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The COVID-19 pandemic and European trade patterns: A sectoral analysis

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Abstract

This article examines how the COVID-19 pandemic affected European trade patterns. Specifically, dynamic panel data models are estimated over the period 2019M1–2021M12 to assess the effects on exports and imports of various sectors and products (selected on the basis of their trading volume or strategic importance) of the restrictions and of other policy measures adopted by national governments during the crisis. The results suggest that the impact of the COVID-19 pandemic was heterogeneous across sectors and product types, both the initial drop and the subsequent rebound being different depending on sectoral characteristics and the degree of resilience. In particular, trade flows of durable products were more significantly affected by the pandemic compared to those of non-durable ones.

KEYWORDS

COVID-19 pandemic, dynamic panel models, Europe, GMM estimator, policy responses, product analysis, sectoral analysis, stringency, trade patterns, uncertainty

1 | INTRODUCTION

The COVID-19 pandemic has been a major shock hitting world output and trade, even though the 8.9% fall recorded in the latter in 2020 was smaller than during the global financial crisis (GFC) and than initially forecast by the World Trade Organization (WTO, 2020); moreover, according to the Organization for Economic Cooperation and Development (OECD, 2022) during 2021 trade recovered sharply and was already expected to have returned to pre-pandemic levels by the first quarter of 2022. However, it should be noted that the impact of the pandemic on trade was different across goods, services and trade partners, which resulted in more pronounced pressures on specific sectors and supply chains (OECD, 2022). In particular, the value of exports of services in OECD countries declined in 2020 by twice as much as that of imports (−16.7% and −8.2%, respectively). Some supply chains (e.g., for personal protective equipment) experienced significant difficulties owing to a huge increase in demand whilst others (e.g., for parts and components for automobiles and for semiconductors) were more resilient.

The epidemic originated in China, which is a key supplier of essential inputs to most economies, whose manufacturing sectors are at the heart of various international supply chains. A supply shock is likely to lead to 'supply chain contagion' through trade in intermediate goods. In fact, supply chains appear to have shifted geographically as a result of transport issues, with China acquiring a bigger role and seeing an increase in demand for its exports (OECD, 2022). Such changes are likely to affect both efficiency and risks for global value chains (Arriola et al., 2020). Demand shocks also disrupted them (Del Rio-Chanona et al., 2020).

Since China is one of Europe's largest partners for trade in goods (Eurostat, 2022) shocks affecting its economy also have a direct impact on European trade. In fact, the COVID-19 pandemic represented a serious challenge for the European countries as well. To stop the spread of the virus their governments introduced restrictions on movement and social distancing which affected the labour supply and transport and resulted in some businesses being partially or completely closed. As for trade, the restrictive measures caused supply chain disruptions (Kohlscheen et al., 2020) and both European exports and imports dropped sharply at the beginning of 2020 relative to the previous year; this was inevitable given the fact that the European countries have a relatively open trade regime, and thus are deeply integrated into global markets and have developed trade relationships with a wide range of partners.[1]

However, the COVID-19 pandemic had heterogeneous effects owing to differences in the industrial structure of the European economies. The product structure of trade changed during the pandemic period, with trade in some goods and services plummeting whilst increasing in the case of others. Some sectors where remote work was possible because of a high degree of digitalization were less affected by the restrictive measures (Caporale et al., 2022). Trade flows of home office equipment such as Wi-Fi routers, laptops, portable storage etc.) rose significantly in the second quarter of 2020 according to the United Nations Conference on Trade and Development (UNCTAD, 2022). Given the differences between industrial sectors as well as between the European countries in terms of their industrial structure one would therefore expect that any disruption to supply chains would have a heterogeneous impact across both sectors and economies and thus would result in shifts in trade patterns. This is the research question addressed empirically in the present study, that fills a gap in the existing literature since no previous contribution has provided a systematic analysis of the effect of the COVID-19 pandemic on trade patterns in the case of a wide range of European economies by using an appropriate econometric framework.

More specifically, in the light of the above discussion, this article aims to explore more thoroughly the impact of the COVID-19 pandemic on trade patterns applying dynamic panel techniques to monthly sectoral level data for Europe, which is one of the most important players in global trade. The fact that Europe accounts for as much as 16% of world imports and exports (European Commission, n.d https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/eu-position-world-trade) and its strong trade links with China,[2] where the pandemic started, make it a particularly interesting case to examine. More precisely, our study first analyses the effects on the main sectors of the economy and the most traded goods of a wide set of government policies adopted in response to the COVID-19 pandemic in order to investigate whether such effects vary across sectors and types of goods. Second, it examines specifically the impact on total trade of the restrictive measures introduced by national governments through their interaction with sectoral trade flows. The estimated model also includes a world pandemic uncertainty index (WPUI) developed by Ahir et al. (2022) which, to our knowledge, has not been used before in studies in this area of the literature. The main research question we aim to answer is whether clear evidence can be found that the restrictive measures as well as other policies adopted by the European national governments in response to the COVID-19 pandemic had heterogeneous effects on sectors and goods depending on whether or not they were deemed essential and the extent to which they were digitalized and thus 'work-from-home' (WFH) was possible (these hypotheses are further elaborated and discussed in Section 3.3).

