



# The Effects of the Covid-19 Crisis on Romania's Main Trading Relationships in 2020

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**Abstract:** This paper is motivated by the influences that the COVID-19 health crisis had on the economies of the world. The economic crisis that has evolved from the health crisis affected economic life at all levels (global, national, industry, and company levels), including the trading relationships between countries. The purpose of the paper is to analyze the influence of the COVID-19 health crisis on the bilateral trading relationships between Romania and its main trading partners in terms of both exports and imports, for the year 2020. The research method used is multiple regression with exports and imports as dependent variables and the COVID-19 burden (solely the number of COVID-19 cases, solely the number of COVID-19 deaths and both taken together) and GDP in both Romania and the trading partners, as independent variables. The data has been collected from international organizations' statistical databases. The findings of the paper illustrate that both the GDP of Romania and the COVID-19 burden in both Romania and the partner countries influenced the bilateral trading relationships of Romania with its main trading partners in 2020. Romanian imports were more affected than exports by the COVID-19 burden both from Romania and from the trading partners. The number of deaths due to COVID-19 had a higher influence on trade than the number of COVID-19 cases. Based on this country case study, we can assert that global sanitary crises do have an influence on the international trade relationships of countries. Consequently, specific measures need to be taken by policymakers in order to first ensure economic recovery and second to support and maintain international trade flows during times of strong health crises.

**Keywords:** bilateral trade relationships; the economic impact of COVID-19 health crisis; Romania; trading partners.

## Introduction and literature review

The ongoing COVID-19 health crisis-affected and is affecting the whole world at unprecedented and unexpected levels (Tudorache & Nicolescu, 2021a), as the health crisis impacts economies and societies at multiple levels (Bremmer, 2020; Manyika, 2020), as it transformed itself rapidly in a global economic crisis. The economic consequences of the health crisis are seen at numerous levels: world level, national level, industry level, company level, and individual level (Belhadi et al., 2021; Ibn-Mohammed et al., 2021).

The present paper approaches the global and the national levels and analyses the influence of the COVID-19 crisis on economic interdependencies between countries, respectively on foreign trade. The purpose of the paper is to identify what is the extent to which the COVID-19 crisis influenced the foreign trade relationships between countries. And for this purpose, the case study of Romania and its bilateral trading relationships are used. The present paper develops the research idea launched by Tudorache and Nicolescu (2021b).

As a still ongoing and very recent event, the COVID-19 health crisis is a phenomenon that caught the interest of numerous researchers. Various studies started to be conducted in relation to the COVID-19 crisis and its influences on the whole world, but very few studies were concerned with the effect of the COVID-19 crisis on foreign trade (Tudorache & Nicolescu, 2021a). Concurrently, specialists

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appreciate the necessity to conduct studies and call for research looking at the influence of the COVID-19 crisis at all levels (Zahra, 2020) so that to increase the understanding of how the health crisis influences economic life. One aspect of the economic life that has been affected by the COVID-19 crisis refers to the international trade flows that decreased during the crisis period. The factors considered to have led to the decrease of international trade are the interruption of economic activity due to lockdowns, travel restrictions, closure of borders, and other containment measures (Khorana, Martinez-Zarzos, & Ali, 2021).

The trade flows have been affected by the pandemic along both demand and supply channels (Lakatos, 2020). On the supply side, the pandemic disrupted manufacturing sectors, as the lockdowns and the other measures diminished the production of various products. The production shocks determined by the pandemic influenced negatively output, employment, and trade. This impacted the GDP and determined an economic downturn. And at the same time, a lower supply impacted the international flows of intermediate inputs (Khorana et al., 2021). Also on the supply side search, McKibbin and Fernando (2020) advance the idea that the reduced labor supply (due to lockdowns and the disease) raised the costs of production, and consequently this affected production, consumption, but also trade. In the international context, the participation to Global Value Chains (GVC) determined especially for the highly integrated economies, the transmission of COVID-19 shocks, and associated economic shocks (Sforza & Steininger, 2020). On the demand side, the diminished households' income (due to loss of jobs, lockdowns, and home isolation) decreased households' spending and consequently the demand for products (domestic or imported) (Correia, Luck, & Verner, 2020) with adverse consequences for international trade.

