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International relations through the prism of the new technological division of power

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Abstract: The aim of this paper is to determine which country has technological superiority in the field of industry by analysing the strategic approaches to the industrial development of three leading industrial countries (Germany, China, and the US), as well as selected indicators of industrial development. The results of the research show that China has the most ambitious approach and pretension to take a leading position in a large number of high-tech industries. Since 2014, China has become the second-largest industrial power, right after Germany, while the US has been in fourth place since 2017. China leads in terms of the share of industrial products in global trade and the share of manufacturing value added in the total world gross domestic product. Since 2015, China and Germany have developed intensive cooperation in the area of hi-tech industrial production, while bilateral relations between China and the US are tight due to the trade war. While the US, as the third-largest bilateral trading partner of Germany (after China and the Netherlands), is generating a trade deficit, China is making a breakthrough towards the European market, which is in line with the strategy of taking the position of a global leader in high technology.

Keywords: Germany, China, the United States, international relations, the fourth industrial revolution, technological development, industry.

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Introduction

New revolutionary technological inventions have always preceded global socio-economic and political changes (Lučić 2019) and marked the beginning of a new industrial revolution. The first industrial revolution is symbolically associated with the invention of the steam engine in 1769, while as a beginning of the second industrial revolution is taken 1860 as a year when were promoted innovations in steel production which further enabled mass production, electrification of production and development of new industries. The third industrial revolution began in the late 1970s thanks to the development of digital and information technology, electronics and telecommunications, which improved the automation of the industry through the development and application of robotics in industry. On the foundations of the digital revolution, the current fourth industrial revolution ("Industry 4.0") has been developing, characterized by a fusion of various technological breakthroughs that blur the line between the physical, digital and biological spheres (NICVA 2021). The essence lies in the smart functioning of ubiquitous networks, the emergence of smart devices and big data technology-based applications, cloud technology and the internet of things. Unlike previous industrial revolutions, the fourth industrial revolution is far faster and brings changes in all industrial areas and branches. It was preceded by a period of great movements in international capital and productivity growth (Tošković and Filipović 2017; Marjanović 2010), but the global turnaround in terms of reindustrialization occurred after 2009 when it became clear that economic recovery was not possible without strengthening industry and technological modernization (Gerlitz 2016).

The fourth industrial revolution was officially presented in 2016 at the World Economic Forum, through the transformation of digital, physical and biological technologies, which announced the global transformation of entire production and management systems. Improving efficiency and productivity, reducing transport and communication costs, innovations provided better logistical support and inclusion in global supply chains, which together boost international trade (Schwab 2016). In the sphere of production, these technologies are based on merging the virtual and the real, introducing artificial intelligence, increasing computer and telecommunication capacities (Šenk 2018), which qualitatively changes material production and affects the international division of labor. On one hand, automation can lead to greater inequality, not only on labor market but also inequality among countries (Brinjolfsson and McAfee 2015), while on the other hand technological advances have the potential to raise income level and quality of life globally (iED 2019).

The turnaround in global economic policy after escalation of the global economic crisis, showed that economic growth based on services was not sustainable and that process of reindustrialization was necessity. To respond more effectively to new challenges of technological progress, most countries have adopted national strategies to define future industrial development. Among the first in the European Union (EU), Germany adopted "Industrie 4.0" and France "Nouvelle France Industrielle" after which Italy adopted "Fabbrica del Futuro", the Netherlands "Smart Factori", Great Britain "High Value Manufacturing Catapult", Spain "Industria Conectada 4.0" and the Czech Republic "Prumisl 4.0". In Asia, strategic programs have been developed by Japan's "Industrial Value Chain Initiative" and several emerging economies such as China's "Made in China 2025", the Republic of Korea's "Manufacturing Innovation 3.0", India's "Make in India", Singapore's "Smart Nation Program", Malaysia "National Industry 4.0 Policy ", and Kazakhstan's" National Technology Initiative", etc. (Kheyfets and Chernova 2019).

In their strategic documents, the countries opted for so-called sectoral approach (separation of special sectors of industry) or for a horizontal approach, which implies the creation of general conditions that encourage innovation, digitalization and technological transformation. Accelerated development of nano, bio- and information technology, determine the main direction of global innovation dynamics, while the use of new technologies become the basis for the formation of new markets and significantly affect the appearance of traditional industries (energy, transport, industrial production, etc.).

Analysing the strategic approach to the industrial development of three leading industrial countries (Germany, China and the US), as well as selected indicators of industrial development, the aim of this paper is to determine which country has technological superiority in the field of industry. The fourth industrial revolution is creating new leaders on market of high-tech industrial products,where new divison of power might be one of important factor influencing on further international relations of countries that claim to become global leaders.In accordance with the goal and the general hypothesis, the paper is structured so that the first chapter gives an overview of the strategic industrial goals of world centers of industrial power in the direction of reindustrialization and taking a position on a competitive market of high-tech products. The second chapter provides analysis of selected indicators of industrial performance and ranking on the international list of industrial competitiveness. Considering the strategic directions of development and indicators of industrial performance, the third chapter provides insight how current positions and pretensions in the field of high technologies are reflecting on international relations. Finally, in the concluding part, certain conclusions are drawn.

Strategic approaches to the Fourth industrial revolution

The need for reindustrialization became obvious after the escalation of the global economic crisis in 2008 when it became clear that a service-based model of economic growth was not sustainable. In addition, the rapid spread of technology and intensified global competition have further accelerated the process of reindustrialization and led to the definition of different national strategic approaches to the fourth industrial revolution, with a focus on the development of new high-tech industries.

Innovation and digitalisation as the backbone of the German approach

Germany, as member of the EU, defines its national industrial policy in accordance to EU recommendations and its national needs. Generally, the EU industrial policy is based on a horizontal approach where future industrial policy guidelines are going in the direction of competitiveness development, creation of a favorable business environment and encouragement of investment, as well as continuous improvement of entrepreneurship and innovation. In addition to horizontal principles and instruments, every EU member state can define its national industrial policies which can boost competitiveness and launch initiatives.

