czech Republic.

| Main Drivers | SK | CZ | SK/CZ |
|---|---|---|---|
| Drivers of Production | 5.3 | 6 | 88% |
| **Technology & Innovation** | **4.2** | **5.1** | **82%** |
| Ability to innovate | 2.3 | 3.1 | 74% |
| Scientific and technical publications (number per Billion PPP$ GDP) | 19.6 | 34,.7 | 56% |
| Patent applications (applications per million pop.) | 7.45 | 23.32 | 32% |
| Venture capital deal volume (US $millions) | 672.8 | 5412.7 | 12% |
| Venture capital deal volume per size of economy (US$/GDP) | 7.3 | 27.7 | 26% |
| **Human Capital** | **5.3** | **6.5** | **82%** |
| Future Labour Force | 3.5 | 5.4 | 65% |
| Migration (migrants/100000 pop) | 2.8 | 19 | 15% |
| Country capacity to attract and retain talents (1-7 best) | 2.2 | 3.3 | 67% |
| Quality of Universities (count) | 1 | 10 | 10% |
| **Global Trade & Investment** | **5.9** | **6.2** | **95%** |
| Investment | 1.5 | 1.8 | 83% |
| Greenfield Investments (US $ millions) | 2025.8 | 3365.5 | 60% |
| FDI inflows (US$ millions) | 510.7 | 5018 | 10% |

**Figure 8. The main indicators with underperformance: the Slovak Republic compared to the Czech Republic**
Source: own calculation based on WEF (2018).

On Figure 9 we can find the indicators, which are higher in the Slovak Republic than in the Czech Republic. These indicators belong to four of the main drivers. Seven of the indicators (female participation in labor force, electricity infrastructure, FDI and technology transfer, internet users, government procurement of advanced technology products, mobile cellular subscriptions, and domestic credit to private sector) are just slightly higher than in the Czech Republic. From the Global Trade Investment, the Trade indicator performed higher than the other two in this sub-driver. The case is similar to Hungary when it comes to the R&D expenditures indicator, the value of which is 180% of the level of the Czech Republic. There are four sustainability indicators with significantly higher value than in the Czech Republic.

## CONCLUSIONS

One of the main goals of The Readiness Assessment from the WEF is to catalyse structured multi-stakeholder dialogues between the public and private sectors. We chose the V4 countries as a focus of our paper. Therefore we analysed Hungary and the Slo-

vak Republic, which belong to the Legacy archetype and compared them to the Czech Republic, which was used as a benchmark. After we expanded the main indicators, the results of the analysis showed us a diverse picture on the differences between the levels of the sub-indicators. In terms of the defined main assumptions from the WEF, Hungary and the Slovak Republic have lower values in three out of the four most important drivers in connection with the Drivers of Production.

| Main Drivers | SK | CZ | SK/CZ |
|---|---|---|---|
| Drivers of Production | | | |
| **Technology & Innovation** | | | |
| Technology Platform | | | |
| Mobile-cellular telephone subscriptions (/100 pop) | 128 | 115.5 | 111% |
| Internet users (% population) | 80.5 | 76.5 | 105% |
| FDI and technology transfer (1-7 best) | 5.2 | 5 | 104% |
| Ability to innovate | | | |
| Gov't procurement of advanced technology products (1-7 best) | 3.2 | 3 | 107% |
| R&D expenditures (% GDP) | 0.9 | 0.5 | 180% |
| **Human Capital** | | | |
| Current Labour Force | | | |
| Female participation in labor force (ratio) | 0.88 | 0.86 | 102% |
| **Global Trade & Investment** | | | |
| Trade | | | |
| Trade (% GDP) | 183.9 | 153.3 | 120% |
| Investment | | | |
| Domestic credit to private sector (% GDP) | 57 | 51.2 | 111% |
| Infrastructure | | | |
| Electricity infrastructure (0-100) | 100 | 96.5 | 104% |
| **Sustainable Resources** | | | |
| Sustainability | | | |
| Alternative and nuclear energy use (% total energy use) | 0.4 | 0.3 | 133% |
| CO2 intensity level (CO2 emissions in megatons/GDP (US$ billions) | 0.3 | 0.5 | 167% |
| CH4 intensity level (CH4 emissions in megatons/GDP (US$ billions) | 0 | 0.1 | NA |
| Baseline water stress (Annual withdrawals, % of annual available blue water) | 0.2 | 1.1 | 550% |

**Figure 9. The main indicators with overperformance: the Slovak Republic compared to the Czech Republic**
Source: own calculation based on WEF (2018).