There were few studies that looked directly at the relationship between international trade and COVID-19 incidence and crisis. Hayakawa and Mukunoki (2020) as a first study identified on the topic, analyzed the relationship between COVID-19 burden (cases and deaths) and foreign trade (bilateral exports and imports of machinery goods) and found that international trade was suppressed by the COVID-19 burden, especially at the beginning of the pandemic (first months of 2020, for which the study was conducted). Maliszewska, Mattoo, and van der Mensbrugge (2020) explore the impact of COVID-19 on trade with services via a simulation of the potential impact of COVID-19 on GDP and trade. The results of their study illustrated that the most affected were the international tourist services and the other type of domestic services. Espitia, Mattoo, Rocha, Ruta, and Winkler (2021) looked at how COVID-19 induced supply and demand shocks have impacted the bilateral trading relationship of 28 exporting countries and their partners for the first half of 2020. They used a sector-level gravity model and found that economic shocks differed by sector and also that the participation in GVC increased the vulnerability of traders. Khorana et al. (2021) analyzed the impact of COVID-19 on bilateral trade flows in Commonwealth countries, for a period ranging from January 2019 up to November 2020. They used an adjusted gravity model and their results show that "COVID-19 has an adverse impact on trade and that exports decreased as the number of COVID-19 cases rose in an importing country" (p. 19), mainly for low income exporting countries.

Still, Khorana et al. (2021) consider that there has been no detailed contextualization of the link between trade flows within different countries and the incidence of the COVID-19 virus. The present research comes to fill in some of the existing research gaps, by analyzing the impact of the COVID-19 on bilateral foreign trade, on the example of Romania's foreign trade relationships for the year 2020 with its top trading partners. This is a new geographical context in which this relationship is analyzed, adding to the limited existing studies on the topic.

The next sections of the paper are organized as follows: the following section looks at the research question and the methodology that presents the models used for the analysis followed by a discussion on the validity of the models. The findings of the analysis are included in the third section that illustrates the influence of the COVID-19 health crisis on the bilateral top trade relationships of Romania for the year 2020. The paper ends with conclusions that sum up the paper and point out its theoretical and practical contributions.

## Research objectives, research question, and methodology

The purpose of this paper is to evaluate the impact that the COVID-19 health crisis on international trade activity. As a case study, one country was chosen for analysis: Romania. The research question is: "What is the influence of the COVID-19 burden on Romania's bilateral trading relationships?". We hypothesize that both bilateral Romanian exports and imports have been negatively influenced by the COVID-19 burden during the first year of the COVID-19 pandemic, the year 2020.

The analysis looks at Romania's main bilateral trading relationships for the year 2020, the year for the debut of the COVID-19 health crisis. The research model used was proposed and tested by Hayakawa and Mukunoki (2020). Their econometric model is a new research model, developed in the context of the present COVID-19 health events.

In the present research, we started from this existing trade model, and we designed the regression models for the present paper considering different combinations of the COVID-19 related influencing factors for a country's exports and imports activities. The regression models used in the present research are presented in equations 1a), 1b), 1c), 2a), 2b) and 2c). We tested these models in the context of the Romanian international trade.

$$\log \text{EXP}_{\text{RO}-i,t} = \beta_0 + \beta_1 \log \text{GDP}_{\text{RO},t} + \beta_2 \log \text{GDP}_{i,t} + \beta_3 \log \text{COVCASES}_{\text{RO},t} + \beta_4 \log \text{COVCASES}_{i,t} + \varepsilon_{it} \quad (1a)$$

$$\log \text{EXP}_{\text{RO}-i,t} = \beta_0 + \beta_1 \log \text{GDP}_{\text{RO},t} + \beta_2 \log \text{GDP}_{i,t} + \beta_3 \log \text{COVDEATHS}_{\text{RO},t} + \beta_4 \log \text{COVDEATHS}_{i,t} + \varepsilon_{it} \quad (1b)$$

$$\log \text{EXP}_{\text{RO}-i,t} = \beta_0 + \beta_1 \log \text{GDP}_{\text{RO},t} + \beta_2 \log \text{GDP}_{i,t} + \beta_3 \log \text{COVCASES}_{\text{RO},t} + \beta_4 \log \text{COVCASES}_{i,t} + \beta_5 \log \text{COVDEATHS}_{\text{RO},t} + \beta_6 \log \text{COVDEATHS}_{i,t} + \varepsilon_{it} \quad (1c)$$

