COVID-19 Crisis and International Trade. Two Country Cases

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Abstract

The recent COVID-19 health crisis determined a global economic crisis and numerous economic consequences at different levels. In these conditions, the study of the economic impact of the health crisis became a necessity. Therefore, the present paper focuses on the study of the impact of the COVID-19 crisis on international economic relations, using the example of two countries. Based on the regression methodology it was measured the impact of the COVID-19 burden on the international trade flows of two European countries, namely Romania and Hungary. The results of the research illustrated that the COVID-19 burden had an effect on international trade in the two countries. However, the influences differed in the two countries, with the exports flows being more affected than imports in both countries and with exports in Hungary being more affected that those of Romania.

Keywords: *COVID-19 crisis, International Trade, Central and Eastern Europe, Hungary, Romania.*

JEL classification: *F10, F18, F40*
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1. Introduction

The present health crisis, the COVID-19 crisis affected the whole world at an unprecedented and unexpected level (Tudorache & Nicolescu, 2021a). There are opinions that the impact of the health crisis is felt at multiple levels, as the health crisis quickly transformed in a global economic crisis (Bremmer, 2020; Manyika, 2020). The multiple levels at which the economic impact of the health crisis can be looked at are considered to be: the global level (world level), the macro-level (national economy level), the mezzo level (industry level) and the micro-level (at company level) (Ibn-Mohammed et al., 2021; Belhadi et al., 2021). In this paper, we are interested to analyze the economic impact of the COVID-19 crisis for the specific aspect of the economic interdependencies (global level) of a country (national level). The type of interdependency of interest here is the international trade. Therefore, the present paper envisages to analyze how the international trade was influenced by the COVID-19 crisis.

The paper is organized as follows: the next section looks at international trade and influencing factors, as presented in the literature. This is followed by

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methodology section that focuses on the presentation of methodological aspects: the purposes of the study and the research question and the research methods. The results section includes findings about international trade and how it was impacted by the COVID-19 burden for the two selected country cases. The paper ends with the conclusion section that emphasizes the contribution of the paper to literature and practice.

2. International trade and influencing factors

Specialists agree that at global level the COVID-19 crisis had a large impact on the global supply chains that have been disrupted (Garofali, 2020), but also on the international trade flows that have been highly and negatively affected by countries' lockdowns and border closures (Gruszczynski, 2020). There is agreement in the literature (Zahra, 2020; Rebelo, 2020) that international business networks and global production processes have been disrupted by the COVID-19 crisis.

As the purpose of the present study is to analyze how international trade evolves in time of a sanitary crisis, there are two types of factors that are considered:

a) firstly, the sanitary factors, in the present case we talk about the COVID-19 burden, that can be measured according to Hayakawa and Mukunoki (2020) as the number of COVID-19 cases in a country and as the number of COVID-19 deaths in a country and

b) secondly, the classical economic factors, that are seen as influencers of the international trade activity. Among the classical factors that are identified in the literature is the GDP (Gross Domestic Product) (Hayakawa & Mukunoki, 2020; Whitten et al., 2021). The evolution of GDP is an indicator of the economic growth of a country that is also an influencer for international trade (Umutesi, 2018). Also other numerous factors are seen as influencers of international trade in a classical way. These include political relations between countries (Whitten et al., 2021), but also other aspects such as geography and distance, population, exchange rate, trade agreements (Umutesi, 2018) and inflation (Bi et al., 2019). Some of these factors have been considered in the present research.

Generally speaking, it is acknowledged that the economic impact of sanitary crises is insufficiently studied (Leach et al., 2021) and that there are few studies approaching this topic. The present sanitary crisis, the COVID-19 crisis is also a topic that needs to be studied (Zahra, 2020). The COVID-19 crisis is a recent event and it is still an on-going global phenomenon and therefore, even though many studies started to be conducted in relationship to it, very few are concerned with the effect of the COVID-19 crisis on international trade (Tudorache & Nicolescu, 2021a; 2021b). At the same time, there are calls that research needs to be conducted at all levels (Zahra, 2020) in order to better know how the health crisis influences the economic life. COVID-19 health crisis has economic impact

at global, at national, at industry, at company and at individual level and research is needed at each of those levels.

