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# EVALUATION OF INFLUENCING FACTORS ON GREAT BRITAIN‘S EXPORT VALUES

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**Abstract**

**Research purpose.** The research aimed at identifying the main factors influencing export values in the region of Great Britain (GB) for the period of the last 30 years.

**Design / Methodology / Approach.** In order to implement the investigation, the following tasks were intended: (1) To analyse scientific literature and mark out at least five non - dependent variables that impact export values of Great Britain. (2) Basing on findings, outlined in a scientific review, suggest or choose the methodology that is the most appropriate for this kind of tasks' determination. (3) Collect the data for dependent and non-dependent variables (at least 30 samples). (4) Based on the presented methodology, determine the selected factors' impact and make the statistical and economic analysis. The research was mainly done using quantitative analysis methods (descriptive, correlation, regressive analysis). Quantitative modelling and descriptive statistics methods are selected for investigation because they can suggest a different approach to analysing the factors influencing export values.

**Findings.** Five non-dependent variables were marked out as factors influencing the export values in the selected region: gross domestic product (GDP); the number of employees in the region; amounts of cargo transportation; average salary in the region and labour costs. Calculation of the correlation coefficients showed that all independent variables were statistically significant. There is a very strong relationship between export values and GDP, employment, and labour costs.

**Originality / Value / Practical implications.** The findings of this research can be applied in order to evaluate and determine the economic impact of the GB processes on the entire world, as Britain’s export values are among the top ten in the world. It is important to emphasise that the deeper analysis of the influencing factors of the volume of export in Great Britain showed an interrelation of these factors. So further investigation of this factor’s impact is essential.

**Keywords:** Impact analysis; GB export values; Quantitative analysis; Influencing factors.

**JEL codes:** E01, D20.

## Introduction

Trade may affect incomes through specialisation because of comparative advantage exploitation of returns from economies of scale, information exchange, arising from improved communication channels and travel, as well as the technological spillovers through investments and exposure to new goods and services. This created new methods of production and new ways of organisation. International trade is also a great way to increase investment opportunities that create new technologies and boost the country's economy. Exports are an important source of income and an engine of growth, so a successful export drive stimulates a positive multiplier effect on the economy with important feedback effects (Caleb et al., 2014).

Export intensity is an essential indicator of each country and plays a crucial role in the world economy. Comparing this indicator between different countries, the international exchanges can be foreseen and the way it is being developed in different countries. Higher exports show that one or another country has more influence in the world trade. The volume of exports is also an important indicator of economic development. Exports help to establish economic relations with other countries, help to improve the economy of their country. Without exports, a country may not generate enough revenue or even incur losses.

Exports are a bilaterally dependent variable. From one point of view, it depends on various factors such as GDP, transport volume, unemployment rate, but it influences the economy in general. The level of imports depends on the volume of exports, the same as the level of unemployment. Exports contribute to the country's economic growth, providing that the demand for goods grows. Britain's exports are among the top ten in the world, and this country's exports have a direct impact on the World economy.

This paper analyses the main factors influencing export values in the region of Great Britain from the period of 2000-2019 in order to identify the level of impact being done by active economic elements.

## Literature review

There are plenty of researches investigating the impact of various factors on export values in different regions and even continents. They cover very different topics, multiple themes, and economic factors affecting export value, which is definitely one of the most significant economic indicators of each country and plays an essential role in the world economy. The newest researches undoubtedly include the most relevant topics, like the impact of the COVID-19 pandemic on exports (LIN & ZHANG, 2020) or COVID-19 pandemic economic impacts on some particular issues like livestock exports (Mtimet et al., 2021). Some studies examine the effect of destination tariffs on exports in some specific regions (Xu et al., 2020), or the impact of tighter controls on chemical exports in general (Hosoe, 2021), either the impact of de-globalisation on economic transformation, regarding the manufacturing export (He et al., 2020). Some innovative topics are on top as well, such as the impact of innovation ambidexterity on export performance (Yan et al., 2021), and disentangling the effect of various innovation types, financial constraints, and geographic diversification on SMEs' export growth (Bodlaj et al., 2020), or the impact of environmental policies and innovation on EU exports (Costantini & Mazzanti, 2012). There are not too many researches examining the effect of greatly influencing economic factors like GDB, number of employees, cargo transportation volumes, average salary, and labour costs. There are some reviews and analyses, but not much and they excludes the newest research and statistics (Chen et al., 2020; Fontes et al., 2020b; Ni & Kurita, 2020b; Trlaković et al., 2018b). This literature review here and after is an analysis of each of these factors seriatim.

