TRADE LIBERALIZATION AND TECHNOLOGICAL PROGRESS OF THE EU ECONOMY[96]

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Abstract: *Liberalization of the world economy is a powerful and dynamic process characterized by the abolition and/or reduction of customs restrictions, which results in static and dynamic impacts that largely determine a country's position in global trade relations. The process of liberalization also enables technology transfer and the exchange of other forms of investments in research and development 'outcomes', which represent the foundations of achieving a long-term economic growth and competitiveness in the modern business environment. However, the success of countries or integrations in such conditions is largely determined by the ability to adapt and to absorb positive effects of the liberalization process.*

The research problem in this paper arises from the potentially negative effects of trade liberalization, especially on the loss of competitiveness of the European economy, which was mainly established through technological progress in the previous decades. The conducted research is based on the scientific hypothesis: it is possible to determine the effects of liberalization of international trade, as well as the trade agreements that the EU concludes with third countries, on the technological progress of the European economy.

With the profound 'insight' into the relevant literature, the authors of this paper found that most of economic theorists have so far dealt with the effects of globalization and related processes of increased levels of technological readiness on trade liberalization. In this paper an inverse approach was used in order to investigate the effects of the removal of trade barriers on achieving the technological progress of the European economy. This approach represents the fundamental scientific contribution of the conducted research. The results showed that the EU has, in the past sixteen years, along with a few rounds of enlargements, basically doubled its international trade, achieving almost constant surplus of the foreign trade balance.

Also, together with the growth of international trade, an orientation of the European economy toward modern 'engines of growth', particularly based on investments in research and development and their outcomes is noticeable. In the observed period, the EU achieved increased levels of: 1) investments in R&D, 2) sales of high technology products, 3) international trade of high technology products, and 4) employment in high technology sectors. The pressure of global competition and demographic changes, which can greatly slow down economic growth and innovation activities of the European economy because of their adverse effects, are recognized as the most important challenges for the EU in the future process of trade liberalization (or de-liberalization) and the achievement of technological progress.

Keywords: *EU, liberalization, progress, technology, trade*

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1. INTRODUCTION

The liberalization of world trade implies systematic removal of customs and non-tariff barriers to international trade [25]; resulting in static and dynamic impacts and effects on production and consumption [18]. Static effects relate to resource provision changes, while dynamical ones imply the increase of production productivity, the strengthening of competition, the absorption of new knowledge and technologies, and the increasing inflows of foreign direct investments. Furthermore, the effect on consumption is manifested through the reduction of domestic market prices, impacts of incomes and the improvement of welfare of the population, while the effect on production has the most significant impact on inefficient domestic producers, which were protected by customs and non-tariff barriers. On the other hand, domestic producers who exported before liberalization, increase their competitiveness, as they have been given free access to new markets [18].

Creating international economic and trade integrations results in positive and negative effects for the countries involved, but also for those who "stay out" of them. It is important to point out to the liberalists, who advocate that through the actions of the market mechanisms customs and non-customs obstacles to free international trade are removed, establishing unique conditions for economic growth and the creation of favorable conditions for the establishment of economic integrations as well as the integration of markets and market prices ([40], [28], [11], [3]. On the other hand, institutionalists believe that markets cannot be expanded solely by liberalization, but by planning and programming, i.e. by creating a general economic development policy. They represent a relatively heterogeneous group, including protectionists, who emphasize the importance of regional protection of national economies [2], and dirigists, who see integrations as a regional expansion of the role of the state in international economic relations [38]. However, liberalists are increasingly re-orientating their attitudes toward institutionalized solutions to free market competition, mainly through harmonized national policies, while institutionalists rely on more liberal attitudes regarding the need to respect market legitimacy and to look at integrations as complex systems with many elements that can be the subject of interactions between states.

In the context of globalization, particular emphasis should be placed on the effects of liberalization on the achievement of technological progress, which is a key starting point for the conducted research. The research problem stems from the possibility of losing competitiveness on the EU level, primarily in the technological sense, given the effects of globalization and the liberalization of international trade. The purpose of the research is to determine to what extent trade liberalization affects technological progress, i.e. to determine the level of technological progress of the European economy achieved through effects of trade liberalization.

