Business Confidence in the Sustainable Manufacturing Sector in the Context of Production, Production Prices, and Interest Rates

Alžbeta Suhányiová 1,*, Ladislav Suhányi 2 and Michaela Kočišová 1

Abstract: Business confidence can be a very important predictor of future development and sustainability in a selected industry. It is one of the economic sentiment indicators belonging to the most important indicators of the health of the economy. This paper examines the relationships between the Business Confidence Indicator (BCI) of the manufacturing sector and the production, production prices, and interest rates of two neighbouring countries, the Slovak Republic and Hungary. These relationships are examined within the manufacturing sector because it has long been the driving force of sustainable economic development and has significant spill-over effects on the other sectors of the economy. A cluster analysis is performed with the aim of positioning the selected countries into clusters within the OECD countries in relation to the examined variables. Multiple regression models were used to verify the mentioned relationships between variables, separately for each of the two analysed countries. The coefficients of determination are not too high (Slovakia 0.5 and Hungary 0.38), but in the case of sentiment, they reach higher values than in comparable research. Data from the freely available OECD database was used. It can be concluded that the results show positive relationships between the BCI and the production and long-term interest rates, and negative relationships between the BCI and the Producer Prices Index (PPI) and short-term interest rates. The relationship with the short-term interest rates cannot be confirmed in the case of Hungary. Other differences are also shown in that a higher PPI can negatively affect the BCI more intensively in Hungary (regression coefficient 0.18), and that in the case of the Slovak Republic, it appears that the level of influence of the long-term interest rates on the BCI is higher than that in Hungary (the difference between the regression coefficients is 0.27). Practical implications are stated for relevant institutions in the country in three areas: (1) in support of increasing production; (2) in the regulation and subsidization of input production costs; (3) in the stabilization of the lending behaviour of financial institutions.

Keywords: sustainability of business confidence; manufacturing sector; sustainable economic development; production; production prices; interest rates

1. Introduction

There is a relationship between business confidence and general economic indicators from the point of view of the principle represented by the business confidence indicator—which is that business confidence is used to predict the future development of the economy (see Section 2). However, a relationship can be unidirectional or bidirectional. This article deals with the verification of the claim that the selected indicators could have an effect on business confidence in the manufacturing sector. Such research has its justification, and its basic argument is that if such a direction of a relationship is confirmed, the relevant institutions in the country could have a tool to partially influence the perception of the business environment, and thus its development and sustainability. The authors are aware...
that business confidence is affected by several variables that are not always possible or easy to quantify—such as the stability of the political environment, the threat of frequent legislative changes, the environment and related regulations, etc. Taking into account this limitation, the selected economic variables are evaluated, in which the relationships (either bidirectional or unidirectional) were confirmed based on other research also mentioned in Section 2.

The objective of this paper is to examine the relationships between the Business Confidence Indicator (BCI) and the economic variables of the manufacturing sectors of two neighbouring countries (the Slovak Republic and Hungary) using cluster analysis and multiple regression models as the methodology for analysing the relationships between variables. In addition to the BCI (which is an economic sentiment-based indicator), the following variables were included in the study: the production of the manufacturing sector, the Producer Prices Index (PPI) of the manufacturing sector, and the Short-term and Long-term Interest Rates of the market. Data from the freely available OECD database were used.

Economic sentiment-based indicators are among the most important indicators that show the health of the economy [1]. Sentiment can generally serve as the description of the opinions of economic subjects on the future development of the economy, which may affect its sustainability, as it affects the decision-making of economic subjects at present [2]. In the case of economic subjects, sentiment involves two contradictory aspects that are taken into account simultaneously. These are confidence and uncertainty [3]. This paper focuses on confidence, and it examines the relationships between one of the confidence indicators (the BCI) of the manufacturing sector and the mentioned variables of two countries—the Slovak Republic and Hungary. Both countries are neighbouring countries with a common history, and which are culturally and socially, but especially economically very close, but is also possible to find certain differences (such as the fact that the Slovak Republic is part of the European Monetary Union and Hungary is not).

The novelty of this study also lies in the examined direction of the relationship, from economic variables to business confidence. The research in this paper is focused on the manufacturing sector whose importance is also recognized by the European Commission, which has stated that the manufacturing sector has a strong spill-over effect on the other sectors of the economy. History has taught us that the manufacturing sector has been the driver of sustainable economic development [4,5]. When monitoring business confidence in countries considered to be more advanced from the point of view of economic cooperation and development (the OECD countries), it is usually based on data from the manufacturing sector.

The content of this paper includes a literature review, which contains an overview of the theoretical background and research results of the topic concerning the ties explored in this article. The Section 3 specifies the materials and methods aimed at fulfilling the established research objective. Section 4 shows the results of the cluster analysis and multiple regression models. It is followed by their critical discussion and evaluation. The last part of the paper is the conclusions.

2. Literature Review

In order to maintain a critical view, it should be mentioned that there are also authors who claim that sentiment surveys cannot predict economic development [6] or its sustainability. Gagea [7] or den Haan [8], among others, state that the weakness of sentiment indicators is the subjective evaluation of interested parties (mainly entrepreneurs and consumers), i.e., the data quality, which most often relates to the short-term evaluation of their own interests. However, due to changes in the economy (which may happen quite frequently and may be not so easy to predict), it is necessary to have some forecasting tools that will serve as early warning indicators [9]. They are exceptionally important because they predict developments and future states that are likely to occur in the economy [10]. The confidence index is one such indicator.
Economic agents’ sentiment indicators may also include the Business Confidence Indicator and Consumer Confidence Indicator. Although the analysis of consumer confidence is quite common, there are still relatively few research studies analysing business confidence. Unlike consumer confidence studies, business confidence surveys assess managerial sentiment regarding past and future performance. Compared to consumers, managerial access to business information enables a more informed view of future market conditions. There are indices of business confidence for various sectors that explain the mood of individual parts of the economy. These indices of business confidence are usually based on surveys of current and future trends. The Business Confidence Indicator (BCI) is one of the most important early warning indicators. The Organization for Economic Cooperation and Development (OECD) calculates the BCI based on the economic indices and business expectations of monthly and quarterly periods (Business Confidence Survey—BCS). It shows the current business situation, which justifies the causality of the existing economic trend. Also, the authors Santero and Westerlund revealed that measures of business confidence provide well-useful information when trying to predict future economic trends and assess the current economic situation. Another study analysed the indicators of business confidence in the EU and found significant spill-over effects. The authors concluded in their study that changes in the indicator of confidence in Belgian industry significantly influence changes in the economic situation of the Eurozone countries.