The findings of this article have implications for the design of appropriate trade policies aimed at reducing pandemic-related trade risks and facilitating trade logistics; in particular, policy coordination could be useful to achieve a faster recovery (WTO, 2020). They are also relevant for firms, which might need to reconsider the resilience and reliability of their supply chains given the changes in trade patterns which have occurred during the pandemic and the fact that some of them could be long-lived. The layout of the article is as follows: Section 2 briefly reviews the relevant theoretical and empirical literature; Section 3 outlines the methodology, describes the data and formulates the hypotheses of interest; Section 4 discusses the empirical findings; Section 5 offers some concluding remarks.

2 | LITERATURE REVIEW

2.1 | Theoretical literature

Various theoretical models have been developed to analyse international trade flows and patterns. For instance, the Ricardian model is based on comparative advantage, namely on the idea that countries will specialise in producing goods for which they have a lower opportunity cost compared to other countries. Building on this model, Heckscher and Ohlin (1991) developed what in recent decades has become the most widely used framework for analysing trade. Their model is based on the differences in factor endowments between countries and predicts that they will specialise in producing and exporting goods that utilise their relatively abundant factors of production and will import those that use their scarce factors.

Despite the popularity of this framework, it is clear that no single model can comprehensively explain all trade patterns, owing to the complexity of global trade. In addition to factor endowments, there are other possible determinants of trade such as technology, economies of scale, transportation costs, government policies and so on, and therefore other possible models. Among them, the gravity model of international trade is increasingly used to explain trade flow between countries. It is based on the idea that the volume of trade between two countries is directly related to their economic size, often measured by GDD, which is inversely related to the distance between them. The international trade literature provides theoretical justifications for this approach such as the impact of increasing returns to scale, imperfect competition, and geographical factors, including transportation costs (see Anderson, 1979; Bergstrand, 1989; Helpman & Krugman, 1985).

2.2 | Empirical literature

The empirical literature on changes in trade patterns during the COVID-19 pandemic comprises two types of studies, which focus on global value chains (GVC) and within product analysis respectively. These are based on the theoretical models discussed above.

The first category includes, for instance, the article by Bonadio et al. (2020), who modelled lockdowns as a labour supply shock which is transmitted across countries through GVCs. Eppinger et al. (2021) examined instead whether decoupling from GVCs can increase a country's welfare by reducing its exposure to foreign supply shocks; specifically, they carried out simulations using a quantitative trade model and found that welfare losses from decoupling outweigh any benefits from lower shock exposure. Using a Ricardian model with sectoral linkages, trade in intermediate goods and sectoral heterogeneity in production, Sforza and Steininger (2020) were able to show that global production linkages have an important role in magnifying the effects of the production shock, and also that such effects are heterogeneous across sectors, regions and countries. Hayakawa and Mukunoki (2021a) investigated the impact of COVID-19 cases and deaths on demand, output and value chains by focusing on finished machinery products and found that supply chain effects were the most significant. Finally, Kejzar and Velic (2020) estimated a gravity model using monthly bilateral trade data for EU member states over the period from June 2015 to May 2020 and provided evidence that supply chains disruptions played an important role in the transmission of COVID-19 demand shocks.

The second category explores the sources of heterogeneity using within product data. For instance, in a comprehensive study Liu et al. (2021) estimated a gravity model applying panel methods with fixed effects to Chinese monthly export data at the HS 8-digit level over the period January 2019–December 2020. More specifically, they split the sample between medical goods (MG) and non-MGs and distinguished between durable and non-durable consumer goods (since the trade collapse resulting from the GFC had affected the former more significantly, as shown by Bems et al., 2013); in addition, they used the work-from-home shares from Dingel and Neiman (2020) and Bonadio et al. (2020) as activities that can be performed from home are affected differently by lockdowns from those requiring physical presence; finally they took into account the level of contract intensity by measuring the share of intermediate inputs that require relationship-specific investment as in Nunn (2007), and also the position of products along GVCs by distinguishing between capital goods, intermediate goods, and final goods for consumption. Their findings confirm the presence of considerable heterogeneity; in particular, it appears that MGs were not affected by the pandemic, and products with a high 'work-from-home' share or a high contract intensity as well as capital goods to a lesser extent in comparison to other goods.