The paper is structured into five mutually related parts. After the introductory considerations defining the key elements of the research, an overview of the current research follows indicating the effects of trade liberalization on the achievement of technological progress. Furthermore, secondary data from relevant international databases was used for descriptive analysis of trade liberalization and technological progress of the European economy. Based on the results of the analysis, key challenges and perspectives of liberalization and technological progress have been identified for Europe. The paper rounds up with the synthesis of the key conclusions that have arisen during the research.

2. LITERATURE REVIEW

The liberalization of world trade places increasing pressure on the continuous development of economies and enterprises based solely on research and development (R&D) investments and their outputs, which are the foundation of economic growth and competitiveness. Namely, [26] points out that liberalization processes, through increased competition, create strong pressure on "domestic" companies, which under these conditions must create favorable conditions for achieving technological progress. According to [20] technological advances can be broadly aligned with the development of innovations, resulting from the conscious investments in research and development enterprise-wide, but also the whole economy. Such growth requires a continuous accumulation of knowledge emerging as a result of the liberalization and spread of knowledge between countries and regions [34], which affirms the need to improve education systems. The importance of education in the process of achieving economic progress has been considered in [30], [10], [36], [31] and [35]. Furthermore, [22], [8] and [7] point out that countries have to "open" borders to achieve global competitiveness and allow free access to foreign technologies. [1] point out that R&D has become the key driver of socio-economic changes, with the most developed countries responding to economic globalization and liberalization as an active creator in strengthening the global economy by promoting scientific and technological policies with the aim of ensuring competitive advantages and employment, and also finding solutions to global problems. In the process of achieving technological progress in the context of liberalization, special attention should be paid to the scientific and research activities of the business sector, which is the bearer of economic activity in the European economy [5], [34], [27], [37]. Also, [7] recognizes the lack of business sector investments in R&D activities and their market implementation as one of the main reasons for EU's lagging behind the major competitors (USA, China, South Korea, etc.). Namely, investments from the business sector are the basis for further employment and increased production, especially in the high technology sector, which ultimately contributes to improving economic performances with particular emphasis on increasing the share of high-tech exports in total exports. This orientation of the economy results in positive effects in terms of achieving economic growth and productivity growth, as recognized in works of [9] and [4].

Productivity growth has been identified as the most significant effect of liberalization, due to the increase in technological progress. This is highlighted in works of [9], [33], [23], and [12]. On the other hand, "skeptics" like [24] and [40], argue that the liberalization and international competition negatively affect domestic companies, primarily by reducing their sales. However, later research largely disputes their findings and points to a strong link between liberalization and productivity growth through the promotion of technological progress. Besides productivity, [21] point out that trade liberalization results in multiple effects on national economies, especially when taking into account the impacts of foreign technology inflows.

Recent research into the effects of liberalization on the achievement of technological progress and productivity growth has been largely focused on "dynamically" developing countries, e.g. Australia [28], Turkey and Azerbaijan [21], and India [6], while the research of European countries was basically "neglected".

All above mentioned contributes to the theoretical and practical justification of the conducted research.

3. ANALYSIS OF LIBERALIZATION AND TECHNOLOGICAL PROGRESS OF THE EUROPEAN ECONOMY

In this section a descriptive analysis of trade liberalization and technological progress of the European economy has been carried out. Liberalization, thus, has been characterized by variables "trade" (% of GDP), "exports and imports of goods and services" (% of GDP), "trade balance of goods and services" (% of GDP) and "foreign direct investments" (% GDP) in the period 1960 to 2017. Technological progress has been analyzed using the indicators such as "expenditure on research and development" (% of GDP), "expenditure on research and development funded by the business sector" (% of total R&D), "employment in high tech sectors" (% of total employment) and high tech exports (% of manufacture exports) for the period 2007-2017. The data were collected from the World Bank and Eurostat databases.