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**Appendix 1 Definitions of the main indicators of the Drivers of Production**

| Drivers of Production | Description |
|---|---|
| **Technology & Innovation (Weight: 20%)** | |
| Technology Platform (7) | |
| Mobile-cellular telephone subscriptions | Number of mobile-cellular telephone subscriptions per 100 people. This includes post-paid subscriptions, active prepaid accounts (i.e. that have been active during the past three months) and all mobile-cellular subscriptions that offer voice communications. |
| LTE mobile network coverage | Percentage of the population covered by at least an LTE/WiMAX mobile network. Refers to the percentage of inhabitants that live within range of LTE/LTE-Advanced, mobile WiMAX/WirelessMAN or other more advanced mobile-cellular networks, irrespective of whether or not they are subscribers. This is calculated by dividing the number of inhabitants that are covered by the previously mentioned mobile-cellular technologies by the total population and multiplying by 100. It excludes people covered only by HSPA, UMTS, EVDO and previous 3G technologies, and also excludes fixed WiMAX coverage. |
| Internet users | Percentage of individuals who used the internet from any location and for any purpose, irrespective of the device and network used, in the last three months. |
| FDI and technology transfer | Executive Opinion Survey: "To what extent does foreign direct investment (FDI) bring new technology into your country? (1 = not at all, 7 = to a great extent)" |
| Firm-level technology absorption | Executive Opinion Survey: "In your country, to what extent do businesses adopt the latest technologies? (1 = not at all, 7 = to a great extent)" |
| ICT-enabled business models | Executive Opinion Survey: "In your country, to what extent do ICTs enable new business models? (1=not at all, 7=to a great extent)" |
| Cybersecurity commitment | Score from the 2017 Global Cybersecurity Index, which measures cybersecurity commitment across five pillars:<br>Legal: Measured based on the existence of legal institutions and frameworks dealing with cybersecurity and cybercrime.<br>Technical: Measured based on the existence of technical institutions and frameworks dealing with cybersecurity.<br>Organizational: Measured based on the existence of policy coordination institutions and strategies for cybersecurity development at the national level.<br>Capacity Building: Measured based on the existence of research and development, education and training programs; certified professionals and public sector agencies fostering capacity building.<br>Cooperation: Measured based on the existence of partnerships, cooperative frameworks and information sharing networks. |
| Ability to innovate (10) | |
| State of cluster development | Executive Opinion Survey: "In your country, how widespread are well-developed and deep clusters (geographic concentrations of firms, suppliers, producers of related products and services, and specialized institutions in a particular field)? (1 = nonexistent, 7 = widespread in many fields)" |

| | |
|---|---|
| Company investment in emerging technologies | Executive Opinion Survey: "In your country, to what extent do companies invest in emerging technologies (e.g. Internet of Things, advanced analytics and artificial intelligence, augmented virtual reality and wearables, advanced robotics, 3D printing)? (1=not at all, 7= to a great extent)" |
| | |
| Companies embracing disruptive ideas | Executive Opinion Survey: "In your country, to what extent do companies embrace risky or disruptive business ideas? (1 = not at all, 7 = to a great extent)" |
| Multi-stakeholder collaboration | Average score of the three following Executive Opinion Survey questions: "In your country, to what extent do people collaborate and share ideas within a company? (1 = not at all, 7 = to a great extent)"; "In your country, to what extent do companies collaborate in sharing ideas and innovating? (1 = not at all, 7 = to a great extent)"; and "In your country, to what extent do business and universities collaborate on research and development (R&D)? (1 = not at all, 7 = to a great extent)" |
| R&D expenditures | Expenditure on research and development (R&D) as a percentage of gross domestic product (GDP). Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society and the use of knowledge for new applications. R&D covers basic research, applied research and experimental development. |
| Scientific and technical publications | Number of scientific and technical journal articles published per billion PPP$ GDP. Article counts are from a set of journals covered by the Science Citation Index (SCI) and the Social Sciences Citation Index (SSCI). Articles are classified by year of publication and assigned to each country/economy on basis of the institutional address(es) listed in the article. Articles are counted on a count basis (rather than a fractional basis)—that is, for articles with collaborating institutions from multiple countries/economies, each country/economy receives credit on the basis of its participating institutions. |
| Patent applications | Total number of patent families filed in at least two of the major five (IP5) patent offices in the world per million people. The major five (IP%) offices are: the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), and the United States Patent and Trademark Office (USPTO). Data is extracted from the PATSTAT database by earliest filing date and inventor country, using fractional counts. Presented in average number of applications over 2012-2014 and divided by the average population over the same period to get per million population. |
| Venture capital deal volume | Three-year average value of venture capital deals (US$). Deal status includes: Completed; Announced; In bidding process; Upcoming; Postponed. Deal date from: 1 January 2014 to 31 December 2016. |
| Venture capital deal volume per size of economy | Three-year average value of venture capital deals divided by the three-year average value of GDP (US$). Deal status includes: Completed; Announced; In bidding process; Upcoming; Postponed. Deal date from: 1 January 2014 to 31 December 2016. The data are reported per billion PPP$ GDP. |
| **Human Capital (Weight: 20%)** | |
| Current Labour Force (6) | |