As mentioned, this paper examines the relationship between a sentiment-based indicator (the Business Confidence Indicator) and between several variables: production, production price, and interest rates (short- and long-term). The following paragraphs deal with the individual variables mentioned.

The relationship between sentiment-based indexes and industrial production has been proven by several studies. The study of Arisoy specifically investigated the Business Confidence Indicator and concluded that it does have an impact on important macroeconomic variables including industrial production. The results of another study in Germany showed that sentiment-based indexes are the best predictors of industrial production. Also, the investigation of the whole euro-area economy suggests that changes in sentiment indicators do have an impact on important macroeconomic variables such as production. It is also worth examining this relationship the other way around. The study of Nežnínský and Baláž proves that it is necessary to examine not only relationships with production but also relationships between confidence indicators and producer prices. In their study, they focused on the Visegrad Group countries (Czech Republic, Slovakia, Hungary and Poland), confirmed relationships and also stated that the absolute values of the adjusted R-squared were relatively low, but significantly higher than those in studies using confidence indicators for forecasting GDP growth and consumer spending in the USA and the euro area. Another study by Bildirici and Badur examined the relationships between the prices of oil/gasoline producers and sentiment-based indexes in the US and Turkey. They found that there is a bidirectional causality between prices and the confidence index in the US and that there is a unidirectional relationship between the prices and the confidence index in Turkey.

Not surprisingly, researchers have also begun to examine the relationships between business environment conditions and bank lending behaviour (including interest rate setting) with renewed attention following the 2008 economic crisis, as the consequences of this crisis affected many developed and developing countries around the world. There are also studies that examine the relationships between the perception of the situation by economic agents (business sentiment, which also includes business confidence) and the lending behaviour of banks. The research of Caglayan and Xu proves the opposite relationship, that changes in the sentiment of economic agents and its volatility negatively affect the lending behaviour of banks.

According to what Kirchner states in his study, members of the business community, especially bank executives, claim that cuts in official interest rates can negatively
damage economic sentiment, as lower interest rates are seen as a negative symbol, a sign something is wrong and there is a weakness in the economy. Also, the research of Roberts and Simon [6] shows that increases in the official interest rate have an economically and statistically significant negative effect on consumer and business sentiment in all of their regressions.

As it turns out, business confidence can be a very important predictor of future development and sustainability in a selected industry. This article examines the relationships between the Business Confidence Indicator of the manufacturing sector and the following variables: the production of the manufacturing sector, the Producer Prices Index of the manufacturing sector, and the short-term and long-term interest rates of the market. Within the multiple regression model, the Business Confidence Indicator is considered the dependent variable and the remaining variables are considered independent variables. The cases of two countries, the Slovak Republic and Hungary, are examined. The rationale for their selection is presented in the Materials and Methods chapter. The aim is to create an assumption that the aforementioned selected quantifiable variables could have an effect on the Business Confidence Indicator—which belongs to the group of sentiment-based indexes—and to observe the differences between two neighbouring countries.

3. Materials and Methods

This research is focused on two neighbouring countries, the Slovak Republic and Hungary. The research design follows the approach that first the cluster analysis is performed with the aim of positioning the selected countries into clusters within the OECD countries in relation to the examined variables. Consequently, multiple regression models were used to verify the relationships between variables, separately for each of the two analysed countries.

The research question that guided this study was whether it is possible to assume a relationship between the BCI and the selected economic variables (production, PPI, and interest rates), especially in the direction from the selected variables to the BCI. Based on several studies (also presented in the literature review), it is possible to assume that a relationship exists, but mostly it is monitored whether the BCI has the ability to predict their development, and not whether the perceptions of business agents (their sentiment) is also influenced by these selected economic variables.

The data needed for the analysis were collected from the freely available OECD database. The Manufacturing Sector is the sector examined within the study (C of NACE Rev. 2.). Following NACE Rev.2 divisions, the following fields of manufacturing are excluded: the processing of nuclear fuel, the manufacture of weapons and ammunition, the building of ships and boats, the manufacture of air and spacecraft and related machinery, and the manufacture of military fighting vehicles (i.e.; C24.46, C25.4, C30.1, C30.3, C30.4).

Two countries, the Slovak Republic and Hungary, were selected for analysis in this study. These are countries where the authors of this research paper are engaged professionally. The Slovak Republic and Hungary are neighbouring countries with a common history, and which are culturally and socially [29], but especially economically very close. Both countries are part of the smaller grouping of the four Vysegrad Group (V4) countries that have a lot in common from the point of view of the development of economic indicators, specifically in the manufacturing sector as well [30]. The Vysegrad Group states in its own documentation [31] that it groups together four countries in the Central European area (Poland, Hungary, the Czech Republic and the Slovak Republic), which are characterised by a common goal within pan-European integration, to cooperate in several common-interest areas. At the same time, both investigated countries are member countries of the EU and NATO. However, it is also possible to find certain differences between them, such as the fact that the Slovak Republic is part of the European Monetary Union (EMU) and Hungary is not.

The examined period is from January 2016 to December 2022. The data were collected on a monthly basis. This means that for each of the two investigated countries, 84 data
were available for each of the investigated variables. The period examined in this article was limited by the availability of data for all the variables examined. The data for each variable were collected from the publicly available online database OECD.Stat, available at https://stats.oecd.org (accessed on 19 October 2023).

3.1. Data Description

The following variables were included in the study (with their description given by the Key Statistical Concept of the OECD database):

- **Business Confidence Indicator (BCI)—OECD Standardized.**
  - Data for this variable were used from the OECD database. More in detail, the database themed Monthly Economic Indicators in which the dataset of Composite Leading Indicators (MEI) was used (subject: OECD Standardised BCI with monthly frequency).

  The standardized BCI is computed only for the manufacturing sector. Other sectors (construction, retail trade and services) are not included due to the poor data availability among the OECD member countries.

  The computation of the standardized indicators is based upon the availability of either the business confidence indicator (using the national definition or computed internally) or the business situation, future or current, which can be used as a proxy.

  The indicator is calculated as an index, where the long-time average = 100.

- **Production of the manufacturing sector.**
  - Data for this variable were used from the OECD database. More in detail, the database themed Monthly Economic Indicators in which the dataset of Main Economic Indicators Publication: Production and Sales was used (subject: Production > Manufacturing > Total manufacturing with monthly frequency).

