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Contemporary Factors of Economic Growth and Competitiveness: Theoretical Aspects

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Abstract

Globalization and the contemporary business environment affect countries' production and economic performance and largely determine SMEs' key drivers. The current development strategies emphasize R&D and innovative governance as the leading determinants of a country's global positioning. In light of this, this research presents the theoretical aspects of factors underlying modern economic growth and competitiveness. The research supports the claim that achieving global competitiveness is consequential upon investing in state-of-the-art economic growth drivers. Provided that they emerge from strategic management, these actions can spur convergence and reduce the countries/regional developmental differences. Relatedly, under the scope of this paper, special consideration is placed on the deindustrialization process and the implementation of Industry 4.0. In the context of present-day challenges, the authors observed that the countries' economic success is the outcome of the historical heritage and the national decision-makers' resoluteness to implement high-quality structural reforms.

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I. Introduction

Globalization and modern economic trends have greatly changed modern economic paradigms and ways of achieving economic growth and competitiveness in the long run. Simultaneously, increasing and the crucial emphasis is placed on modern, "smart" sources of economic growth and competitiveness, which are largely based on investments in R&D, education, and their outputs, mostly innovations. The EU and other leading world organizations have placed increased emphasis on these areas in the last 20 years. However, by taking a more in-depth insight into relevant scientific papers, it is possible to determine that economic theorists have oriented these areas back in the 1950s.

As a starting point, it is necessary to highlight Solow's works (1956, 1957). In these papers, Solow, as a representative of neoclassical economics, points out that, in addition to traditional production factors (labour, capital, etc.), technology and technological progress are increasingly becoming a key factor of long-term economic growth and progress. Solow points out that technological progress arises as a kind of coincidence. In other words, as a by-product of companies' investments in physical capital. Thus, Solow emphasizes the importance of initiating organized actions and procedures on companies and countries level that will ensure continuous progress, which will prove to be the basis for future actions and aspirations promoted by modern economists and economic policies. The so-called endogenous economists, who emphasize knowledge creation and accumulation, follow the research of Solow and other neoclassicists (Jakovac, 2012). In addition, endogenous economists point out that the afore-mentioned knowledge creation and accumulation results in positive effects in the form of innovation, knowledge spill over, technology transfers, and general improvement of production processes (Romer, 1986, 1990). However, unlike neoclassicists, endogenous economists emphasize the market character of knowledge as well as rivalry and exclusivity as its key characteristics. Another key setting of endogenous economists is the importance of conscious and continuous investment in R&D processes, which ultimately results in both an increased number of products and their improved quality. These setting(s) represent a key upgrade of the neoclassical model (Lucas, 1988; Grossman and Helpman, 1990; Aghion and Howitt, 1992). In addition to the presented theoretical assumptions of neoclassical and endogenous economists, special attention should be paid to the research of contemporary economic theorists (those after the year 2000), which was conducted in the continuation of this research.

This research aims to present the basic theoretical aspects regarding modern factors of economic growth and competitiveness. Apart from presenting previous research that identifies the importance of R&D investment in achieving economic growth and competitiveness, the research in this paper focuses on achieving competitiveness and its basic principles, which arise as a direct consequence of investing in modern sources of economic growth. Furthermore, this orientation results in convergence, i.e., catching-up with developmental differences in countries/regions with similar characteristics. While considering this topic, special emphasis was placed on related processes that largely determine the trends and dynamics of individual countries' economic activity. The deindustrialization and implementation of Industry 4.0 are strongly accentuated.

The paper consists of seven interrelated chapters. The research begins with introductory considerations in which the research elements are defined, and the structure of the paper is presented. The second part of the paper deals with the contemporary theoretical aspects of R&D investment as a factor of achieving long-term economic growth and competitiveness, which is a prerequisite for achieving international competitiveness. This sub-topic is discussed in the third part of the paper. The successful implementation of these processes results in reducing development differences between countries and regions, which is discussed in the fourth part of the paper. The fifth and sixth parts present key theoretical findings regarding deindustrialization and Industry 4.0, which represent key development directions in modern economic conditions. The concluding part of the paper represents a synthesis of the key results obtained during the research.

II. Investment in R&D as the Key Contemporary Economic Resource

Modern approaches in considering the role of R&D investment in achieving economic growth and competitiveness place the focus on activities in small and medium enterprises (SMEs). According to the European Commission's official statistics, this type of enterprise represents a key engine of economic development in the EU and other countries of the world. Recent data indicate that SMEs account for more than 99% of the total number of enterprises and generate a significant share of employment and added value. Globalization trends and modern challenges in the business environment place new demands on these companies, primarily in developing new and better products, constant workforce education and training, and their adaptation to dynamic conditions on the labour market (Tomljanović, 2017). In general,

according to Grilliches (1998) and Barro (1998), the results of R&D investment in these businesses are primarily manifested through increased productivity.

Modern approaches have developed several new terms and concepts, among which it is necessary to highlight "new industrial spaces", "industrial clusters", "innovative milieu", "self-learning regions" or "regional innovation systems". Chesire and Malecki (2005) state that spatial innovation systems are created due to the concentration of enterprises characterized by high levels of innovation, continuous and planned processes of R&D, and investment in education. Such systems make and maintain links with other actors in the region (educational institutions, local and regional authorities, etc.) and thus generate positive effects in knowledge transfer, technology transfer, and the creation of a large number of new and quality products. Here it is especially important to emphasize the connection and cooperation of highly advanced and technology-oriented business entities with educational and scientific institutions. According to Audretsch (2006), modern universities are becoming an increasingly important factor in achieving economic growth and competitiveness, primarily due to scientists' entrepreneurial inclinations and due to generating a large number of innovations. At the same time, connecting with the business sector is a key step in the commercialization of innovations and putting them in the lead role regarding the development of the entire economy. To achieve this, modern economies and integrations are becoming increasingly motivated to develop and create efficient scientific and technological policies, which will achieve competitive advantages and contribute to creating and developing new and quality jobs. Considering other relevant research, it is possible to see a consensus among modern economists on investing in R&D as an effective tool for dealing with burning global challenges and problems. In addition, contemporary authors recognize these "smart" sources of economic growth and competitiveness as a key accelerator of social and economic processes.