$$\log \text{IMP}_{\text{RO}-i,t} = \beta_0 + \beta_1 \log \text{GDP}_{\text{RO},t} + \beta_2 \log \text{GDP}_{i,t} + \beta_3 \log \text{COVCASES}_{\text{RO},t} + \beta_4 \log \text{COVCASES}_{i,t} + \varepsilon_{it} \quad (2a)$$

$$\log \text{IMP}_{\text{RO}-i,t} = \beta_0 + \beta_1 \log \text{GDP}_{\text{RO},t} + \beta_2 \log \text{GDP}_{i,t} + \beta_3 \log \text{COVDEATHS}_{\text{RO},t} + \beta_4 \log \text{COVDEATHS}_{i,t} + \varepsilon_{it} \quad (2b)$$

$$\log \text{IMP}_{\text{RO}-i,t} = \beta_0 + \beta_1 \log \text{GDP}_{\text{RO},t} + \beta_2 \log \text{GDP}_{i,t} + \beta_3 \log \text{COVCASES}_{\text{RO},t} + \beta_4 \log \text{COVCASES}_{i,t} + \beta_5 \log \text{COVDEATHS}_{\text{RO},t} + \beta_6 \log \text{COVDEATHS}_{i,t} + \varepsilon_{it} \quad (2c)$$

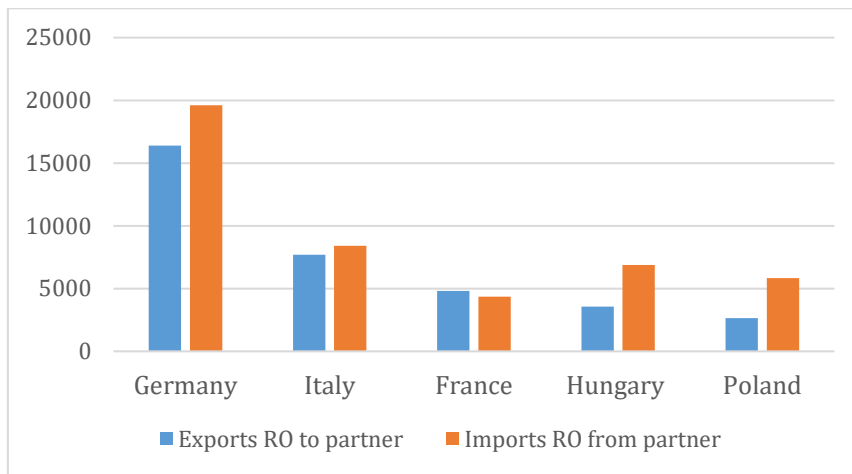
where,  $\text{EXP}_{\text{RO}-i,t}$  represents the exports from Romania to partner country  $i$  at moment  $t$  and  $\text{IMP}_{\text{RO}-i,t}$  represents the imports of Romania from the partner country  $i$  at moment in time  $t$  (month in our case), while  $\beta_0$  is the intercept and  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  and  $\beta_6$  are the regression coefficients for the GDP in Romania and in the partner country, the number of cases of COVID-19, the number of deaths due to COVID-19 in Romania and in the partner country and  $i$  and  $t$  subscripts represent the partner country and the year.  $\varepsilon_{it}$  is the error term.

There were developed more models as the purpose was to try to identify what was the influence on Romania's trade relationships of the number of COVID-19 cases as an influencing factor alone, then of the number of COVID-19 deaths as a factor alone and then the combined influence of the two (number of cases and number of deaths) called the COVID-19 burden.

Monthly data were collected from databases of international organizations as follows: for exports and imports: World Trade Organization; for COVID-19 burden: the European Centre for Disease Prevention and Control of EU; for quarterly GDP (that has been decomposed in monthly data): Eurostat.

