

INTERNATIONAL SPECIALIZATION OF BULGARIA AS PER LAFAY INDEX: CHALLENGES TO NATIONAL COMPARATIVE ADVANTAGES IN THE NEW COVID - 19 GLOBAL REALITIES^{*52}

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Abstract:

The present paper aims to measure and analyze the changes in the trade specialization pattern of Bulgaria for the period 2001-2018. In theoretical aspect a juxtaposition has been made highlighting the differences and the links between classical (static) models of comparative advantages and contemporary (dynamic) models of competitive advantages of nations to reach complete and comprehensive evaluation of international economic specialization in international trade of small countries with open resource-intensive economy as that of Bulgaria. In methodological aspect the research paper analyzed Lafay index for measuring trade specialization of nations under conditions of rising share of intra-industry trade in added value chains of production. In practical aspects the research piece presents results from statistical analysis of international specialization of Bulgaria as per Lafay index for the period 2001-2018. The results of the empirical model point that for the analyzed period Bulgaria preserves comparative advantages in low-tech and resource-intensive economic sectors, which can not be a stable source of long-term and sustainable economic growth. Bulgaria remains in the group of technologically lagging countries. The paper evaluated potential consequences of pandemic Covid 19 crisis on trade specialization of Bulgaria and advanced some recommendations for overcoming negative impacts and boosting the effect from positive opportunities that Bulgaria faces.

Keywords: trade specialization, Lafay index, comparative and competitive advantages, international trade, Covid-19

JEL classification: F10, F20, F49

Introduction

Traditional theoretical models for international trade (availability theory, Kravis, 1956) focus on supply factors, with trade models reflecting differences in production opportunities and the geographical distribution of natural resources (Hirsch, 1974) and other resources, as differences in prices and costs that determine the comparative advantages of countries and the structure of their trade ("surplus model of trade", Caves, 1965). In these theories, human capital is presented as an asset with a certain return, measured by the present value of income above the minimum wage (Kenen, 1968) (or by the average wage) in an industry (i.e. the transition from a model of trading in capital-intensive products to those requiring highly qualified skills). Thus, traditional theoretical models of absolute and comparative advantages are complemented by models of competitive advantages in international business (Porter, 1990; Hunt & Morgan, 1995), ensuring the comprehensiveness of the analysis of factors for the competitiveness of countries in international business.

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According to a study by the International Trade Center (2010), trade specialization is a good indicator of a country's economic specialization, with higher levels of specialization countries report higher GDP growth and better adaptation of their export profile to change in the global demand model. According to the IMF (2019), achieving sustainable economic growth requires structural changes, which are associated with the reorientation of factors of production from extractive sectors to industry and services. The stages of diversification according to Imbs & Wacziarg (2003) are associated with the formation of a U-shaped relationship between specialization and income: at low income countries start with diversification and after reaching a high level of per capita income - to re-concentration/ specialization of production. For Imbs & Wacziarg, the explanation for this relationship is through Ricardo's trading model of increasing productivity with diversification and reducing trade costs with the concentration of production.

An important feature for countries achieving long-term economic growth according to MsKinsey report (2019) is the provision of macroeconomic stability even during global fluctuations and a sufficiently high degree of export orientation. In addition to macroeconomically favorable conditions include significant institutional resilience, measured by the components of the World Bank's Institutional Performance Index (e.g. regulatory quality, order and law, etc.). In microeconomic terms, leading companies in exports rely on innovative leadership, realizing over 50% of their revenues from the introduction of new products and services (measured by the number of issued patents).

Under conditions of market imperfections, according to Neary (2003), a transition from the model describing the framework of comparative advantages of nations to a general equilibrium model of competitive advantages of the countries is necessary. Such a model presumably requires the presence of competitive markets with low barriers to entry and/or the presence of a large number of firms operating in this market and providing absolute advantages to economic agents due to natural conditions or trade measures (e.g. low taxes, etc.); degree of labor market flexibility. For Porter (1990) the application of the model of competitive advantage at the company level through different product differentiation strategies leads to the realization of sustainable competitive advantage in the long run due to specific company factors leading to value generation and benefits (economic, social, environmental, etc.). The group of these specific company factors (Hunt & Morgan, 1996) includes financial, physical, legal, human, organizational, informational etc., providing dynamic advantages on a national scale (i.e. the so-called "Porter's diamond" in the framework of the dynamic model of competitive advantages).