| | |
|---|---|
| Manufacturing employment | The share of manufacturing employment in total employment. Employment is defined as comprising all persons of working age who, during a specified brief period, were in the following categories: paid employment (whether at work or with a job but not at work) or self-employment (whether at work or with an enterprise but not at work). No distinction is made between persons employed full time and those working less than full time. The sectors of economic activity are defined according to the International Standard Industrial Classification of All Economic Activities (ISIC), Revision 3 (1990) and Revision 4 (2008). Manufacturing refers to industries belonging to the sector D defined by ISIC Revision 3, or C defined by ISIC Revision 4. Figures for updates are obtained from national data and estimates produced by the International Labour Organization (ILO). |
| Knowledge-intensive employment | Sum of people in categories 1 to 3 as a percentage of total people employed, according to the International Standard Classification of Occupations (ISCO). Categories included are: ISCO-08: 1 Managers, 2 Professionals, and 3 Technicians and associate professionals (years 2007– 15); ISCO-88: 1 Legislators, senior officials and managers, 2 Professionals, 3 Technicians and associate professionals (2007–15); ISCO-68: 1 Professional, technical and related workers (category 0 Armed forces is excluded), 2 Administrative and managerial workers, 3 Clerical and related workers (years 2007–08). |
| Female participation in labour force | The ratio of the percentage of women aged 15–64 participating in the labour force as workers earning wages and salaries to the percentage of men aged 15–64 participating in the labour force as workers earning wages and salaries. |
| Mean years of schooling | Average number of completed years of education of a country's population aged 25 years and older. |
| Availability of scientist and engineers | Executive Opinion Survey: "In your country, to what extent are scientists and engineers available? (1 = not available at all, 7 = widely available)" |
| Digital Skills among population | Executive Opinion Survey: "In your country, to what extent does the active population possess sufficient digital skills (e.g. computer skills, basic coding, digital reading)? (1= not at all, 7= to a great extent)" |
| Future Labour Force (11) | |
| Migration | The measure of net migration (inflows and outflows) in a country over the period from 2010–2015, in 000s of people (in thousands), per 2015 population size. |
| Country capacity to attract and retain talents | Average score of the two following Executive Opinion Survey questions: "To what extent does your country attract talented people from abroad? (1 = not at all; 7 = to a great extent, the country attracts the best and brightest from around the world)" and "To what extent does your country retain talented people? (1 = not at all, the best and brightest leave to pursue opportunities abroad; 7 = to a great extent, the best and brightest stay and pursue opportunities in the country)" |
| Quality of Universities | The number of universities for each country included in QS World University Ranking 2018 out of 972 universities. |
| Quality of vocational training | Executive Opinion Survey: "In your country, how do you assess the quality of vocational training? (1 = extremely poor, among the worst in the world; 7 = excellent, among the best in the world) |