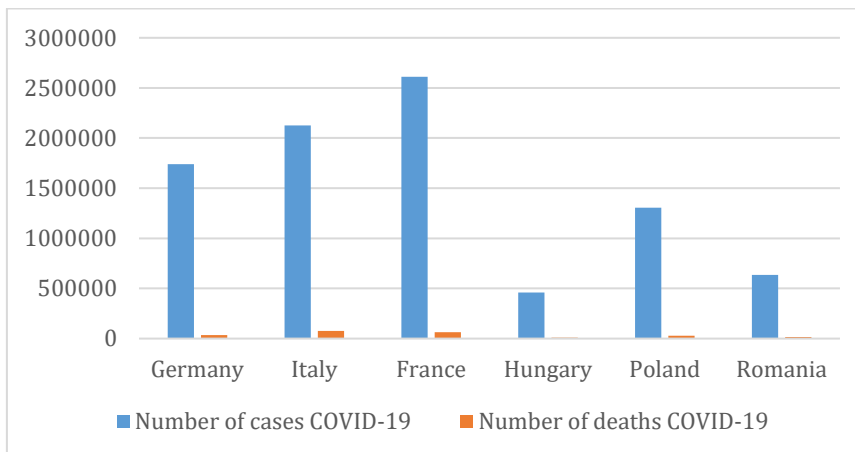
The top five trading partners of Romania for both exports and imports in the year 2020 have been selected to make the analysis of the bilateral trading relationships of Romania and the degree to which they have been influenced by the evolution of the sanitary crisis, measured through the COVID-19 incidence. Figure 1 presents the top trading partners in terms of trade flows (exports and imports expressed in mill. Euros) for the year 2020.

Figure 1 illustrates that the main top partners of Romania for exports were Germany, Italy, France and Hungary, whereas for imports were Germany, Italy, Hungary and Poland. There were three countries that represent the main trading partners in terms of both exports and imports in 2020: Germany, Italy and Hungary, with Germany being the top trading partner in both exports and imports. Romania's bilateral trading relationships with the five countries were analyzed for the year 2020 based on the presented trade models.



**Figure 1. Top trading partners of Romania in 2020**  
 (IMF, 2021, interactive database)

Figure 2 illustrates for the year 2020 the level of the COVID-19 burden in the analyzed countries for both the total number of COVID-19 cases and the total number of COVID-19 deaths.



**Figure 2. COVID-19 burden in Romania and its top 5 trading partners in 2020**  
 (European Centre for Disease Prevention and Control EU, 2021, interactive database)

### The validity of the regression models

Most of the three types of the regression trade models used, proved to be valid based on the analysis of the data collected. Table 1 illustrates the validity of the regression models for all countries included in the analysis, as the main trading partners of Romania in 2020.

**Table 1. Validity of the regression models**

Main trade partners countries of Romania 2020	Exports RO to partner						Imports RO from partner					
	COVID-19 cases (1a)		COVID-19 deaths (1b)		COVID-19 cases and deaths (1c)		COVID-19 cases (2a)		COVID-19 deaths (2b)		COVID-19 cases and deaths (2c)	
	R <sup>2</sup>	P-value	R <sup>2</sup>	P-value	R <sup>2</sup>	P-value	R <sup>2</sup>	P-value	R <sup>2</sup>	P-value	R <sup>2</sup>	P-value
Germany	0.687	0.090	0.0927	0.004	0.9627	0.030	0.810	0.023	0.993	0.000	0.993	0.000
Italy	0.619	0.157	0.7324	0.104	0.7898	0.323	0.5887	0.192	0.897	0.010	0.907	0.109
France	0.599	0.179	0.6868	0.149	0.9404	0.059	0.6112	0.166	0.941	0.002	0.990	0.003
Hungary	0.805	0.050	0.9626	0.000	0.9897	0.004	0.960	0.001	0.977	0.000	0.993	0.002
Poland	0.846	0.028	0.9566	0.001	0.9648	0.027	0.9435	0.002	0.987	0.000	0.990	0.004

Source: Authors' calculations

In the case of the Romanian exports towards its main trading partners, the validity of the models that only consider one COVID-19 factor proved to be higher than the validity of the model that considers the two factors (cases and deaths) combined. For Germany, Hungary, and Poland all three types of models (1a, 1b, 1c) proved to be valid for the export analysis, while for Italy and France, the relationships tested in all models seemed to be weaker (neither of them having a probability of 95%).

As far as the Romanian imports from its main trading partners are concerned, again all three types of trading models (2a, 2b, 2c) tested for Germany, Hungary and Poland showed statistical validity with a 95% probability. For Italy, apart from the model considering only the number of COVID-19 deaths that was valid at a 5% threshold, all others illustrated weaker relationships. At the same time, for France, the two types of models that were statistically valid were the ones considering first only the number of COVID-19 deaths as a factor and second the one considering the combined influence of the number of COVID-19 cases and the number of COVID-19 deaths.

Generally speaking, we can state that the trading models used were valid for most of the countries considered, illustrating the existence of a relationship between variables.