For resource-intensive economies such as Bulgaria, it is important to increase productivity in sectors with a comparative advantage in the production of goods and a transition upwards in the production value chain. An empirical study by UNCTAD (2015) found that if the share of industrial exports increased by 1 percentage point, poverty rate would fall by 0.011 percentage points on average for the sample of developing countries by encouraging diversification in and among different economic sectors. This creates positive externalities in the course of diversification in industrial sectors (Greenway, Morgan & Wright, 1999) through the formation of inter- and intra-industry links. According to an IMF study (2019), diversification in production and export structure is an important determinant of achieving sustainable economic growth, especially in low-income countries, and this is confirmed in a UNCTAD study (2018). For 144 developing countries (including sub-Saharan Africa) for the period 1970-2015, the study found that trade is associated with diversification in a short period of time, but in the long run the intensity of trade leads to concentration and therefore the benefits of diversification require active macroeconomic policies to avoid so-called "Dutch disease" (Sachs & Warner, 2001), in which the consequences of the concentration in the export of certain resources are due to high fluctuations in the volume of production, deteriorating trading conditions and low productivity growth.

In the context of the post-pandemic effects of the Covid - 19 crisis, expectations are for deepening of regional fragmentation in global supply chains within national economies. This will inevitably slow down globalization (the so called "slowbalization" effect) and renew interest in the concept of "country of origin" of goods due to existing restrictions on outsourcing/offshoring of production to

achieve competitive advantages due to significant costs/barriers to trade and production abroad. Very important consequences of these processes will be to assess in the future the impact of trade processes on the natural environment and in particular the emission of carbon gases in order to measure the value of carbon components in each of the demand factors (consumption, investment, export). Determining the carbon content requires assessing the effects at different stages of production, not just the emissions from exports and imports. The “Beyond GDP” initiative aims to assess the state of the economy, which ensures environmental sustainability beyond the macroeconomic approach to analysis through the development of environmental accounting standards.

Description of the Problem

The changes in global trade flows in the current Covid - 19 pandemic crisis require adaptation of the pattern of specialization of nations and modification in the national foreign economic policies for maintenance and boosting of national competitiveness. The present report aims to determine the divergence or convergence in trade specialization patterns of Bulgaria in the pre-accession period to the EU (2001 - 2007) and in the period after the global financial crisis up to the current Covid-19 realities and to formulate conclusions regarding tendencies and consequences. According to the National Strategy for Intelligent Specialization 2014-2020 of Bulgaria are identified industries with potential for medium to high-tech production of goods such as: medicines, ICT, machinery and equipment, metal products, mechatronics and clean technologies, creative and recreational industries, biotechnology, nanotechnology, food technology. The document identifies the comparative and competitive advantages of the production and export specialization of Bulgarian productions in over 80 product groups through the Balassa index, which cover over 70% of Bulgaria's exports.

A novelty of the research approach in the present paper is the application of an alternative index, namely the Lafay index to determine the competitive advantages of Bulgaria for the analyzed research period, as Lafay index overcomes some of the methodological disadvantages of the Balassa index in determining trade specialization patterns. Structural constraint for Bulgaria remains the small Bulgarian economy, despite the high degree of openness (over 110% as of 2011 compared to the EU average of 27.39%). According to a study by Inotay (2013) determinant of the size of the market are the incomes of the population, which in Bulgaria remain the lowest for the EU-27 and therefore the economy is not able to take advantage of technology transfer as a result of the openness of the Bulgarian economy given its low competitiveness and weak production base (Tasev, A., 2012).