| | |
|---|---|
| Quality of math and science education | Executive Opinion Survey: "In your country, how do you assess the quality of math and science education? (1 = extremely poor, among the worst in the world; 7 = excellent, among the best in the world)" |
| School life expectancy | Total number of years of schooling (primary to tertiary) that a child can expect to receive. Based on the assumption that the probability of his or her being enrolled in school at any particular future age is equal to the current enrollment ratio at that age. |
| Pupil-to teacher ration in primary education | Average number of pupils per teacher based on the headcounts of both pupils and teachers in a country. |
| Critical thinking in teaching | Executive Opinion Survey: "In your country, how do you assess the style of teaching? (1 = frontal, teacher based and focused on memorizing; 7 = encourages creative and critical individual thinking)" |
| Active labour policies | Executive Opinion Survey: "In your country, to what extent are unemployed people supported in reskilling and finding new employment? (1=not at all, 7=to a great extent)" |
| On-the-job training | Average score of the two following Executive Opinion Survey questions: 1) "In your country, how available are high-quality, professional training services? (1 = not available at all, 7 = widely available)" and 2) "In your country, to what extent do companies invest in training and employee development? (1 = not at all, 7 = to a great extent)" |
| Hiring and firing practices | Executive Opinion Survey: "In your country, to what extent do regulations allow flexible hiring and firing of workers? (1 = not at all, 7 = to a great extent)" |
| **Global Trade & Investment (Weight: 20%)** | |
| Trade (4) | |
| Trade | The sum of exports and imports of goods and services measured as a share of GDP. |
| Trade tariffs | Trade-weighted average tariff rate. An applied tariff is a customs duty that is levied on imports of merchandise goods. This indicator is calculated as a weighted average of all the applied tariff rates, including preferential rates that a country applies to the rest of the world. The weights are the trade patterns of the importing country's reference group. |
| Prevalence of trade barriers | Executive Opinion Survey: "In your country, to what extent do non-tariff barriers (e.g. health and product standards, technical and labeling requirements, etc.) limit the ability of imported goods to compete in the domestic market? (1 = strongly limit, 7 = do not limit at all)" |
| Logistics performance | Average score of five components from the International Logistics Performance Index:<br>-Customs: the efficiency of customs and border management clearance<br>- Ease of arranging shipments: the ease of arranging competitively priced shipments<br>- Quality of logistics services: the competence and quality of logistics services—trucking, forwarding and customs brokerage<br>- Tracking and tracing: the ability to track and trace consignments<br>- Timeliness: the frequency with which shipments reach consignees within scheduled or expected delivery times |
| Investment (3) | |

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|---|---|
| Greenfield Investments (US $ millions) | Five-year average value of announced greenfield FDI projects, by destination, in US$ (millions). A greenfield investment is a form of foreign direct investment where a parent company builds its operations in a foreign country from the ground up, organically. |
| FDI inflows (US$ millions) | Five-year average net FDI flows of country or economy. FDI inflows and outflows comprise capital provided (either directly or through other related enterprises) by a foreign direct investor to a FDI enterprise, or capital received by a foreign direct investor from a FDI enterprise. Data on FDI flows are presented on net bases (capital transactions' credits less debits between direct investors and their foreign affiliates) |
| Domestic credit to private sector (% GDP) | Financial resources provided to the private sector by financial corporations as a percentage of GDP. Financial resources are loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. |
| Infrastructure (2) | |
| Transport Infrastructure | This indicator is calculated by the World Economic Forum by aggregating eight indicators that measure roads, railroads, air transport and water transport infrastructure. |
| Electricity infrastructure (0-100) | This indicator is calculated by the World Economic Forum by aggregating two indicators that measure the electrification rate and electric power transmission and distribution losses. For more information, write to |
| **Institutional Framework (Weights: 20%)** | |
| Government (4) | |
| Regulatory efficiency | Average of score of three components from the Index of Economic Freedom:<br>- Business Freedom: the extent to which the regulatory and infrastructure environments constrain the efficient operation of businesses.<br>- Labour Freedom: considers various aspects of the legal and regulatory framework of a country's labour market, including regulations concerning minimum wages, laws inhibiting layoffs, severance requirements, and measurable regulatory restraints on hiring and hours worked, plus the labour force participation rate as an indicative measure of employment opportunities in the labour market.<br>- Monetary Freedom: combines a measure of price stability with an assessment of price controls. |
| Corruption Perceptions Index | Overall score from the Corruption Perceptions Index (CPI). The CPI scores/ranks countries/territories based on their perceived level of corruption in the country's public sector. It is a composite index: a combination of surveys and assessments of corruption, collected by a variety of reputable institutions. |
| Future orientation of government | Average score of the following four Executive Opinion Survey questions:<br>1) "In your country, how fast is the legal framework of your country in adapting to digital business models (e.g. e-commerce, sharing economy, fintech, etc.)? (1 = not fast at all, 7 = very fast)"; 2) "In your country, to what extent does the government ensure a stable policy environment for doing business?"; 3) "In your country, to what extent does the government respond effectively to change (e.g. technological changes, societal and demographic trends, security and economic challenges)?"; 4) "In your country, to what extent does the government have a long-term vision in place?" For the last three questions, the answer ranges from 1 (not at all) to 7 (to a great extent). |