  Production is defined as the gross output of industrial activities, covering sales of final and intermediate goods and services. Adjustments are made for work in progress and for changes in stocks of finished products. Consumer and value-added taxes are not included. This variable is calculated as an index. The production indices measure monthly changes in production and are calculated according to international standards. The Industrial Production Index replaced the previous indicator, “production of goods” calculated until 1998, which measured the final production of the enterprise. Production included changes in the stocks of finished goods and changes in work-in-progress but excluded non-principal production.

- **Producer Prices Index (PPI) of the manufacturing sector.**
  - Data for this variable were used from the OECD database. More in detail, the database themed Monthly Economic Indicators in which the dataset of Main Economic Indicators Publication: Price Indices was used (subject: Producer Prices Index > Economic activities > Manufacturing > Total with monthly frequency).

  The Producer Price Index measures on a representative basis the average price development of active products as well as of products that are produced by industrial producer units in the manufacturing sector and are sold on the market (total, domestic and foreign markets). The price included in the calculation of the index is based on the ex-factory price without value-added tax (VAT), which is the price that the business unit charges the customer (transaction price). Discounts, rebates and subsidies are taken into account. Transportation costs are excluded.

- **Short-term interest rates (IR_ShortT)**
  - Data for this variable were used from the OECD database. More in detail, the database themed Finance in which the dataset of Monthly Monetary and Financial Statistics (MEI) was used (subject: Short-Term Interest Rates per cent per annum with monthly frequency).
Short-term rates are usually either the three-month interbank offer rate attaching to loans given and taken amongst banks for any excess or shortage of liquidity over several months or the rate associated with Treasury bills, Certificates of Deposit or comparable instruments, each of a three-month maturity.

- **Long-term interest rates (IR_LongT).**
  
  Data for this variable were used from the OECD database. More in detail, the database themed Finance in which the dataset of Monthly Monetary and Financial Statistics (MEI) was used (subject: Long-Term Interest Rates per cent per annum with monthly frequency).

Long-term (in most cases 10-year) government bonds are the instrument whose yield is used as the representative ‘interest rate’ for this area. Generally, the yield is calculated at the pre-tax level and before deductions for brokerage costs and commissions, and is derived from the relationship between the present market value of the bond and that at maturity, taking into account also interest payments paid through to maturity.

### 3.2. Cluster Analysis

In the first part of the analysis, a cluster analysis was carried out in two steps. The above analysis was performed on a sample of OECD countries for which data were available for all variables for the period of December 2022. The condition was met by the following 28 countries: Austria, Canada, Estonia, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal, the Slovak Republic, Slovenia, Spain, the United Kingdom, the United States, Belgium, Chile, Colombia, Hungary, Latvia, Luxembourg, Norway, Sweden, Denmark, Ireland, Lithuania, Poland, and Switzerland. The goal was to divide the available countries into clusters according to all examined variables at the end of the examined period within this study, and to look at the characteristics of the clusters in which the Slovak Republic and Hungary are currently located. It should be noted here that the OECD countries are those that are evaluated by the Organization as more advanced from the point of view of their economic cooperation and development [32].

If a cluster analysis is carried out, certain groupings will be created that have certain common features, the so-called clusters. However, these groupings can be considered as clusters only if their data are analysed in relation to the variables included in the clustering [33]. Clusters are specified after identifying significantly different groupings. From the point of view of the variables, groupings can differ mostly in one of two ways. One is the value level of the examined variable, and the other is its variability [34].

From the point of view of the type of clustering, two methods were used in this article:

- **Hierarchical clustering**

  Ward’s method is a “procedure for forming hierarchical groups of mutually exclusive subsets on the basis of their similarity with respect to specified characteristics” [35]. Geometric distance and Euclidean distance are the most frequently used tools for measuring distances between the elements of cluster analysis. Ward’s clustering method used in the model (which is applied within the research in this article) mainly uses Euclidean distances. Divisional clustering is used for the set of all countries initially forming one common cluster. Within it, all countries are gradually, step by step, divided into a larger number of clusters. Such a method of clustering is characterised by the advantage that at the beginning there is no need to know the total number of clusters that the countries make up, but their number is worked on gradually.

- **Non-hierarchical clustering**

  This article uses a sequence where hierarchical clustering was implemented first and then non-hierarchical clustering. Thanks to hierarchical clustering, it is possible to answer the basic question of non-hierarchical clustering. The question is how many clusters to use. From the group of non-hierarchical methods, the K-means method was applied. The K-means method consists of dividing \( n \) objects with \( m \) characters into \( k \) clusters so that
the between-cluster sum of squares ($SS_B$) is minimized. Non-hierarchical methods use the optimization procedure, where it happens that during the formation of clusters an object (country) is closer or further away from the cluster in which it is currently located. Then the optimization procedure places it in another (closer) cluster [32].

$$SS_B = \frac{nm}{nm - m} \sum_{l=1}^{k} \sum_{i=1}^{m} \sum_{j=1}^{n_k} (1 - \delta_{ijl})(y_{ij} - c_{il})^2$$  \hspace{1cm} (1)

- It is assumed that $n$ objects are divided into $k$ clusters. Then the $k$-th cluster contains $n_k$ objects. Each object is described by $m$ characters. The missing value of the $i$-th character in the $j$-th line and in the $k$-th cluster is denoted as $\delta_{ijk}$. The $x_{ij}$ data are pre-standardized and denoted as $y_{ij}$. The value of $c_{ik}$ is the mean value (average) of the $i$-th character in the $k$-th cluster [33].

Using this method, the OECD countries included in the analysis are divided on the basis of all variables into a specified number of clusters so that the smallest possible sum of squares between the clusters is achieved. Countries are assigned to the cluster they are closest to, thus optimizing their cluster membership. In this case, Euclidean distances were used again.

### 3.3. Multiple Regression

In the next part of the analysis, by the use of the multiple regression model, the following hypotheses were validated:

- **H1:** The level of the Business Confidence Indicator in the manufacturing sector in the Slovak Republic can be affected by the production of the manufacturing sector, the Producer Prices Index (PPI) if the manufacturing sector, the level of the long-term interest rates, and the level of short-term interest rates.

- **H2:** The level of the Business Confidence Indicator in the manufacturing sector in Hungary can be affected by the production of the manufacturing sector, the Producer Prices Index (PPI) of the manufacturing sector, the level of the long-term interest rates, and the level of short-term interest rates.