The European continent's trade orientation has been steadily increasing since 1963. The first initiatives about the introduction of the common market, the customs union, the implementation of the single market and the efforts made in the realization of a genuine internal market, together with the development of international trade relations with third countries, triggered the liberalization processes and paced trade as the key factor for achieving European economic growth. In the observed period, total value of trade increased from the initial 38.8% of GDP up to 85.83% of GDP in 2017. Total growth of trade was accompanied by the increase of exports and imports, whose values have almost tripled (Appendix 1). The growth trend is also present in foreign direct investments. Until 1993, Europe was highly import-oriented and achieved continuous trade deficits. However, after 1993, due to accelerated integration trends, there is an increase in export activities and the achievement of trade surpluses.

Considering trade partners, exports are mainly oriented to the United States, China and Switzerland, accounting for 32.9% of EU's total exports. Similar situation exists for imports, where 41.8% of the total value refers to China, the United States and Russia [13]. This indicates a very high level of connections but also the EU's dependence on trade with major global partners. In such circumstances, the European economy needs to turn to new technological solutions and intensify their implementation in manufacturing processes, thereby strengthening the position on the global market. Thus, it is necessary to take advantage of the opportunities that, in the context of technological progress, enable the process of global trade liberalization.

With certain exceptions, during the period from 1996 to 2016, the EU has steadily increased the level of investments in R&D, reaching a level of 2.04% of GDP. According to recent economists, the business sector's scientific research activity increased, with investment up from 1.15% to 1.32% of GDP in 2017. Also, total business sector investments amounted to 55.2% of total R&D investments (Table 1).

Table 1: Key indicators of technological progress in the EU in the period 2007-2017

Year	R&D (% of GDP)	Business sector R&D (% of total investments)	Employment in high tech sectors (% of total employment)	High tech export (% of manufactured export)
2007	1.77	54.9	n.a.	16.1
2008	1.84	54.8	3.80	15.4
2009	1.93	54.1	3.70	17.1
2010	1.93	53.8	3.80	16.1
2011	1.97	55	3.90	15.4
2012	2.01	55.1	3.90	15.7

2013	2.02	55.2	3.90	15.3
2014	2.04	55.3	3.90	15.6
2015	2.05	55.2	4.00	17.0
2016	2.04	n.a.	4.00	17.9
2017	n.a.	n.a.	4.00	17.8

Source: developed by authors based on [14], [15], [42], [47], 2018.

Positive trends in the field of business sector R&D activities are also reflected on employment in high tech sectors, which recorded steady growth in the period from 2009 onwards. The latest available data suggest that 4% of EU-wide employment refers to employment in *high technology* sectors.

The EU's orientation towards achieving technological progress, economic growth and international competitiveness has been strongly expressed in 2010 with the adoption of the EUROPA 2020 strategy, whose basic goal was to *"create the most competitive and fastest-growing economy of the world by 2020, based on knowledge and its outputs"*. It is also visible in the trend of high technology production. The data from Table 2 indicate that most of the member states in the post-recession ("crises") period increased the levels of high-tech production. France, Germany, the United Kingdom and the Netherlands achieved the highest values.

Table 2: Production value of high technology[100] manufacturing in the EU in the period 2008-2016[101]