Hayakawa and Mukunoki (2021b) also used a panel approach with fixed effects to examine the impact of the COVID-19 pandemic on monthly exports of 34 countries to 173 countries over the period from January to August in 2019 and 2020, and found again heterogeneous trade effects across industries. Specifically, in the case of imports the pandemic decreased demand for mineral products, leather products, and transport equipment (all non-essential goods whose purchase can be postponed), whilst it increased it for chemical products, textiles, and precious metals (the former two including medical products, such as masks or protective equipment for medical use). As for exports, labour-intensive industries such as textiles, leather products and footwear appear to have suffered from the negative effects of lockdowns and other containment measures; a negative impact of the pandemic was also estimated in the case of transport equipment, which was affected by both a supply and a demand shock.

The present article belongs the second category of empirical studies, which focuses on sectoral and within product analysis, but unlike previous related contributions analyses the specific case of the European countries.

3 | METHODOLOGY AND DATA

3.1 | Econometric framework

The empirical framework chosen to analyse the impact of the COVID-19 pandemic on trade is a dynamic panel model with a set of explanatory variables including a COVID-19 index. Its general form is the following:

$$TRD_{i,t}^{m} = \alpha_{i,0} + \delta_{I,1} TRD_{i,t-1}^{m} + \sum_{k=1}^{K} \lambda_{i,k} X_{i,t}^{k} + \sum_{j=1}^{J} \beta_{i,j} COVID_{i,t}^{j} + \mu_t + \eta_i + \varepsilon_{i,t}, \tag{1}$$

where the dependent variable $TRD_{i,t}^{m}$ is an international trade indicator (for exports and imports in turn); as for the regressors:

- $X_{i,t}^{k}$ denotes a set of control variables affecting international trade.
- $COVID_{i,t}^{j}$ is the main variable of interest and stands for stringency and a wider index of the governmental responses to the pandemic in turn.
- μ_t and η_i stand for time-specific and country-specific effects respectively, ε_{it} is a white noise error with zero mean, where $i = 1, 2...,$ and N and $t = 1, 2,...,$ T denote the country and time period, respectively, and α_i is the country-specific intercept that can vary across countries.

Various specifications are estimated. In particular, first we focus on the direct impact of the governmental policy responses to the pandemic on both exports and imports of various sectors, and also on goods at the HS 2-digit level; second, we examine their indirect impact on total trade using an interaction term (STR × TRDS), where STR stands for a stringency index and TRDS for sectoral trade (EXPS and IMPS for exports and imports in turn).

Our empirical approach is based on a sector-level trade model, which leads to estimating the following export and import equations:

$$EXPS_{i,t}^{s} = \alpha_i + \beta_{i,0} EXPS_{i,t-!}^{s} + \beta_{i,1} IPI_{i,t} + \beta_{i,2} WPUI_{i,t} + \beta_{i,3} STR_{i,t} + \beta_{i,4} EC\_SUP_{i,t} + \beta_{i,5} CPI_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}, \tag{2}$$

$$IMPS_{i,t}^{s} = \alpha_i + \beta_{i,0} IMPS_{i,t-1}^{s} + \beta_{i,1} IPI_{i,t} + \beta_{i,2} WPUI_{i,t} + \beta_{i,3} STR + \beta_{i,4} EC\_SUP_{i,t} + \beta_{i,5} CPI_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}, \tag{3}$$

where, $EXPS_{i,t}^{s}/IMPS_{i,t}^{s}$ is the sectoral exports and imports, IPI is the industrial production index; WPUI is the World Pandemic Uncertainty Index, STR = stringency index (STR); EC_SUP is the economic support, and CPI is the consumer price index.

To check for the robustness of the results we also use a wider measure of the response to the COVID-19 pandemic, namely the governmental response index (GOV_RESP), which includes both the restrictions and other policies adopted during the pandemic; thus the estimated equations become the following:

$$EXPS_{i,t}^{s} = \alpha_i + \beta_{i,0} EXPS_{i,t-!}^{s} + \beta_{i,1} IPI_{i,t} + \beta_{i,2} WPUI_{i,t} + \beta_{i,3} GOV\_RESP_{i,t} + \beta_{i,4} CPI_{i,t} + + \mu_t + \eta_i + \varepsilon_{i,t}, \tag{4}$$

$$IMPS_{i,t}^{s} = \alpha_i + \beta_{i,0} IMPS_{i,t-1}^{s} + \beta_{i,1} IPI_{i,t} + \beta_{i,2} WPUI_{i,t} + \beta_{i,3} GOV_{RESP} + \beta_{i,4} CPI_{i,t} + + \mu_t + \eta_i + \varepsilon_{i,t}, \tag{5}$$