In this context, the present research comes to fill in some of the existing research gaps, by first offering more evidence about the economic impact of sanitary crises in general and in doing so, in the case of this particular health crisis, by analyzing the impact of the COVID-19 on international trade, that can be seen as an analysis of a phenomenon taking place at global level (international economic interdependencies) as well as, at national level (specific countries are considered).

3. Methodology

The purpose of the study is to analyze the economic impact of the COVID-19 health crisis on one main economic activity at international level, namely international trade. The research question of this study is the following: What is the impact of the COVID-19 crisis on the international trade activity?

Therefore, the aims of the research are:

- to identify if the economic crisis that was triggered by the sanitary and health crisis impacted international trade
- to see if there are differences from one country to another in terms of influence of COVID-19 crisis on international trade.

For this purpose two European countries are analyzed in the present paper, namely Romania and Hungary by looking at the consequences of the COVID-19 crisis on the evolution of the international trade (in terms of both imports and exports) for year 2020.

The impact of the COVID-19 crisis on international trade is measured through the regression method, where the dependent variables are exports and imports, while de independent variables include the COVID-19 burden (measured as number of COVID-19 cases and as number of deaths due to COVID-19) (Hayakawa & Mukunoki, 2020) and some other variables known in the literature as influencing factors for the international trade activity (such as GDP, exchange rates, inflation) (Umutesi, 2018; Whitten et al., 2020).

There are 3 models that are analyzed: 1) the first one only looks at the influence of the COVID-19 burden on both exports and imports; 2) the second includes as independent variables the COVID-19 burden and the GDP as one main influencing factor of foreign trade (Hayakawa & Mukunoki, 2020) and 3) the third model includes as independent variables all variables considered (COVID-19 burden, the GDP, the exchange rate and the inflation).

The regression equations 1a), 1b), 2a), 2b), 3a) and 3b) present the three econometric models that have been used for the analysis of both exports and imports in the two countries:

Model 1:

$$EXP_{i,t} = \beta_0 + \beta_1 COVCASES_{i,t} + \beta_2 COVDEATHS_{i,t} + \varepsilon_{it} \quad (1a)$$

$$IMP_{i,t} = \beta_0 + \beta_1 COVCASES_{i,t} + \beta_2 COVDEATHS_{i,t} + \varepsilon_{it} \quad (1b)$$

Model 2:

$$EXP_{i,t} = \beta_0 + \beta_1 COVCASES_{i,t} + \beta_2 COVDEATHS_{i,t} + \beta_3 GDP_{i,t} + \varepsilon_{it} \quad (2a)$$

$$IMP_{i,t} = \beta_0 + \beta_1 COVCASES_{i,t} + \beta_2 COVDEATHS_{i,t} + \beta_3 GDP_{i,t} + \varepsilon_{it} \quad (2b)$$

Model 3:

$$EXP_{i,t} = \beta_0 + \beta_1 COVCASES_{i,t} + \beta_2 COVDEATHS_{i,t} + \beta_3 GDP_{i,t} + \beta_4 EXCHR_{i,t} + \beta_5 INFL_{i,t} + \varepsilon_{it} \quad (3a)$$

$$IMP_{i,t} = \beta_0 + \beta_1 COVCASES_{i,t} + \beta_2 COVDEATHS_{i,t} + \beta_3 GDP_{i,t} + \beta_4 EXCHR_{i,t} + \beta_5 INFL_{i,t} + \varepsilon_{it} \quad (3b)$$

where:
β_0 - intercept
$\beta_{1,}$ - regression coefficients for the number of COVID-19 cases,
β_2 - regression coefficients for the number of COVID-19 deaths,
β_3 - regression coefficients for the GDP
β_4 - regression coefficients for the exchange rate (national currency to Euro)
β_5 - regression coefficients for the inflation
t - the country
i - the year
ε_{it} - the error terms

Monthly data are used for all indicators and the sources of data were the statistical data bases of international organizations: World Trade Organization for exports and imports, the European Centre for Disease Prevention and Control of EU for the COVID-19 burden, Eurostat for quarterly GDP (that has been decomposed in monthly data) and monthly inflation and the Romanian National Bank and Forex Limited for exchange rates. The data series have been tested for stationarity using the Augmented Dickey Fuller test (ADF test) and they have been stationarized (by differentiation) before being included in the regression analysis.