However, it is necessary to keep in mind the specific difficulties SMEs face during their scientific research activities and the generation of positive economic and social effects. Namely, SMEs often have limited resources, and their activities in this area are often limited. Therefore, SMEs must focus on technology transfers and absorption from abroad, which according to Guelllec and Pottelsberghe (2001) and Damien et al. (2003), requires state assistance, especially in opening borders and ensuring appropriate and favourable scientific regulation. The same authors state that the tangible positive effects of R&D investment at the enterprise level cannot be expected in the short run, but rather in the medium or long-term.

According to Dabić (2007) and Bečić and Dabić (2008), the low level of business sector investment in R&D activities in the EU is a key reason for their lagging behind the largest global competitors, primarily the USA and South Korea. The situation is even more unfavourable if we look at the new and less developed EU member states' position. The authors emphasize the low level of R&D investment, insufficient involvement of the business sector, and the lack of cooperation between universities and the economy in the commercialization of innovations. Furthermore, the closed nature of the scientific systems themselves (i.e., weak mobility of scientists, teaching staff and students, weak international dispersion of research results, as well as the insufficient cooperation of institutions with relevant international partners) was highlighted as a major problem. This resulted in the emergence of two negative processes: (1) brain drain and (2) brain waste (leaving the research sector and going to better-paid jobs). In the research by Šimurina (2004, 2006), using the EU member states, the author points out that technology and technological processes do affect their development. When it comes to planning their long-term development strategies, special attention should be paid to their historical heritage.

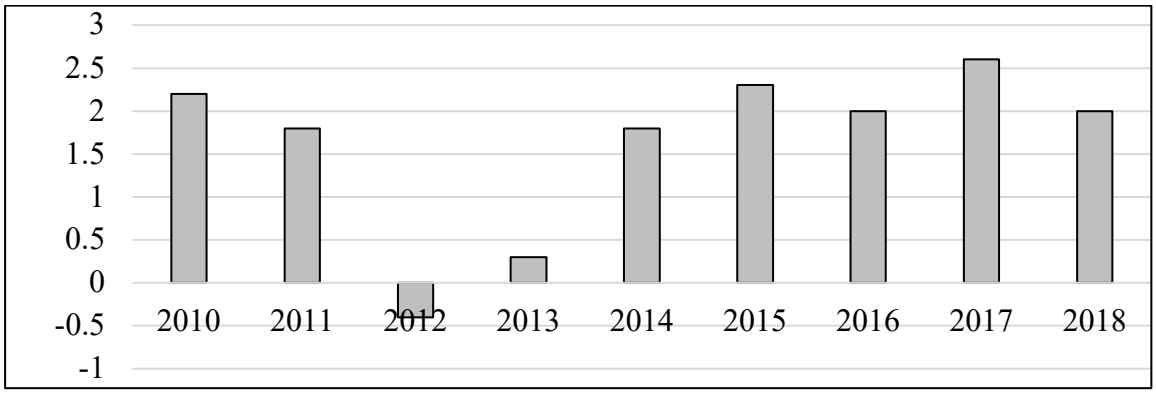
In the following part of the paper, we have conducted a statistical analysis of EU member states according to key R&D indicators. To get a complete picture of the EU's current global level position, a comparison was made with its main competitors (USA, China, Japan, and South Korea). The data was collected from the Eurostat and the World Bank databases for the period from 2010 to 2018.

In that particular period, EU member states continuously increased their scientific research activities (see Appendix 1). According to the latest available data from 2018, they averaged 2.11% of GDP in the EU-27, which represents an increase compared to 2010. Besides, the data indicate that almost all EU member states (except Estonia, Ireland, Spain, Luxembourg, Portugal, and Slovenia) achieved an increase in this indicator. At the same time, the largest investments were made in Sweden (3.32% of GDP), Germany (3.12% of GDP), and Denmark (3.03% of GDP). Such a situation is expected if we consider these countries' economic, social, and political positions. On the other hand, Romania (0.5% of GDP), Bulgaria (0.76% of GDP), Latvia (0.64% of GDP), and Cyprus (0.63% of GDP) have the lowest levels. These numbers significantly point to the growing differences between the new EU member states and the "hard-core" Europe. This unfavourable so-called power ratio between those countries slows down further development of the EU's integration process. Simultaneously, a comparison of

the EU with its main competitors suggests that the EU is lagging globally. According to this indicator, the predominant world leader is South Korea, whose R&D investments amount to 4.53% of GDP, followed by Japan (3.28%), USA (2.82%), and China with 2.14%. To achieve its most important goal, which is to "become the most competitive and dynamic knowledge-based economy in the world", the EU must engage all available instruments and launch processes to reduce existing (global) backlogs in scientific research activities.

The data from Figure 1 suggest that positive trends in the segments of R&D investment also resulted in positive trends regarding economic growth throughout the observed period. However, in this case, the presented data represent only a rough estimation in terms of the connection between increased scientific research activities and the achieved economic growth. In this regard, future research should focus on further identifying key R&D investment indicators responsible for the progress of the EU economy while considering and analysing the effects of the crisis caused by the COVID-19 pandemic.

Figure 1: Real GDP growth rate in the EU for the period 2010 - 2018 (in %)



Source: Made by the authors based on Eurostat.

Modern development strategies emphasize the affirmation of R&D investments undertaken by the business sector (primarily SMEs) in the context of achieving economic growth and international competitiveness. The data indicate (see Appendix 2) that almost all EU member states (except the Czech Republic, Denmark, Estonia, Latvia, and Finland) have achieved positive trends in this area. The average level of R&D investment by the business sector at the EU level is 58.4% of total gross domestic expenditure on R&D. Although a positive trend has been achieved, the EU still lags significantly behind main global competitors (i.e., Japan with

79.1%, South Korea and China with 76.6% and the USA with 62.4%). Considering the situation among EU member states, the business sector's scientific research activities are mostly present in Germany, Malta, and Ireland, while Croatia, Lithuania, and Bulgaria achieve the lowest levels.