As mentioned, the established hypotheses were verified using a multiple regression model. A statistical software application (Statistica version no. 13.5.0.17) was used to apply hierarchical and non-hierarchical clustering, as well as a multiple regression model.

A multiple regression model detects the effect of independent variables on the dependent variable. Thus, the independent variables are the explanatory variables, and the dependent variable is the explained one. The determination of the variables for the purposes of the multiple regression model is as follows:

- Dependent variable: Business Confidence Indicator (BCI)—OECD Standardized.
- Independent variable 1: Production of the manufacturing sector.
- Independent variable 2: Producer Prices Index (PPI) of the manufacturing sector.
- Independent variable 3: Long-term interest rates (IR_LongT)
- Independent variable 4: Short-term interest rates (IR_ShortT).

The goal of using the regression model is to verify the validity of the effect in terms of the above variables and to identify their measure. The best possible linear model describing the above relationships should be created. The compiled resulting model for analysis has the following form:

$$BCI_t = f(\text{Production}_t, \text{PPI}_t, IR\_LongT_t, IR\_ShortT_t)$$  \hspace{1cm} (2)

This regression model was used within the validation of both hypotheses (H1 and H2), meaning that it was used for both analysed countries separately. The intention is to find out
what the differences are between the neighbouring countries of the Slovak Republic and Hungary, as they belong to different clusters based on the results of the cluster analysis.

The suitability of the multiple regression model is verified using the Analysis of Variance (ANOVA) method. By comparing the variance caused by the input fields with the variance caused by the source of the variance, it is investigated whether the mean values differ. If there is a situation where the ratio of the stated variances would be high in favour of the variance caused by the source of variance (i.e., unexplained variance), in that case, it is not possible to confirm the statistical significance of the mean values. This evaluation uses the F-test with a set significance level of alpha 0.05. At a lower level of significance, it is confirmed that the mean values are statistically significant in the case of a multiple regression model.

4. Results

Figure 1 shows the development of the variables included in the study during the examined period from January 2016 to December 2022. In the case of both examined countries—the Slovak Republic and Hungary—a similar evolution of the variables is noticeable in the first half of 2020, when the arrival of the COVID-19 pandemic was revealed in the mentioned countries. Based on the graphic representation, it is shown that after this period the Business Confidence Indicator (BCI) recovered faster in the Slovak Republic compared to Hungary. The recovery of the BCI in Hungary was slower, but thanks to continuous growth, it reached significantly higher values by the end of 2021 than in the Slovak Republic, where the BCI had already stagnated and oscillated around its neutral value very close to 100.

![Figure 1. Development of variables during the examined period. Note: The y-axis on the left shows the values for the variables BCI, production, and PPI. The y-axis on the right shows the values for the variables IR_LongT and IR_ShortT.](image-url)
It is also worth mentioning the development of the three variables—namely PPI, IR_LongT and IR_ShortT—in the post-COVID period. In both countries, the mentioned variables grew, but with different dynamics. Hungary recorded significantly faster growth. What is interesting is the different rate of development of the variables IR_LongT and IR_ShortT in Hungary, where, at the end of the period, the short-term interest rates significantly outstripped the long-term interest rates (note: the monetary policy of the Slovak Republic is influenced by the European Central Bank within the Eurozone, while Hungary has its own currency, the Hungarian Forint).

4.1. Cluster Analysis

Within the cluster analysis, those OECD countries were examined for which data were available for each of the variables included in the research in the last interval (month) of the examined period. Based on this criterion, it was possible to include in the analysis 28 countries with data for the month of December 2022. As mentioned above in the methodology, two different clustering methods were used. The first, the hierarchical Ward’s method was used to create an idea of the possible clusters and to estimate the number of clusters for subsequent use in the non-hierarchical method. The results of hierarchical clustering in the form of a Tree Diagram can be seen in Figure 2. When Ward’s method was applied, Euclidean distances were used to determine the distances between the elements of the cluster analysis.

![Tree Diagram for 28 Cases](image)

**Figure 2.** The results of hierarchical clustering. Note: The red boxes show the three resulting clusters of hierarchical clustering.

Three groups of countries showing similar characteristics were identified in the dendrogram. From the point of view of the issues examined in this article, it is important that the Slovak Republic and Hungary are located in two different clusters. Both clusters in which the two examined countries are located are relatively large in relation to the total number of countries that could be included in the analysis.

In the next step, non-hierarchical clustering using the K-means method was used for a deeper analysis of the characteristics of the clusters, which included the analysed...
countries, the Slovak Republic and Hungary. It was also based on Euclidian distances. To
determine the number of clusters, the results of the previous hierarchical clustering were
used, and thus three clusters were examined. The results were obtained after performing
three iterations.

When looking at the cluster means (Table 1), Cluster No. 1 is characterised by the
fact that the main examined variable, the Business Confidence Indicator (BCI), reaches the
highest values, while the variable production reaches the lowest values of all three clusters.
The mean value of the variable Producer Prices Index (PPI) is somewhere in the middle
between the other two clusters. At the same time, it can be concluded that the mean values
of the remaining two variables—the long-term interest rates (IR_LongT) and the short-term
interest rates (IR_ShortT)—are significantly lower than in the case of Cluster No. 2, but
very similar to Cluster No. 3.

Table 1. Cluster Means and Euclidian Distances between Clusters—K-means method.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cluster Means</th>
<th>Cluster (No. 1)</th>
<th>Cluster (No. 2)</th>
<th>Cluster (No. 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>production</td>
<td>112.4970</td>
<td>114.5720</td>
<td>162.4092</td>
<td></td>
</tr>
<tr>
<td>PPI</td>
<td>131.4696</td>
<td>152.7549</td>
<td>114.3636</td>
<td></td>
</tr>
<tr>
<td>IR_ShortT</td>
<td>2.5070</td>
<td>6.5732</td>
<td>2.8439</td>
<td></td>
</tr>
<tr>
<td>IR_LongT</td>
<td>3.1474</td>
<td>5.1345</td>
<td>3.1862</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cluster Number</th>
<th>Euclidean Distances between Clusters *</th>
<th>No. 1</th>
<th>No. 2</th>
<th>No. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>0.00000</td>
<td>95.59270</td>
<td>556.7955</td>
<td></td>
</tr>
<tr>
<td>No. 2</td>
<td>9.77715</td>
<td>0.00000</td>
<td>756.0056</td>
<td></td>
</tr>
<tr>
<td>No. 3</td>
<td>23.59652</td>
<td>27.49556</td>
<td>0.0000</td>
<td></td>
</tr>
</tbody>
</table>

Note: * Distances below diagonal; Squared distances above diagonal.