The model specification for product analysis is instead the following:

$$EXPP_{i,t}^{p} = \alpha_i + \beta_{i,0} EXPP_{i,t-!}^{p} + \beta_{i,1} IPI_{i,t} + \beta_{i,2} WPUI_{i,t} + \beta_{i,3} STRING_{i,t} + \beta_{i,4} EC\_SUP_{i,t} + \beta_{i,5} CPI_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}, \tag{6}$$

$$IMPP_{i,t}^{p} = \alpha_i + \beta_{i,0} IMPP_{i,t-1}^{p} + \beta_{i,1} IPI_{i,t} + \beta_{i,2} WPUI_{i,t} + \beta_{i,3} STRING_{i,t} + \beta_{i,4} EC\_SUP_{i,t} + \beta_{i,5} CPI_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}, \tag{7}$$

where $EXPP_{i,t}^{p}$ is the product (good) export value, $IMPP_{i,t}^{p}$ is the product (good) import value, $p = 1...99 =$ HS2-code.

To analyse how the policy responses affected the contribution of the main sectors to international trade, again we include an interaction term (STR × TRDS) and re-specify the equations as follows:

$$EXPT_{i,t} = \alpha_i + \beta_{i,0} EXPT_{i,t-!} + \beta_{i,1} IPI_{i,t} + \beta_{i2} WPUI_{i,t} + \beta_{i,3} STR\_EXPS_{i,t} + \beta_{i,4} EC\_SUP_{i,t} + \beta_{i,5} CPI_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}, \tag{8}$$

$$IMPT_{i,t} = \alpha_i + \beta_{i,0} IMPT_{i,t-!} + \beta_{i,1} IPI_{i,t} + \beta_{i,2} WPUI_{i,t} + \beta_{i,3} STR\_IMPS_{i,t} + \beta_{i,4} EC\_SUP_{i,t} + \beta_{i,5} CPI_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}, \tag{9}$$

where: $EXPT_{i,t}/IMPT_{i,t}$ is the international trade (total value of export and total values of imports).

$STR\_EXP_{i,t} = STR_{i,t} \times EXPS^{s}_{i,t}$ and $STR\_IMP_{i,t} = STR_{i,t} \times IMPS^{s.}_{i,t}$.

Each specification includes various control variables that are selected on the basis of the theoretical and empirical literature discussed in Section 2 (e.g., Caporale et al., 2022; Hayakawa & Mukunoki, 2021b). Unlike previous studies, we analyse both the impact of the policy responses to and of the uncertainty generated by the pandemic (measured by WPUI).

The estimated dynamic panel models include lagged values of the explanatory endogenous variables as instruments, thus controlling for endogeneity and measurement errors. The system Generalized Method of Moments (GMM) estimator developed by Arellano and Bover (1995) is employed. Sargan tests of the over-identifying restrictions are carried out to check the validity of the chosen instruments, and serial correlation tests (AR (1), AR (2)) are also performed. Before proceeding to the estimation, we also perform the cross-section dependence (CD) test developed by De Hoyos and Sarafidis (2006), whose results suggest that the errors are independent.[3] Given this evidence, it is legitimate to use the Harris and Tzavalis (1999), Breitung (2000) and Levine et al. (2002) unit root tests.[4] All series are found to be stationary and therefore no co-integration analysis is necessary and the GMM estimation can be done directly.[5]

3.2 | Data description

The dataset comprises monthly data over the period 2019M1–2021M12 for 28 European countries (the EU27 as well as the UK). The selected sample period reflects the main purpose of this study, which aims to provide evidence on the impact of the Covid-19 pandemic on European trade flows at the sectoral and product level. Therefore it includes the period immediately preceding the pandemic and it ends when this had ceased to be a concern to national governments and the restrictive measures aimed at containing it had been removed. As already mentioned, $\left(COVID^{j}_{i,t}\right)$ is the main variable of interest: we use a stringency index (STR)[6] and an overall government response index (GOV_RESP)[7] in turn to measure the impact on trade of the policies adopted by national governments to handle the pandemic. The former is based only on restrictive measures such as social distancing, workplace closures, and travel bans, whilst the latter includes both closure policies and health system and economic policies to support households and businesses during the crisis period. Both have been obtained from the Oxford COVID-19 Government Response Tracker (OXCGRT) and range between 0 and 100, with higher values indicating tighter restrictions/stronger policy responses, and both peaked during the first wave of COVID-19 in the first two quarters of 2020.

The model also includes the World Pandemic Uncertainty Index (WPUI) developed by Ahir et al. (2022), which counts 'the number of times uncertainty is mentioned within a proximity to a word related to pandemics in the Economist Intelligence Unit (EIU) country reports' (see Figure 4).[8] It captures uncertainty directly related to the pandemic and it is therefore more appropriate for our purposes than a general uncertainty index based on economic and political uncertainty. This series has been obtained from https://worlduncertaintyindex.com.