The global Covid-19 pandemic crisis is expected to lead to a decrease in the number of active SMEs in Bulgaria (so far by about 15%) against the background of rising unemployment in the country and the fact that in Bulgaria the number of active SMEs is declining at the fastest pace for the EU - 28 (6.8%) for the period 2012-2015. It is encouraging that with the increase of digitalization of the offered public services after the pandemic crisis, a reduction of the administrative burden for SMEs with active trade activity and improvement of access to public procurement can be expected and an increasing level of transparency of procedures. The shrinking investment costs and declining export revenues will further limit the potential for R & D & I and deepen regional imbalances in R & D in the country towards reverse convergence (i.e. divergence) and convergence with the level of lagging countries and regions in the EU, which is reinforced by the processes of deindustrialization in the context of growing shares of services in the digital economy of the 21st century.

Methodology and Data

The present paper analyzes the trade specialization of Bulgaria with the application of the Lafay Index. This index includes variables for trade and production, eliminating the impact of macroeconomic variables. Thus, customs tariffs and other safeguard measures on imports, subsidies or voluntary export restrictions on exports lead to the distortion of trade measures. According to Lafay, among the important favorable factors for the acquisition of comparative advantages in a country are: 1) abundance of natural resources; 2) low relative production costs, which correspond to the macroeconomic conditions and the level of productivity of the factors of production; 3) low relative costs through innovations in the production process and/or use of monopoly advantages at microeconomic level.

The extended formula of the Lafay Index is:

$$LI_{ij} = \left(1000 \cdot \frac{X_{ij} - M_{ij}}{Y_i} \right) - \left(\frac{X_{ij} + M_{ij}}{\sum_j (X_{ij} + M_{ij})} \cdot \frac{1000 \sum_j (X_{ij} - M_{ij})}{Y_i} \right) \quad (1)$$

Representing the index in abbreviated form:

$$LI_{ij} = \frac{1000}{Y_i} \cdot \frac{2(X_{ij}M_i - X_iM_{ij})}{X_i + M_i} \quad (2)$$

The Lafay index (LI) includes total GDP, thus avoiding the problem of classification. In addition, this index is characterized by the requirement for symmetry of the distribution, but the empirical distribution generally has a right-hand tail. A country *i* has a comparative advantage in trade with a given commodity when $LI_{ij} > 0$, and the neutral point of the index is when the net export = 0. The algebraic sum of the LI points of a given country is always 0, ie:

$$\sum_j LI_{ij} = 2000 \cdot \frac{M_i X_i - X_i M_i}{Y_i (X_i + M_i)} = 0 \quad (3)$$

The above formula assumes that the distribution in a Lafay index of a country can take into account intra-industry flows by using import and export variables and control the deviation in macroeconomic factors by the GDP variable. In addition, the International Trade Center uses Lafay index and Balassa index (BI) as measures of trade specialization. Taking into account imports and exports, LI corrects the possible deviation in BI regarding the competitiveness of a country.

The application of the Lafay index in the present empirical analysis follows the Galtonian regression methodology (Hart et al., 2001) to examine the structural changes that occur in trade specialization in Bulgaria for the period 2001-2018. The main directions in which the increase in exports is associated with an increase in overall productivity and economic growth are expected to be: 1) an increase in the comparative advantages in the specialized sectors and growth in GDP; 2) dynamic benefits from trade with increased investment, growth in productivity and prosperity (in the direction of reducing poverty and inequality).

Using Bayesian Model Averaging, the IMF (2019) found that significant factors limiting the benefits of countries' export diversification are: the size of the economy and the abundance of natural resources, controlling the effect of such variables as the quality of institutions. For countries that realize significant benefits from higher export diversification, the IMF model finds that the following factors have a statistical significance in the following order of importance: 1) a higher level of human capital development; 2) greater openness to trade; 3) high quality of institutions 4) developed financial sector; 5) developed infrastructure (including internet connectivity); 6) opening of the capital account for investments.

In order to overcome the fluctuations in the normal distribution of the residual values of the standard errors, the empirical analysis follows a logarithmic and Box-Cox transformation to achieve a normal distribution in the standard errors and tests to establish the normality of the distribution are followed (e.g. Shapiro - Wilk W test etc.).