The analysis of the data was conducted by testing the regression equations presented. The following section, comprising the results of the empirical research, also comments on the validity of the regression equations.

4. Findings about impact of COVID-19 crisis on international trade Romania

The analysis of the research results for Romania reveals that from the three types of regression models tested only one (model 3 for exports) had statistical validity with a p-value for the F-test lower than 0.05 illustrating a probability of 95% of the model being valid and a very high probability of the existence of a relationship between the dependent variable of the model (in this case exports) and the independent variables. In other words, exports of Romania in the year 2020 were influenced by a combination of factors including the COVID-19 burden (number of cases and deaths), the GDP, the exchange rate and the inflation. This model explained 89.2% of the evolution of exports in Romania in the analyzed period, based on the coefficient of determination R^2. Model 3 tested for imports for Romania showed that there is a relationship between variables, but this relationship is weaker from statistical significance point of view (p-value for model 3 imports = 0.13), but still the model explains 80% of the evolution of imports according to the coefficient R^2.

As far as the other two tested models are concerned (model 1 and model 2), in the case of Romania, model 2 was not statistically valid, neither for exports, nor for imports. At the same time, the testing of model 1 that considers the impact of only the COVID-19 burden (cases and deaths) on international trade, illustrates the existence of a relationship between variables, but with a smaller statistical significance (model 1: p-value for exports = 0.15, for imports = 0.19). See Table 1.

Table 1. Validity of the regression models – Romania

	ROMANIA					
	Model 1		**Model 1**		**Model 3**	
	Exports	**Imports**	**Exports**	**Imports**	**Exports**	**Imports**
R Square	0.4165	0.3762	0.4343	0.3834	0.8921	0.8025
Adjusted R Square	0.2498	0.1980	0.1515	0.0752	0.7573	0.5556
Significance F *(p-value)*	0.1517	0.1916	0.299	0.3736	0.0454	0.1382

Source: author's calculations

The analysis of the regression coefficients (Table 2) showed that in model 3 for exports, for the number of COVD-19 cases, the number of COVID-19 deaths and inflation were coefficients that were statistically significant at the 5% level, illustrating their influence on the Romanian exports in 2020. An increase with one person of the number of cases of COVID-19 in Romania determined an increase of 0.046 mill. Euros (46.000 Euros) in exports. At the same time, an increase in the number of deaths with one, determined a decrease of the Romanian exports with 3.313 mill. Euros and an increase with one percent of the inflation in Romania determined a decrease of 2.131 mill. Euros in exports.

Table 2. Regression models' coefficients – Romania

ROMANIA													
	Model 1				Model 2				Model 3				
	Exports		Imports		Exports		Imports		Exports		Imports		
	Regr. Coeff.	P-value	Regr. Coeff.	P-value	Regr. Coeff.	P-value	Regr. Coeff.	P-value	Regr. coeff.	P-value	Regr. coeff.	P-value
Intercept	248.8	0.543	333.9	0.441	193.4	0.67	298	0.54	6906	0.028	6576	0.080
COVID-19 cases	0.028	0.061	0.026	0.088	0.027	0.090	0.026	0.12	0.046	0.006	0.045	0.022
COVID-19 deaths	-2.11	0.68	-2.10	0.081	-2.077	0.096	-2.082	0.111	-3.313	0.008	-3.321	0.023
GDP (mill. Euro)	-	-	-	-	0.370	0.678	0.239	0.799	0.970	0.22	0.735	0.46
Exchange rate	-	-	-	-	-	-	-	-	-34263	0.28	-37984	0.37
Inflation (%)	-	-	-	-	-	-	-	-	-2131	0.04	-1976	0.11