The industrial production index (IPI) measures output in industries such as manufacturing, mining, electric, and gas industries relative to a base year. It is a standard proxy for GDP (for which monthly data are not available) since the value added of industrial production normally represents a significant share of GDP and thus can be used to assess its current state and short-term outlook (see Mitchell et al., 2005). The source is the Eurostat database.

Economic support (EC-SUP) captures the economic policies adopted by governments to support households and business during the lockdown measures. This index is created using two indicators, namely income support and debt and contract relief for households, and it is also extracted from the Oxford Covid-19 Government Response Tracker (OXCGRT).

$EXPT^{s}_{i,t}/IMPT^{s}_{i,t}$ and $EXPP^{p}_{i,t}/IMPP^{p}_{i,t}$ stand for exports and imports at sector and product level (the HS 2-digit level) respectively. Specifically, we select the main sectors producing durable and non-durable goods such as agriculture, food and drink, mineral products, chemical products, plastics, base metals, instruments and apparatus, textiles and footwear and machinery and vehicles. These are chosen on the basis of their share of total trade but also of their importance for the economy. For instance, the agriculture and food sectors are included because they are normally considered by governments a national priority (Beckman & Countryman, 2021). For a better understanding of the impact of the pandemic on trade, we also extend the analysis to the goods level. The goods considered are those whose trade volume was above 60 billion dollars in 2021, more precisely cereals (10), mineral fuels (27), organic chemical (29), pharmaceutical products (30), iron and steel (72), articles of iron and steel (73); machinery and mechanical appliances (84); electric machinery and equipment (85); vehicles other than railway (87); aircraft, spacecraft and parts (88); optical, photographic, cinema (90). This type of investigation is particularly interesting since it allows to establish whether the effects of governmental policy responses differed for durable and non-durable goods. All trade data are taken from United Nations Commodity Trade

TABLE 1 Descriptive statistics for exports and imports, 2019 and 2020.

Variable	Obs+	Mean	Std. dev	Min	Max
2019					
Exp	32,256	7.170201	1.610644	0	10.3816
Imp	32,256	8.263521	1.183162	0	10.1640
2020					
Exp	32,256	6.535897	1.500415	0	10.3766
Imp	32,256	7.389940	1.153079	0	10.2059

Statistics Database (UN-COMTRADE). Table 1 reports some descriptive statistics for aggregate exports and imports for the period immediately preceding the COVID-19 pandemic (part a) and for its earlier phase (part b), which was the most intense, in order to provide prima facie evidence on its impact on trade flows. It can be seen that, as one would expect, the mean value was lower for both during the pandemic period whilst both were less volatile, as indicated by their standard deviations. Further, their range, measured by the difference between their maximum and minimum values, was greater for exports than for imports in both periods, but decreased for the former whilst increased for the latter during the pandemic.

Finally, $CPI_{i,t}$ is the consumer price index which is used to measure inflation; the source is the EUROSTAT database.

3.3 | Hypothesis development

The econometric framework outlined in Section 3.1 is applied to the data described in Section 3.2 to test a number of hypotheses of interest. Previous evidence for other countries (see, e.g., Liu et al., 2021 and Hayakawa & Mukunoki, 2021b) leads us to expect a heterogeneous impact of the restrictive measures adopted by the European countries to limit the spread of the Coronavirus on different sectors and products. More specifically, our prior is that the stringency index STR for the restrictions introduced by national governments, as well as the wider index of policy measures adopted in response to the pandemic and denoted by GOV_RESP, should both affect less sectors and goods which were either deemed essential during the pandemic (e.g., chemicals and agriculture) or were characterised by a higher rate of digitalization ad thus ‘work-from-home’ (WFH) share. Similarly, we expect the variables measuring the possible additional effects of either those two indices through their interaction with trade flows, namely STR × TRDS, to be less significant for sectors or goods either essential or with a high WFH share. Concerning the control variables, the coefficient in WPUI is expected to be negative, as greater uncertainty should have a detrimental effect on trade; the coefficients on PI and EC_SUP are expected instead to be positive as higher output usually corresponds to higher trade as a share of output; finally, the price effects will depend on trade elasticities.

4 | EMPIRICAL RESULTS

The estimation results are reported in Tables 2–11. First, we focus on the direct effects of the COVID-19 policy responses on trade patterns in the European countries by estimating separate equations for the exports and imports of each sector considered.

It can be seen from Table 2 (exports) and Table 3 (imports) that the impact of the restrictive measures on trade varied across sectors. In particular, neither exports nor imports appears to have been affected in the case of agriculture, chemicals and food and drinks. By contrast, there is evidence of sizable negative effects in the case of machinery and vehicles, mineral products, plastics, base metals, textiles and footwear and instruments and apparatus. The reason for the greater resilience of some sectors is that during the pandemic those producing essentials, such as agri-food or chemical products, were allowed to continue to work or were even exempted from implementing lockdown measures and workplace closures.