The orientation of SMEs on investment activities in R&D results in developing new and higher quality products, whose acceptance on the international market generates positive economic effects for national economies. As a key indicator, it is possible to point out exports of high technology products (see Appendix 3). The data show that most EU member states (19 of them) have made progress in this field while some countries have seen smaller or larger reductions. At the EU level, the export of high-tech products accounts for 17.9% of total exports, with Ireland (34.7%), Mata (25.6%), and France (20.5%) well ahead of other member states. On the other hand, the lowest levels are present in Portugal (4%), Slovenia (5.8%), and Bulgaria (5.9%). According to the World Bank data, the EU lags significantly behind its main competitors, which is especially pronounced compared to South Korea, where 36.3% of total exports are high-tech products. In addition, high-tech products account for 31.43% of Japan's total export.

The previously presented theoretical findings confirm the well-known premises about the importance of SMEs in achieving national economies' progress. However, in modern business conditions, they must be increasingly oriented towards advanced production processes and solutions to develop new and better products. In this way, they achieve recognition and success at the international level, which can be seen through the share of high-tech products in each economy's total exports. This stresses the need to achieve a competitive advantage, a concept represented in all key development and economic strategies. In the paper's continuation, we provide a synthesis of key theoretical assumptions that determine the concept of competitiveness and its most important elements.

III. Theoretical Basis of Competitiveness

Consideration of the term competitiveness occupies a wide range of interests of contemporary economic theorists. However, this concept is complex, susceptible to change, and introduces new elements in parallel with changes in the international business environment. According to Segler (1986), the long-term competitiveness of the economy is achieved by increasing

productivity, primarily through improving the quality and number of products, which ultimately positively affects the standard of living. When considering the concept of competitiveness, it is necessary to consider the production costs and companies' ability to cope with international competition. On the other hand, as a fundamental determinant of increasing productivity and achieving competitiveness in the short-term, it is possible to highlight prices, costs, income, exchange rate levels, and close cooperation between the community, political activity holders, and society as a whole. Fagerberg (1988), who points out that the key determinant of competitiveness is the achievement of key economic goals through increased employment and income and control of the balance of payments deficit, follows Segler's (1986) thoughts. This is also the case with Krugman (1994, 1996). Porter (1990) provided a significant contribution to the development and definition of competitiveness through a new theory of competitiveness, which starts from the assumption that the welfare of a country is the result of strategic directions and not the result of its heritage. Porter identifies the main groups of indicators that determine a country's competitiveness, i.e., the existence of significant and lasting exports at the global level and investment in new markets through resources developed in the domestic economy. Vellosso (1990) developed the concept of international competitiveness. It implies the country's ability to increase its presence in a dynamic international environment, primarily through export activities and quality products while respecting international productivity standards and efficient use of available resources. This approach generates positive economic and social effects in the form of full employment, increased income, and standard of living.

Leko-Šimić (1999) looks at international competitiveness in a broad and a narrow sense. In a broad sense, international competitiveness implies comparing key macroeconomic indicators and the measurement of living standards and efficiency. On the other hand, international competitiveness in a narrower sense refers to a country's export activities on the international market. This approach is especially affirmed in the modern business environment where an individual company's success, and thus the entire economy, is largely determined by the share of high-tech products in total exports. Participation in the international market should take place on equal and fair terms for all participants (Neslihan and Huseyin, 2012), which, despite the significant efforts of the World Trade Organization (WTO) and other international trade policymakers, is still unfeasible (Salvatore, 2009).

As previously pointed out, the specification of contemporary determinants of competitiveness is significantly influenced by globalization trends. Therefore, Bienkowski (2006) and Lovrinčević et al. (2008) point out that it is crucial to adjust the economic structure to modern trends in international trade and base the production on modern, advanced factors. In other words, to focus on the high value-added sector(s). From all of the above, the theoretical approach of Aiginger et al. (2013) states that "competitiveness means the ability of a country or region to create high added value, ensure high employment rate and improve the living standards of the population".

Consideration of the concept of competitiveness can also be carried out based on Croatian and other international organizations and institutions' views. For example, the National Competitiveness Council of Croatia (2015) defines "competitiveness as the country's ability to achieve success in the international market that enables a better standard of living for the entire population". At the same time, many factors affect its realization, such as a stimulating business environment, the creation of a conducive investment climate, and the economy's capacity to develop high value-added products. According to the European Commission (2020), competitiveness is defined as "the economy's ability to ensure sustainability, i.e., to provide citizens with a high and rising standard of living and high employment rates".

In addition to defining, it is necessary to consider other measuring competitiveness methods, which differ according to individual authors. Trabold (1995) emphasizes the so-called "hard indicators", i.e., rates of economic growth, the inflow of foreign direct investment (FDI), income level, etc. Trabold (1995) points out that "the ability of the economy to adapt, which is reflected in the speed with which the economy responds to changing market conditions and sees new opportunities, cannot be covered by a single macroeconomic indicator". In this case, "the ability of the economy to adapt" is shown through the level of R&D investment, which is one of the foundations of modern economic paradigms. On the other hand, Lovrinčević et al. (2008) emphasize the so-called "soft indicators" based on conducted business surveys and inquiries. These surveys contain the surveyed subjects' perception of the current economic situation, and therefore their results should be viewed with a dose of caution. According to Bezić (2008), an individual country's competitiveness is also expressed based on its position on international scales. Therefore, it is necessary to single out the Global Competitiveness Report, World Competitiveness Index, World Bank Ease of Doing Business Index, Economic Freedom Index, Business Competitiveness Index, and export competitiveness indicators.