In accordance to the new Industrial Policy Strategy (European Commission 2020) which promotes increase of global competitiveness based on green and digital transition, the aim of Germany is to accelerate and drive changes, innovations and growth, and to reduce strategic dependence on key materials and technologies, food, infrastructure and security. Higly prioritising decarbonisation process and supporting the EU goal to become the world's first climate-neutral continent by 2050, Germany is promoting innovation, digitalization, global competition and key technologies (Council of the European Union 2019). Having in mind that key areas of intervention (European Council 2019), one of the great challenges will be how to neutralize the risk of inequality, given that innovation and digitalisation (as key areas of intervention) are agglomerations that are sustainable and more concentrated towards increasing disparities in regional development (Pilati 2019).

Building an industry based on digitalization, innovation and the application of new technologies that are efficient and non-harmful to the environment (circular and carbon economy), is linked with direct investments in these technological areas, knowledge and skills of employees (European Commission 2017).

Accordingly, the key areas that should contribute to the improvement of the further German industry are: digitalization, innovation, investment, internationalization, improvement of knowledge and skills of employees and circular and carbon economy.

Germany, as the most developed industrial country, was the first which presented the idea of "Industry 4.0 (I40)" and smart companies (Belov 2016). Germany adopted "The High-Tech Strategy 2020" in 2010, and then in 2012 the strategic document "Industry 4.0" (Federal Ministry of Education and Research 2010). Unlike the previous approach, in which German industry was focused on the growth of industrial production so that industrial production has a high share in gross domestic product (GDP), new priorities became innovation and digitalization (Gerlitz 2015; Davies 2015) that should secure Germany a competitive position on the global market (Ramsauer 2013). It is estimated that this approach will bring an annual growth of 1.7% by 2025, and an additional 78 billion EUR for six key industrial sectors, of which mechanical engineering 23.04 billion EUR, automotive industry 14.80 billion EUR, electrical engineering 12.08 billion EUR, chemical industry 12.02 billion EUR, information and communication technology 14.05 billion EUR and agriculture 2.78 billion EUR (Bauer et al. 2014, 6-7). However, as other countries are rapidly working to improve the industry, Germany is challenged to maintain its high competitive position (Federal Ministry for Economic Affairs and Energy 2018), constantly reviewing existing business models and supporting inovations within its industry (Burmeister et al. 2015).

Leading position in high-tech industries as a strategic goal of China

In 2015, China adopted the strategic document "Made in China 2025", which announced the revitalization and modernization of the industry, following the example of the German national strategy "I40" (ISDP 2018). The strategic goal is to achieve a global leadership position in a large number of high-tech industries (production of medical devices, aero-nautical equipment, robots, etc.), as well as to meet as much as 70% of demand for high-tech products from its own production (Laskai 2018).

The Strategy "Made in China 2025" defines the process of improving the industry in three phases with the goal that China will become the leading world manufacturing power by 2049. The strategy is guided by two principles: "innovations driven by quality, green development, structurally optimizes and human-oriented" as well as the principle of "market orientation, government

guidance, focus on the present, future perspective, overall promotion, key discoveries, independent development, opening and cooperation" (Zhang et al. 2016). Thus, this strategy represents the first phase of strategic development whose implementation by 2025 should contribute to the development of Chinese technological innovations and the creation of recognizable local brands in the global market, which will make China the leading innovative superpower (Mehanik 2018). In the second phase, the goal is to reach the medium level of the world manufacturing powers to 2035, while the third phase refers to further consolidation of China's position as a manufacturing power and strengthening comprehensive Chinese manufacturing at the top of the world list until 2049. According to Huimin et al. (2018), the strategy "Made in China 2025" identifies nine priority tasks: 1) Improving production innovation; 2) Integration of information technology and industry; 3) Strengthening the industrial base; 4) Support for Chinese brands; 5) Strengthening green production; 6) Promotion of discoveries in 10 key sectors (information technology, numerical control tools and robotics, aeronautical equipment, equipment for ocean engineering and high-tech ships, railway equipment, energy saving and new energy vehicles, energy equipment, new materials, biological medicine, medical funds and agricultural machinery); 7) Improving the restructuring of the manufacturing sector; 8) Promoting service-oriented manufacturing and manufacturing-related service industries; and 9) Internationalization of production.

These goals indicate that it is necessary to deepen institutional reforms primarily through the creation of a market environment, financial support and improvement of industrial processes. Improving technologically backward industrial processes with investments of USD 300 billion (Bradsher and Mozur 2017), the aim is to improve the competitiveness of domestic industry and to gradually prepare China for global expansion (Wübbeke et al. 2016). With the development and promotion of advanced technology, China is gradually using domestic technology instead of foreign technology. In order to promote smart manufacturing, China is setting up smart plants and digital workshops as pilot projects in major industrial areas and accelerating the application of advanced manufacturing techniques and equipment (including smart human-machine interaction, industrial robots, intelligent logistics management and additive production). Thus, in 2017 China produced a third of the installed robots in the world, while the plan is to become the leader with over 950 thousand robots in the next few years (IFR 2018). In addition, the goal is that as much as 40% of chips for smart mobile devices will be produced by domestic Chinese manufacturers, and that domestic production cover more than 60% of the demand for smart technologies by 2025.

Strengthening the competitive position as a priority for the US

In order to strengthen the competitiveness of industrial production, the US adopted the "US Recovery and Reinvestment Act", the "American Clean Energy and Security Act 2009" in 2009, while the Barack Obama Government adopted the "United States Production Promotion Act 2010" (Xu 2013). In order to encourage technologically advanced industrial production, „A National Strategic Plan for Advanced Manufacturing" was adopted in 2012. This strategic plan is based on the promotion of innovation, encourages cooperation between science and economy and advocates a stimulating business environment that supports technologically advanced production and strong development of domestic technologies (National Science and Technology Council 2012).

With the arrival of Donald Trump as the President of the US in 2017, the process of industrialization was more strongly advocated. At the very beginning of his mandate, Trump asked for a study of the competitiveness of the US economy, which would form the basis for the creation of the national production and defense "industrial base". The research pointed to the loss of US global competitiveness, as well as the consequences of uncertain government spending, declining sales in certain markets, negative long-term effects of switching certain sectors abroad due to lower prices, loss of labor skills (Intergovernmental working group of the US 2018). Also, according to the National Science and Technology Council (2018), private investment in manufacturing technology has been reduced as investors have focused on a quick return on investment through software launches. Although the US remain the largest producer of products in some sectors, it is concerned about the sharp decline in production and employment in some strategically important sectors, especially in the IT sector. Also of key importance to the US industry is the military industry, which relies on other sectors and which must maintain the capacity for rapid innovation. That is why an office for trade and production (White House 2017) was formed at the White House, and employment in the production sector was promoted.