One of the main factors influencing exports is the gross domestic product (GDP). Part of the domestically produced products or services travels abroad. In this way, the country generates income, exports also contribute to the improvement of the micro and macro environment and thus promote economic efficiency, and this has a significant impact on gross domestic product (Trlaković et al., 2018a). A professor of economics studying Chinese exports proved that rising wages and rising monetary rates had an impact on the volume and price of output. As a result, production and exports declined, along with the gross domestic product. Thus, changes in GDP also have a direct impact on changes in exports (Xing, 2018).

The number of employees is also one of the factors affecting exports. Companies invest heavily in human resources, so they need to raise prices to increase sales revenue. This leads to a reduction in sales turnover and lower export values (Katsikea et al., 2016). The scientific article "Employee quality and financial reporting outcomes" expresses a different opinion on the dependence of exports on employees. It is stated that highly qualified employees can perform more complex and better-performing work. They do the work more efficiently, faster, and more consistently. Due to sound quality, competent work, and good work results, the volume of exports also increases (Call et al., 2017). Thus, a smaller number of highly educated employees can improve financial performance and, at the same time, improve export values.

Also, an important factor contributing to the change in exports is the volume of freight transported. All products require transportation, without which the goods would not reach their destination, and each company chooses which mode of transportation is best for them: planes, ships, lorries, etc. However, all transportation is aggregated into one total quantity and freight volumes are calculated in each country. The most popular way to export goods is to export by air. This method helps to save time, reach harder to reach places. Rapid response to customer's needs stimulates demand, which is especially important for exports (Larrodé et al., 2018). In developing countries, there is a direct relationship between export values and shipments. Poor logistics infrastructure increases trade costs and time, which hampers the efficient movement of products in global production networks (Töngür et al., 2020).

One more factor influencing export growth is average wages. It has been observed that industries around the world pay higher wages to their workers when exporting large quantities of goods to high-income countries. This is because such companies that export to high-income countries, export goods of better quality. In rich countries, there is a greater demand for quality products. Ensuring good quality is expensive and requires the use of a highly skilled workforce. As a result, the production of high-quality products creates higher wages and increases average wages (Brambilla & Porto, 2016). A study of Chinese export companies also found that companies with higher export intensities pay higher wages to their employees (Kong et al., 2018). This situation could have occurred due to the fact that companies engaged in international trade are economically stronger. They are more likely to expand and generate high incomes. This makes it easier for exporting companies to cover export costs, all other costs incurred, to spend a bigger share of the revenue on wages. Another study of Brazilian companies supports the claim that exports are contingent on wages because companies that employ highly skilled workers tend to be successful in export activities. Moreover, by earning high revenues, a firm has the ability to pay higher wages as well (Fontes et al., 2020a).

Finally, labour costs also contribute to the change in export values. Sometimes there is no need for highly skilled workers to increase exports. A large workforce is sufficient because more workers can work for lower wages and, thus, incur lower wage costs. For countries dominated by cheap labour and low-skilled workers, this can become an advantage for international trade. High labour costs relatively increase exports (Ni & Kurita, 2020a). This is because more employees can get the job done faster, so the work is done more efficiently. This produces more products and can expand export values to more countries. In this way, higher profits can be made, and higher profits help companies become economically stronger.

Table 1 below summarises the investigated export relationship with five different variables. Taking as an example the exports, it can be seen that it impacts growth in GDP, average wages, freight volumes, and labour costs. By increasing those factors, exports decrease the number of employees.