Based on the aforementioned theoretical knowledge, the latest approaches to defining competitiveness have also been formed. Djogo and Stanišić (2016) define competitiveness as "the country's ability to maintain a trade balance in free and fair market conditions, create new jobs, and ensure an increase in household income. At the same time, great emphasis is placed on satisfactory levels of investment without increasing the level of public debt and while respecting the goals of environmental protection". Šegota et al. (2017) state that "competitiveness is the ability of a country to achieve continuous economic growth which ultimately contributes to higher welfare, assuming an increase in employment and maintaining stable level(s) of public debt. With the necessity of increasing exports, countries must adapt to globalization trends, which places significant emphasis on R&D investment, exports of high-tech products and the creation of a favourable environment for FDI inflows". In addition, Cvečić et al. (2020) realize that "the international competitiveness of European SMEs stems from their ability to maintain market positions vis-à-vis domestic and global competitors. The key elements are the production of high value-added products with competitive prices and continuous workforce education and training as a prerequisite for success on the global market".

The previously presented theoretical directions undoubtedly confirm the justified orientation of modern economics on the concepts and ways of achieving competitiveness, especially in terms of productivity, economic growth, full employment, and the implementation of structural changes based primarily on “smart” sources and high value-added factors. The implementation of such approaches enables the reduction of development differences in countries/regions. In other words, it enables the smooth running of the convergence process.

IV. Legality of the Real Convergence Process

The existence of pronounced development differences between individual countries and regions (i.e., polarization) is increasingly present globally. Developmental lags stem largely from countries/regions' ability to adapt to new conditions and ways of doing business. This places an increasing emphasis on achieving the convergence process and related cohesion(s). Consideration of these concepts began in the 1960s and has continued to this day in parallel with the development of modern economics and changes in the international environment.

Consideration of convergence processes is based on identifying reasons for lagging, which can be historical, social, and political. Bjorkstenn (2000) finds the sources of developmental differences in different inherited conditions, physical (geographical) characteristics, and different implementation of policies, which ultimately result in differentiated effects regarding applying common or similar policies. Bjorkstenn (2000) points out that convergence is mostly oriented to the real economy but can also be considered from the aspect of other economic and social components (i.e., interest rates, education, information and communication technologies).

Based on the findings of Bogunović (2001) as well as Verblan and Vahter (2005), Kandžija and Cvečić (2008) provide a comprehensive and general approach to defining the concept of convergence. According to Kandžija and Cvečić (2008), convergence represents "a process of systematic reduction of development differences between countries/regions in a certain period whereby special attention needs to be paid to the time dimension and conditions that determine the direction and speed of the entire process". Tomljanović (2019) defines convergence as "a complex and comprehensive process whose core objective is to reduce and equalize development differences between regions with the ultimate goal of achieving economic growth, increase in productivity and improvement of living standards". Considering the legality and regularity of the EU integration process, Jacobsen et al. (2004) linked the convergence process's stability with the success of achieving economic, social, and political goals.

Many authors introduce and define different types of convergence processes. It is necessary to single out Beta-convergence and Sigma-convergence. According to Bogunović and Vukoja (2008), Beta-convergence represents a more pronounced economic growth of poorer regions than richer ones, where long-term economic growth rates and stability can be achieved by focusing on new technologies and human capital. Bogunović and Vukoja (2008) define absolute Beta-convergence, present in situations when a group of countries converges towards the same development levels (determined primarily by GDP per capita). Kandžija and Cvečić (2010) consider Sigma-convergence as a necessary condition for achieving Beta-convergence. This concept denotes the dispersion of real income per capita, which decreases and slows down over time. Monfort (2008) also affirms the notion of Sigma-convergence and points out that “that the concept of Sigma-convergence is more revealing of the reality as it directly describes the distribution of income across economies without relying on the estimation of a particular model”.

Furthermore, convergence can be absolute, economic and structural. Solow (1956) introduced the concept of absolute convergence where he states that "countries with similar characteristics, regardless of their initial outputs per capita, will converge to a similar balanced-growth path and their income levels per capita ultimately become similar in the long run". Bilas (2005) defines economic convergence as "the approximation process of economic indicators with the purpose of catching-up with development levels in richer countries". Vujčić (2003) defines the concept of structural convergence and points out its relatedness with the fulfilment of optimal currency area requirements, i.e., "mobility of production factors (labour), similarity of inflation rates, price and wage flexibility, trade openness and cross-border trade, interest rates, fiscal integration and harmonization of business cycles".

Contemporary economic theory is primarily oriented towards achieving economic convergence, which consists of real and nominal convergence. This paper's focus is on real convergence, and the approaches to defining real convergence will be discussed in more detail below. In explaining real convergence, Jovančević (2005) points to the dynamics of integration processes between developed and underdeveloped countries, which ultimately, over a certain period, reduces differences in productivity and prices. However, convergence processes should not occur spontaneously but should be the result of designed and implemented programs and policies and dynamic change management. According to Kersan-Škabić and Mihaljević (2010), any attempt to reach certain development levels as soon as possible, without a defined and implemented political and structural infrastructure, will most likely result in stagnation or even economic decline together with a significant slowdown in the convergence process. Kowalski (2003) and Kulhanek (2012) state the achievements of convergence in GDP per capita and the balance of the real exchange rate. Drastichova (2012) cites employment and unemployment levels as key indicators of real convergence (along with the dynamic equilibrium level of economic growth). In addition, Drastichova (2012) emphasizes the need to synchronize business cycles in accordance with the theory of optimal currency areas.