In October 2018, the White House published a quadrennial Strategy for American Leadership in Advanced Manufacturing whose vision is the creation of American leadership in advanced manufacturing across industrial sectors to ensure national security and economic prosperity. In that sense, three strategic goals have been defined: 1) Development and transition of new production technologies; 2) Improving education, training and connecting the productive workforce; 3) Expanding the possibilities of the supply chain of domestic production (NIST 2018). For each of these goals, specific goals have been identified together with action plans that define the measures and specific actions that need to be implemented

in the next four years. In addition to emphasizing the importance of innovation and competitiveness in production, the strategy also stressed the need to improve the military industry, in terms of modernization and growth of investment in this sector, strengthening the independence of supply sources from other countries, improving cooperation with partner countries, growth of research and development, etc.

Since the strategy for the US leadership in advanced production was created during Donald Trump's tenure, one of the priorities of his administration was to improve competence and develop certain profiles because the lack of applied knowledge from science, technology, engineering, mathematics and technology was recognized. In addition, it was pointed out the need for all levels of government to act to support research and development, improving the competencies of the workforce, creating a stimulating business environment. Nevertheless, the US federal agencies have a key role in fostering the growth of advanced production through investment in research and development, education and workforce development.

Based on the defined strategic priorities of the Germany, China and the US, Table 1 shows the key areas for further development of the industry.

Table 1: Priorities in scientific and technological development

	Germany	China	US
Medicine and biotechnology	Medicine	Medicine Agricultural production system with high value added	Medicine and biotechnology
ICT	Communication technology	The system of pervasive information network	ICT
New materials		Composite materials	Composite materials
Green technologies	Ecology / Energy sectors	Sustainable resources, nuclear power	Clean Energy
Production technologies		Smart manufacturing technologies	Management of complex systems
Other	Mobility Security	Use of space and the ocean potential Security and defense system	Space and aviation technologies Defense technologies

Source: Kheyfets and Chernova 2019.

Comparison of industrial performance

In 1966, the UNIDO developed a methodology for the international comparison of countries' industrial competitiveness based on six categories of industry performance indicators.[3] The survey covers 152 countries, which are categorized as developed industrialized countries, emerging industrialized countries, other developing economies and least developed countries.

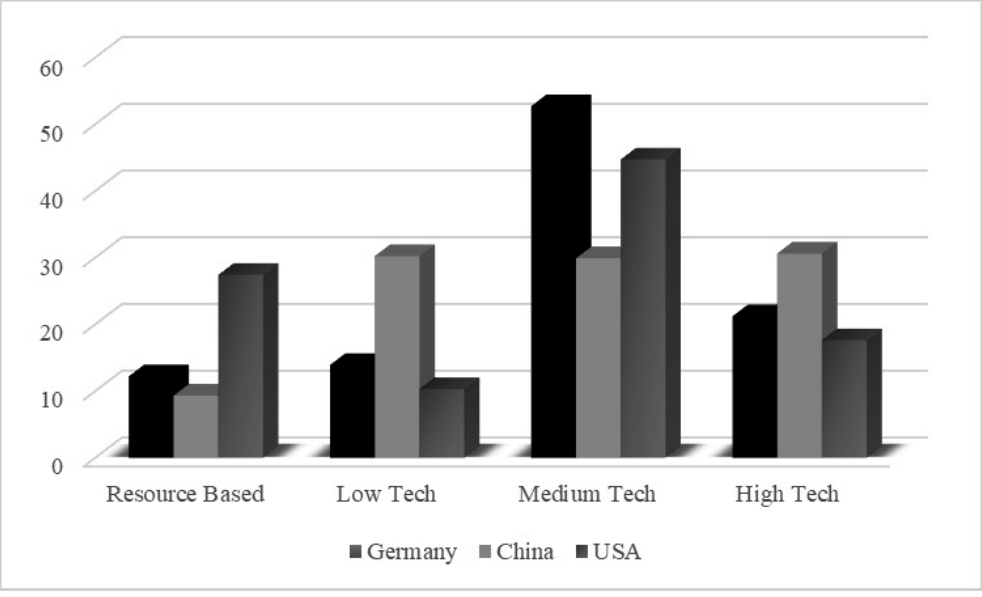
According to the UNIDO report from 2019, on the international list of industrial competitiveness, Germany is the best placed, followed by China, the Republic of Korea, the US and Japan. By the way, Germany is the best placed country since the beginning of monitoring this indicator in 1990. In the same period, the US held the second position, and China was on the 15th position on average. However, China climbed from 32nd positions in 1990 to 7th place in 2008, and in 2014 it became the second placed country, after which it was held this position to this day. The US fell to third place in 2015, and then to fourth position in 2017, where they are and today.

According to the latest available UNIDO data for 2018, it is evident that Germany and the US have such an industry structure in which medium tech leads, with 52.7% and 44.7% respectively, while China has an equally distributed industry on high tech 30.6%, medium tech 29.9 % and low tech 30.2% (Diagram 1). In other words, in China, high tech industries are more represented than in Germany (21.2%) and the US (17.6%). Observed by sectors individually, the main industrial sectors in China are: basic metals (14.3%), chemicals (10.8%), food and beverages (8.9%), machinery and equipment (8.5%), radio, television and communication equipment (6.8%). In Germany, machinery and equipment (18.6%), motor vehicles, trailers (17.6%), shemicals (10.3%), fabricated metal products (9.2%), food and beverages (7.2%) are in the lead. In the US, chemical products (16.4%), food and

[3] Every of six indicators has it's sub-indicators: Per capita indicators (Manufacturing Value Added per capita, Manufactured Exports per capita), World share indicators (Impact of a country on World Manufacturing Value Added, Impact of a country on World Manufactures Trade), Share of medium- and high-tech activities (Medium- and High-tech Manufacturing Value Added share in in total manufacturing value added, Medium and High-tech manufactured Exports share in total manufactured exports), Share of national aggregates (Manufacturing Value Added share in total GDP, Manufactured Exports share in total exports), Manufacturing export indexes (Manufactured Exports per capita index, Share of manufactured exports in total exports index, Share in world manufacturing exports index, Share of Medium, High-Tech Activities in Manufacturing Export Index, Industrial export quality index) and Manufacturing Value Added (MVA) indexes (MVA *per capita* index, Share of world MVA index, Share of MVA in GDP index, Share of Medium and High-Tech Activities in Total MVA Index, Industrialization intensity index) (UNIDO 2010).

beverages (14.3%), fabricated metal products (7.7%), office, accounting and computing machinery (7.4%) have the largest share.