Cluster No. 2 is characterised by the lowest mean value of the BCI variable, while the
mean value of the production variable is only slightly higher than in the case of Cluster No.
1, but significantly lower than in the case of Cluster No. 3. The most significant differences
compared to the two remaining clusters are achieved by Cluster No. 2 in the remaining
three variables—the PPI, IR_ShortT and IR_LongT—where the mean values of all three
variables are significantly higher than in the other clusters.

Cluster No. 3 is the cluster with the significantly highest mean value of the production
variable and the lowest mean value of the PPI variable. Looking at the mean BCI value,
this cluster is approximately in the middle between the remaining two clusters. As already
mentioned, the mean values of the variables IR_ShortT and IR_LongT in this cluster are
very similar to the first one and are significantly different (they are significantly lower) than
those in Cluster No. 2.

From the point of view of the Euclidian distances between the clusters themselves,
it can be seen that the most distant cluster, which differs the most, is Cluster No. 3. Its
distance from the previous two clusters is relatively similar. At the same time, the distances
between Cluster No. 1 and Cluster No. 2 are evident. It is in those two clusters that the
countries that are emphasized in this article, the Slovak Republic and Hungary, are located
(as can be seen in Table 2).
Table 2. Members of Clusters and Distances from Respective Cluster Centre—K-means method.

<table>
<thead>
<tr>
<th>Members of Cluster No. 1 (15 Cases)</th>
<th>Distance</th>
<th>Members of Cluster No. 2 (8 Cases)</th>
<th>Distance</th>
<th>Members of Cluster No. 3 (5 Cases)</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>6.28009</td>
<td>Belgium</td>
<td>5.79258</td>
<td>Denmark</td>
<td>2.73554</td>
</tr>
<tr>
<td>Canada</td>
<td>4.87376</td>
<td>Chile</td>
<td>7.25627</td>
<td>Ireland</td>
<td>20.22411</td>
</tr>
<tr>
<td>Estonia</td>
<td>5.51915</td>
<td>Colombia</td>
<td>7.47096</td>
<td>Lithuania</td>
<td>9.53556</td>
</tr>
<tr>
<td>Finland</td>
<td>5.15662</td>
<td>Hungary</td>
<td>7.25568</td>
<td>Poland</td>
<td>10.83437</td>
</tr>
<tr>
<td>France</td>
<td>5.74424</td>
<td>Latvia</td>
<td>6.18926</td>
<td>Switzerland</td>
<td>10.56489</td>
</tr>
<tr>
<td>Germany</td>
<td>8.17306</td>
<td>Luxembourg</td>
<td>10.08052</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>6.72176</td>
<td>Norway</td>
<td>7.99341</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>3.98296</td>
<td>Sweden</td>
<td>4.98659</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Netherlands</td>
<td>5.06692</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>5.43213</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>3.12759</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td>11.59960</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>1.66590</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2.98794</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>6.69198</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The composition of the clusters achieved by clustering using the K-means method shows that the Slovak Republic is placed in Cluster No. 1, the largest of the three clusters. Hungary is placed in Cluster No. 2, and the same was the case with hierarchical clustering using Ward’s method. It can be concluded that the analysed two countries are stably divided into these two clusters.

As already mentioned above, from the point of view of the Euclidian Distances between clusters, Cluster No. 3 stands out the most. The fact that this cluster is most different from the previous two can also be seen in the graphic representation in Figure 3.

Figure 3. Mean values of the variables by cluster.
Cluster No. 3, compared to the two previous ones, is characterised by the fact that it shows relatively very high production in the manufacturing sector at a relatively very low level of PPI. In reverse of the proportion that is the case in Cluster No. 1 and Cluster No. 2.

In the context of this article, it is interesting to observe the differences between the first and second clusters, which include the two countries forming the area of interest. Cluster No. 1 is characterised in this time period by the fact that the mean value of the examined dependent variable BCI is the highest of all, while all four examined independent variables have mean values lower than those in the case of Cluster No. 2. Analogously, in the case of Cluster No. 2, the mean value of BCI is the lowest here, while all mean values of independent variables are higher than those in the case of Cluster No. 1.

Therefore, the question arises whether there could be a difference between the two examined countries in the relationship between the dependent variable and the independent variables since the Slovak Republic belongs to Cluster No. 1 and Hungary to Cluster No. 2.

4.2. Multiple Regression—The Cases of the Slovak Republic and Hungary

Within this subsection of the presentation of the results, this article deals with the use of a multiple regression model. The dependent variable is the Business Confidence Indicator (BCI). The stated results serve as a basis for the validation of the two hypotheses presented in Section 3. Each of the hypotheses assumes a relationship between the mentioned dependent variable and independent variables (Production, PPI, IR_LongT, and IR_ShortT). However, in the first hypothesis, the relationship is verified in the case of the Slovak Republic, and the second hypothesis in the case of Hungary. Summary regression statistics for both cases are presented in Tables 3 and 4.

Table 3. The summary output of the Multiple Regression Model—Slovak Republic.

<table>
<thead>
<tr>
<th>SUMMARY OUTPUT—SR</th>
<th>Regression Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
<td>0.707295065</td>
</tr>
<tr>
<td>R Square</td>
<td>0.500266309</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.474963337</td>
</tr>
<tr>
<td>Standard Error of Estimate</td>
<td>1.25739328</td>
</tr>
<tr>
<td>$p$</td>
<td>$2.61465 \times 10^{-11}$</td>
</tr>
<tr>
<td>No. of cases</td>
<td>84</td>
</tr>
</tbody>
</table>

Table 4. The summary output of the Multiple Regression Model—Hungary.

<table>
<thead>
<tr>
<th>SUMMARY OUTPUT—HU</th>
<th>Regression Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
<td>0.615400885</td>
</tr>
<tr>
<td>R Square</td>
<td>0.37871825</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.347260946</td>
</tr>
<tr>
<td>Standard Error of Estimate</td>
<td>1.701480016</td>
</tr>
<tr>
<td>$p$</td>
<td>$1.09123 \times 10^{-7}$</td>
</tr>
<tr>
<td>No. of cases</td>
<td>84</td>
</tr>
</tbody>
</table>

The resulting regression statistics show that the value of the Multiple R correlation coefficient is relatively high. In the case of the Slovak Republic, its value is 0.71, which is assessed as a high degree of dependence, and in the case of Hungary, its value is 0.62, which is assessed as a significant degree of dependence.