### **The influence of the COVID-19 burden on the top 5 bilateral trading relationships of Romania**

The analysis of the COVID-19 influence on Romania's international trade is conducted by considering the results revealed by all three types of trade models considered (a – just the number of COVID-19 cases seen as a COVID-19 influencing factor; b – just the number of COVID-19 deaths seen as a COVID-19 influencing factor and c – both factors seen as a combined influence).

#### **Exports**

Starting with the analysis of the Romanian exports towards its main trading partners and the way exports were influenced by COVID-19, the three trading models have been tested.

Model 1a. The model that considers the number of COVID-19 cases alone as an influencing factor of COVID-19 (see Table 2), revealed statistically significant influences only in the case of Romanian exports towards Poland. In the case of the trading relationships with Poland according to model 1a) the Romanian GDP and the Romanian number of COVID-19 cases are the factors that did influence the Romanian exports to Poland, with the GDP having a positive influence and with the number of COVID-19 cases having a negative influence. This can be interpreted that for every new case of COVID-19 in Romania in 2020, the Romanian exports to Poland decreased by 557000 Euros. The

GDP and the number of COVID-19 cases from Poland did not have an influence on Romanian exports during the first year of the COVID-19 crisis.

For the other countries analyzed, model 1a) did not result in statistically significant coefficients, suggesting that the number of COVID-19 cases alone considered in both countries (Romania and trading partner), did not really influence the Romanian exports.

**Table 2. The influence of the COVID-19 cases on Romania's top exporting partners – results (model 1a)**

Exporting top partners of Romania 2020 (1a)	Factors							
	GDP - RO		GDP - partner		COVID-19 cases RO		COVID-19 cases partner	
	$\beta_1$	P-value	$\beta_2$	P-value	$\beta_3$	P-value	$\beta_4$	P-value
Germany	0.490	0.775	3.014	0.468	0.015	0.872	-0.050	0.498
Italy	1.365	0.679	0.500	0.930	-0.053	0.535	-0.007	0.907
France	2.740	0.484	-0.127	0.986	-0.081	0.710	-0.026	0.882
Hungary	2.815	0.438	2.902	0.635	-0.324	0.123	-0.022	0.740
Poland	5.418	0.039	-0.201	0.941	-0.577	0.050	0.0884	0.485

Source: Authors' calculations

Model 1b). Table 3 illustrates the results for model 1b) that considers alone the number of COVID-19 deaths as an influencing factor of the COVID-19 crisis. In this case, for three countries (Germany, Hungary and Poland) both the GDP of Romania and the number of COVID-19 deaths in Romania had statistically significant coefficients illustrating an influence of these factors on Romanian exports during the first year of the health crisis. For Italy and France, the model showed a weaker influence (but still an influence) of the number of COVID-19 deaths from Romania on Romania's exports in these countries.

The Romanian GDP had a positive influence on Romanian exports during the health crisis and the number of COVID-19 deaths from Romania had a negative influence on the Romanian exports in its bilateral trading relationships with all countries. The increase in the number of COVID-19 deaths in Romania determined a decrease in the Romanian exports to partner countries.

The number of COVID-19 deaths in the partner countries, seem not to have any kind of influence on the Romanian exports in those countries, as the regression coefficients were not statistically significant.

**Table 3. The influence of the COVID-19 deaths on Romania's top exporting partners – results (model 1b)**

Exporting top partners of Romania 2020 (1b)	Factors							
	GDP - RO		GDP - partner		COVID-19 deaths RO		COVID-19 deaths partner	
	$\beta_1$	P-value	$\beta_2$	P-value	$\beta_3$	P-value	$\beta_4$	P-value
Germany	4.078	0.014	-3.571	0.196	-0.2740	0.0171	-0.0244	0.400
Italy	5.107	0.207	-5.111	0.415	-0.2286	0.1497	0.0091	0.830
France	0.735	0.115	-0.0787	0.676	-0.6079	0.1396	-0.0784	0.468
Hungary	7.380	0.006	-7.2080	0.051	-0.4201	0.0019	0.0347	0.213
Poland	5.862	0.002	-4.0309	0.060	-0.4662	0.0047	0.0593	0.284

Source: Authors' calculations

Model 1c). The last trading model tested in the case of exports, model 1c) considered the combined influence of the number of COVID-19 cases and the number of COVID-19 deaths on Romanian exports. Results are presented in Table 4.