Diagram 1: Structure of the industry as a percentage of GDP, 2018.



Source: author's calculation based on UNIDO database.

In the period 1990-2019, Germany as the most developed EU country and the third largest economy in the world, had an average growth rate of 1.6% of GDP, while the EU noted an average of 1.8%. The average rate of exports of goods and services as a percentage of GDP in Germany, in the same period was 20.4%, while the highest level of exports (47.3% of GDP) was achieved in 2017. In EU in the same period exports averaged 36.9% of GDP, while the highest share of exports in GDP was 47.27% and that record was achieved in 2018. According to data for 2019, the share of manufacturing value added as a percentage of GDP in Germany was 26.7%, while the highest level was reached in 2016 in the amount of 27.6% of GDP (World Bank 2021). In EU, industry as a branch of the economy had the largest share of 24.4% in GDP in 2006, while manufacturing value added as a percentage of GDP in 2016 achieved the greatest success with 15% of the share (World Bank 2021).

According to the World Bank, China has maintained the continuity of high economic growth for years. In the period 1990-2019, the average growth rate was

as much as 9.3%, while the rate of exports of goods and services as a percentage of GDP was 22.7%. The highest level of exports of goods and services was achieved in 2006 in the amount of 36.04%, while in 2019 exports amounted to only 18.5% of GDP. According to data for 2019, the share of industry value added as a percentage of GDP was 38.5%, while the highest level (47.6% of GDP) was reached in 2006. At the same time, manufacturing value added as a percentage of the GDP was 37% (World Bank 2021).

As part of the 1978 structural reforms, China emphasized the development of industrial production, which took place in three phases (Wübbeke et al. 2016). The first phase (1978-1990) was supported by a strong inflow of foreign direct investment (primarily from the US, after the establishment of diplomatic relations in 1979) which enabled access to new technologies (Filipović 2020) and the development of electronic products and electrical appliances. During this period, there was a development of the food and military industry, but still the main problem of this phase was the insufficient supply. In the second phase of the development of industrial production (1990-2000), the supply grew so that the main challenge became the adaptation of production to new market conditions and the harmonization of production with the requirements of foreign markets. The development of the private sector, with the support of foreign investment, has encouraged the rapid development of industrial production in coastal areas and China is becoming a base for outsourcing production (Huimin et al. 2018). The third phase (2000 to date) is characterized by a sharp increase in exports, primarily due to the fact that China became a member of the World Trade Organization (WTO) in 2001. In addition, there was an influx of foreign direct investments (Xia 2017), which together with investments in infrastructure (railways, highways and communication facilities), gave a strong impetus to the development of machine and car industry, steel industry, electronics sector, forming an industrial chain.

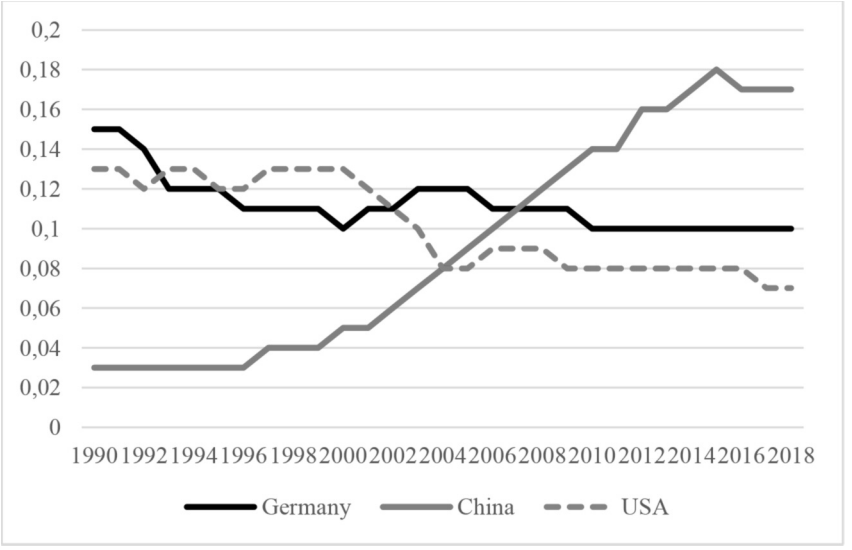
In the US, economic growth has long been based on the services sector, so that the decline in the relative importance of industrial production has over time led to a loss of competitiveness in the industrial sector. The subprime mortgage crisis brought the US economy into recession in 2007 (Eichengreen et al. 2012), so the US had to turn to a revival of industrial production. After defining the new industrial strategy (White House 2012), more and more new industrial formats are being developed (Pan and Zhu 2019), which, among other things, imply attracting a larger number of American manufacturers to start their production in the US. However, there are different opinions in the US about the idea of reviving industrial production. First, there is the opinion that the revival of industrial production will not succeed because the race in competition with China has been lost, precisely because of globalization and the liberalization of trade and financial flows.

Therefore, the reorientation of production is a political reflection of the economic and social consequences arising from the globalization of capitalism (1980s) so that the trend of globalization cannot be changed. On the other hand, there are opinions that US industrial production has a significant impact on Chinese production, primarily through US technology used by Chinese manufacturers, as well as the US directing of foreign direct investment in China based on the wage ratio between Chinese and the US workers, which shows a positive correlation in export competitiveness. Also, an increase in US foreign direct investment will promote Chinese industrial upgrade and encourage the adjustment of Chinese production structure to high-quality areas, while, conversely, a decrease in foreign direct investment would hamper Chinese industrial upgrade.

In the period 1990-2019, the US had an average growth rate of 2.5% of GDP. In the same period, the average share of exports in GDP was only 11%, while the highest value of the share of exports in GDP (13.5%) was achieved in 2013. According to data for 2018, the share of industry in GDP was 18.3%, and the highest level was reached in 2006 (21.6%), while the manufacturing value added as a percentage of GDP was 11.2% (World Bank 2021).