Year Country	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria	8,514.5	7,332.5	7,538.0	8,146.9	7,993.9	8,628.9	9,029.6	9,638.1	10,257.8
Belgium	n.a.	14,440.5	19,629.0	15,548.9	16,193.6	19,840.5	20,129.0	22,966.2	27,013.4
Bulgaria	624.3	515.3	628.2	700.5	756.9	778.3	850.1	947.5	996.3
Czech Rep.	n.a.	10,389.7	12,131.3	11,780.1	13,098.3	11,932.1	12,414.6	13,884.8	13,547.7
Germany	149,173.0	107,940.2	118,034.7	125,985.3	126,355.7	132,536.6	135,925.6	148,261.2	156,940.0
Denmark	11,162.3	10,121.8	11,365.5	12,432.7	13,758.8	13,849.4	15,825.8	17,529.1	18,219.3
Estonia	n.a.	407.8	934.6	1,682.3	1,769.7	1,793.5	1,835.9	1,669.5	n.a.
Greece	1,964.2	n.a.	1,795.9	1,464.7	n.a.	n.a.	1,523.2	1,963.0	1,897.8
Spain	27,156.4	22,637.7	23,063.6	21,967.6	21,926.7	22,948.6	23,803.0	26,442.4	26,800.5
Finland	24,366.9	17,071.3	16,812.9	15,951.7	n.a.	12,237.9	11,176.9	n.a.	10,770.8
France	97,591.7	85,012.2	85,600.4	85,800.2	91,216.5	96,891.6	101,976.1	n.a.	167,787.6
Croatia	1,314.6	890.2	889.6	810.2	n.a.	1,052.5	1,088.4	1,203.8	1,325.1
Hungary	18,806.5	14,973.2	18,033.2	17,784.5	n.a.	n.a.	n.a.	12,885.2	13,269.2
Italy	64,248.9	51,339.2	56,304.1	55,310.7	54,640.2	53,88.4	53,167.4	54,443.4	53,236.4
Lithuania	n.a.	n.a.	325.9	299.2	287.0	310.9	360.2	484.1	502.1
Latvia	229.0	198.5	237.0	285.2	316.3	358.2	361.0	468.2	482.8
Netherlands	n.a.	13,540.0	15,653.3	15,651.3	n.a.	14,389.8	34,670.2	42,949.2	42,717.6
Poland	12,107.4	9,988.5	13,865.5	12,353.4	12,299.7	12,320.2	13,233.9	14,021.3	13,997.9
Portugal	3,349.1	n.a.	n.a.	2,736.6	2,520.3	2,396.0	2,401.3	2,630.4	3,101.8
Romania	2,204.1	2,566.3	3,520.7	3,292.3	2,424.2	2,352.7	2,592.6	2,912.8	2,921.9
Sweden	28,099.4	25,481.8	29,360.6	30,363.5	n.a.	n.a	24,260.9	n.a.	n.a.
Slovenia	2,118.4	1,768.6	1,920.2	2,075.1	2,182.7	2,285.4	2,347.9	n.a.	n.a.
Slovakia	6,184.7	6,326.2	6,953.8	6,155.3	n.a.	5,746.5	n.a.	n.a.	5,823.6

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[100] Included: pharmaceuticals, computers, electronic and optical products and air spacecraft.
[101] Not included: Luxembourg, Cyprus, Malta and Ireland (no relevant time series available).

| United Kingdom | 71,741.2 | 57,967.8 | 66,591.1 | 64,066.5 | 66,550.0 | 66,082.0 | 67,667.8 | 76,934.6 | 74,863.8 |

Source: developed by authors based on [16], 2018

This orientation of production has also contributed to increased exports of high technology products (Table 1). In the observed period it increased from 16.1% to 17.8% of total exports. The export of high technology products is largely directed to the United States, China and Switzerland. On the other hand, the EU is still import-oriented in this segment, where 79% of total imports of high-tech products come from China, the USA, Switzerland, Vietnam, Malaysia and Japan. It is clear that the EU has a deficit in the trade of high technology products. Looking at the leading trade partners, the EU has a deficit in the trade in high technology products with China, Vietnam, the USA, Malaysia, Thailand, South Korea, Switzerland and Japan. As opposed to that, countries where the EU has materialized a surplus in the trade of high tech products are Mexico, Israel, Canada, Singapore, Norway, Brazil, Hong Kong, India, Saudi Arabia, Turkey, Russia and United Arab Emirates.

Summing up; it is clear that trade liberalization has a positive impact on the technological progress of the European economy, particularly in terms of increased overall investments in R&D, stimulation of business sector activities, encouraged employment in high technology sectors and a more favorable trade balance, especially through increased exports of high-tech products. In such circumstances, the European economy creates conditions for economic growth and productivity growth.

4. CHALLENGES AND PERSPECTIVES OF LIBERALIZATION AND TECHNOLOGICAL PROGRESS OF THE EUROPEAN ECONOMY

As the most important challenges of the liberalization process with regards to technological progress, it is possible to point out on issues such as dumping and the use of state subsidies in particular countries. Repercussions of such trade practices indicate negative impacts on industrial production, employment, market shares, sales or profit. Subsidizing certain companies through tax reliefs, preferential interest rates or direct payments to companies reduces the price of subsidized products, making these products more attractive to domestic and foreign markets. Dumping and unfair state subsidies are considered to be detrimental to the global trading system, mainly because they interfere with the normal pricing mechanisms, fuel manufacturing inefficiencies, endanger domestic producers, and call on for the retaliation from the government.