**Table 1. The review of the variables** (Source: created by author)

| Metric | Relationship |
|---|---|
| GDP | + GDP ➡ + Exports<br>- GDP ➡ - Exports |
| Number of Employees | + No. Employees ➡ - Exports<br>- No. Employees ➡ + Exports |
| Freight volumes | + Freight volumes ➡ + Exports<br>- Freight volumes ➡ - Exports |
| Average wage | + Average wage ➡ + Exports<br>- Average wage ➡ - Exports |
| Labour costs | + Labour costs ➡ + Exports<br>- Labour costs ➡ - Exports |

Upon the summary of and based on the scientific sources five factors influencing the volume of exports were identified: gross domestic product, number of employees, freight volumes, average wages, and labour costs. Basically, the authors in their particular researches have chosen the monetarist point of view. Most ideas are related to controlling the supply of money (or other incomes) that flows into the economy while allowing the rest of the market to fix itself. With the constant development of technology and the expansion of manufacturing companies, it is important to pay attention to how these factors change the volume of exports. However, it is also necessary to address the fact that the export values could skyrocket and eliminate all the variables as a contributing factor. Thus, in the following parts of the work, the aim is to determine the influence of active factors on the research subject.

## Research methodology

The literature review was the basis for identifying the main factors influencing the investigated indicator. The analysis of the scientific literature identified few factors influencing the volume of exports. In this work, after finding five (5) independent variables, it is necessary to determine, based on the reliable methodology, whether they are significant and affect the volume of exports. If the independent variables are significant, it will be necessary to identify and elucidate the strength of the relationship.

The proposed set of variables has been chosen based on the descriptive scientific literature review and overview, considering the insights of authors who investigated in their works the GDP as a variable, which is being influenced by the spectrum of possible different factors. The distinguished variables that will be used to solve the tasks are the following:

Dependent variable:

$Y$ - British export values;

Independent variables:

$x_1$ - gross domestic product;

$x_2$- number of employees;

$x_3$- cargo transportation volumes;

$x_4$- average salary;

$x_5$-labour costs.

Specific clarification of the difference between “average wages” and “labour costs” is as follows: labour cost here defines the total of wages, benefits, and payroll taxes paid for all employees. Average wages here show a benchmark for the wage level of individual workers in a country.

In order to be able to structurally systematise and graphically represent the investigated data, it is appropriate to use the method of descriptive statistics. This statistical method allows for the concentrated recording of information contained in large data sets and is therefore often used to process data for the whole population and to provide reasonable conclusions. Descriptive statistics will be used first to study these factors. Čekanavičius and Murauskas (2000) defined descriptive statistics as a “systematic representation of data. The advantage of this method is that it will allow the concentrated recording of information in large arrays." In this work, seven methods of descriptive statistics were analysed: arithmetic mean, median, mode, standard deviation, variance, and the minimum and maximum values. The results calculation are presented in the research results’ section.

Further, after performing and analysing the descriptive statistics, the correlation analysis methodology was used to model the relationship between random variables. The correlation analysis method is an appropriate statistical model used to study the relationship between economic indicators. In this particular case, the relationship between export values and GDP, number of employees, freight volumes, average wages, and labour costs are examined. Correlation analysis allows determining whether there is a relationship between the analysed factors, expressed in quantitative indicators (Činčikaitė & Pabedinskaitė, 2016).

First, statistical hypotheses need to be put forward to calculate the correlation coefficient. Hypotheses help to organise the activities of researchers purposefully (1):

$$\begin{cases} H_0: r = 0 \\ H_1: r \neq 0 \end{cases} \quad (1)$$

here:

*r*- sample correlation coefficient;

When the hypothesis is assigned, the correlation coefficient is calculated. Using this coefficient, conclusions are made in order to determine the strength of the correlation with formula (2).

$$r = \frac{n\sum x_i y_i - (\sum x_i)(\sum y_i)}{\sqrt{(n\sum x_i^2 - (\sum x_i)^2) \times (n\sum y_i^2 - (\sum y_i)^2}}, \quad (2)$$

here:

r - correlation coefficient;

$y_i$ - is a dependent variable;

$x_i$ - is an independent variable;

n - is the sample size.

Further, the regression analysis is performed. It helps to identify a functional relationship of several quantities or, in other words, regression analysis shows whether there are independent variables in the model that have a relationship to the dependent variable. First, a linear regression analysis is performed. It is performed only with statistically significant indicators. Finding the relationship between the dependent and independent variables in the form of a line, the regression curve formula (3) (Činčikaitė & Pabedinskaitė, 2016).

$$y = ax_i + b, \quad (3)$$

here:

y - is a dependent variable;

a - coefficient;

b - free member.