The agriculture and agro-food sector is considered strategic by the European countries. Initially concerns arose owing to labour shortages caused by border closures and movement restrictions. An example is the fruit and vegetable subsector where such measures significantly reduced the availability of seasonal workers during periods of peak labour demand or labour-intensive production in the European Union (Beckman & Countryman, 2021). Besides, consumer panic buying, especially during the first wave of the pandemic, had an impact on the food supply. However, various measures adopted by the European countries such as classifying the agri-food workforce as essential and introducing green lanes helped to mitigate the negative impact of the pandemic and made this sector more resilient (see Figure 1a). Economic crises can also have an impact on the competitiveness of the agricultural sector. Specifically, during such periods, the comparative advantage in agri-food trade may deteriorate as a result of increased uncertainty in trade relationships and higher risks on the demand side. In the case of EU-28 member states, the global financial crisis led to a lower comparative advantage index for their agri-food exports on the global markets in the long term (Bojnec & Fertő, 2018).

TABLE 2 The direct effects of the COVID-19 pandemic (STR-stringency measure) on exports of the main sectors in the case of the European countries.

Sectors variables	(1) Agriculture EXPS	(2) Food & drinks EXPS	(3) Mineral products EXPS	(4) Chemical products EXPS	(5) Plastics rubber EXPS	(6) Base metals EXPS	(7) Instruments apparatus EXPS	(8) Textiles footwear EXPS	(9) Machinery & vehicles EXPS
L.	0.964	0.952	0.722	0.961	0.879	0.882	0.675	0.698	0.730
	(8.60)***	(5.45)***	(8.68)***	(3.81)***	(3.73)***	(4.22)***	(7.77)***	(5.99)***	(8.75)***
IPI	0.0021	0.0023	0.0024	0.0023	0.0027	0.0034	0.0060	0.0064	0.0039
	(3.92)***	(7.26)***	(3.56)***	(6.13)***	(4.30)***	(6.66)***	(5.69)***	(10.56)***	(3.80)***
WPUI	−0.0000	−0.0002	−0.0005	0.0000	−0.0000	−0.0003	−0.0004	−0.0002	−0.0005
	(0.29)	(3.24)***	(1.81)*	(0.12)	(0.11)	(2.12)**	(1.77)*	(1.48)	(1.72)*
STR	−0.0003	−0.0002	−0.0005	−0.0004	−0.0009	−0.0006	−0.0012	−0.0010	−0.0016
	(0.96)	(0.40)	(1.67)*	(0.94)	(5.03)***	(1.70)*	(2.41)**	(5.18)***	(2.72)***
EC-SUP	−0.0043	0.0156	−0.0777	0.0665	0.0521	0.0390	0.0080	−0.0011	0.0525
	(0.29)	(1.19)	(1.51)	(4.01)***	(4.12)***	(1.73)*	(2.94)***	(0.04)	(1.52)
CPI	−0.0035	−0.0061	−0.0236	−0.0406	0.0264	0.0716	−0.0314	−0.0985	0.0290
	(0.17)	(0.41)	(0.44)	(1.42)	(4.48)***	(2.12)**	(1.20)	(3.90)***	(0.71)
Constant	0.2684	0.4093	2.1820	0.3292	0.9750	0.8415	2.2750	1.9769	2.1320
	(1.23)	(1.53)	(3.50)***	(1.58)	(3.29)***	(3.33)***	(3.79)***	(6.90)***	(3.31)***
Observations	13,720	8820	2940	10,780	1960	10,780	980	18,620	8820
AR(1)	−3.26 (0.000)	−4.35 (0.000)	−3.97 (0.000)	−5.11 (0.000)	−4.93 (0.000)	−3.99 (0.000)	−5.33 (0.000)	−3.80 (0.000)	−4.77 (0.000)
AR(2)	0.42 (0.673)	0.46 (0.279)	1.07 (0.283)	1.25 (0.212)	−1.35 (0.177)	−1.51 (0.131)	−0.42 (0.675)	0.29 (0.774)	0.87 (0.384)
Sargan test (1958)	6.71 (0.459)	8.06 (0.327)	3.84 (0.799)	1.03 (0.794)	10.05 (0.186)	7.04 (0.425)	11.82 (0.107)	2.28 (0.32)	3.89 (0.793)

Note: Column (1) is live Animals, Animal products and Vegetable products; Column (2) is Food & Drinks; Column (3) is Mineral products; Column (4) is Chemical products; Column (5) is Plastics, Rubber and articles thereof; Column (6) is Base metals and articles of base metal; Column (7) is Instruments, Apparatus; Column (8) is Textile and Footwear and Column (9) is Machinery and Vehicles. Absolute value of *t* statistics in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

TABLE 3 The direct effects of the COVID-19 pandemic (STR-stringency measure) on imports of the main sectors in the case of the European countries.