Rubinić and Tajnikar (2019a) investigated the cyclical influence on inequality. They found out that "uncoordinated cycles driven by unequal exchange, as well as asymmetric shocks, resulted in cross-country inequality exposing tension between national and supranational interests. This made the implementation of optimal policies notoriously difficult. Sub-optimal practice is further enhanced by limited policy instruments at the disposal of national governments, which, given the lack of harmonious policies, have acted to protect conflicting national interests". In

another paper by Rubinić and Tajnikar (2019b), the authors conclude that "unequal labour exchange is an essential concept that generates inequality. The fundamental problem that arises from unequal labour exchange is that with one hour of work, workers realise a different national income within individual countries. The results indicate that within the EU, the prices of the labour force are not uniform on a cross-country level. Given that 19 countries share a common currency, theoretical reasoning would argue that labour prices (especially among those countries) should converge. This does not occur, which indicates underdeveloped labour force mobility". Therefore, the redefinition of existing policies and the initiation of inclusive policies, reinforcing cross-country cohesion, has to become a prerequisite for protecting the ideals of equality and solidarity that united European countries in the first place.

Briefly, the real convergence as an ultimate goal is mostly restricted by economic inequality, which impedes real convergence. Relatedly, this renders nominal convergency as a set of formal postulates, which ensure the persistence of the ongoing power relations. In other words, insisting on the nominal convergence, given the extensive inequality, predominantly locks countries into the current (relative) development positions by making the rich country richer and the poor country poorer. Hence, the central question: how will the developing country invest in R&D and Industry 4.0 to achieve competitiveness and economic growth?

In addition, convergence can also be expressed through the Deka Converging Europe Indicator (DCEI), which measures monetary, fiscal, real, and institutional convergence levels. Fiscal convergence takes into account the levels of the budget deficit, private consumption, and external debt. Monetary convergence includes inflation, long-term interest rate, exchange rate, and credit growth. On the other hand, the real convergence analyses GDP growth levels, the primary sector's contribution, unemployment, and trade relations with the EU in the overall trade balance. Institutional convergence is expressed based on the effectiveness of policies, banking, legal institutions, and the achieved level of progress in European integration processes (Dekabank, 2019). As previously pointed out, convergence processes are largely related to various technological advances and adjustments of business processes in accordance with modern and global requirements. This new orientation of economic activity significantly affects the way of doing business and emphasizes the deindustrialization process.

V. Deindustrialization as a Process

Systematization and consideration of the process of deindustrialization began in the late 1950s with the works of Clark (1957) and Kaldor (1966) and continued through the research of Baumol (1967) and Fuchs (1968). The aforementioned authors start from the premise that deindustrialization is an expected, normal (natural) process typical primarily of developed countries that arises due to economic growth changes, driven primarily by economic growth. The same authors point out that due to technological changes, the industry share in added value and employment decreases. However, and as emphasized in Solow's (1956, 1957) works, with the implementation of new solutions, industry's productivity increases. Although the "first" authors emphasize the positive context of deindustrialization, Singh (1977) takes a negative approach to this concept, arguing that deindustrialization is a state in which the economy is limited in achieving full employment, progress, and resource allocation. A similar view is taken by Priewe (1993), who introduces the notion of premature deindustrialization by taking the example of ex-communist developing countries. This author points out that structural reforms in these countries result from political processes and decisions, with deindustrialization initiated in a situation where the economy has not reached high levels of industrial production. Consequently, in terms of ensuring economic stability, deindustrialization processes should be slowed down or completely prevented.

Further consideration of the concept of deindustrialization was continued in the works of Caincross (1982) and Lever (1991) by defining four key approaches, which are the basis of contemporary research on this topic. The authors state that deindustrialization is (1) characterized by a decrease in production and employment in the industrial sector as well as by an orientation towards service activities, whereby (2) the share of industrial products in a country's international trade decreases, resulting in (3) trade deficit increase and (4) a decline in economic growth. According to Crafts (1992), the most important deindustrialization indicators are the levels of GDP growth per capita, i.e., expansion or recession of the economy, trends in international trade, and implemented structural changes in the economy.

The process of deindustrialization is triggered by the action of external and internal factors. Rowthorn and Ramaswamy (1997) as well as Rowthorn and Coutts (2004) consider internal factors and place special emphasis on increasing productivity stating that “labour productivity growth is responsible for more than 60% of industry share reductions” and that “on every 4.4

jobs lost in the industry due to the competition of cheap imports, on average, one job is created in the industry due to the growth of exports of more sophisticated products". In addition to productivity, the most important internal factors are consumption patterns, trade relations with low-income countries, and sensitivity of income demand (Kollmeyer, 2009). Rowthorn and Wells (1987) point out that increased productivity makes industrial products cheaper, thereby stimulating demand and requiring fewer workers involved. Positive changes in productivity and differences in income elasticity result (initially) in the emergence of industrialization, which later grows into deindustrialization. Positive changes in productivity and differences in income elasticity result (initially) in the emergence of industrialization, which later develops into deindustrialization.

The notions of relative and absolute deindustrialization are connected with productivity movements. Relative deindustrialization implies less employment in the industry without reducing industrial production. Penava and Družić (2014) define absolute deindustrialization in which the reduction of the industrial output leads to a drop in employment. Deindustrialization can be positive, negative, and trade-related (Alderson, 1999). In this classification, positive deindustrialization is associated with economic growth and increased productivity, while negative is caused by structural imbalances leading to stagnant incomes and rising unemployment. Trade-related deindustrialization depends on the trade balance position, i.e., whether a country has a surplus or deficit in international trade.

The most important external factor in the deindustrialization process is the country's involvement in international trade flows, which forces domestic companies to increase their productivity to survive in the face of international competition. The latter orientation results in positive trends regarding the company's productivity and directing their productions towards the development of high value-added products (Lawrence, 1983; Bluestone, 1984). In the conditions of growing international competition, the decline and elimination of low-efficiency domestic companies are inevitable. As a factor of deindustrialization, international trade is especially relevant in times of global economic trends and liberalization. Saeger (1997) systematized the effects of increased participation in international trade flows on the deindustrialization process. It is an interaction of four key phenomena. Those are the following: (1) shifting the "comparative advantages" of highly industrialized countries from factories to offices (or distribution networks) resulting in growing specialization in the services sector; (2) pressure from new competitors with low labour costs and weak environmental regulations

resulting in "survival" of the most productive companies whose products have no substitutes in cheap imports; (3) reorganization of companies to benefit (on a global level) from the advantages of differences in (international) costs by opening foreign subsidiaries (for different segments of the production process) in the (economically) most favourable locations; (4) developing countries become "new" markets (i.e., a shift in international trade results in producers' relocation from developed to developing countries.