If the impact of a country on world manufactures trade was analyzed, which presents a share of manufactured exports in total world exports, according to the data for 2018, China leads with 0.17%, followed by Germany with 0.10% while the US achieved only 0.07%. Considering the average value of this indicator in the period 1990-2018, the US impact of a country on world manufactures trade was 0.10%, while China and Germany recorded 0.09% and 0.11%, respectively. However, the decline in the US impact of a country on world manufactures trade occurred in 2004 when it was 0.08%, while China has started its growing share. Therefore, during the period 2001-2018, China increased the average impact on world manufactures trade to 0.12%, while the United States had an average of 0.08%. Germany, as the most developed EU member state (Wang 2016), had a constant impact on world manufacturing trade, which was not below 0.10% (Diagram 2).

Diagram 2. Impact of a country on world manufactures trade (%)



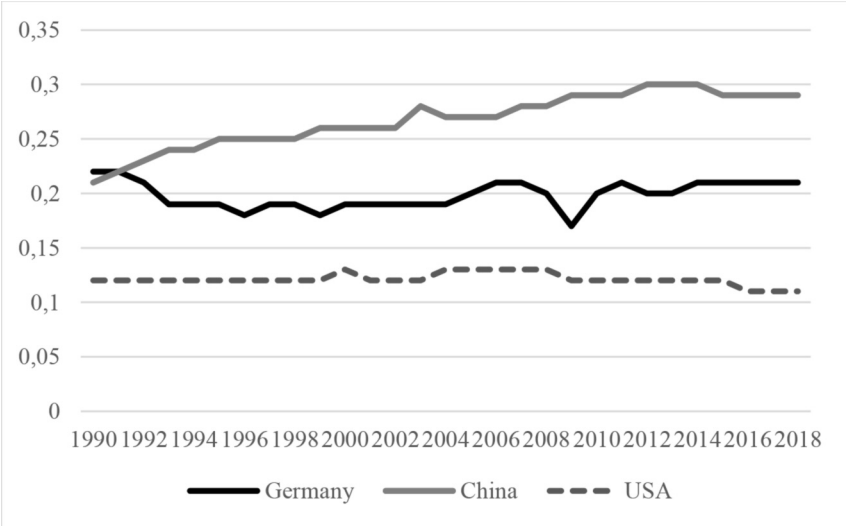
Source: author's calculation based on UNIDO database.

The Manufacturing Value Added (MVA) indicator in GDP measures the share of gross value added in production in total world GDP:

$$\text{Share of MVA in GDP} = \frac{MVA}{GDP} \times 100$$

Industrialization contributes to the value of GDP and increases the share of MVA in GDP. In highly industrialized countries, service sectors tend to grow faster than manufacturing sectors (e.g., China is more industry-oriented than the US). Accordingly, MVA share in total GDP is higher in China (0.29%) than in Germany (0.21%) and the US (0.11%). Considering the average MVA in total world GDP (Diagram 3), China has an average share of 0.26%, Germany 0.19%, and the United States 0.12%. With the decline in value added in the US production, employment in the manufacturing sector gradually decreased, with e.g. 32% in 1953, to only 8.7% in 2015 (Chien and Morris 2017), which led to a difference in income or greater inequality.

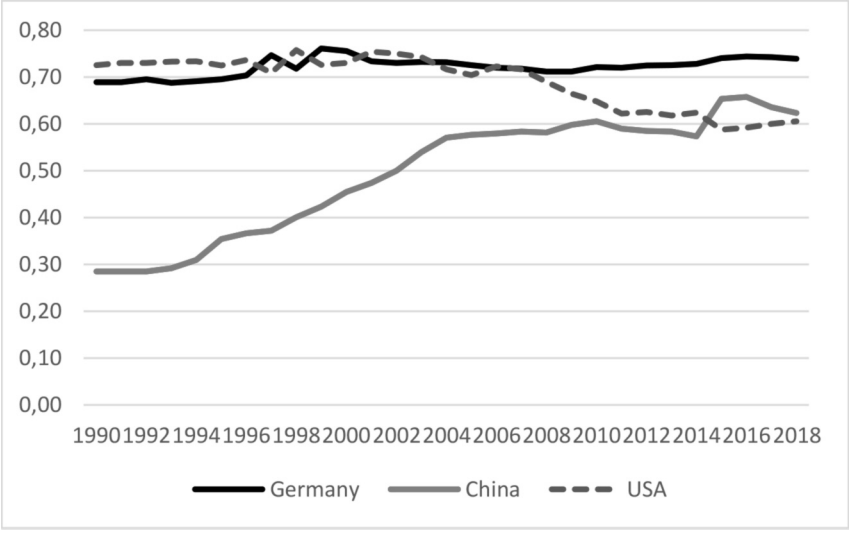
Diagram 3. Manufacturing Value Added share in total GDP (%)



Source: author's calculation based on UNIDO database

Medium and high-tech manufactured exports share in total manufactured exports shows the country's competitiveness in the production of technologically advanced products for export to foreign markets, ie share of medium- and high-tech activities. According to the data for 2018, the share of total exports is led by Germany with 0.74%, while China achieved 0.62%, and the United States 0.61%. Considering the period 1990-2018, it is noticeable that Germany had the largest share of 0.72%, followed by the United States with 0.69% and China 0.49%. Although China recorded a markedly smaller share of medium and high-tech products in total exports in the early 1990s, it increased its share by increasing production after the second wave of the economic crisis (Diagram 4). From this, it is clear that China is making a step towards high technology and thus represents a serious competitor to the US, and the "Trade War" with the US can be called the "Technological War" (Reghunadhan 2018).

Diagram 4. Medium- and High-tech manufactured exports share in total manufactured exports (%)



Source: author's calculation based on UNIDO database

International economic relations among industrial superpowers

In international trade relations with China, the US have recorded a high deficit in trade, ie a surplus in trade of products and in services. If the exchange in services is analyzed, the US are the second largest trade partner of services to China, while China is the third largest export market of the US services. According to Filipović (2020), the value of the US trade in services increased from USD 24.94 billion in 2007 to USD 75.05 billion in 2017, which means that the export of the US services to China increased by 340% during ten years. As much as 20% of China's deficit in trade in services is based on imports of services from the US in the field of tourism, transport and intellectual property royalties. For example, China's trade deficit with the US in tourism rose from USD 430 million in 2006 to USD 26.2 billion in 2016, with an average annual growth rate of 50.8%.

Considering trade, China was the third largest export market for the US goods and the largest supplier of goods in 2019 (USTR 2021). Overall, the US have had a large trade deficit in goods for many decades. At the end of 2017 trade deficit was

USD 811 billion, which is about USD 64 billion more than in 2016. On the other hand, in 2017 China recorded a trade surplus of USD 421 billion, which is as much as USD 173 billion less than in 2015.

