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Research Results
Резултати от научни изследвания

BULGARIA'S TECHNOLOGICAL DEVELOPMENT THROUGH THE PRISM OF HIGHER EDUCATION POLICIES

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Abstract. The current paper aims at studying the technological development and the economic growth related with it from the perspective of the development of human brains and cognitive abilities of people, thus linking it to the educational framework, strategies, and policies, which a country sets as a basis for such development. The paper focuses on the technological development of Bulgaria and relating it to the country's educational development. The research question set in the current paper is if and how technological development of a country is influenced by its educational policies in the field of higher education. Main results of the study show that Bulgaria has implemented a number of educational changes during the past 30 years, arguing that doing so will assist the nation achieve higher levels of socioeconomic development. There are still significant educational inequalities based on location and socioeconomic background, and overall productivity increases have not yet fully translated into sustainable and equitable growth in Bulgaria.

Keywords: technological change; higher education policy; industrial economics; industrial business

1. Introduction

Technological change may have many triggers but at its very core it is about looking for a solution of a problem and finding that solution that leads to growth and prosperity – societal change that steps on that new technology. From a theoretical point of view, the impact of technology on the economy is mainly seen in the cumulative causality model of Kaldor (1966), which considers the positive relationship between gross national product and production growth. This idea introduces the concept of production as an engine of economic growth, and it is based on the recognition that industrialisation accelerates the pace of technological change throughout the economy.

Technology development rarely occurs by chance and even if it does – the chance comes after hours of deliberate intellectual endeavour, trial and error,

and background knowledge and experience that find their way in a successfully developed new product, process, method, after many failures. Technology cannot exist without the creative effort of intelligent beings given the inherent knowledge and requisite organization of technology as a system that allows it to produce objects and perform techniques to achieve goals. We can see from the theories regarding the development of civilizations to the theories discussing technological development that such changes and tools as reaction to the environment were made as human brain developed and knowledge-based on experience, built, in the process of problem solving. As a recent study shows (Adams, Converse, Hales & Klotz 2021) it is human nature to solve problems and it is human nature to add complexity to the problems, considering solutions that add features than solutions that remove them, even when removing features is more efficient.

In today's dynamic world, which is largely based on technological change, the increasing replacement of traditional jobs and the emergence of new professional roles, countries also need different approaches to education in general, and science and technological education. The success of any technological innovation depends on the skills, knowledge and creativity of the people involved in its development. Such development often requires combining expertise from different fields, such as engineering, computer science and business, etc. Technology development, taking into account all societal challenges, requires a diverse set of skills, creativity, problem solving and critical thinking. These skills are typically developed through education, training and experience and are essential for the successful creation and deployment of new technologies.

The current paper aims at studying the technological development and the economic growth related with it from the perspective of the development of human brains and cognitive abilities of people, thus linking it to the educational framework, strategies, and policies, which a country sets as a basis for such development. The paper focuses on the technological development of Bulgaria and relating it to the country’s educational development.

2. Methodology of the research

The research design phase is based on four main processes: (1) a deductive analytical process defined by the nature of the structural analysis methodology employed, (2) an inductive analytical process defined by the data gathering process and activities of the system in focus (3) a process of theory matching defined by the abductive reasoning method and (4) an inductive operationalization process defined to maximize internal validity of the study and following a logical sequence constructed by supporting the final output, structured as a response to the stated aim and focus of the study.

Regarding the conceptual methodological model, the approach is based on research that aims at examining the different components of a system to recognize the links between them and determine the value of each of them. The application of this method allows combining a wide range of theories into a relational model. The next step involves selecting a method of analysis that will allow interpretation of the quantitative components contained in economic indicators and parameters, after which a process of data matching is used to determine patterns, grouping criteria and outliers for further analysis. The use of this method ensures consistency of this part of the study with recent work on technology theory from a macroeconomic perspective, in which the method of abduction reasoning is applied.

The research question set in the current paper is if and how technological development of a country is influenced by its educational policies in the field of higher education.