Note: P-value < 0.05 => Confidence level 95%; P-value < 0.10 => Confidence level 90%
Source: author's calculation

Model 3 for imports in Romania even though reflected a weaker relationship from statistical point of view for the overall model (p-value = 0.13), showed statistically significant coefficients, at 5% level for both: the number of cases of COVID-19 and the number of deaths due to COVID-19 for 2020. This illustrates that over 2020 imports in Romania were also influenced by the number of COVID-19 cases and the number of deaths, with a 95% probability.

Model 1 for both exports and imports in Romania, even though with a weaker significance for the overall models, indicated a statistically significant relationship (at 90%) between exports and the number of COVID-19 cases and also between imports and both the number of cases and the number of deaths

Hungary

The analysis of the data for Hungary indicates that only model 1 for exports is valid from statistical point of view with a p-value for the F-test of 0.07, illustrating a 90% probability of exports in Hungary being influenced by the combination of two factors in 2020, the number of cases of COVID-19 and the number of deaths because of the COVID-19. This model explained 52.6% of the changes in the Hungarian exports in 2020 according to the determination coefficient R^2. Model 1 for imports illustrates the existence of a relationship between imports and the number of COVID-19 cases and deaths in Hungary, but the statistical significance is weaker and the model explains 39.2% of the evolution of imports in Hungary in 2020.

For Hungary the testing of model 3, showed that this model is not valid from statistical point of view, while for model 2, only for exports by enlarging the range of validity, it can be stated that there is a relationship between imports and COVID-19 cases and deaths, but this is weaker (p-value = 0.18).

The validity of all three tested models for Hungary is presented in Table 3.

Table 3. Validity of the regression models – Hungary

	HUNGARY					
	Model 1		**Model 2**		**Model 3**	
	Exports	**Imports**	**Exports**	**Imports**	**Exports**	**Imports**
R Square	0.5262	0.3921	0.5262	0.4086	0.6468	0.4744
Adjusted R Square	0.3909	0.2185	0.2894	0.1129	0.2053	0.1825
Significance F(p-value)	0.0731	0.1750	0.1862	0.3358	0.366	0.6412

Source: author's calculations

The analysis of the regression coefficients (Table 4) shows for the valid model (model 1 for exports) the regression coefficients are significant from statistical point of view at the 5% threshold and that at an increase with one of the COVID-19 cases, the exports in Hungary increased with 0.103 mill. Euros (103.000 Euros), while an increase with one in the number of deaths determined a decrease of 6.73 mill. Euros in exports.

Table 4. Regression models' coefficients – Hungary

HUNGARY													
	Model 1				Model 2				Model 3				
	Exports		Imports		Exports		Imports		Exports		Imports		
	Regr. coeff	P-value	Regr. coeff	P-value	Regr. coeff	P-value	Regr. coeff	P-value	Regr. coeff	P-value	Regr. coeff	P-value	
Intercept	195	0.71	190.8	0.663	193.8	0.75	109.2	0.83	33409	0.30	17808	0.52	
COVID-19 cases	0.103	0.027	0.065	0.071	0.103	0.042	0.065	0.094	0.1074	0.07	0.066	0.16	
COVID-19deaths	-6.73	0.031	-4.18	0.082	-6.73	0.048	-4.09	0.11	-6.628	0.09	-4.08	0.20	
GDP (mill. Euro)	-	-	-	-	0.010	0.996	0.768	0.69	-0.697	0.80	0.41	0.86	
Exchange rate	-	-	-	-	-	-	-	-	101.8	0.50	50.1	0.70	
Inflation (%)	-	-	-	-	-	-	-	-	-9580	0.30	-5103	0.52	

Note: P-value < 0.05 => Confidence level 95%; P-value < 0.10 => Confidence level 90%
Source: author's calculations