The US trade deficit with China in 2017 amounted to USD 391.5 billion where trade deficit was the highest in the following products: computers and electronics USD 167.3 billion, electrical equipment USD 39.9 billion, misc. manufacturing USD 38.6 billion, apparel USD 29.3 billion, machinery USD 25.7 billion, furniture USD 23.4 billion, fabricated metal USD 20.3 billion, leather USD 19.8 billion, plastics and rubber USD 15.6 billion, textiles USD 11.6 billion. China runs up huge surpluses in medium technology products. On the other hand, the US surpluses with China in 2017 amounted to USD 40.8 billion, where surplus was the highest in farm crops USD 15.3 billion, transportation equipment USD 10.5 billion, oil and gas USD 6.9 billion, waste and scrap USD 5.5 billion, minerals and ores USD 1.5 billion, forestry products USD 1.1 billion (United States Census Bureau 2021). The trade deficit between the US and China increased to USD 419 billion in 2018, while in 2019 it was reduced to USD 345 billion. The US had a services trade surplus of an estimated USD 36 billion with China in 2019, which is decrease of 4.1% in comparison with 2018 (USTR 2021).

China's economic campaign, through the announcements of further strategic development, has called into question the competitive position of the US on the world market. Ever since the Trump administration, the US have considered China an economic rival, and the Chinese model of growth as a threat to the world trade system. Given that the US have had a problem with the trade deficit and loss of competitiveness for a long time, they accuse China for distorting its economic position at the expense of unfair competition, manipulation of the national currency and theft of intellectual property. Besides, the US referred to the Chinese influence on the global competitiveness of the US economy, endangering national security, and even China's interference in the US elections (Filipović 2020). These accusations were the announcement for the beginning of the trade war which has started with introduction of tariffs by the US. In addition, the US argue that WTO rules do not restrict China sufficiently to subsidize domestic industry, aid and favor state-owned enterprises, and discriminate against foreign investors, particularly through forced transfer of technology. In order to reduce the foreign trade deficit, especially with China, the Trump administration tried to pull the US out of the WTO, with the intention of creating a series of bilateral trade agreements that would protect American producers. Although, WTO members have the right to apply unjustified prohibitions, various anti-dumping and countervailing duties to a non-member country, they introduce permits and bans on the import of goods and other obstacles (Trošić Jelisavac and Rapaić 2015, 129).

The US first imposed a 30% tariff on import of Chinese solar panels in January 2018, accusing China for unfairly subsidizing the solar energy sector in order to benefit the global market. As China produces more than 2/3 of the world's solar panels, the growth of tariffs is an obstacle to Chinese competitiveness and further growth of production and exports, which was a strong hit to Chinese industry.

In March 2018, the US imposed 25% of tariffs on Chinase steel and 10% on aluminum. Believing it was not violating international trade rights, China responded by imposing tariffs on steel and aluminum worth USD 2.4 billion.

In April 2018, the US administration imposed sanctions on the Chinese company ZTE, which was one of the key players in the field of telecommunications and information technologies[4] on the US market. The sanctions stemmed from ZTE's non-compliance with US regulations on the illegal export of telecommunication equipment to Iran and North Korea.[5]

In June 2018, the US introduced tariffs of 25% on Chinese goods worth about USD 50 billion, which includes over 800 different industrial products (Nikolić 2018) ranging from dishwashers to aircraft tires, while China then imposed similar measures with tariffs on the US agricultural and industrial products (soybeans, pork, cotton, airplanes, cars, steel pipes, etc.).

Meanwhile, in May 2019, the US government imposed sanctions on the Chinese company Huawei, and banned the production of chips for smart devices, as a result of US fears of Chinese spying using the "backdoor" and "kill-switch" programs (Kawamata 2018). This step was provoked by Huawei's ambitions to develop the fifth generation of mobile telephony (5G network), which is characterized by high flow rates. Despite this, Huawei has continued to develop and build its AppGallery platform, which upgrades to missing applications.

At the end of December 2019, Washington and Beijing concluded a trade agreement with the goal of reducing tensions in the mutual trade war. The agreed

[4] Previously, under the control and regulation of the Chinese government, the entry of American ICT companies into this sector in China was limited. For example, the American Facebook has not been available in China since 2009, and Twitter, Google search, Google maps, Youtube since 2010. Thus, the Chinese Baidu and Weibo gained a huge number of users, while Alibaba achieved market dominance in online shopping. However, Apple established its cloud service in China and sold a VPN application, but transferred its work to a Chinese company in 2017 after implementing the "Cyber ecurity Law of the People's Republic of China" (Kawamata 2018).

[5] Considering that in March 2017, the company ZTE admitted the violation of sanctions due to the illegal sending of telecommunication equipment to Iran and North Korea, for which it had to pay compensation in the amount of USD 1.19 billion and fines for employees involved in breach of contract, ZTE secretly rewarded employees, followed by US sanctions in April 2018.

terms of the "first phase" of the future trade agreement were supposed to reduce US tariffs on Chinese goods, while China would increase the purchase of US agricultural, energy and industrial products, which would also improve the protection of intellectual property. Also, the US pressured China not to insist on US companies in China to do business through a Chinese partner and not to share its technology, which is explicitly prohibited by WTO rules on the one hand, while China denies violating that rule, claiming that US companies are not forced to share technology, but to do so voluntarily in order to access the Chinese market (Николић and Николић 2019). The truce was a short because immediately after the spread of the COVID19 pandemic outside the borders of China, the US continued to make accusations against China. And while the epidemic has been contained in China, it has spread to the US with far more casualties than in China.

According to Trapara (2018), China's economic development and presence in world trade previously corresponded to the US policy, while the US promoted itself as a protector of globalization, to which China significantly contributed with its development and market. However, as China took advantage of globalization, began to reap the benefits, and approached the US economic power, the US wanted to curb China's further strengthening. The US began to perceive Chinese growth as a threat to its position as the most powerful power in the international system, even during the mandate of Barack Obama, when the US policy turned to East Asia. In addition, the US have begun to view the international relations between the EU and China through Chinese interests, which poses a certain threat to the US economy. Namely, until the beginning of the crisis in 2008, Chinese capital did not have access to the European market. However, the global economic crisis, the public debt crisis and the weakening of the EU's financial capacities have opened the door for the inflow of Chinese capital into this strategic market. China, as the country with the largest foreign exchange reserves in the world, provided assistance to the EU in order to prevent its weakening as an important actor in preserving the multipolar world (European Council 2018), but also to preserve its important export market, maintain access to European technologies and investors (Arežina 2020).