Furthermore, it is possible to evaluate the value of the coefficient of determination R Square, which, after multiplying by 100 (i.e., percentage expression), expresses the level to which the selected regression line explains the variability of the dependent variable. It is evident from Tables 3 and 4 that the chosen regression model explains the variability of the
Business Confidence Indicator (BCI) to 50% in the case of the Slovak Republic and 38% in the case of Hungary. In certain cases, these values would be interpreted as low, but it is also necessary to take into account two facts that the authors of this study are fully aware of: (1) the way the OECD compiles the BCI indicator—it has the character of soft data and the attitudes of representatives of the business sector; (2) the aforementioned variable is affected by other variables in the manufacturing sector that are not always possible to quantify—such as the stability of the political environment, the threat of frequent legislative changes, the environment and related regulation, etc. In the mentioned context, it is possible to consider the values of the coefficient of determination as sufficient, somewhat more so in the Slovak Republic than in Hungary. The same number of cases were evaluated in both countries, which is also in line with the examined period (seven years multiplied by twelve months for each year). There were no missing data in the examined variables.

The results of the regression summary show (Table 5) that in the case of the Slovak Republic, at the set level of $\alpha$ (p-value should be equal to or less than 0.05), a significant relationship is confirmed in the case of all examined variables. In the case of Hungary, such a clear result cannot be confirmed (Table 6). For one of the examined variables, a significant relationship is not proven since the p-value of the variable short-term interest rates is higher than the significance level of $\alpha$ 0.05.

The results of the implementation of the regression model for the conditions of the Slovak Republic show (Table 5) that there is a positive relationship between the dependent variable and two independent variables and that the other two independent variables show a negative relationship.

The regression function in this case has the form:

$$BCI_t = 97.63166 + 0.11683 \times Production_t - 0.11797 \times PPI_t + 1.16102 \times IR_{Long T}_t - 1.74861 \times IR_{Short T}_t$$  \hspace{1cm} (3)
Analogously, it can also be assumed that, with other variables unchanged, the value of the BCI should decrease with an increase in the PPI or short-term interest rates. When looking at the values of Coefficients (b), it should be noted that the BCI variable is expressed as an index (its values oscillate around 100). In the cases of the independent variables, the production and PPI also have the form of an index (values oscillate around 100), but the long-term and short-term interest rates are expressed as percentages. This must be taken into account when interpreting the height of the resulting Coefficients (b) for the individual variables in the resulting form of the regression equation. Table 5 also shows the individual values of the coefficient of determination for the individual variables and also includes the partial correlation values.

Based on the above (if the suitability of the model is confirmed by testing using the ANOVA method), it can be concluded that the null hypothesis assuming the insignificance of the respective regression coefficients is rejected. The first hypothesis (H1) is validated as follows: the level of the Business Confidence Indicator in the manufacturing sector in the Slovak Republic can be affected by the production of the manufacturing sector, the Producer Prices Index (PPI) of the manufacturing sector, the level of the long-term interest rates, and the level of the short-term interest rates.

Since the regression model compiled on the data of Hungary (Table 6) did not confirm the significance of one of the variables, the variable short-term interest rates (IR_ShortT) was excluded from further analysis based on the principle of Stepwise Regression using the Backward Elimination method. The results of the regression model can be seen in Table 7.

Table 7. Regression summary for Dependent Variable: Business Confidence Indicator (BCI)—only significant independent variables—Hungary.

<table>
<thead>
<tr>
<th>HU N = 84</th>
<th>b*</th>
<th>Std. Err. (of b)*</th>
<th>Partial (Cor.)</th>
<th>Semipart (Cor.)</th>
<th>Tolerance</th>
<th>R-Square</th>
<th>Coefficients (b)</th>
<th>Standard Error of (b)</th>
<th>t Stat</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>104.6963</td>
<td>3.031767</td>
<td>34.53310</td>
<td>0.000000 ***</td>
<td>104.6963</td>
<td>3.031767</td>
<td>34.53310</td>
<td>0.000000 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>0.56950</td>
<td>0.160066</td>
<td>0.369613</td>
<td>0.360608</td>
<td>0.400949</td>
<td>0.599051</td>
<td>0.1225</td>
<td>0.034439</td>
<td>3.55787</td>
<td>0.000632 ***</td>
</tr>
<tr>
<td>PPI</td>
<td>−1.24612</td>
<td>0.313934</td>
<td>−0.405638</td>
<td>−0.402315</td>
<td>0.104235</td>
<td>0.895765</td>
<td>−0.1828</td>
<td>0.046063</td>
<td>−3.96937</td>
<td>0.000156 ***</td>
</tr>
<tr>
<td>IR_LongT</td>
<td>0.78378</td>
<td>0.255224</td>
<td>0.324736</td>
<td>0.311257</td>
<td>0.157706</td>
<td>0.842294</td>
<td>0.8856</td>
<td>0.288379</td>
<td>3.07096</td>
<td>0.002915 **</td>
</tr>
</tbody>
</table>

Note: ***, ** indicates that the p-value is equal to or less than 0.001 and 0.01.

The results of the implementation of the regression model for Hungarian conditions show (Table 7) that there is a positive relationship between the dependent variable and two independent variables, and one independent variable shows a negative relationship.

The regression function in this case has the form:

$$\text{BCI}_t = 104.6963 + 0.1225 \times \text{Production}_t - 0.1828 \times \text{PPI}_t + 0.8856 \times \text{IR}_\text{LongT}_t$$ (4)

In the case of Hungary, it follows from the above that if we were to consider the other variables unchanged, then the model would assume that with an increase in production or an increase in long-term interest rates, the BCI value would also increase. On the contrary, it is possible to assume that with other variables unchanged, the BCI value should decrease with an increase in the PPI. Similarly, as in the previous case, it should be noted that the interest rate is expressed as a percentage and not as an index based on the value of 100, and this has an impact on the value of the Coefficient (b). Table 7 also shows the individual values of the coefficient of determination for individual variables and also includes the partial correlation values.

Based on the above (if the suitability of the model is confirmed by testing using the ANOVA method), it can be concluded that the null hypothesis assuming the insignificance of the respective regression coefficients is rejected in the case of three of the four independent variables. The second hypothesis (H2) is validated as follows: the level of the Business Confidence Indicator in the manufacturing sector in Hungary can be affected by the production of the manufacturing sector, the Producer Prices Index (PPI) of the manufacturing sector, and the level of the long-term interest rates.
Next, the appropriateness of the selected multiple regression models for both countries is tested. In accordance with the information in Section 3, the mentioned testing is carried out using the Analysis of Variance method.