The following regression equation is used in the present analysis:

$$LFI_{ij}^{END_t} = \alpha_i + \beta_i LFI_{ij}^{START_t} + \varepsilon_{ij}, \quad (4)$$

to test the changes in the model of trade specialization of Bulgaria, where START and END represent the selected points in time, α_i and β_j are the standard linear regression coefficients, and ε_{ij} is the standard error. In the regression model, the distribution of the Lafay index at the end of the study period (i.e. 2018) is the dependent variable, and the distribution of the same index at the beginning of the study period (i.e. 2001) is the independent variable, while the year 2007 of Bulgaria's accession to the EU is a fictitious (dummy) variable.

The purpose of the regression analysis is to establish how similar or different are the distributions in the Lafay index at two points in time (2001 and 2018), and thus to determine the stability and convergence/divergence in the trade specialization of Bulgaria during these two selected periods (i.e. the pre-accession process to the EU and in the post-crisis period after 2008).

The hypotheses formulated in the regression analysis are:

- a) H0: in the model of trade specialization of Bulgaria for the period of time (2001 - 2018) there is no structural change in respect of the analyzed commodity group;
- b) H1: in the model of trade specialization of Bulgaria for the above-selected time period there is a structural change in respect of the commodity group

Data source: The data on exports, imports and other variables in the model needed to calculate the Lafay index were obtained from the International Trade Center (www.intracen.org) and are based on the Harmonized System 2 level of aggregation (which includes a total of 98 sector). The country's GDP data for the respective years are based on the IMF WEO database. The following product groups were selected for analysis:

- Electrical machinery and equipment and parts thereof (code 85);
- Machinery, mechanical appliances, nuclear reactors, boilers, parts thereof (code 84);
- Mineral fuels, oils and products for their distillation (code 27);
- Vehicles other than railway or other rolling stock (code 87);
- Pharmaceutical products (code 30);
- Furniture, etc. (code 94);
- Shoes, etc. (group 64).

Results

The first stage of the empirical analysis presents the following results of descriptive statistics for data in the selected commodity groups:

Table 1

Descriptive statistics of Lafayette index data by analyzed commodity groups

	Electrical machinery and equipment and parts thereof (code 85) (first differences of Lafayette index)	Mineral fuels, oils and products for their distillation (code 27) (logarithm of the Lafayette index)	Machines, mechanical appliances, nuclear reactors, boilers, parts thereof (code 84) (first differences of Lafayette index)	Vehicles other than railway or rolling stock (code 87) (first differences of Lafayette index)	Pharmaceutical products (code 30) (first differences of Lafayette index)	Furniture, etc. (code 94) (logarithm of the Lafayette index)	Shoes, etc. (group 64) (logarithm of the Lafayette index)
Average	-0,77588	3,2717	-0,56882	-0,89294	-0,0076471	1,4727	1,0299
Median	0,54000	3,2418	-1,3900	-0,010000	0,060000	1,6144	1,0558
Minimum significance	-19,920	2,2083	-27,050	-21,390	-3,7600	0,42527	-1,2730
Maximum significance	22,080	3,8967	23,800	11,210	2,9300	1,9988	2,4723
Standard deviation	8,3253	0,45137	9,3109	6,4573	1,6603	0,42643	1,0805
Coefficient of variation	10,730	0,13796	16,369	7,2315	217,11	0,28956	1,0491
Asymmetry	0,32651	-0,64047	-0,32376	-1,6256	-0,35528	-0,91070	-0,65717
Kurtosis	2,9983	-0,077852	4,4700	4,6368	0,014629	-0,023086	-0,13830
Interquartile distance	4,1100	0,69436	4,8000	3,9300	2,2250	0,68964	1,3864
Missing values	1	0	1	1	1	0	1

Source: author's own calculations

From the above table it is clear that a moderately asymmetric distribution of the Lafay index was established for commodity groups: 27, 30, 94 and this confirms previous empirical studies that the distribution of the analyzed index is not characterized by normality of the distribution. From the analysis of the arithmetic mean value of the Lafay index from Table 1 above it can be concluded that Bulgaria achieves a comparative advantage in commodity groups 27, 94 and 64, where the arithmetic mean value is greater than the neutral point 0 of comparative advantage. These results are confirmed in a study of Georgiev and Velushev (2018), who apply an index of the revealed comparative advantages of Bulgaria's tradable goods according to the Harmonized System for the period 2007-2016. On the other hand, Bulgaria reports no comparative advantage with negative values of the analyzed Lafay index in the other analyzed commodity groups (30, 84, 85, 87). These results are also confirmed in the study of Georgiev and Velushev (2018).