In the case of this model, the GDP from Romania did have a positive influence on Romanian exports towards all top trading partners (except Italy), illustrating higher Romanian exports at a higher Romanian GDP. At the same time, the GDP of the partner country had a clear negative influence on Romanian exports in the case of Hungary and a weaker influence and still negative influence in the case of France and Poland, meaning that the higher the GDP in the partner country, the lower the exports of Romania towards that country. For Germany and Italy, it was no statistically significant influence of their GDPs on Romanian exports to them.

In the case of the number of COVID-19 cases, neither the number of COVID-19 cases in Romania nor those in the partner country influenced the Romanian exports to its partners. The only exception is that of Hungary, for which the number of COVID-19 cases from Romania had an influence on Romanian exports to Hungary and the influence seems positive.

As far as the number of COVID-19 deaths from Romania is concerned, this is a factor that did influence the Romanian exports in a statistically significant manner for Germany, France and Hungary, with a negative influence for all three. The highest influence was encountered in the relationship with France, for which an increase with one in the number of COVID-19 deaths in Romania, resulted in a decrease in the Romanian exports towards France by 825000 Euros.

The number of COVID -19 cases from the partner countries and the number of COVID-19 deaths from the partner countries did not have a statistically significant influence on Romania's exports to these countries.

It can be concluded that Romanian exports (as part of a bilateral relationship) in time of COVID-19 health crisis, were rather influenced positively by the level of the GDP in Romania, negatively the level of GDP in the partner country and also negatively by the number of COVID-19 deaths from Romania. The number of COVID-19 cases both in Romania and in the partner countries did not have an influence on Romanian exports and also similarly the number of COVID-19 deaths in the partner countries did not influence the exports of Romania in those countries.

## **Imports**

The second side of an international trading relationship refers to imports and the way the Romanian imports were influenced during the health crisis was analyzed also using three models 2a), 2b) and 2c), similarly as in the case of exports.

Model 2a). Looking at the results from model 2a) that considers only the number of COVID-19 cases as a health crisis influencing factor, Romanian imports were only influenced by the Romanian GDP in the case of the trading relationship with Poland. In the case of the partner countries' GDP, the trading relationship (imports) with Hungary was positively influenced by this factor – the higher the GDP in the partner country, the higher the Romanian imports from that country. See Table. 5.

**Table 4. The combined influence of the COVID-19 cases and deaths on Romania's top exporting partners – results (model 1c)**

Exporting top partners of Romania 2020 (1b)	Factors											
	GDP - RO		GDP - partner		COVID-19 cases RO		COVID-19 cases partner		COVID-19 deaths RO		COVID-19 deaths partner	
	$\beta_1$	P-value	$\beta_2$	P-value	$\beta_3$	P-value	$\beta_4$	P-value	$\beta_5$	P-value	$\beta_6$	P-value
Germany	3.405	0.0625	-4.096	0.4160	0.3137	0.1913	-0.0790	0.6075	-0.4980	0.0470	0.0148	0.8880
Italy	6.7121	0.2596	-11.535	0.3420	0.3012	0.5141	0.1338	0.6194	-0.4896	0.2456	-0.10590	0.6139
France	8.8592	0.0385	-12.160	0.1360	0.3647	0.3799	-0.0083	0.9548	-0.8250	0.0620	-0.01255	0.8863
Hungary	8.418	0.0067	-11.675	0.0219	0.2524	0.0760	0.0377	0.3545	-0.6073	0.0053	0.01528	0.5982
Poland	5.5486	0.0260	-3.7350	0.1800	-0.1307	0.6499	0.15333	0.4684	-0.3429	0.2158	-0.05821	0.7272

Source: Authors' calculations

**Table 5. The influence of the COVID-19 cases on Romania's top importing partners – results (model 2a)**

Importing top partners of Romania 2020 (2a)	Factors							
	GDP - RO		GDP - partner		COVID-19 cases RO		COVID-19 cases partner	
	$\beta_1$	P-value	$\beta_2$	P-value	$\beta_3$	P-value	$\beta_4$	P-value
Germany	0.6636	0.637	3.2683	0.341	-0.0420	0.589	0.0320	0.591
Italy	2.2000	0.515	-1.2257	0.832	-0.0698	0.430	0.01498	0.809
France	0.2453	0.921	2.9348	0.560	-0.0420	0.775	0.01231	0.915
Hungary	-0.0608	0.955	5.0383	0.037	-0.1571	0.035	-0.00683	0.750
Poland	2.5411	0.042	2.06713	0.158	-0.3631	0.0202	0.0777	0.227

Source: Authors' calculations



The influence of the number of COVID-19 cases in Romania had a statistically significant negative influence on the Romanian imports from Hungary and Poland: an increase in the number of COVID-19 cases in Romania resulted in a decrease in Romania's imports from Hungary and Poland. In the case of model 2a) applied to Germany, Italy and France, there was no factor with influence on the Romanian imports from those countries.