For Hungarian imports analyzed through model 1 (that illustrates a weaker statistical validity), the regression coefficients are also statistically significant at the 10% threshold, with similar directions of influence: the increase in the number of COVID-19 cases determines a small increase in imports (65.000 Euros increase in imports with every new case of COVID-19), whereas the increase in the number of deaths determined a decrease in the value of imports (4.18 mill. Euros decrease with every new death). In case of Hungary model 2 for exports has a weaker validity of the model (p-value for F test of 0.18), but it has regression coefficients statistically significant at the level of 5% for both number of cases and number of deaths of COVID-19, illustrating the influence of the COVID-19 burden on the Hungarian exports in 2020. Model 3 is not valid for Hungary, even though both COVID-19 burden coefficients showed to be statistically significant at a 10% threshold in case of exports.

The different models that were tested wanted to identify if the COVID-19 burden variables alone have an influence on international trade or if they have a combined influence with other classical economic influencers of international trade.

Looking at the results obtained from the testing of the three models, it can be observed that for Romania model 1, that only considered the influence of the COVID-19 burden on international trade and model 3, that considered the influence of more factors on international trade (the COVID-19 burden and other economic factors) proved to have certain levels of validity and statistically significant coefficients (with both 95% and 90% probability), whereas in case of Hungary model 1 and model 2 had certain levels of validity with regression coefficients statistically significant (with both 95% and 90% probability).

5. Conclusions

The conclusions of the present paper are that COVID-19 crisis influenced international trade in both countries and that the impact of the COVID-19 burden manifested both on imports and exports in Romania and Hungary during 2020.

However, the results of the study have a contradictory character, as the increase in the number of COVID-19 cases in both Romania and Hungary during 2020, determined an increase (small, but still an increase) in exports, while the number of deaths due to COVID-19 determined a decrease in exports and also in imports in both countries. The impact exists, exports and imports fluctuated during 2020 with a decrease tendency in the first part of the year followed by a recovery in the second part of the year. Data on international trade is statistically related to the COVID-19 data, but the directions of influence are not very clear as far as the two indicators measuring the COVID-19 burden are concerned. While for the number of the COVID-19 deaths, the impact on international trade was clear, determining decreases for both exports and imports in both countries in the case of all three models considered, for the number of the COVID-19 cases the influence seems to be positive, determining a small increase in both imports and exports for both countries in all three tested models. In other words, the number of COVID-19

cases seem to have a positive influence on international trade, while the number of COVID-19 deaths had a negative influence. For Romania, inflation was also a factor with negative influence on exports.

The results of this research are very novel, as they consider on-going events. Some early studies tried to approach the topic and the results of our research it is consistent with the early results of Hayakawa and Mukunoki (2020) for example, who studied the impact of COVID-19 burden on international trade at the beginning of 2020 and concluded that COVID-19 influenced the worldwide trade and the negative influences rather come from developing countries whose exports were the most affected. Another study that assessed the impact of COVID-19 on trade between Eastern Europe and China (Megits et al., 2020) and forecasted the evolution of international trade between the two regions, also found that COVID-19 crises determined a decrease in trade between the analyzed countries. Such evolutions, also illustrate how different types of crises (Nicolescu & Tudorache, 2020) economic or sanitary impact economic and financial life in Central and Eastern Europe.

The contributions of the paper are multifold: a) theoretical, as the research developed a category of models that measures the impact of the COVID-19 burden on the overall international trade of a country, models that have been partially validated by the analyzed data and b) the practical contribution of the paper consists in lessons for policy makers at the level of authorities and decision makers at company level for future actions in the situations of sanitary crisis (to identify ways to diminish the potential negative effects on purchasing and on supply activities of companies, on imports and exports of companies and countries determined by the health crisis).

The overall conclusion is that economic interdependencies between countries are affected by global sanitary crises (such as the present one) and they need to be considered by decision makers at all levels. Future research can consider more specific influences of COVID-19 crisis, such as on bilateral trade relationships between countries and even industry specific level trade influences

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