The results of linear regressions of Lafay index for the commodity groups for which a comparative advantage was identified are as follows:

Table 2

Least squares model
Dependent variable: logarithm Lafay Index for commodity group Minerals

	Coefficient	Standard Error	t-test	p-value	
const	0,770070	0,541051	1,423	0,1782	
time	-0,00194276	0,0191367	-0,1015	0,9207	
dummy_EC_accession	-0,411650	00,130140	-3,163	0,0075	***
Simple definition coefficient	0,591458		Adjusted R-squared	0,497179	
F(2, 13)	3,100334		P-value(F)	0,000362	
Log-likelihood	-2,722727		Akaike information criterion	13,44545	
Bayesian Schwartz information criterion	16,77831		Hannan-Quinn	13,77675	
rho	0,218415		Durbin-Watson	0,218415	
Correlation coefficient: 0,4218 (time) -0,1169 (dummy_EC_accession)					

Source: own calculations

As can be seen from Table 2 above, $0 < \beta < 1$, without being statistically significant, hypothesis H1 is confirmed, for a change in the established comparative advantage in the commodity group Mineral fuels, oils and products for their distillation (code 27) by 2018 compared to 2001 (p-value $0.000362 < 0.05$), in the direction of deterioration compared to the initial analyzed period. The dummy variable 2007 (indicative of Bulgaria's accession to the EU) turned out to be statistically significant for the change in the trade specialization in commodity group 27.

Table 3

Least squares model
Dependent variable: logarithmic values Lafay Index for commodity group Furniture

	Coefficient	Standard Error	t-test	p-value	
const	1,17364	0,354262	3,313	0,0056	
time	0,0317272	0,0247809	1,280	0,2228	
dummy_EC_accession	-0,575413	0,151673	-3,794	0,0022	***
Simple definition coefficient	0,231007		Adjusted R-squared	0,112700	
F(2, 13)	30,11486		P-value(F)	0,000013	
Log-likelihood	-7,374378		Akaike information criterion	20,74876	
Bayesian Schwartz information criterion	23,06652		Hannan-Quinn	20,86744	
rho	0,973578		Durbin-Watson	0,973578	
Correlation coefficient: 0,2970 (time) - 0,1169 (dummy_EC_accession)					

Source: own calculations

As can be seen from Table 3 above, $\beta < 1$, without being statistically significant, hypothesis H_1 is confirmed, for a change in the established comparative advantage in the commodity group Furniture (code 94) as of 2018 compared to 2001 (p-value 0.000013 < 0.05), and reported a slight improvement compared to the initial analyzed period. The dummy variable 2007 (the year of Bulgaria's accession to the EU) turned out to be statistically significant for the change in the trade specialization in commodity group 94.

Table 4

Least squares model
Dependent variable: logarithm Lafay Index for commodity group Footwear

	Coefficient	Standard Error	t-test	p-value	
const	2,98398	0,193893	15,39	1,01e-09	
time	-0,202039	0,0254577	-7,936	2,44e-06	
dummy_EC_accession	-0,0703542	0,0831880	-0,8457	0,4130	***
Simple definition coefficient	0,887796		Adjusted R-squared		0,870533
F(2, 13)	53,08837		P-value(F)		5,56e-07
Log-likelihood	-4,995888		Akaike information criterion		15,99178
Bayesian Schwartz information criterion	18,30954		Hannan-Quinn		16,11046
rho	0,772363		Durbin-Watson		0,575070
Correlation coefficient: -0,9523 (time) -0,1169 (dummy_EC_accession)					

Source: own calculations

As can be seen from Table 4 above, $0 < \beta < 1$, and is statistically significant, confirming hypothesis H_1 , for a change in the established comparative advantage in the commodity group Footwear (group 64) as of 2018 compared to 2001 (p-value 5.56e-07), and reported deterioration compared to the initial analyzed period. The dummy variable 2007 (Bulgaria's accession to the EU) did not turn out to be statistically significant for the change in the trade specialization in commodity group 64.