In addition to involvement in global trade flows, deindustrialization is increasingly driven by levels of FDI. According to Alderson (1999), FDI reduces industry employment as companies (searching for cheap labour) move their production facilities to developing countries. In addition, FDI can increase the required marginal rate of return on domestic investment, relocate investment from industry to the service sector, and reorient them from productive investments.

The industrial sector is facing growing business challenges in an international environment, which require the development of high value-added products through the implementation of modern technological solutions. A new momentum for the European and global industry is the fourth industrial revolution and the growing aspiration and need to implement the Industry 4.0 concept.

VI. Industry 4.0 as the Future of Global Economic Development

The concept of Industry 4.0 arose because of movements within the third (popularly called the Digital Revolution) and, most of all, the fourth industrial revolution. Both revolutions were marked by intensified efforts to achieve digitalization, digital transformation, and other processes towards both the knowledge economy and society. The basis of their development is primarily R&D investment and continuous education and training of employees in accordance with the labour market changes and needs. The fourth industrial revolution is a development direction that relies heavily on advanced solutions such as robotics, autonomous vehicles, the Internet of Things (IoT), 3D printing, etc. Within this “revolution”, the concept of Industry 4.0 was created at the end of 2011, which significantly directs further ways of conducting the economic activity and achieving economic growth and competitiveness at the global level.

In the theoretical definition of the term Industry 4.0, it is necessary to start from the assumption of universal informatization of the production process and its connection with the information

network. Matejak (2017) defines Industry 4.0 as "the organization of production processes based on technology and devices for autonomous mutual communication". Also, Matejak (2017) comments that Industry 4.0 is "founded on the concept of modern/intelligent factories of the future in which computer systems manage and control physical processes (thus creating a copy of the physical world) and make decentralized decisions based on self-organization mechanisms".

Industry 4.0 consists of trends, elements, and priorities. Kagermann et al. (2014), and Smith et al. (2016) elaborate in detail the key elements, the systematization of which is presented below. Interoperability, virtualization, decentralization, real-time capability, service orientation, and modularity can be singled out as crucial trends of the Industry 4.0 concept. Each of these trends is realized through elements and priorities, the interconnectedness of which below

Table 1: Trends, elements and priorities of Industry 4.0

Trends	**Elements**	**Priorities**
Interoperability	Internet of Things	Standardization and referential architecture
Virtualization	Internet services	Managing complex systems
Decentralization	Big Data	Broadband Internet
Real-time capability	Cloud Computing	Safety and protection
Service orientation	Robotics	Organization and labour design
Modularity	Artificial intelligence	Education and knowledge improvement, life-long learning
	Autonomous vehicle	Regulatory framework
	3D printing	Efficiency of resources
	Nanotechnology	
	Biotechnology	
	Industrial Internet	
	Advanced production	
	Cyber-physical production systems (CPPS)	
	Smart factory	

Source: Tomljanović et al. (2019).

Industry 4.0, like all modern concepts, rests on innovation and other forms of new products and services. Therefore, Delloite (2015) points out that vertical networking of smart production systems, horizontal integration using value chains, and the implementation of exponential technologies are the most important innovations developed within this concept. However, the implementation of the whole process regularly faces many challenges, among which

Kagremann et al. (2014) emphasize the improvement, standardization, and development of new business models, product availability, and new methods of work organization. Likewise, given the speed of change and transformation, Industry 4.0 faces challenges arising from lack of employee skills, deficiencies, and limitations of the intellectual property protection system and the overall legislative system, as confirmed by Smite et al. (2014) and Geissbauer et al. (2015).

In addition, a key issue is the company's readiness for new challenges. The study by Smith et al. (2014) on a sample of German companies indicates that 90% of respondents are aware of this process's positive aspects. However, only 12% of them consider themselves ready for their implementation and complete digital transformation. On the other hand, according to a study by Deloitte (2015), Swiss companies are more oriented towards perceiving the potential costs and limitations of this process, especially from the aspect of production, procurement, and R&D conduct.

The potential future effects of implementing the Industry 4.0 can be generally seen at the company level and the whole economy level. Buhr (2015) concludes that the overall effects will be manifested through increased competitiveness, accelerated economic growth, and the creation of better jobs, driven by lower production costs, greater opportunities for consumers, development of new employee skills, and comprehensive application of new technologies.

Buhr (2015) defines three key areas of their future business on the company level and identifies them as Disruption, Progress, and Destruction. The choice of the appropriate direction will depend on each country's specifics and related policies as well as the willingness of economic and political actors to implement quality and comprehensive structural changes based primarily on digitalization and digital transformation. According to this classification, Disruption will result in the replacement of old technologies and the full implementation of new technological solutions. In Progress's case, the "Industry 4.0 solves the problems of today with the technologies of tomorrow". On the other hand, Destruction denies the Industry 4.0 concept's innovative character and calls into question the necessity and usefulness of its application.

Tomljanović et al. (2019) define Industry 4.0 as a “complex process, resulting from deindustrialization, which implies the advancement of industrial production and its close connection with information and communication technologies. Such an approach requires increased R&D activities, labour force training in key areas, which will ultimately result in

producing a large number of high-value products. By this approach, it is possible to ensure long-term economic growth and export competitiveness of the economy".

In most cases, modern economic trends do not question the existence and necessity of implementing contemporary development concepts. Instead, arises the question of speed and quality regarding their adoption and generating positive economic effects. Therefore, Industry 4.0 is not the future, but the obvious and enduring present distinguishes the successful from the unsuccessful ones. Furthermore, it should be borne in mind that its time is rapidly ending. Conditions for developing and implementing a new concept that is increasingly being incorporated into economic theory and practice are becoming more and more pronounced. This new concept is called Industry 5.0, which will probably become the dominant development direction in the next period.