Model 2b). Table 6 presents the results for model 2b) that considers the influence of only the number of COVID-19 deaths on Romanian imports.

The level of the Romanian GDP had a statistically significant and positive influence on the Romanian imports from all its main trading partners, while the partner's GDP proved to be statistically significant only in the case of Italy with a negative influence and to a smaller extent for France, also with a negative influence.

The number of COVID-19 deaths in Romania had a negative influence on Romanian imports from partner countries. The number of COVID-19 deaths from Romania had the highest influence in the case of the Romanian imports from France: at every new death due to COVID-19 in Romania, imports from France decreased by 454100 Euros. At the same time, the number of COVID-19 deaths in the partner countries also influenced Romanian imports, but in a positive way.

Model 2c). The last model tested, model 2c) considers the combined influence of COVID-19 cases and the COVID-19 deaths in both Romania and the partner countries and the results are presented in Table 7.

It can be noticed that the GDP from Romania did influence positively Romanian imports from all partner countries considered. The exception is Hungary, a country for which, the GDP from Hungary had a statistically significant positive influence on Romanian imports (at a 10% threshold).

The number of COVID-19 cases from Romania only influenced the imports of Romania from Germany (with a positive influence). At the same time, the number of COVID-19 cases from the partner countries did negatively influence the imports of Romania from Germany, France and Hungary (an increase in the number of cases in the partner countries resulted in a decrease in the imports of Romania from those countries).

The number of COVID-19 deaths from Romania did influence Romania's imports from all considered countries (with a weaker influence in the case of Italy) and the influence was negative, in the sense that an increased number of COVID-19 deaths in Romania resulted in a lower level of imports from those countries. At the same time, the number of COVID-19 deaths in the partner countries did influence the imports of Romania from those countries for the relationship with Germany, France and Hungary and the influence was positive.

There was no statistically significant connection between the number of COVID-19 deaths in the partner country and the imports of Romania from those countries for Italy and Poland. It can be concluded that Romania's imports were more influenced by the COVID-19 deaths from both Romania and the partner countries than the number of COVID-19 cases from Romania and the partner countries.

**Table 6. The influence of the COVID-19 deaths on Romania's top importing partners – results (model 2b)**

Importing top partners of Romania 2020 (2b)	Factors							
	GDP - RO		GDP - partner		COVID-19 deaths RO		COVID-19 deaths partner	
	$\beta_1$	P-value	$\beta_2$	P-value	$\beta_3$	P-value	$\beta_4$	P-value
Germany	3.458	0.0002	-0.6501	0.436	-0.2929	0.0001	0.03230	0.0092
Italy	7.87685	0.0148	-9.2560	0.047	-0.3481	0.0083	0.04395	0.1374
France	5.13165	0.0074	-3.5697	0.138	-0.4136	0.0025	0.06906	0.0386
Hungary	1.713	0.1140	0.7354	0.650	-0.1812	0.0050	0.02280	0.1420
Poland	2.87958	0.0014	-0.3604	0.631	-0.3071	0.0007	0.06715	0.0239

Source: Authors' calculations

**Table 7. The combined influence of the COVID-19 cases and deaths on Romania's top importing partners – results (model 2c)**

Importing top partners of Romania 2020 (1b)	Factors											
	GDP - RO		GDP - partner		COVID-19 cases RO		COVID-19 cases partner		COVID-19 deaths RO		COVID-19 deaths partner	
	$\beta_1$	P-value	$\beta_2$	P-value	$\beta_3$	P-value	$\beta_4$	P-value	$\beta_5$	P-value	$\beta_6$	P-value
Germany	3.0377	0.0005	1.3121	0.1568	0.0849	0.0655	-0.0946	0.0235	-0.3642	0.0007	0.09416	0.0090
Italy	7.1402	0.1100	-8.0706	0.3161	0.0934	0.7501	-0.0708	0.6859	-0.3872	0.1809	0.09216	0.5104
France	4.3701	0.0062	-0.8289	0.6242	0.1020	0.3368	-0.1295	0.0324	-0.4541	0.0079	0.11693	0.0104
Hungary	0.9139	0.2766	3.4653	0.0987	-0.0761	0.2399	-0.0456	0.0957	-0.1178	0.0825	0.04867	0.0425
Poland	3.0576	0.0126	-0.1551	0.8746	-0.0396	0.7414	-0.0224	0.7921	-0.2946	0.0497	0.08921	0.2579