The research hypothesis of the paper is that the industrial performance of a country (based on its technological development) is a result of industrial enterprises having highly skilled and highly qualified employees and that retaining and growing the industrial performance of a country is possible with the prospective change of its educational policies.

3. The economic development model of Bulgaria

Bulgaria's economic development model has historically been based on low wages and a lack of emphasis on education. However, the current scenario is changing, as many sectors are grappling with a shortage of skilled labour. Despite the challenges, there are evident prospects for economic growth in the evolving world economy. The Bulgarian industry holds the potential to become a robust catalyst for this growth. According to Zhelev (2017), the key to achieving this lies in the adoption of a proactive national industrial policy. In his view, without a comprehensive industrial strategy to improve international competitiveness, achieve sustainable export-led growth, and position the manufacturing sector globally, Bulgaria will remain on the economic periphery of the EU. Success will require clear objectives, measurable results, rigorous monitoring, proper evaluation, and ensuring ownership, legitimacy, realism, flexibility, and transparency of the industrial strategy.

Most types of industrial production in our country are still dominated by traditional – inherent in the industrial age technologies. However, the fact is that the penetration of various high technologies is increasing. The main question now is – to prepare ourselves so that the technological breakthroughs are not missed, and Bulgarian society does not turn out to be a technological follower and our economy a catching-up appendage of the European and global one.

Such an approach is necessary for several reasons at least. The first is that, agreeing with Klaus Schwab's statement that "The fourth industrial revolution builds on the foundations of the digital revolution and combines a multitude of technologies that lead to unprecedented changes in the economy, society and the individual" (Schwab 2016), adequate efforts should undoubtedly be made to adapt education in this direction. It should not be forgotten that the future is multivariate and open, but it is most logical to take account of objective development trends. Quite a few of them are increasingly materialising in the direction of the views expressed by Klaus Schwab and the World Economic Forum. The basic characteristics of the new technological revolution described by him and the opportunities and dilemmas it brings with it should be taken into account in our concrete reality. Awareness of the speed and vast scope of this new revolution can be of considerable benefit to the overall development of our country. However, as long as we do not all remain blind to the shifts in all sectors of the economy brought about by new technologies, business models, restructuring of production, consumption, etc. Social relations are constantly changing – state management and institutions, education and many others are undergoing radical changes. The world, societies, businesses are increasingly networked (Slatinski 2014). The question is what the readiness of Bulgarian society is to direct its future development in an adequate direction.

In order for Bulgaria not to fall behind in the next industrial revolution, we need to know what it actually is. The lesson of the First Industrial Revolution is still valid today – the main factor of progress remains the degree to which a society is ready to embrace the innovations inherent in any era. Historically, our national ascents to date (albeit as a nation often playing catch-up) have been built on education. Perhaps in today's amplified times, that is the way to go as well. Adequate education will help us to understand the nature of widespread change. Adequate education in the country, especially higher education in general and that in economics and technology in particular, can help us rethink and adapt our economic, social and political systems adequately to the times.

Looking at the United Nations Industrial Development Organization (UNIDO) and the Competitive Industrial Performance (CIP) index we see that for the year 2020 the country is ranked 54 in the world with Upper Middle quintile (CIP score = 0.047). As the graph below shows Bulgaria GDP % of Manufacturing, Medium and High-Tech Industry data was reported at 32.628 % in 2020. This record is an increase from the previous number of 30.538 % for 2019. Bulgaria GDP% of Manufacturing Medium and High-Tech Industry data is updated yearly, averaging 28.015 % from Dec 1990 to 2020, with 31 observations. The data reached an all-time high of 33.103 % in 1996 and a record low of 22.233 % in 1995.