VII. Conclusion

This paper analyzed theoretical directions and approaches that explain modern factors of economic growth and competitiveness. The research results indicate that R&D investments (and their products) have become a critical resource of modern economic activity necessary to achieve sustainable development and progress at the international level. Increased scientific research activities at both country and company levels improve their economic and business performance, especially visible from an increased productivity viewpoint. Orientation towards new paradigms of economic activity positively affects achieving (genuine) competitiveness, which is a key focus area of modern economic theorists. This concept is characterized primarily by an increase in the number and quality of products placed on the international market, allowing certain companies and countries to increase their shares internationally. The movement of the whole process continues with the realization of convergence and its ultimate goal, cohesion. It should be noted that modern convergence processes closely follow modern economic theories and put the necessity of human capital development at the centre, i.e., workforce improvement through continuous education and training.

To make progress in modern business conditions, companies must adapt their production structure to new challenges. The process of deindustrialization, which is characterized by a reduction in the share of the industrial sector in GDP and employment, is particularly noteworthy. The reindustrialization process marks the development of the industrial sector

towards a new direction(s) focusing on modern and "smart" sources. The latter has developed and implemented the so-called Industry 4.0 concept, which is increasingly becoming the dominant direction of global economic activities. This paper represents a starting point for future research on this topic, becoming necessary in a globally dynamic environment. Future research should focus on quantitative analysis (using appropriate econometric methods) of the effects of implementing modern factors on economic growth and competitiveness on selected groups of countries, with particular emphasis on new EU member states and developing countries.

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Appendices

Appendix 1. R&D investment in EU member states and main global competitors for the period 2010–2018 (% of GDP)

Country/time	2010	2011	2012	2013	2014	2015	2016	2017	2018
EU	1,92	1,96	2	2,01	2,02	2,03	2,04	2,08	2,11
Belgium	2,06	2,17	2,28	2,33	2,37	2,43	2,52	2,66	2,68
Bulgaria	0,57	0,53	0,6	0,64	0,79	0,95	0,77	0,74	0,76
Czechia	1,33	1,54	1,77	1,88	1,96	1,92	1,67	1,77	1,9
Denmark	2,92	2,94	2,98	2,97	2,91	3,06	3,09	3,05	3,03
Germany	2,73	2,81	2,88	2,84	2,88	2,93	2,94	3,05	3,12
Estonia	1,57	2,28	2,11	1,71	1,42	1,46	1,23	1,28	1,41
Ireland	1,59	1,56	1,56	1,57	1,52	1,18	1,17	1,22	0,99
Greece	0,6	0,67	0,7	0,81	0,83	0,96	0,99	1,13	1,18
Spain	1,36	1,33	1,3	1,28	1,24	1,22	1,19	1,21	1,24
France	2,18	2,19	2,23	2,24	2,23	2,27	2,22	2,2	2,19
Croatia	0,74	0,75	0,75	0,81	0,78	0,84	0,86	0,86	0,97
Italy	1,22	1,2	1,26	1,3	1,34	1,34	1,37	1,37	1,43
Cyprus	0,44	0,45	0,44	0,49	0,51	0,48	0,52	0,55	0,63
Latvia	0,61	0,7	0,66	0,61	0,69	0,62	0,44	0,51	0,64
Lithuania	0,79	0,91	0,9	0,95	1,03	1,04	0,84	0,9	0,94
Luxembourg	1,5	1,46	1,27	1,3	1,27	1,3	1,3	1,27	1,21
Hungary	1,14	1,19	1,26	1,39	1,35	1,35	1,19	1,33	1,53
Malta	0,59	0,67	0,8	0,74	0,69	0,72	0,56	0,57	0,6
Netherlands	1,7	1,88	1,92	1,93	1,98	1,98	2	1,98	2,14
Austria	2,73	2,67	2,91	2,95	3,08	3,05	3,12	3,05	3,14
Poland	0,72	0,75	0,88	0,87	0,94	1	0,96	1,03	1,21
Portugal	1,54	1,46	1,38	1,32	1,29	1,24	1,28	1,32	1,36
Romania	0,46	0,5	0,48	0,39	0,38	0,49	0,48	0,5	0,5
Slovenia	2,05	2,41	2,56	2,56	2,37	2,2	2,01	1,87	1,95
Slovakia	0,61	0,66	0,8	0,82	0,88	1,16	0,79	0,89	0,84
Finland	3,71	3,62	3,4	3,27	3,15	2,87	2,72	2,73	2,76
Sweden	3,17	3,19	3,23	3,26	3,1	3,22	3,25	3,36	3,32
United Kingdom	1,65	1,65	1,58	1,62	1,64	1,65	1,66	1,68	1,73
United States	2,74	2,77	2,68	2,71	2,72	2,71	2,76	2,81	2,82
China	1,71	1,78	1,91	1,99	2,02	2,06	2,1	2,12	2,14
Japan	3,14	3,24	3,21	3,32	3,4	3,28	3,14	3,2	3,28
South Korea	3,32	3,59	3,85	3,95	4,08	3,98	3,99	4,29	4,53

Source: Made by the authors based on Eurostat.