Based on the empirical analysis above, it can be noted that Bulgaria has not yet made the transition to technology-intensive industries and remains in the group of technologically lagging countries. In this sense, such technological backwardness cannot be expected to provide an opportunity for a technological leap with the introduction of the most advanced technologies (the so-called "advantage of backwardness" phenomenon, ECB, 2003). Despite the significant investments in the course of Bulgaria's EU membership in the global value chains after 2007, with the demographic crisis and the significant outflow of highly qualified labor resources from Bulgaria during 30 years of democratic transition, the country fails to take advantage of the beneficial effect technological leap, similar to the CEE countries (ECB, 2003). Applying the theoretical postulates of the product space framework, Bulgaria can achieve successful trade specialization through a diversification strategy in closely related product groups from the export basket with a revealed comparative advantage for a period of more than five years. The process of structural transformation in developing countries such as Bulgaria is strongly influenced and dependent on the production conditions according to the theoretical framework for the product space. Therefore, empirical research has found (UN Industrial Development Organization, 2018) that in relatively poor countries, improving the business environment and regulatory framework supports the ability to overcome limited static comparative advantages and to implement strategies of radical product diversification.

Conclusions

In conclusion, the application of statistical regression analysis of the Lafay index establishes a comparative advantage of Bulgaria in three commodity groups, including mineral fuels, furniture and footwear for the period 2001 - 2018, which are confirmed in other empirical studies in Bulgarian authors (see Georgiev and Velushev, 2018). In addition, a least squares stability test (quantile regression, not included in the present paper) confirmed that Bulgaria reported divergence in the model of trade specialization in these three commodity groups at the end of the analyzed period, and such a deterioration in the Lafay index is explained not only by existing institutional constraints in the business environment, but also by the impact of the global financial and economic crisis and the European debt crisis after 2008. In the three analyzed commodity groups, Bulgaria's accession to the EU turned out to be a statistically significant independent variable for the comparative advantage of Bulgarian trade (in the direction of divergence), which is a confirmation of the effect of "trade diversion" and increasing competitive pressure, especially in the commodity groups of mineral fuels and footwear.

The high levels of perception of corruption in the business environment in Bulgaria and the deterioration of the democratic and legal state have a particularly unfavorable effect on the commercial competitiveness of Bulgarian SMEs. Freedomhouse (2020) defines Bulgaria in the category of semi-structured democracies, while the Corporate Europe Observatory (2019) analyzes the weaknesses in economic development in the "captured" countries. Bulgaria remains in one of the last positions in the Forbes ranking (Best Countries for Business, 2019) due to high levels of corruption, weaknesses in the judiciary, organized crime etc. Improving regulatory quality can encourage exports to industries that use a variety of inputs (such as metals, electronics) by about 5%, total imports by about 3% and accelerate integration into global value chains according to the OECD (2014).

In this sense, among the risks that create threats and opportunities for developing peripheral countries such as Bulgaria from technological backwardness (divergence) can be identified: 1) increasing unemployment in the segment of low-skilled labor with increasing the degree of digitalization of the economy within Industry 4.0 (for example, increasing production efficiency is associated with a reduction in employment of around 50% in all sectors in developing countries in Asia, other things being equal, WTO et al., 2019) and the potential for increasing income inequalities, social stratification and disrupt the potential for future social cohesion; 2) at the same time, a further increase in the relative demand for highly skilled labor in R & D & I activities within GVS is expected (Frederick et al., 2018), which imposes a policy of retaining highly skilled workers in Bulgaria (Hristova - Balkanska, I. , 2012) and in this sense the free movement of labor resources in the European Union raised the issue of the shortage of medium and highly qualified personnel in the country (Rangelova, R., 2017); 3) the need to rethink Bulgaria's potential for smart specialization within existing production chains and improve their production efficiency, improved access to finance for SMEs and promote strategic prospects for the formation of unique key competencies and competitiveness of Bulgarian SMEs in the aftermath of the Covid-19 new realities. The key to achieving export-oriented growth and sustainable competitiveness is productions in the middle and high-tech segment, defined as a driving force for sustainable exports for small countries with open economies.

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