The following formulas (4) are used to calculate the unknowns a and b:

$$a = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{n\sum x_i^2 - (\sum x_i)^2}, b = \frac{\sum y_i}{n} - a \times \frac{\sum x_i}{n}, \quad (4)$$

Multivariate correlation analysis can also be used to check the relationship between dependent and independent variables. The advantage of this analysis is that several independent variables and a dependent variable can be studied simultaneously. To construct a polynomial regression equation, it is also necessary to pay attention to the same conditions that were used in the calculation of the multivariate regression. However, in this case, all calculated p-values must be less than 0.05; otherwise, the regression equation cannot be constructed. If all variables meet the conditions, the equation can be calculated with the formula (5) (Činčikaitė & Pabedinskaitė, 2016):

$$y = a_0 + a_1x_1 + \ldots + a_nx_n, \quad (5)$$

All calculated indicators will be relevant for the study. Descriptive statistics will help to identify the main features and interrelationships of the variables, and correlation analysis will help to assess the strength of the dependency. The equations generated with the help of linear regression analysis will show the dependence between the dependent variable and each statistically significant factor separately, and the multivariate regression analysis will show the strength of the relationship between the analysed variable and all other factors together.

The correlation analysis and simple and multiple linear regressions can suggest a different approach to analysing the factors influencing the country's GDP. For this reason, every mentioned method is used in this research. Descriptive statistics will help see the main tendencies of the retrieved data, while correlation and regression models will help to learn the dependency of the investigated GDP indicator.

## Research results

The first step that needs to be taken to properly evaluate the third task to determine the impact of the selected indicators is to compute the descriptive statistics. Twenty years' worth of data was calculated, from 1998 to 2018, which includes the change in British export values, which are potentially being influenced by GDP, the number of employees, freight volumes, average wages, and labour costs. The main indicators of descriptive statistics have been calculated (Table 2). These results will influence further calculations.

**Table 2. Descriptive statistics** (Source: by author)

| | **Number of employees (thousand)** | **Cargo transportation volumes (thousand tons)** | **Average wage** | **Labour costs (thousand people)** | **Export value (million dollars)** | **GDP ($)** |
|---|---|---|---|---|---|---|
| Mean | 28213.65 | 149965.19 | 39592.29 | 30188.1 | 562189.60 | 27225.19 |
| Median | 28260.46 | 152604.40 | 43452.23 | 29694.28 | 557918.66 | 27088.29 |
| Standard Deviation | 2114.78 | 12245.94 | 8780.14 | 1944.817 | 174592.35 | 9185.07 |
| Sample Variance | 4472295.63 | 149963054.8 | 77090893.4 | 3782311 | 30482487380 | 84365464.75 |
| Minimum | 25088 | 123600 | 3126.59 | 27895 | 282584.38 | 12906.63 |
| Maximum | 32354.05 | 173080 | 46728.22 | 33700.73 | 844728.85 | 42522.18 |

The second step is correlation analysis. Its aim is to find out whether there was a link between GB export values and GDP, the number of workers, freight volumes, average wages and labour costs. To achieve this goal, a hypothesis was put forward that was applied to all calculations.

$$\begin{cases} H_0: r = 0 \\ H_1: r \neq 0 \end{cases}$$

Correlation coefficients were then calculated, and the relationship between the variables considered was determined. The calculated data show (see Table 3) that there is an average relationship between the value of exports and freight volumes, there is a strong relationship between exports and average wages, and there is a very strong relationship between export values and all other variables. Also, the correlation coefficient is more than 0 everywhere, so it is concluded that the relationship is positive.

**Table 3. Correlation coefficients** (Source: by author)

| | **Export value (million dollars)** |
|---|---|
| Export value | 1 |
| GDP | 0.985097319 |
| Number of employees | 0.948644329 |
| Cargo transportation volumes | 0.604438348 |
| The average salary | 0.797842942 |
| Labour costs | 0.934082336 |

The next step is linear regression analysis. Using this method, each independent variable will need to be checked with the dependent variable separately.