Germany and China started mutual economic cooperation at the beginning of economic and systemic reforms in China, which initially relied on German investments that were important for China due to access to developed technology. During the fourth industrial revolution, the German and Chinese governments agreed on cooperation in the field of industry cooperation, development of common standards and science and research (Platform Industrie 2021). Two German-Chinese Memoranda of Understanding were adopted (Weiss 2021). The first was adopted in 2015 between the German Federal Ministry for Economic

Affairs and Energy (BMWi) and the Chinese Ministry of Industry and Information Technology (MIIT), while the second was adopted in 2016 between the Federal Ministry for Education and Research (BMBF) and the Chinese Ministry of Science and Technology (MoST). The main goal of the cooperation is to improve the business environment for entrepreneurs with the proactive shaping of the digital development of the manufacturing industry (Platform industrie 2021). In addition, the two countries have established a sub-working group with the aim of standardization in the field of industry 4.0, as part of the German-Chinese Commission for Collaboration on Standardization (DCKN) led by BMWi and the State Agency for Standardization of the People's Republic of China (SAC). Then, in 2016, the German-Chinese working group "Companies for Intelligent Production and Connection of Production Processes (AGU)" was established in Beijing, which enables direct cross-sectoral exchange, identifies new business activities and formulates proposals for improvement. The working group consists mainly of German-Chinese business representatives and experts in science. Their cooperation is mainly related to data security and intellectual property rights.

Germany and China became the largest trading partners in 2015, while in 2020 they achieved foreign trade worth USD 258 billion, which is a growth of as much as 3% despite the COVID-19 pandemic (Casey 2021). Hamburg's strong rail connections to the European hinterland that have made it a key link between the land and maritime arms of China's ever-expanding "Belt and Road Initiative" have contributed to this. As Chinese goods make up even the weight of cargo in Hamburg, Chinese companies are increasingly trying to direct their supply chain. Industrial products such as cars, chemicals and precision machines are mainly shipped from Germany via the port of Hamburg, while mobile phones, computers, home appliances and clothes are shipped from China to Germany, and then further distributed throughout Europe. The strengthening of international relations between China and Germany was contributed by the new Chinese "Belt and Road Initiative" (Weibin 2013), which further intensified the Chinese threat for the US. Through this initiative, China strives to achieve the broader goals of the New Silk Road development strategy, which not only determines the directions of China's internal development, but also provides guidelines for its strategic cooperation with neighboring countries and countries on other continents (Dimitrijević 2018; Dimitrijević and Jokanović 2020). The "Belt and Road Initiative" allows huge Chinese industrial capacities, mainly in the creation of steel and heavy equipment, to be exported along the New Silk Road and further allows for a focus on technologically superior industrial products (Lockhart-Bruce 2017). The "New Silk Road" seeks to accelerate the revitalization of this part of the world that is inhabited by more than 4.4 billion people and generates a third of the world's GDP (Janković 2016). "Belt

and Road Initiative" (BRI) is a Chinese foreign policy project that includes coordination of policies, connection of infrastructure and facilities, free trade, financial integration and closer ties between people (Vučić 2020). Part of this development strategy is so-called the "16 + 1"[6] cooperation mechanism, which brings together sixteen countries of Central and Eastern Europe and China, with the aim to develop and promote cooperation between them (Šekarić 2020; Filipović and Ignjatović 2021). Open door policy[7] in China, marked a complete turn in the economic development of China, where a new form of development is called market socialism or socialism with Chinese characteristics (Zakić and Radukić 2018; Garić and Filipović 2019).

However, smaller German producers are worried about China's penetration of the German market. For this reason, after the Chinese company Midea took over the robotics company Cook, in 2017 Germany introduced new laws to protect sensitive industries. This resulted in the examination of dozens of possible contracts by the German authorities, so that numerous takeovers by Chinese state-owned companies were blocked, including Leifeld Metal Spinning in 2018 and satellite manufacturer IMST in 2020. In addition, the Federation of German Industries published a report in 2019 describing China as a "systemic competitor", calling on EU legislation to address state-subsidized Chinese industry and thus protect European IT companies. In the same year, rules for the difficult operation of Huawei's 5G mobile network were introduced. In June 2021, the German parliament passed a law requiring German companies, as well as their foreign subsidiaries, to keep their supply chains free from environmental abuse or forced labor. While part of the future German government has demanded the introduction of import duties and protection of digital and physical infrastructure from Chinese influence, another part of the German government praises China's development of Duisberg as a rail hub for BRI, which advocates strengthening trade relations between the two countries.

On the other hand, the international relations between Germany as an EU member state and the US are based on the Transatlantic Cooperation. In 2007, Germany supported the establishment of the Transatlantic Economic Council (TEC),

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[6] The CESEE-16 region includes eleven EU member states in Central and Eastern Europe (CEE) (Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) and five Western Balkan countries (Albania, Bosnia and Herzegovina, North Macedonia, Montenegro and Serbia) which are (potential or) candidates for EU membership. Since 2019, this mechanism has been renamed "17 + 1", because Greece has joined the project.

[7] China has had major infrastructure projects such as the TAZARA railway in Tanzania and Zambia, the Kinkon and Tinkisso hydropower plants in Guinea, and Bounenza in Congo.

between the EU and the US, to guide the work on transatlantic economic convergence, bringing together ongoing activities of economic co-operation between the two countries on issues of common interest (Council of The European Union 2007). Negotiations on the Transatlantic Trade and Investment Partnership (TTIP) with the aim of eliminating customs duties and increasing trade began in 2013, but were very quickly interrupted by the opposition of primarily Germany, but also France. As a reason for opposition, it was stated that customs barriers are low even without an agreement. Besides, the removal of regulations on workers' rights, the environment, privacy, food safety and toxic chemicals were mentioned as problems. One of the objects was the non-transparency of negotiations in the period (Žarković 2016). In spite of that, trade between Germany and the US is considered a central element of fragile bilateral economic relations, due to significant the US deficit, for what the US blame for the undervalued euro exchange rate and tariff deviations.