Source: Authors' calculations

## Conclusions

This paper looked at the influence of the COVID-19 burden (measured in three ways: solely as the number of COVID-19 cases, solely as the number of COVID-19 deaths and as a combination of the previous two) on the bilateral trading relationships of Romania. The trading relationships were looked at as both exports and imports flows and were considered for the main top trading partners of Romania, namely Germany, Italy, France, Hungary and Poland, for the year 2020, the first year of the COVID-19 health crisis.

The models used to test these relationships were developed starting from the model proposed by Hayakawa and Mukunoki (2020). The models were based on the regression analysis and included as dependent variables exports and imports and as independent variables and influencing factors the GDPs of the two trading partners in the bilateral trading relationship and the COVID-19 burden (measured in three ways) in all countries for each of the bilateral trading relationship analyzed.

The results showed that the regression models used were valid for all countries (one exception for Italy for one model), illustrating the existence of a relationship between foreign trade and the considered health crisis indicators. Among the considered models, the ones that seem to better explain the relationships are the ones that included the COVID-19 burden measured by both number of cases and the number of deaths.

The interpretation of the results allows us to conclude the following:

- a) the Romanian situation in all respects (GDP, number of COVID-19 cases and number of COVID-19 deaths) has a higher influence on its bilateral trading relationships than the situation in the partner countries. For example, the GDP of Romania mainly had a positive influence on the bilateral trading relationships of Romania with its top five partners, while the GDP of the partner countries has lower influences or no influences at all on the trading relationship.
- b) Romania's imports were more influenced by the health crisis than the Romania's exports, as in the case of imports, the health crisis indicators (number of cases and deaths) in both trading countries (Romania and partner country) did influence Romania's imports from the respective country.
- c) at the same time, Romania's exports were rather influenced by what happened in Romania (in terms of COVID-19 cases and deaths), with no influence of what happened in the destination countries from the health crisis indicators perspective.
- d) the number of COVID-19 deaths had a higher influence on Romania's bilateral trading relationships than the number of COVID-19 cases. The number of COVID-19 deaths in Romania and the partner countries highly influenced the Romanian imports from those countries, while the number of COVID-19 deaths from Romania influenced the Romanian exports to those countries.

As an overall conclusion, it can be said that there is a link between exports and the impact of COVID-19 in Romania and that there is also a link between imports and the impact of COVID-19 in Romania and the partner countries. The main bilateral trading relationships of Romania were influenced by the COVID-19 health crisis during 2020 and Romania's trade has been affected negatively by the health crisis.

The present paper has both theoretical and practical implications. In terms of theoretical implications, the paper comes to reinforce the validity of the model proposed by Hayakawa and Mukunoki (2020), a model that has been applied in different circumstances in the present study. In practical terms, the results of the present study can be used by policymakers in order to take public policy measures to encourage foreign trade in times of health crises. Such encouraging public policy can include measures to support the recovery of the economy (that is the first to be negatively affected by the health crisis), but also measures to support the trading activity as such, that suffers from the impact of COVID-19 and the associated containment measures.

The paper comes to fill in an existing research gap consisting in a general lack of evidence about the influence of the health crisis on international trade, as in spite of the fact that numerous studies related to COVID-19's impact emerged over the last two years, very few approached the impact of COVID-19 on international trade.

However, the paper has also a number of limitations. One limitation relates to the fact that it focuses on only one country and only considers the main trading relationships of this country. Another limitation is determined by the recency of the events and the limited data availability with an analysis conducted only for the year 2020. Further studies can complement such limitations by extending the period of time for the analysis, once data becomes available and by considering a larger number of trading partners for the country subject to analysis, as well as considering a higher number of countries for analysis.

Given the need for more information about the economic impact of COVID-19 (including in the field of international trade), the research topic can be further developed in different directions. One research direction could be to conduct analyses on the international trade structure at the country level and identify changes over the health crisis period. Another research direction could be to make analyses of the evolutions of the trade relationships between countries during this period and to compare countries in order to find out how their trade has been affected by the health crisis and what are the differences between countries.

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