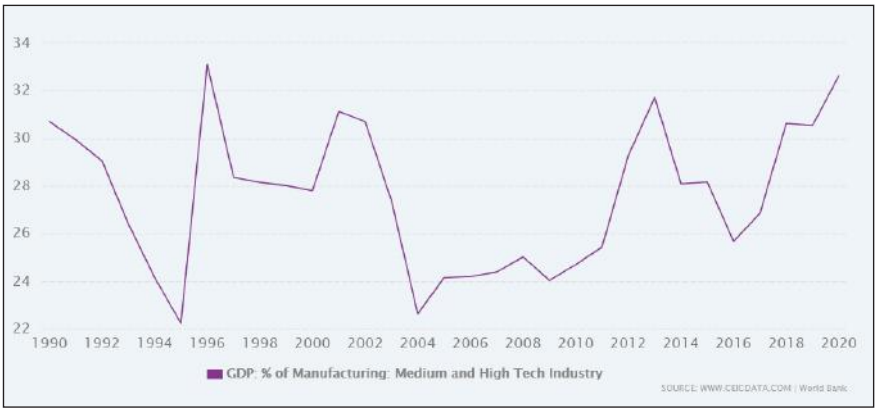

Figure 1. Bulgaria, GDP % of Manufacturing, Medium and High-Tech Industry
Source: CEICDATA/World Bank

4. Education and technological development of Bulgarian industry

When it comes to occupations employed in the manufacturing sector in Bulgaria in 2020 we can see that the top three occupations are "machine and plant operators", "other manufacturing workers" and "metal and machinery workers" (see Fig. 2). Employed population by age in Bulgaria in 2020 has 25 – 49 aged workers is on the lead with 60.5% while 15 – 24 aged has the lowest value, equal to 3.3%; workers aged 50 – 64 still have a significant representation in the sector of Manufacturing with 34,2%[1].

The lack of qualified personnel in the industry in Bulgaria is confirmed in numerous research and studies like the "Employers' labour needs survey", conducted by the Bulgarian Employment Agency in 2022[2], the joint report published by the European Investment Bank (EIB) and the European Patent Office (EPO) entitled "Deep technology innovation in smart connected technologies"[3]. The CEDEFOP Skills Forecast about the future employment growth (in %) in Manufacturing sector in Bulgaria compared to EU27 in 2020 – 2030 shows EU27 is on the lead with -2.9 while Bulgaria follows with -10.1[4].

Bulgaria has implemented a number of educational changes during the past 30 years, arguing that doing so will assist the nation achieve higher levels of socioeconomic development. There are still significant educational inequalities based on location and socioeconomic background, and overall productivity increases have not yet fully translated into sustainable and equitable growth in Bulgaria. We can clearly see that a significant part of the workers (more than 1/3) in the Manufacturing sector are of age between 50 and 64. These people were educated long before any educational reform was set in place (considering all of these reforms were started after the political system change in 1989). At the same

time, particularly in the last decade, it is evident that an increasing number of firms (foreign, joint venture or large national enterprises) are doing what they can to raise the technological level of the economy, and hence the need and legitimate claims for raising the quality of human resources. In general, however, the results of our society's efforts in this direction have not been positive[5]. These are also the assessments of the quality and adequacy of education in Bulgaria.