In the ANOVA, the null hypothesis is tested for H1 (Table 8) and H2 (Table 9), which states that the regression model chosen to explain the dependence is not suitable (the alternative hypothesis states the opposite) individually for the Slovak Republic or for Hungary. To evaluate these statements, the F test is used, the \( p \)-value of which should be lower than 0.05 (the chosen level of significance \( \alpha \)). The \( p \)-value in the case of the regression model for the Slovak Republic as well as in the case of the regression model for Hungary is below the chosen level of significance. For both stated hypotheses, the H0 is rejected, which means that according to the results, both models were chosen correctly. This result confirms the validation of hypotheses H1 and H2 as stated above.

**Table 8.** Testing the suitability of the model for the Slovak Republic—Analysis of Variance.

<table>
<thead>
<tr>
<th>ANOVA—SR</th>
<th>Sums of (Squares)</th>
<th>df</th>
<th>Mean (Squares)</th>
<th>F</th>
<th>Significance F (( p )-Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>125.0351</td>
<td>4</td>
<td>31.25878</td>
<td>19.77105</td>
<td>0.000000 *****</td>
</tr>
<tr>
<td>Residual</td>
<td>124.9020</td>
<td>79</td>
<td>1.58104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>249.9371</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: ***** indicates that the \( p \)-value is equal to or less than 0.001.

**Table 9.** Testing the suitability of the model for Hungary—Analysis of Variance.

<table>
<thead>
<tr>
<th>ANOVA—HU</th>
<th>Sums of (Squares)</th>
<th>df</th>
<th>Mean (Squares)</th>
<th>F</th>
<th>Significance F (( p )-Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>65.5898</td>
<td>3</td>
<td>21.86325</td>
<td>5.781394</td>
<td>0.001250 **</td>
</tr>
<tr>
<td>Residual</td>
<td>302.5326</td>
<td>80</td>
<td>3.78166</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>368.1224</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: ** indicates that the \( p \)-value is equal to or less than 0.01.

5. Discussion

First, a cluster analysis was performed for the manufacturing sector, on the basis of which the OECD countries were analysed (for which all data were currently available in the last interval of the examined time period) and the countries were divided into three different clusters. It was revealed that the Slovak Republic and Hungary are included in two different clusters, as expected. The third cluster (to which the examined countries do not belong) is characterised by significantly higher production compared to the previous two. The difference between the two clusters where the Slovak Republic and Hungary belong is mainly that the cluster where Hungary belongs has a higher Producer Price Index compared to the latter, and at the same time, it has significantly higher long-term and short-term interest rates.

Producer prices are one of the indicators more commonly used in the literature to assess the competitiveness of Eurozone member countries [36,37]. The Slovak Republic and Hungary are neighbouring countries that have a lot in common. Not only historically, geographically, and culturally, but also from the point of view of the development of economic indicators specifically in the manufacturing sector [30]. But the Slovak Republic, which is in the cluster with a lower PPI, belongs to the euro-area member countries. While Hungary still uses its national currency, it also belongs to a cluster with a relatively higher PPI. The PPI in each country can be affected by several factors, such as the cost structure, degree of market competition, demand conditions and inflationary pressures [38]. In the research studies, the relationship between consumer prices and producer prices is also often examined (and proved). In this context, the research of Žifkov et al. [39] also confirmed
the differences between the Slovak Republic and Hungary. Researchers also examine the relationship between prices and business confidence [25,26].

In economic theory and practice, interest and interest rates are given a lot of attention, primarily because they have a significant impact on the economy, on the management of households and companies, as well as on the behaviour and decision-making of all economic entities. Our analysis showed that the cluster to which Hungary belongs shows higher interest rates than that to which the Slovak Republic belongs. The membership of the Slovak Republic to the Eurozone, where the role of the European Central Bank and higher monetary stability are present, can also play a significant role in these results.

Within the multiple regression analysis, the Slovak Republic and Hungary were separately examined over a longer period of time, starting in 2016. In the case of the Slovak Republic, the following hypothesis was confirmed: the level of the Business Confidence Indicator in the manufacturing sector in the Slovak Republic can be affected by the production of the manufacturing sector, the Producer Prices Index (PPI) of the manufacturing sector, the level of the long-term interest rates, and the level of the short-term interest rates.

In the case of Hungary, the hypothesis was partially confirmed, as follows: the level of the Business Confidence Indicator in the manufacturing sector in Hungary can be affected by the production of the manufacturing sector, the Producer Prices Index (PPI) of the manufacturing sector, and the level of the long-term interest rates.

The difference between the two countries was shown in that, in the case of Hungary, it is not possible to confirm the significance of the independent variable short-term interest rates. In relation to the development presented in Figure 1, it can be seen that this variable appears to be less stable in the case of Hungary than in the case of the Slovak Republic. A closer look at the resulting regression functions of both countries shows that the variable production in the manufacturing sector has a positive effect on the Business Confidence Indicator in the manufacturing sector and in both countries to a very similar extent (assuming the remaining independent variables remain unchanged). Mostly, research studies deal with the opposite relationship to what was confirmed in this study. That is, they examine how confidence indicators can influence industrial production. Most of the research confirms the relationship in this direction, for example [19–24]. An example could be the research carried out in the past in the Euro Area by Cizmesija et al. [40], where they concluded on the basis of a regression analysis that, in accordance with changes in confidence indicators, it is possible to predict the direction of changes in industrial production because business survey results are available before the official statistics are published. Another recent study by Ptáčková and Fisher [41] shows in the case of the Czech Republic that the industrial business sentiment indicator well predicts both the industrial production (for the next month) and the gross value added into the industry (for the next quarter). A significant contribution and novelty of the present research results, in comparison to the previous studies, is that they indicate the existence of a relationship in an opposite way, also. This means that the business confidence of economic agents in the manufacturing sector (producers) can be positively influenced if they see that the production in the manufacturing sector has an increasing trend. At the same time, in both countries, it is shown that a higher PPI can have a negative effect on the BCI value. The PPI is one of the variables in which the difference between the clusters to which the Slovak Republic and Hungary belong was more noticeable. The regression functions also show that (assuming the remaining independent variables remain unchanged) a higher PPI can negatively affect the BCI more intensively in Hungary than in Slovakia. These findings are consistent with the findings and results of other research [25,26], which confirm the relationship between both variables, even at the bidirectional level. The authors Haberli et al. [42] also found out in their research on the case of Brazilian farmers that their business confidence is affected by the cost of production and the sale price in the way that they have generated short- and medium-term expectations. Their research shows the same direction of relationship as the results of this study. The relationship between long-term interest
rates and BCI turns out to be positive. Interest rates are variables in which significant differences can be observed between the analysed countries (and the clusters to which they belong). It is worth mentioning that in the case of Hungary with its higher interest rates, it appears that the degree of their influence on the BCI is lower than in the case of the Slovak Republic. This may mean that business agents in the manufacturing sector are more sensitive to their changes in Slovakia, a country with lower interest rates. Increasing the long-term interest rates increases their business confidence. Such a research result can be considered a significant novelty of this study because it does not occur in other research in relation to long-term interest rates. Future research directions should be focused on the further verification, testing and investigation of such a relationship, the existence of which is indicated by this research study. On the contrary, the result that is also confirmed in other research studies is the relationship with short-term interest rates \[6,28\]. More in detail, Kirchner \[28\] examined the Australian monetary policy and exactly its effect on business confidence. They concluded that business confidence is negatively affected by an increase in the 90-day bank-accepted bill rate, the same as this research study showed. But in the cases of the analysed countries, their negative impact on business confidence can only be confirmed in the case of Slovakia, as in the case of Hungary it was not possible to demonstrate the statistical significance of this independent variable in the model.