Also, the future dynamics of liberalization can be observed through the context of structural unemployment, environmental protection costs and through the infant industry argument. Structural unemployment refers to the fact that trade liberalization often leads to changes in the equilibrium of the economy. In this context, industries are developing with different dynamics and often can result in the structural unemployment of certain industries. When it comes to environmental protection, trade liberalization could lead to greater exploitation of the environment; for example, with higher levels of raw material production or *toxic waste trade* with countries with weaker ecological legislation. In the case of infant industries, liberalization can cause damage for developing economies, which are unable to compete in conditions of free trade. Therefore, the infant industry argument advocates trade protection as justified when it comes to helping developing economies with progress and development of new industries. Given the fact that most economies had periods of trade protectionism, it is argued that it might not be fair to insist that developing economies cannot use some forms of protectionism.

Protectionism has recently been identified as one of the main factors behind the slowdown of globalization. The World Economic Forum cites evidence of "decline in the openness of the economies" in the form of non-tariff barriers, rules of FDI and the prevalence of foreign ownership [38].

Despite the perceived progress, the EU is still lagging behind its global competitors in key areas of technological progress (Table 3). In the area of R&D investments the EU currently achieves higher levels than Russia but more modest levels than other competitors. A noticeable gap is evident with comparison to South Korea, whose investments are almost twice as high as the EU average.

Table 3: Comparison of key technological progress indicators of EU and main global partners in 2017

Country	Research and development (% of GDP)	Business sector research and development (% of total investments)	High tech exports (% of total manufactured export)
EU	2.03	55.3	17.8
Russia	1.1	26.5	10.71
United States	2.79	64.2	19.95
China	2.07	74.7	25.23
Japan	3.29	78	16.22
South Korea	4.23	74.5	26.58

Source: developed by authors based on [14], [42], [44], 2018

Still insufficient, the encouragements of business sector investments in R&D activities has led to a lag behind its main competitors in the production and exports of high technology products, which represent the most important way of achieving global benefits. Taking into account the growing trade conflicts at the global level, the EU has to take a firm stance and improve its position at the international level. In this context, it is necessary to establish a sustainable risk management system and to define trade parameters to enable innovation, which in turn promotes trade and ensures progress. This includes the strengthening and modernization of the World Trade Organization with the technology-related negotiating programme, along with a more effective system of monitoring and reforming the dispute resolution system.

In the context of liberalization, [38] marks technologies that could have a significant impact on global trade: Blockchain, artificial intelligence and smart machines, trade services via digital platforms, three-dimensional printers, and mobile payments. The World Economic Forum study suggests that the introduction and widespread use of new forms of technology should have a significant impact on future international trade; for instance, after the three-dimensional printing gets more available, widely accepted and cheap enough, the global trade could be reduced by 25%, given that such technologies require less labour and reduces the need for imports.

5. CONCLUSION

The paper analyzes the effects of liberalization on the technological progress of the European economy. The results suggest that the European economy, due to liberalization and growing market integration, has continually increased the value of all segments and thus improved its own global position. Increased trade orientation, opening up borders and strengthening international cooperation all contributed to technological progress, particularly in terms of

investments in research and development and the engagement of the business sector. The research found that improving performance of these segments has also had an impact on increasing employment in high technology sectors and increasing production of high technology products. With its orientation to modern requirements of economic growth, the European economy maintains positive trends in the trade balance, resulting in economic growth and productivity gains. All of this points to the fundamental scientific contribution of this paper. Future research should focus on quantifying the effects of liberalization on technological progress, with particular emphasis on individual members of the EU.