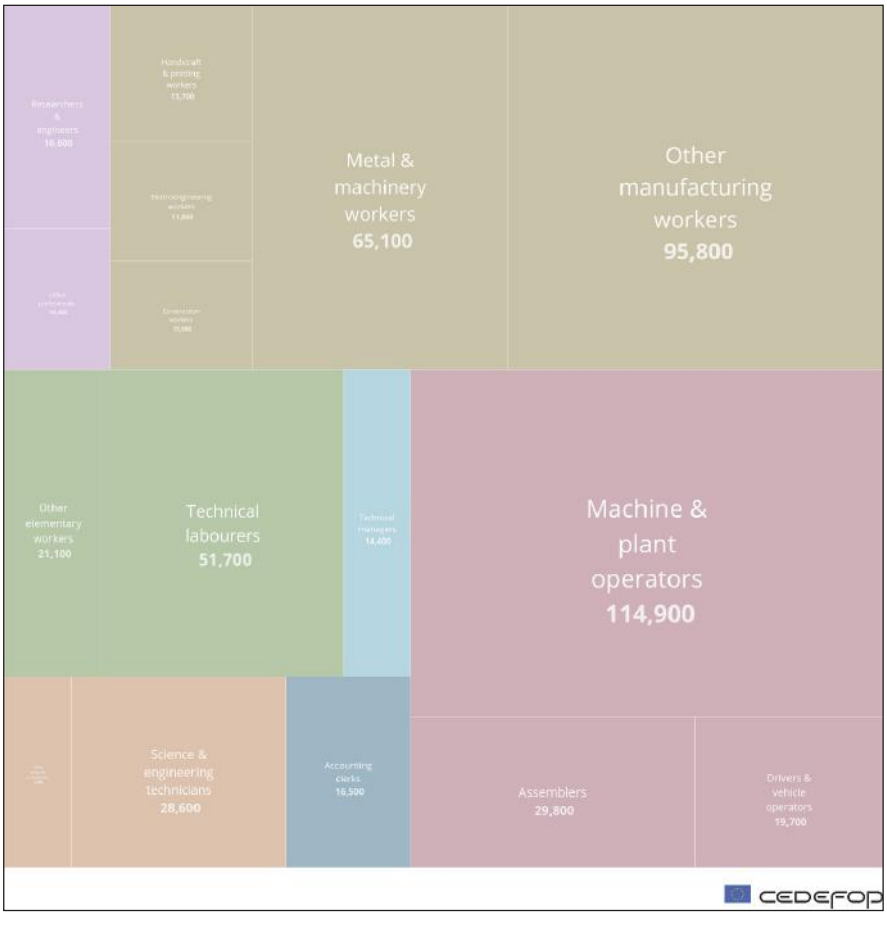

Figure 2. Occupations employed in the manufacturing sector in Bulgaria in 2020
Source: CEDEFOP

The National Development Plan 2030 for Bulgaria emphasizes the value of a highly skilled workforce for the socioeconomic advancement of the nation. One

of the 13 national priorities included in Bulgaria's 10-year national development strategy, Bulgaria 2030, is education and skill development. This strategy, which was approved by the Council of Ministers in 2020, aims to improve the quality of human capital by developing highly educated, creative, and active people who are ready to enter the workforce after graduation[6].

The question that remains open is where and how to train specialists to be adequately trained to work in the conditions identified so far. We argue that it is possible to do this first in economics universities, and in the context of training in the core specialist discipline of Industrial Economics.

5. Industrial economics discipline in higher education

It is an undeniable fact that the explosive technological changes in the world require the creation of an adequate level of professional training of human resources. As Kanev argues (Kanev 2006, p. 152) knowledge, translated into technology and skills, is the decisive factor for the growth of productivity, competitiveness, wealth, and well-being of society. This necessity brings to the fore the issues of the areas, level, and modes of implementation of research and of the educational qualification of the active population.

The above finding is particularly valid when it comes to the training of students in the professional field of Economics. The research is deliberately limited to the training of students in the specialties "Industrial Business" and "Industrial Business and Entrepreneurship" in the three higher economic universities – UNWE – Sofia, University of Economics – Varna and "Dimitar A. Tsenov" Academy of Economics – Svishtov. They are the higher education institutions called to prepare specialized managerial and executive staff in the professional field "Economics" in the field of industry in Bulgaria. In all three universities, their basic profiled training is implemented primarily within the framework of the special basic subject "Industrial Economics".

The key to the modernisation of these specialisations should be the updating of the content of this discipline. A cornerstone of this process is the creation of a culture of action in relation to technological change. A content analysis of curricula and syllabi reveals that when it comes to the nature and understanding of the concepts of Industry and Industrial Economics[7] there is still a classical approach. Building on the achievements of modern Economics as a science of rational use of scarce resources, a view is presented on the need for a change of emphasis in the teaching of Industrial Economics. The direction seems to be clear – building on the indisputable achievements of economic theory, the practical aspect in clarifying the formation, functioning and development of market organization today should be strengthened above all.