| | |
|---|---|
| Rule of law ((2,5)-2 best) | Score for the Rule of Law dimension in the *Worldwide Governance Indicators* report issued by the World Bank. Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence. |
| **Sustainable Resources (Weight: 5%)** | |
| Sustainability (6) | |
| Alternative and nuclear energy use | Alternative energy includes hydropower and nuclear, geothermal, biomass and solar power, among others. Calculated as a % based on Total Primary Energy Supply. |
| CO2 intensity level | Total CO2 (carbon dioxide) emissions in a given country, as a ratio of GDP (US$ billions). |
| CH4 intensity level | Total CH4 (methane) emissions in a given country, as a ratio of GDP (US$ billions). |
| N2O intensity level | Total N2O (nitrous oxide) emissions in a given country, as a ratio of GDP (US$ billions). |
| Baseline Water Stress | Score for Baseline Water Stress from the World Resources Institute report. Baseline water stress measures total annual water withdrawals (municipal, industrial and agricultural) expressed as a percentage of the total annual available blue water. Higher values indicate more competition among users. Countries were sorted into 5 respective categories based on their respective scores, low <10% (score from 0–1), low to medium 10-20% (score from 1–2), medium to high (score from 2–3), high 40–80% (score from 3–4), and extremely high >80% (4–5). |
| Wastewater treatment | Score for Wastewater Treatment from the Yale EPI. The indicator measures the proportion of wastewater collected and produced by households, municipalities, and industry that is treated, weighted by the population covered by the sewage network. |
| **Demand Environment (Weight: 15%)** | |
| Foreign and Domestic Demand (1) | |
| Market size (0-100 best) | This indicator is calculated by the World Economic Forum as an aggregate measure that reflects Gross Domestic Product (GDP) valued at purchasing power parity in billions of international dollars and the imports of goods and services as a percentage of GDP. The score corresponds to the natural logarithm of the sum of GDP and imports, valued at purchasing power parity (PPP). Valuation of imports at PPP is estimated by multiplying the share of exports by the value of GDP. |
| Consumer Base (2) | |
| Buyer sophistication | Executive Opinion Survey: "In your country, on what basis do buyers make purchasing decisions? (1 = based solely on the lowest price, 7 = based on sophisticated performance attributes)" |
| Extent of market dominance (1-7 best) | Executive Opinion Survey: "In your country, how do you characterize corporate activity? (1 = dominated by a few business groups, 7 = spread among many firms)" |

Source: WEF FOP 2018.