Sectors variables	(1) Agriculture IMPS	(2) Food & drinks IMPS	(3) Mineral products IMPS	(4) Chemical products IMPS	(5) Plastics rubber IMPS	(6) Base metals IMPS	(7) Instruments apparatus IMPS	(10) Textiles Footwear IMPS	(11) Machinery & Vehicles IMPS
L.	1.045	0.917	0.850	0.993	0.917	0.828	0.934	0.798	0.773
	(4.17)***	(7.08)***	(11.00)***	(4.73)***	(3.25)***	(4.34)***	(2.62)***	(2.96)***	(9.25)***
IPI	0.0014	0.0012	0.0018	0.0022	0.0024	0.0027	0.0053	0.0033	0.0056
	(6.01)***	(7.16)***	(2.17)**	(6.05)***	(5.63)***	(7.69)***	(5.79)***	(10.02)***	(7.05)***
WPUI	−0.0001	−0.0001	−0.0006	−0.0002	−0.0002	−0.0004	−0.0005	−0.0006	−0.0008
	(1.57)	(3.25)***	(3.07)***	(2.17)**	(2.16)**	(4.54)***	(3.98)***	(9.43)***	(1.93)**
STR	−0.0002	0.0004	−0.0005	0.0003	−0.0004	−0.0003	−0.0002	−0.0004	−0.0006
	(1.16)	(0.71)	(1.79)*	(1.24)	(1.81)*	(1.73)*	(0.80)	(0.26)	(2.01)**
EC-SUP	0.0497	0.0241	−0.0426	0.0714	0.0168	- 0.0061	0.0021	0.0272	−0.0658
	(1.71)*	(1.65)*	(1.24)	(5.03)***	(1.24)	(0.41)	(0.09)	(1.89)*	(1.93)*
CPI	−0.0525	−0.0121	−0.0454	−0.0523	0.0133	0.0530	0.0097	0.0374	−0.0166
	(3.75)***	(1.25)	(1.48)	(2.86)***	(0.82)	(2.92)***	(0.40)	(3.03)***	(0.44)
Constant	−0.2634	0.6795	1.3433	0.1305	0.7080	1.2774	0.5528	1.4394	1.9265
	(1.57)	(4.66)***	(2.19)**	(0.62)	(3.59)***	(5.11)***	(1.77)*	(5.93)***	(2.86)***
Observations	13,720	8820	2940	10,780	1960	10,780	980	18,620	8820
AR(1)	−4.15 (0.000)	−6.58 (0.000)	−5.57 (0.000)	−5.48 (0.000)	−4.11 (0.000)	−3.26 (0.000)	−5.01 (0.000)	−5.23 (0.000)	−4.95 (0.000)
AR(2)	0.35 (0.725)	−0.39 (0.697z0	0.44 (0.663)	−0.51 (0.608)	−0.36 (0.718)	0.42 (0.673)	1.51 (0.132)	1.56 (0.118)	−1.25 (0.212)
Sargan test (1958)	2.73 (0.144)	2.71 (2.58)	7.53 (0.376)	1.95 (0.162)	10.74 (0.150)	1.61 (0.447)	2.86 (0.239)	1.43 (0.490)	1.03 (0.794)

Note: Column (1) is live Animals, Animal products and Vegetable products; Column (2) is Food & Drinks; Column (3) is Mineral products; Column (4) is Chemical products; Column (5) is Plastics, Rubber and articles thereof; Column (6) is Base metals and articles of base metal; Column (7) is Instruments, Apparatus; Column (8) is Textile and Footwear and Column (9) is Machinery and Vehicles. Absolute value of *t* statistics in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