Industrial economics has so far focused on the study and evaluation of the efficiency of the market as an organizational mechanism. Developing it as a core

discipline also means taking a leading role in the formation of graduates with advanced qualifications in industrial business. A way to do this is to create the conditions for the discipline to contribute to the formation of students' knowledge and the creation of skills to analyse and explain specific events in real markets. In order to achieve the desired double effect, it would be productive to focus attention on Bulgarian industry in particular and on global trends in the development of industry in general. The focus on industry as an object of study and learning is not an end in itself. It is the existence of a real object, albeit somewhat abstractly separate from the overall economic system, that is vital to the success of the idea. Good practice in the application of theoretical concepts is also the guarantor of dealing with the real problems of economic life.

The well-established role of the discipline of Industrial Economics is to create knowledge about the relationship between the market organization of industries, the behaviour of firms, and the performance of industries. The emphasis is generally on market-type-dependent firm decisions relating to pricing, product differentiation, vertical acquisitions and mergers, R&D investment, innovation, etc. The second focus of the discipline to date has always been, broadly speaking, on the regulation of industries by the state and the role of institutions to counter practices that restrict competition. Training in this area is refracted through the need for each trainee to acquire the knowledge and skills to put into practice the accepted basic model of the Industrial Economy. This is the "Structure – Behaviour – Performance" model developed by Edward Mason in the 1930s. Usually, once the consideration of specifics from an industry perspective is completed, the focus then turns to industry as a real sector with its specifics and structure. Gradually, in the course of the joint work, the focus turns specifically to the Bulgarian industry. It turns out, however, that knowledge about its history, its contemporary characteristics, its regulatory and institutional environment, government policies affecting it, industrial practices and its competitiveness is insufficient in today's conditions. As Rakarova and Elenkova summarised – the mastery of logical relationships and the consistency of analysis based on the knowledge of economic laws and regularities allow the adequate explanation of processes and the search for solutions to problems in the relations "fundamental conditions - market structure – behaviour – performance". In parallel, the application of Michael Porter's famous model for the analysis of the five competitive forces, along with other models, methodologies and methods, contributes significantly to the expansion of the applied set of analysis tools (Rakarova and Elenkova 2010, pp. 32 – 35).

However, the theoretical-abstract aspect, which has been the leading one so far, needs to be tangibly complemented by creative academic research and practical use of the new theoretical and practical concepts. It is the gap concerning the practical application of these concepts in the context of contemporary industrial transformation that should be filled.

6. Conclusion

A broader advocacy of knowledge acquisition methods and self-directed learning using learning-research technologies would be more likely to be beneficial (Kanev 2006, p. 233). All of this should be done for one overriding reason. As it is defined by Drucker at the beginning of the nineties – adapting to the main new circumstance – the already mentioned global shift towards a knowledge society and economy (Drucker 1992, pp. 173 – 175). If machine production engages in a range of physical labour functions, the hitherto unimaginable advances in science and technology increasingly affect mental labour. This, cannot but be taken into account in our sphere of interest, the Industrial Economy. This is despite the changes that technology, consumer connectivity and the concentration (intertwining) of different economic sectors undoubtedly bring with them. Undoubtedly, these three factors will lead to increasingly tangible changes in business models and will mostly change in the direction of blurring the existing boundaries between different business sectors. A major challenge for the discipline remains to balance fundamental with practical-applied knowledge and skills. This becomes even more difficult because of the need to be in tune with the constant changes in society and the economy. It is the theory and technology of change and risk management, along with the opportunities provided by disruptive technologies, that can fill the gap that has opened up.

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NOTES

1. Dataset: European Union Labour Force Survey (EU LFS), Source Eurostat, Indicator Employed population.
2. Employers' labour needs survey, BG Employment Agency, available at https://www.az.government.bg/pages/prouchvane-potrebnosti-2022-2/.
3. European Investment Bank, European Patent Office. (2022). Deep tech innovation in smart connected technologies: A comparative analysis of SMEs in Europe and the United States. https://www.eib.org/en/publications/eib-epo-deep-tech-smes.
4. Dataset CEDEFOP Skills Forecast, Source CEDEFOP, Indicator Future employment growth.
5. https://op.europa.eu/webpub/eac/education-and-training-monitor-2021/bg/bulgaria.html Obzor na obrazovanieto i obuchenieto za 2021.

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