When performing the linear regression analysis between UK export values and GDP, the coefficient of determination shows that as much as 97% of the gross domestic product explains export values. Also, the significance coefficient and the p-value are less than 0.05, which means that there is at least one significant x in the equation, and we can form an equation (6).

$$Y = 18{,}73x_1 + 52397{,}72 \quad (6)$$

In constructing the regression equation, the number $x_1$ shows how many times the export volume will increase if we increase x1 by one unit. In the present case, if we increase GDP by one unit, the volume of exports will increase by times 18.73.

Economist Adam Smith was one of the first to take an interest in the link between exports and gross domestic product. According to him, countries with high incomes tend to trade more with foreign countries, and their export values are growing, as are revenues. Productivity growth also contributes to GDP growth (Michelis & Zestos, 2004).

When performing the regression analysis between export values and the number of employees, the coefficient of determination is greater for 0.25, and as much as 89% of the variance of the variables explains the equation. The significant factor is less than 0.05, so we can interpret the equation; the P-value is also statistically significant. The regression equation is constructed (see formula (7)). This can be interpreted as follows: if we increase the number of employees by one, the volume of exports will increase by times 78.32. Equation (see formula (7)) confirms that the number of employees is important for exporting companies. The change in the number of employees depends on the amount of demand, since production increases as demand increases. Workers are needed to work efficiently and produce enough. Thus, increasing their number indicates that the company is increasing production. In most cases, an increase in production increases the volume of exports as part of the production travels to a foreign market.

$$Y = -1647455{,}85 + 78{,}32x_2 \quad (7)$$

The regression between export and freight volumes is calculated. The coefficient of determination shows that 37% of the variance of the dependent variable is explained by the independent variable. The significance factor is 0.004 and is less than 0.05, which means that there is at least one significant x in the equation. The P-value is also less than 0.05, so we can form an equation.

A regression equation can be constructed based on the calculated data (see formula (8)).

$$Y = -730146{,}67 + 8{,}62x_3 \quad (8)$$

The resulting equation (see formula (8)) means that increasing the volume of freight transport by one unit will change the volume of exports by times 8.62. From an economic point of view, higher transport volumes mean higher transport of goods. This means that supply to other countries is increasing; in other words, exports are increasing.

The second to last statistically significant factor is the average salary. Therefore, linear regression analysis between export values and average wages is calculated. The coefficient of determination obtained is 0.63. This means that 63% of the data can be explained by the equation below. The significance coefficient and p-value (average salary) are lower than 0.05 (see Table 9); therefore, it can be stated that the coefficients are statistically significant, and a linear regression equation can be formed (9).

$$Y = -65943{,}59 + 15{,}87x_4 \quad (9)$$

It has been observed that export companies tend to hire more highly qualified staff to ensure high-quality goods and services. To such workers exporters pay higher wages, resulting in higher average wages (Bombardini et al., 2019). For many people, wage growth is an incentive to work faster and more efficiently, so it can be argued that wage growth also increases production, which increases exports.

Finally, regression analysis with the fifth independent variable, labour costs, is calculated. The coefficient is statistically significant, and we can construct an equation (10)

$$Y = -1969249{,}28 + 83{,}86x_5 \quad (10)$$

In the present case, if we increase labour costs by one unit, the volume of exports will change by times 83.86. This change will happen because the goods produced depend on costs. Rising labour costs mean increasing production. Production increases as demand increases. When we know how each independent factor individually affects the volume of British exports, a multivariate regression analysis is also needed to find out how export values relate to all or some of the independent variables.

First, a multivariate regression analysis is performed with all independent variables, and a relationship between export values and GDP, number of employees, freight volumes, average wages, and labour costs are sought. The coefficient of determination, the significance of the regression and the p-values must be taken into consideration.

After several tests, determining the regression between the GDP and all the rest independent variables, the solution, which approves the significance of the variables, only examining the relationship between export value and freight volumes and labour costs, it was found that 96% of the variance in the dependent variable is explained by these independent variables. Based on the significance factor, we can interpret the equation because this indicator is less than 0.05.

The coefficient of determination shows that 98% of the scatter of a dependent variable can be explained by independent variables. The significance coefficient is less than 0.05, so it is clear that there are variables that affect the dependent variable.