**Appendix 2 The values of the indicators of the FoP in the V4 countries**

| Main Driver | Sub-Driver | Indicators | Hungary | Slovak Republic | Czech Republic | Poland |
|---|---|---|---|---|---|---|
| Technology and innovation | Technology Platform | Mobile-cellular telephone subscriptions (/100 pop) | 119.1 | 128 | 115.5 | 146.2 |
| | | LTE mobile network coverage (% population) | 98 | 87 | 99.7 | 100 |
| | | Internet users (% population) | 79.3 | 80.5 | 76.5 | 73.3 |
| | | FDI and technology transfer (1-7 best) | 4.7 | 5.2 | 5 | 4.9 |
| | | Firm-level technology absorption (1-7 best) | 4 | 4.8 | 5.1 | 4.6 |
| | | Impact of ICTs on new services and products (1-7 best) | 4.8 | 4.9 | 5.1 | 4.8 |
| | | Cybersecurity commitment (0-1 best) | 0.5 | 0.4 | 0.6 | 0.6 |
| | Ability to Innovate | State of cluster development (1-7 best) | 3.5 | 3.8 | 3.9 | 3.8 |
| | | Company investment in emerging technologies (1-7 best) | 3 | 3.9 | 4.1 | 3.6 |
| | | Gov't procurement of advanced technology products (1-7 best) | 2.8 | 3.2 | 3 | 3.1 |
| | | Companies embracing disruptive ideas (1-7 best) | 2.9 | 3.4 | 3.7 | 3.2 |
| | | Multi-stakeholder collaboration (1-7 best) | 3.2 | 3.6 | 3.9 | 3.1 |
| | | R&D expenditures (% GDP) | 1.4 | 0.9 | 0.5 | 1 |
| | | Scientific and technical publications (number per Billion PPP$ GDP) | 25.3 | 19.6 | 34.7 | 25.1 |
| | | Patent applications (applications per million pop.) | 15.76 | 7.45 | 23.32 | 10.35 |
| | | Venture capital deal volume (US $millions) | 943.5 | 672.8 | 5412.7 | 7975.1 |
| | | Venture capital deal volume per size of economy (US$/GDP) | 7.3 | 7.3 | 27.7 | 16 |
| Human Capital | Current Labor Force | Manufacturing employment (% of working population) | 21.4 | 24.7 | 27.3 | 19.3 |
| | | Knowledge-intensive employment (% of working population) | 34.9 | 31.9 | 37.6 | 37.6 |
| | | Female participation in labor force (ratio) | 0.89 | 0.88 | 0.86 | 0.89 |
| | | Mean years of schooling (Years) | 12.3 | 12.7 | 12.8 | 12.7 |
| | | Availability of scientist and engineers (1-7 best) | 3.6 | 3.5 | 3.8 | 4.2 |
| | | Digital Skills among population (1-7 best) | 3.3 | 4.7 | 5.3 | 4.3 |
| | | Migration (migrants/100000 pop) | 7.6 | 2.8 | 19 | -1 |
| | Future Labor Force | Country capacity to attract and retain talents (1-7 best) | 2.5 | 2.2 | 3.5 | 2.8 |
| | | Quality of Universities (count) | 6 | 1 | 6 | 9 |
| | | Quality of math and science education (1-7 best) | 3.9 | 3.8 | 4.5 | 4.5 |
| | | Quality of vocational training (1-7 best) | 3.2 | 3.6 | 4.8 | 3.6 |
| | | School life expectancy (Years) | 15.4 | 15 | 16.9 | 16.1 |
| | | Pupil-to teacher ratio in primary education (ratio) | 11 | 15.2 | 18.9 | 10.2 |
| | | Critical thinking in teaching (1-7 best) | 3.2 | 3 | 3.4 | 3.2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Active labor policies (1-7 best) | 3.2 | 3.7 | 4.4 | 3.2 |
| | | On-the-job training (1-7 best) | 3.7 | 4.1 | 5.1 | 4.4 |
| | | Hiring and firing practices (1-7 best) | 4.5 | 3.1 | 3.3 | 3.4 |
| Global Trade Investment | Trade | Trade (% GDP) | 174.7 | 183.9 | 153.3 | 100.7 |
| | | Trade tariffs (% duty) | 0.01 | 0.01 | 0.01 | 0.01 |
| | | Prevalence of non-tariff barriers (1-7 best) | 4.1 | 4.5 | 5.1 | 4.6 |
| | Investment | Logistics Performance (1-5 best) | 3.4 | 3.3 | 3.7 | 3.5 |
| | | Greenfield Investments (US $ millions) | 3085 | 2025.8 | 3365.5 | 9018.8 |
| | | FDI inflows (US$ millions) | 4251.9 | 510.7 | 5018 | 9485.5 |
| | | Domestic credit to private sector (% GDP) | 34.4 | 57 | 51.2 | 54.6 |
| | Infra-structure | Transport Infrastructure (0-100 best) | 61 | 54.4 | 63.4 | 59 |
| | | Electricity infrastructure (0-100) | 78.5 | 100 | 96.5 | 92.1 |
| Institution-al Frame-work | Govern-ment | Regulatory efficiency (0-100 best) | 73.4 | 66.8 | 76.9 | 71.3 |
| | | Incidence of corruption (0-100 best) | 48 | 51 | 55 | 62 |
| | | Future orientation of government (1-7 best) | 3 | 3 | 3.2 | 3.1 |
| | | Rule of law ((2,5)-2 best) | 0.5 | 0.7 | 1.1 | 0.7 |
| Sustainable Resources | Sustain-ability | Alternative and nuclear energy use (% total energy use) | 0.3 | 0.4 | 0.3 | 0.1 |
| | | CO2 intensity level (CO2 emissions in mega-tons/GDP (US$ billions) | 0.3 | 0.3 | 0.5 | 0.5 |
| | | CH4 intensity level (CH4 emissions in mega-tons/GDP (US$ billions) | 0.1 | 0 | 0.1 | 0.1 |
| | | N2O intensity level (N2O emissions in mega-tons/GDP (US$ billions) | 0 | 0 | 0 | 0.1 |
| | | Baseline water stress (Annual withdrawals, % of annual available blue water) | 0.5 | 0.2 | 1.1 | 1.3 |
| | | Wastewater treatment (0-100 best) | 84.6 | 86.2 | 89 | 87.4 |
| Demand Environment | Foreign and domestic demand | Market size (0-100 best) | 53.7 | 48.6 | 56.6 | 67.2 |
| | Consumer Base | Buyer sophistication (1-7 best) | 3.2 | 2.9 | 2.9 | 3.4 |
| | | Extent of market dominance (1-7 best) | 3.2 | 3.5 | 4.3 | 4.7 |