Appendix 2. Business sector investment in R&D in EU member states and main global competitors for the period 2010–2018 (% of total gross domestic expenditure on R&D)

Country/time	2010	2011	2012	2013	2014	2015	2016	2017	2018
EU	53,8	55	55,1	55,2	55,5	55,3	57	58,2	58,4
Belgium	57,6	60,2	60,6	60,6		58,6		63,5	
Bulgaria	16,7	16,9	20,8	19,5	22,3	35,6	43,6	43,2	43,1
Czechia	40,8	37,7	36,4	37,6	35,9	34,5	39,5	39,3	33
Denmark	61,1	61,2	59,9	59		59,1		58,5	
Germany	65,5	65,6	66,1	65,4	66	65,7	65,2	66,2	66
Estonia	43,6	55	51,3	42,1	37,1	41	48,2	43,6	40,8
Ireland	52,2	48,9	50,2	52,6	52,2	48,7	49	52,1	59,4
Greece	36,5	32,7	31	30,3	29,8	31,4	40,2	44,8	42,5
Spain	43	44,3	45,6	46,3	46,4	45,8	46,7	47,8	49,5
France	53,5	55	55,3	55,1	55,7		56	56,1	
Croatia	38,8	38,2	38,2	42,8	42,9	46,6	42,9	42,6	33,2
Italy	44,7	45,1	44,3	45,2	47,3	50	52,1	53,7	54,5
Cyprus	12,7	12	12,9	15,8	19	20	34,9	32,8	34,8
Latvia	38,8	24,8	23,7	21,8	27,8	20	21,6	24,1	22,3
Lithuania	32,4	28,2	26,5	27,5	32,7	28,5	39	35,4	38
Luxembourg	43,5	45,3	18,1	16,5	0,9	48,3	0,5	49,6	na
Hungary	47,4	47,5	46,9	46,8	48,3	49,7	56,4	52,7	52,4
Malta	52,5	50	44	39,7	46,5	45,6	54,5	56,4	59,6
Netherlands	na	51,1	51,6	51,1	51,1	48,6	52	51,6	56,7
Austria	45,1	46,2	45,7	48,7	47,7	49,7	53	54,7	53,9
Poland	24,4	28,1	32,3	37,3	39	39	53,1	52,5	53,2
Portugal	43,9	44,7	46	42,3	41,8	42,7	44,4	46,5	47,3
Romania	32,3	37,4	34,4	31	32,9	37,3	49,4	54,4	57,1
Slovenia	58,4	61,2	62,2	63,8	68,4	69,2	69,2	63,1	62,6
Slovakia	35,1	33,9	37,7	40,2	32,2	25,1	46,2	49	48,8
Finland	66,1	67	63,1	60,8	53,5	54,8	57	58	55,8
Sweden		57,6		61		57,3		60,8	
United Kingdom	44	45,9	45,6	46,2	48	49	51,8	53,7	54,8
United States	56,9	58,4	59,5	61,1	62	62,5	63,2	62,5	62,4
China	71,7	73,9	74	74,6	75,4	74,7	76,1	76,5	76,6
Japan	75,9	76,5	76,1	75,5	77,3	78	78,1	78,3	79,1
South Korea	71,8	73,7	74,7	75,7	75,3	74,5	75,4	76,2	76,6

Source: Made by the authors based on Eurostat.

Appendix 3. Exports of high technology products (as a % of total exports) in EU member states for the period 2010–2018

Country/time	2010	2011	2012	2013	2014	2015	2016	2017	2018
EU	16,1	15,4	15,7	15,3	15,6	17,0	17,8	17,8	17,9
Belgium	8,4	7,7	8,6	8,7	9,6	10,2	10,0	9,8	10,3
Bulgaria	4,1	3,7	3,8	4,0	3,9	4,4	5,1	5,4	5,9
Czechia	16,1	16,4	16,1	15,1	15,3	15,5	15,0	16,1	17,8
Denmark	9,3	9,3	9,3	9,3	9,8	10,7	10,6	9,6	9,4
Germany	14,0	13,5	14,2	14,3	14,3	14,9	15,2	15,1	15,1
Estonia	10,4	14,8	14,1	14,9	16,3	15,5	15,6	12,0	11,5
Ireland	19,5	21,2	21,7	20,9	20,9	24,4	28,7	34,5	34,7
Greece	5,6	4,6	3,2	2,7	3,7	4,6	5,0	4,3	4,5
Spain	4,8	4,8	5,0	5,4	5,2	5,5	5,8	5,7	5,5
France	20,4	18,7	20,0	20,4	20,8	21,7	21,7	20,6	20,5
Croatia	7,0	5,8	7,2	7,9	6,6	7,1	9,7	9,2	8,1
Italy	6,5	6,4	6,4	6,6	6,7	7,0	7,1	7,6	7,8
Cyprus	19,3	14,8	11,7	18,1	5,2	10,9	6,9	10,2	9,5
Latvia	4,8	6,7	6,4	8,0	9,7	11,0	10,2	10,6	11,2
Lithuania	6,0	5,6	5,8	5,8	6,6	7,6	7,8	8,1	7,9
Luxembourg	30,7	25,8	26,7	21,9	19,6	19,8	15,3	6,9	7,2
Hungary	21,8	20,9	17,3	16,3	14,5	15,4	15,9	16,0	15,6
Malta	32,9	30,1	29,6	28,5	28,7	24,1	18,5	25,5	25,6
Netherlands	18,6	17,3	18,8	17,7	18,6	20,4	21,0	21,6	21,3
Austria	11,8	11,2	12,8	14,2	14,4	14,2	13,9	14,8	13,8
Poland	6,0	5,1	6,0	6,7	7,9	8,5	8,5	8,4	8,4
Portugal	3,0	3,1	3,3	3,4	3,6	3,8	4,4	4,5	4,0
Romania	9,8	8,8	6,3	5,6	6,4	7,3	8,3	7,9	8,4
Slovenia	5,3	5,3	5,2	5,5	5,4	5,9	5,7	5,6	5,8
Slovakia	6,6	6,6	8,2	9,6	9,9	10,0	9,7	10,5	9,6
Finland	10,0	8,0	7,3	6,2	6,7	7,0	6,8	6,6	6,1
Sweden	14,5	13,8	12,8	13,0	12,9	13,5	13,4	11,9	11,3
United Kingdom	17,7	16,4	17,4	15,5	15,6	16,7	18,4	18,1	16,7

Source: Made by the authors based on Eurostat.