When interpreting, however, it is necessary to take into account that the multiple regression models with the mentioned independent variables explain the variability of the Business Confidence Indicator (BCI) to 50% in the case of the Slovak Republic and 38% in the case of Hungary. This can also be considered as a limitation of the present research study. However, as the authors state, at the same time, it is necessary to add that such values for sentiment-based indicators are higher than usual. This claim is also supported by the research of the authors Nežninský and Baláž \[25\]. They also take a similar argument and attitude towards the values of the indicators.

The implications of these findings could also be in the area of the demonstrated efforts of responsible institutions and organizations to ensure the sustainability of the manufacturing sector and at least partially influence or compensate business confidence in the home country (which belongs to the group of sentiment indicators that are very difficult to grasp exactly). Since it is also a mirror of the business environment and a predictor of possible future behaviour, development, and sustainability, in this case in the manufacturing sector. The results of this research indicate that the practical implications of supporting the business environment and efforts to increase business confidence could be: (1) support for increasing production in the manufacturing sector, either by means of push strategies—by supporting the increase of production capacities of existing enterprises and by minimizing obstacles and simplifying the process of establishing new manufacturing enterprises—or also thanks to pull strategies—by supporting domestic but also foreign demand by supporting exports; (2) Trying to support the reduction of PPI. This could be done by relevant institutions in the country by making efforts to reduce the input costs of manufacturing processes, for example, by regulating input energy costs, subsidizing environmental costs, or supporting the price of labour in the manufacturing sector; (3) Ensuring the stability of the lending behaviour of the banks, using the legislative environment and the policy of the central bank.

The theoretical implications of this research result from the fact that this research suggests that it is worth examining the relationship of the BCI variable in the direction of the selected economic variables to the business confidence.

6. Conclusions

The research carried out in the study aimed to discern whether the examined independent variables—the production of the manufacturing sector, the Producer Prices Index of the manufacturing sector, and the short-term and long-term interest rates in the market—affect the Business Confidence Indicator in the manufacturing sector. The mentioned relationship was examined in the cases of two neighbouring countries, the Slovak
Republic and Hungary. These countries are very similar, but from the point of view of the research in question, differences have emerged. For that purpose, a cluster analysis was performed for the OECD countries, which showed that both countries belong to two different clusters. In comparison with the cluster to which Hungary belongs, the cluster in which the Slovak Republic is placed shows evidently lower values of the indicators of all four independent variables in the last period.

Based on the proposed multiple regression model for the period from January 2016 to December 2022, it was shown that the following relationships can exist between the Business Confidence Indicator and independent variables: production—positive relationship; PPI—negative relationship; long-term interest rates—positive relationship; short-term interest rates—negative relationship. The stated results are applicable to the Slovak Republic. In the case of Hungary, the significance of the variable short-term interest rates was not proven, and therefore it was excluded from further analysis based on the principle of Stepwise Regression using the Backward Elimination method. Consequently, the direction of the relationships between the remaining variables is the same as in that of the case of the Slovak Republic. Other differences were also shown in that a higher PPI can negatively affect the BCI more intensively in Hungary than in the Slovak Republic and that in the case of Hungary, it appears that the level of influence of the long-term interest rates on the BCI is lower than that in the case of the Slovak Republic.

In the article, the authors also state the limitations of the research resulting mainly from the use of a sentiment-based indicator. It is necessary to take into account the way the OECD compiles the sentiment-based BCI indicator, where at the beginning it has the character of soft data (the attitudes of representatives of the business sector) that is subsequently standardized and quantified in the form of an index. Another limitation in relation to the resulting regression relationship is that the aforementioned variable is affected by other variables in the manufacturing sector and in the overall economy that are not always possible to quantify—such as the stability of the political environment, the threat of frequent legislative changes, the environment and related regulation, the market competitors, etc. As part of the limitations, it should also be mentioned that the research was focused on two countries, while it would be worthwhile to expand this selection in order to obtain an overall overview, which proves to be a challenge for the future. It should not forgotten that the limitation resulting from the period under review also included the period of the COVID-19 Pandemic, which the authors are aware of when presenting the results. However, the examined period is relatively long and includes the period before and after the pandemic, which can objectify the results. Researching on a monthly basis may seem divided into too short periods, but when researching sentiment, this can be an advantage.

The practical implications of this research are aimed at institutions dealing with the sustainability of the business environment. This research was carried out in the cases of two countries. As part of further research, the validity of the relationships between variables should be further investigated on a wider sample of countries, and at the same time, the authors plan to expand this research by other variables that could affect the BCI, as it follows from the limitations mentioned in this article.

**Author Contributions:** Conceptualization, A.S. and L.S.; methodology, A.S.; software, L.S.; validation, A.S. and L.S.; formal analysis, L.S.; investigation, A.S.; resources, M.K.; data curation, L.S.; writing—original draft preparation, A.S. and L.S.; writing—review and editing, L.S.; visualization, L.S.; supervision, A.S.; project administration, M.K.; funding acquisition, M.K. All authors have read and agreed to the published version of the manuscript.

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