Source: Own calculation based on WEF 2018

**Appendix 3 The full comparison of Hungary and the Slovak Republic to the corresponding value of the Czech Republic regarding the Drivers of Production**

| Main Driver | Sub-Driver | Indicators | Hungary | Slovak Republic | Czech Republic | HU-CZ | SK-CZ |
|---|---|---|---|---|---|---|---|
| Technology and innovation | Technology Platform | Mobile-cellular telephone subscriptions (/100 pop) | 119.1 | 128 | 115.5 | 103% | 111% |
| | | LTE mobile network coverage (% population) | 98 | 87 | 99.7 | 98% | 87% |
| | | Internet users (% population) | 79.3 | 80.5 | 76.5 | 104% | 105% |
| | | FDI and technology transfer (1-7 best) | 4.7 | 5.2 | 5 | 94% | 104% |
| | | Firm-level technology absorption (1-7 best) | 4 | 4.8 | 5.1 | 78% | 94% |
| | | Impact of ICTs on new services and products (1-7 best) | 4.8 | 4.9 | 5.1 | 94% | 96% |
| | | Cybersecurity commitment (0-1 best) | 0.5 | 0.4 | 0.6 | 83% | 67% |
| | Ability to Innovate | State of cluster development (1-7 best) | 3.5 | 3.8 | 3.9 | 90% | 97% |
| | | Company investment in emerging technologies (1-7 best) | 3 | 3.9 | 4.1 | 73% | 95% |
| | | Gov't procurement of advanced technology products (1-7 best) | 2.8 | 3.2 | 3 | 93% | 107% |
| | | Companies embracing disruptive ideas (1-7 best) | 2.9 | 3.4 | 3.7 | 78% | 92% |
| | | Multi-stakeholder collaboration (1-7 best) | 3.2 | 3.6 | 3.9 | 82% | 92% |
| | | R&D expenditures (% GDP) | 1.4 | 0.9 | 0.5 | 280% | 180% |
| | | Scientific and technical publications (number per Billion PPP$ GDP) | 25.3 | 19.6 | 34.7 | 73% | 56% |
| | | Patent applications (applications per million pop.) | 15.76 | 7.45 | 23.32 | 68% | 32% |
| | | Venture capital deal volume (US $millions) | 943.5 | 672.8 | 5412.7 | 17% | 12% |
| | | Venture capital deal volume per size of economy (US$/GDP) | 7.3 | 7.3 | 27.7 | 26% | 26% |
| Human Capital | Current Labor Force | Manufacturing employment (% of working population) | 21.4 | 24.7 | 27.3 | 78% | 90% |
| | | Knowledge-intensive employment (% of working population) | 34.9 | 31.9 | 37.6 | 93% | 85% |
| | | Female participation in labor force (ratio) | 0.89 | 0.88 | 0.86 | 103% | 102% |
| | | Mean years of schooling (Years) | 12.3 | 12.7 | 12.8 | 96% | 99% |
| | | Availability of scientist and engineers (1-7 best) | 3.6 | 3.5 | 3.8 | 95% | 92% |
| | | Digital Skills among population (1-7 best) | 3.3 | 4.7 | 5.3 | 62% | 89% |
| | | Migration (migrants/100000 pop) | 7.6 | 2.8 | 19 | 40% | 15% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Future Labor Force | Country capacity to attract and retain talents (1-7 best) | 2.5 | 2.2 | 3.5 | 71% | 63% |
| | | Quality of Universities (count) | 6 | 1 | 6 | 100% | 17% |