In 2012, Germany and the US recorded an average of about USD 170 billion trade (United States Census 2021), making Germany the fifth largest trading partner of the US behind, Canada, China, Mexico and Japan. However, although five years later, China surpassed the US as Germany's largest trading partner, the US remained Germany's largest foreign market, receiving as much as 8.4% of all German exports. In 2017, transport goods accounted for 30% of German exports to the US, primarily cars and car parts of the German brands BMW and Mercedes (OEC 2021), where German cars accounted for 8% of total sales of American cars (Riley 2018). On the other hand, US exports to Germany were in machinery, chemical products and transportation goods in the amount of 64% of German imports from the US in 2017 (Georg 2020). According to the OEC (2021) data for 2019, the largest share in German exports to the US have the following products: cars (15.8%), packed medicaments (8.14%), vaccines, toxins and cultures (3.32%), gas turbines (2.34%) and medical instruments (2.27%). Same group of products have the highest share in the US export to Germany: cars (11.4%), vaccines, toxins and cultures (5.99%), gas turbines (5.53%), packed medicaments (4.01%), planes, helicopters and / or spacecraft (3.65%).

According to the Federal Foreign Office (2021), the US were the largest buyer of German products in 2020, and Germany is the most important trade partner of the US in Europe. In terms of the total volume of trade, the US are the third largest bilateral trade partner of Germany (after China and the Netherlands). However, the US government focus is on trade deficit since in the period 2008-2018 the US has the largest total world trade deficit, out of which USD 57 billion with Germany. The US government as the main reason for trade deficit blame depreciation of

euro, denying that the reason for the growing deficit could be the loss of competitiveness of the US industry (George 2020; Kuo et al. 2021).

Conclusion

The need for reindustrialization at the global level became apparent after the escalation of the global economic crisis, when it became clear that the service-based model of economic growth was not sustainable. The process of reindustrialization was affected by the rapid spread of technology and increased global competition, and the world's industrial powers began to compete in the development of new high-tech branches of industry, i.e. the implementation of the fourth industrial revolution.

Analyzing the strategic approach to the industrial development of three leading industrial countries (Germany, China and the US), as well as selected indicators of industrial development, the aim of this paper is to determine which country has technological superiority in the field of industry.

Germany adopted "The High-Tech Strategy 2020" in 2010, and then in 2012 the strategic document "Industry 4.0" promoting digitalisation and innovations in industry. Following the example of Germany, China adopted strategy "Made in China 2025" in 2015, announcing the modernization of the industry with the goal of becoming a global leader in a large number of high-tech industries, as well as that 70% of demand for high-tech products will be supplied from its own production. In order to strengthen the competitiveness of industrial production, the US have adopted a number of documents since 2009, but only after Donald Trump came to power was the process of industrialization was more strongly advocated.

According to the UNIDO methodology for the international comparison of industrial competitiveness, Germany is the best ranked country, followed by China, the Republic of Korea, the US and Japan. Additionally, Germany is the best placed country since the beginning of monitoring these industrial indicators in 1990. In the same period, the US held the second position, and China was on the 15th position on average. However, China climbed from 32nd positions in 1990 to 7th place in 2008, and in 2014 it became the second placed, after which it was held the position to this day. The US fell to third place in 2015, and then to fourth position in 2017, where it is today.

Germany and the US have such an industry structure in which medium technology leads, with 52.7% and 44.7% respectively, while China has an equally distributed industry on high tech 30.6%, medium tech 29.9% and low tech 30.2%.

In other words, in China high tech industries are more represented than in Germany (21.2%) and the US (17.6%). China leads if the impact of a country on world manufactures trade is observed, which represents a share of manufactured exports in total world exports. Likewise, China has the highest share of manufacturing value added in total world GDP. Considering medium and high-tech manufactured export share in total manufactured export, China still lags behind Germany, although in recent years China has made a significant step towards high technology and thus represents a serious competitor to the US, and the "Trade War" with the US can be called "Technological war".

Given that the US has had a problem with the trade deficit and loss of competitiveness in the industrial production for a long time, accusations of intellectual property theft and manipulation of the national currency yuan escalated into a trade war in 2018, resulting in the introduction of tariffs to China. On the other hand, the improvement of international relations between Germany and China is noticeable, especially in the field of Industry 4.0 and intelligent production, ie the fourth industrial revolution in which both governments are cooperating intensively. Despite this, although China is increasingly trying to direct its supply chain using "Belt and Road Initiative", Germany is worried that key technologies could become part of the production competition, and by adopting new laws it is protecting sensitive industries in the market. In addition, the weakening of bilateral economic relations between Germany and the US was caused by a significant the US deficit, whle the US blame the undervalued euro exchange rate and tariff deviations. In addition, Germany is the largest European trade partner of the US.

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MEĐUNARODNI ODNOSI KROZ PRIZMU NOVE PODELE TEHNOLOŠKE MOĆI

Abstrakt: Analizirajući strateški pristup idustrijskom razvoju tri vodeće industrijske zemlje (Nemačka, Kina i Sjedinjene Američke Države), kao i izabrane kvantitativne pokazatelje industrisjkog razvoja, cilj ovog rada je da odredi koja zemlja ima tehnološku superiornost u industriji. Rezultati istraživanja ukazuju da Kina ima najambiciozniji pristup i pretenziju da zauzme lidersku poziciju u velikom broju visoko-tehnoloških industrija. Kina još od 1990-tih godina ostvaruje napredak u performansama industrije, a 2014. godine je postala druga industrijska sila današnjice, odmah nakon Nemačke, dok su SAD od 2017. godine na četvrtom mestu. Kina naročito prednjači u pogledu učešća industrijskih proizvoda u globalnoj trgovini i učešća proizvedene dodate vrednosti u ukupnom svetskom bruto domaćem proizvodu. U oblasti visoke tehnologije, od 2015. godine Kina i Nemačka jačaju međusobnu saradnju, dok su bilateralni odnosi između Kine i SAD zategnuti zbog trgovinskog rata. I dok SAD, kao treći najveći spoljnotrgovinski partner Nemačke (nakon Kine i Holandije), u međusobnoj spoljnotrgovinskoj razmeni ostvaruje deficit, Kina sa inicijativom „Pojas i put“ pravi prodor ka evropskom tržištu, što je u skladu sa strategijom zauzimanja pozicije globalnog lidera u oblasti visoke tehnologije.

Ključne reči: Nemačka, Kina, SAD, međunarodni odnosi, četvrta industrijska revolucija, tehnološki razvoj, industrija.