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[50] World Bank (8) (2018), available on: https://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS

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APPENDICES

Appendix 1: Key trade indicators of the European economy in the period 1963-2017

Year	Trade (% of GDP)	Export (% of GDP)	Import (% of GDP)	Trade balance (% of GDP)	FDI (% of GDP)
1960	38.88	19.41	19.47	-0.06	-
1961	38.35	19.05	19.30	-0.24	-
1962	37.96	18.70	19.26	-0.56	-
1963	38.39	18.59	19.81	-1.22	-
1964	38.84	18.73	20.11	-1.37	-
1965	38.62	18.88	19.74	-0.85	-
1966	39.08	19.12	19.96	-0.84	-
1967	38.34	18.79	19.56	-0.77	-
1968	40.03	19.79	20.24	-0.45	-
1969	41.87	20.73	21.14	-0.41	0.70
1970	39.91	19.70	20.21	-0.51	0.60
1971	39.59	19.76	19.84	-0.08	0.56
1972	39.55	19.74	19.81	-0.06	0.65
1973	42.35	20.78	21.57	-0.79	0.73
1974	49.87	23.77	26.10	-2.33	0.50
1975	45.61	22.27	23.33	-1.06	0.38
1976	48.40	23.32	25.08	-1.76	0.51
1977	48.69	23.84	24.86	-1.02	0.47
1978	47.07	23.50	23.58	-0.08	0.51
1979	49.55	24.25	25.30	-1.05	0.56
1980	51.11	24.46	26.65	-2.19	0.47
1981	53.00	25.75	27.24	-1.49	0.42
1982	52.93	25.80	27.13	-1.33	0.48
1983	52.99	26.17	26.83	-0.66	0.31
1984	56.09	27.90	28.18	-0.28	0.52
1985	56.40	28.15	28.25	-0.10	0.57
1986	50.08	25.22	24.86	0.36	0.75
1987	49.50	24.65	24.85	-0.20	1.00
1988	50.11	24.73	25.38	-0.64	1.31
1989	52.61	25.80	26.81	-1.01	1.24
1990	51.62	25.55	26.07	-0.51	0.95
1991	51.32	25.51	25.82	-0.31	0.84
1992	51.11	25.49	25.62	-0.14	0.98
1993	50.34	25.67	24.67	1.00	0.94
1994	52.79	27.03	25.76	1.26	1.30
1995	55.80	28.61	27.19	1.42	1.20
1996	56.50	28.97	27.53	1.44	1.51
1997	59.80	30.75	29.05	1.70	2.83
1998	60.67	30.95	29.72	1.23	4.16
1999	61.52	31.13	30.39	0.75	8.20
2000	68.62	34.44	34.19	0.25	3.82

2001	67.99	34.38	33.61	0.77	3.92
2002	65.81	33.62	32.19	1.44	2.76
2003	64.74	32.93	31.81	1.12	2.90
2004	67.40	34.33	33.08	1.25	6.69
2005	70.44	35.67	34.77	0.90	7.24
2006	74.91	37.78	37.13	0.65	9.51
2007	75.96	38.39	37.57	0.82	5.63
2008	77.57	38.97	38.60	0.36	2.60
2009	68.41	34.75	33.66	1.09	3.40
2010	75.96	38.45	37.51	0.94	4.64
2011	81.14	41.11	40.03	1.08	4.13
2012	82.58	42.31	40.27	2.04	3.42
2013	82.21	42.43	39.78	2.65	2.29
2014	82.74	42.79	39.95	2.84	3.93
2015	83.21	43.36	39.85	3.50	5.26
2016	82.87	43.16	39.71	3.45	3.53
2017	85.83	44.64	41.19	3.45	n.a.

Source: developed by authors based on [45], [46], [47], [48], [49], [50], 2018

Appendix 2: Productivity and real GDP growth rate in the period 1995-2017

Year	Productivity per person employed (2010=100)	Real GDP growth rate (%)
1995	83.3	1.98
1996	84.50	2.89
1997	86.10	2.97
1998	87.60	3.02
1999	89.30	3.87
2000	91.40	2.20
2001	92.70	1.35
2002	94.10	1.31
2003	95.00	2.57
2004	96.70	2.11
2005	97.70	3.35
2006	99.30	3.08
2007	100.50	0.48
2008	99.90	-4.35
2009	97.30	2.10
2010	100.00	1.71
2011	101.60	-0.42
2012	101.60	0.26
2013	102.20	1.74
2014	102.90	2.32
2015	104.10	1.96
2016	104.90	2.44
2017	105.80	n.a.

Source: developed by authors based on [9], [51]