| | | Quality of math and science education (1-7 best) | 3.9 | 3.8 | 4.5 | 87% | 84% |
| | | Quality of vocational training (1-7 best) | 3.2 | 3.6 | 4.8 | 67% | 75% |
| | | School life expectancy (Years) | 15.4 | 15 | 16.9 | 91% | 89% |
| | | Pupil-to teacher ratio in primary education (ratio) | 11 | 15.2 | 18.9 | 58% | 80% |
| | | Critical thinking in teaching (1-7 best) | 3.2 | 3 | 3.4 | 94% | 88% |
| | | Active labor policies (1-7 best) | 3.2 | 3.7 | 4.4 | 73% | 84% |
| | | On-the-job training (1-7 best) | 3.7 | 4.1 | 5.1 | 73% | 80% |
| | | Hiring and firing practices (1-7 best) | 4.5 | 3.1 | 3.3 | 136% | 94% |
| Global Trade Investment | Trade | Trade (% GDP) | 174.7 | 183.9 | 153.3 | 114% | 120% |
| | | Trade tariffs (% duty) | 0.01 | 0.01 | 0.01 | 100% | 100% |
| | | Prevalence of non-tariff barriers (1-7 best) | 4.1 | 4.5 | 5.1 | 80% | 88% |
| | Investment | Logistics Performance (1-5 best) | 3.4 | 3.3 | 3.7 | 92% | 89% |
| | | Greenfield Investments (US $ millions) | 3085 | 2025.8 | 3365.5 | 92% | 60% |
| | | FDI inflows (US$ millions) | 4251.9 | 510.7 | 5018 | 85% | 10% |
| | | Domestic credit to private sector (% GDP) | 34.4 | 57 | 51.2 | 67% | 111% |
| | Infrastructure | Transport Infrastructure (0-100 best) | 61 | 54.4 | 63.4 | 96% | 86% |
| | | Electricity infrastructure (0-100) | 78.5 | 100 | 96.5 | 81% | 104% |
| Institutional Framework | Government | Regulatory efficiency (0-100 best) | 73.4 | 66.8 | 76.9 | 95% | 87% |
| | | Incidence of corruption (0-100 best) | 48 | 51 | 55 | 87% | 93% |
| | | Future orientation of government (1-7 best) | 3 | 3 | 3.2 | 94% | 94% |
| | | Rule of law ((2,5)-2 best) | 0.5 | 0.7 | 1.1 | 45% | 64% |
| Sustainable Resources | Sustainability | Alternative and nuclear energy use (% total energy use) | 0.3 | 0.4 | 0.3 | 100% | 133% |
| | | CO2 intensity level (CO2 emissions in megatons/GDP (US$ billions) | 0.3 | 0.3 | 0.5 | 167% | 167% |
| | | CH4 intensity level (CH4 emissions in megatons/GDP (US$ billions) | 0.1 | 0 | 0.1 | 100% | N/A |
| | | N2O intensity level (N2O emissions in megatons/GDP (US$ billions) | 0 | 0 | 0 | N/A | N/A |
| | | Baseline water stress (Annual withdrawals, % of annual available blue water) | 0.5 | 0.2 | 1.1 | 220% | 550% |
| | | Wastewater treatment (0-100 best) | 84.6 | 86.2 | 89 | 95% | 97% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Demand Environment** | **Foreign and domestic demand** | Market size (0-100 best) | 53.7 | 48.6 | 56.6 | 95% | 86% |
| | **Consumer Base** | Buyer sophistication (1-7 best) | 3.2 | 2.9 | 2.9 | 110% | 100% |
| | | Extent of market dominance (1-7 best) | 3.2 | 3.5 | 4.3 | 74% | 81% |

Source: Own calculation based on WEF 2018

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