However, according to the calculations, it can be seen that p-values that less than 0.05 are only for GDP and freight transport; p-values for all other independent variables are statistically insignificant; therefore, a regression equation cannot be formed.

Although all these variables individually had an impact on export values, the calculations showed that together they do not have an impact. This may be because independent variables do not interact with each other.

For a multivariate regression between export values and gross domestic product, the average coefficient of determination was calculated to be 0.97 (see Table 4). This means that 97% of the variance scatter explains the equation. The significance factor is less than 0.05, which means that there will be independent variables in the equation that have an effect.

**Table 4. Determinations and significance coefficients of multivariate regression analysis** (Source: by author)

| | |
|---|---|
| Coefficient of determination | 0.961256 |
| Significance factor | 0.0001 |

The next step is to check the p-values. In the table (see Table 5), all calculated p-values are less than 0.05 and are statistically significant so that we can interpret the equation.

**Table 5. Coefficients and p-values of multivariate regression analysis** (Source: by author)

| | **Coefficients** | **P-values** |
|---|---|---|
| Free member (constant) | -2348886 | 0.0001 |
| Cargo transportation volumes | 4.530628 | 0.0001 |
| Labour costs | 73.92446 | 0.0001 |

Based on the data in Table 4, equation (11) is composed:

$$Y = -2348886 + 4{,}53x_3 + 73{,}92x_5 \quad (11)$$

Based on the equation (see formula 16), it can be explained statistically: if we increase $x_3$ by one unit, Y will increase by times 4.53, but taking into consideration that the other variables remain unchanged, and if we increase $x_5$ by one unit, then Y will increase by times 73,92 but provided other indicators remain unchanged.

Increasing the volume of freight transport will increase the value of exports by times 4.53 because if we increase the volume of freight transport, there is a high demand, and we automatically export more; higher exports increase revenue and export value. The same situation occurs with labour costs. Increasing them by one unit will increase the value of exports by times 73.92. This is because rising labour costs mean higher production, and higher production means increased supply and export values. Increased exports increase the revenue generated from them.

To summarise, it can be stated that all independent variables are statistically significant and have a positive relationship with the dependent variable. By constructing a linear regression equation with all independent variables, an analysis of the scientific literature was substantiated, and it was shown that all independent variables influence export values. The multivariate regression analysis was used to construct an equation between export values and freight volumes, and labour costs.

## Conclusions

1. Reviewing scientific sources, five factors affecting the number of exports were classified: gross domestic product, number of employees, freight volumes, average wages, and labour costs. Most recommendations of the authors targeted that taking into consideration the continuous technological development and the increase of manufacturing companies, it is important to pay attention to how these factors make an impact on the volume of GB exports. However, it is also necessary to address the fact that the export values could skyrocket and eliminate all the variables as a contributing factor. In other words, the statistical calculation and findings that have been achieved in this research correlate with the facts reviewed in the existing literature.

2. For clarity, the study only considers the GB export values as the primary data set. Additionally, the timeframe of the data does not exceed 30 years. As a result of these limitations, the study does not provide any substantial information regarding other countries or explain other economic tendencies. The study is also limited in terms of available research into the long-term impact of the trade war and the pandemic of Covid-19. As such, the paper claims to imply viable solutions based on currently available data.

3. The calculation of the correlation coefficients showed that all independent variables are statistically significant. There is a very strong relationship between export values and GDP, employment and labour costs. There is a strong relationship between exports and average wages, and there is a moderate relationship between export values and freight volumes. Linear regression analysis showed that all independent variables have different effects on export values, and paired regression equations were developed with all of them. An increase of one unit in all independent indicators will also increase export values in the United Kingdom. Multivariate correlation analysis has shown that an increase in freight transport by one unit will also increase export values when other factors remain unchanged as well as an increase in labour costs by one unit will also increase export values if other factors remain unchanged.

4. The investigation has shown that there are various factors that have an impact on the volume of exports, and those factors are related and interrelated. For further research, it is recommended to determine the relationship of the investigated variables and continue the research by adding new relationships by supplementing the study with additional independent variables. Some ideas of specific themes to expand the research and can be carried out forward are as follows: ranking one variable over another; specific pairwise analysis to analyse the comparison between them; investigation of ability to negate the impact of each criterion due to the technology progress; collinearity tests.

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