TABLE 4 The direct effects of the COVID-19 pandemic (GOV-RESP) on exports of the main sectors in the case of the European countries.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sectors	**Agriculture**	**Food & drinks**	**Mineral products**	**Chemical products**	**Plastics rubber**	**Base metals**	**Instruments apparatus**	**Textiles footwear**	**Machinery & vehicles**
Variables	**EXPS**	**EXPS**	**EXPS**	**EXPS**	**EXPS**	**EXPS**	**EXPS**	**EXPS**	**EXPS**
L.	0.214	0.153	0.210	0.307	0.748	0.038	0.225	0.173	0.824
	(9.97)***	(11.04)***	(19.15)***	(13.03)***	(17.67)***	(1.89)*	(14.30)***	(7.62)***	(8.48)***
IPI	0.0016	0.0001	0.0043	−0.0002	0.0008	0.0017	0.0014	0.0034	0.0043
	(3.37)***	(0.69)	(32.71)***	(0.75)	(19.22)***	(5.07)***	(1.55)	(9.50)***	(2.11)**
WPUI	−0.0002	−0.0001	−0.0000	−0.0000	−0.0001	−0.0001	−0.0006	0.0001	−0.0004
	(2.09)**	(2.11)**	(0.73)	(0.76)	(2.03)**	(1.65)	(3.97)***	(1.41)	(2.18)**
GOV-RESP	−0.0003	−0.0004	−0.0012	0.0005	−0.0002	−0.0008	−0.0006	−0.0004	−0.0013
	(1.55)	(1.13)	(2.49)**	(1.82)*	(2.00)**	(1.79)*	(2.59)***	(2.23)**	(2.36)**
CPI	−0.0123	0.0076	0.0145	−0.0004	−0.0020	0.0012	0.0549	0.0041	0.0042
	(4.95)***	(6.59)***	(11.26)***	(0.22)	(4.35)***	(0.55)	(4.11)***	(1.86)*	(1.78)*
Constant	5.4652	6.2122	5.8193	5.0842	2.0155	6.7412	4.7936	5.4543	1.3443
	(6.67)***	(6.79)***	(7.80)***	(9.93)***	(5.91)***	(7.36)***	(9.03)***	(6.54)***	(5.88)***
Observations	13,720	8820	2940	10,780	1960	10,780	980	18,620	8820
AR(1)	−4.48 (0.000)	−4.20 (0.000)	−4.13 (0.000)	−4.52 (0.000)	−4.37 (0.000)	−5.22 (0.000)	−5.73 (0.000)	−6.93 (0.000)	−3.56 (0.000)
AR(2)	−1.48 (0.140)	0.79 (0.424)	1.30 (0.193)	1.05 (0.293)	1.25 (0.211)	−0.69 (0.490)	1.58 (0.113)	−0.18 (0.854)	1.47 (0.142)
Sargan test (1958)	8.13 (0.616)	12.45 (0.256)	79.19 (0.166)	4.46 (0.924)	74.83 (0.266)	5.40 (0.863)	6.56 (0.767)	13.13 (0.217)	8.41 (0.589)

Note: Column (1) is live Animals, Animal products and Vegetable products; Column (2) is Food & Drinks; Column (3) is Mineral products; Column (4) is Chemical products; Column (5) is Plastics, Rubber and articles thereof; Column (6) is Base metals and articles of base metal; Column (7) is Instruments, Apparatus; Column (8) is Textile and Footwear and Column (9) is Machinery and Vehicles. Absolute value of *t* statistics in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

TABLE 5 The direct effects of the COVID-19 pandemic (GOV-RESP) on imports of the main sectors in the case of the European countries.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sectors variables	Agriculture	Food & drinks	Mineral products	Chemical products	Plastics rubber	Base metals	Instruments apparatus	Textiles footwear	Machinery & vehicles
	IMPS	IMPS	IMPS	IMPS	IMPS	IMPS	IMPS	IMPS	IMPS
L.	0.111	0.084	0.389	0.452	0.747	0.395	0.254	0.200	0.428
	(5.07)***	(6.61)***	(8.37)***	(6.53)***	(9.29)***	(3.93)***	(6.92)***	(11.46)***	(4.73)***
IPI	0.0008	0.0002	0.0036	0.0009	0.0005	0.0030	0.0033	0.0027	0.0054
	(3.79)***	(1.32)	(6.12)***	(5.38)***	(7.65)***	(11.99)***	(2.02)*	(10.09)***	(6.74)***
WPUI	0.0000	−0.0000	−0.0001	−0.0000	−0.0001	0.0000	−0.0005	0.0000	−0.0002
	(0.11)	(1.01)	(4.28)***	(0.34)	(6.79)***	(0.64)	(2.35)**	(1.41)	(1.68)*
GOV-RESP	0.0008	0.0002	−0.0009	0.0004	−0.0001	−0.0005	−0.0007	−0.0003	−0.0010
	(1.35)	(0.43)	(7.35)***	(2.47)**	(2.88)***	(3.98)***	(4.63)***	(2.21)**	(1.74)*
CPI	0.0021	0.0000	−0.0025	0.0022	−0.0068	−0.0028	0.0139	−0.0061	0.0019
	(1.30)	(0.05)	(1.57)	(1.58)	(3.03)***	(1.66)*	(1.30)	(3.70)***	(0.66)
Constant	6.4084	6.9250	4.7750	4.1249	2.0567	4.4026	4.7617	5.5088	4.4620
	(4.54)***	(7.78)***	(6.57)***	(4.27)***	(7.72)***	(3.00)***	(6.74)***	(4.73)***	(3.24)***
Observations	13,720	8820	2940	10,780	1960	10,780	980	18,620	8820
AR(1)	−4.44 (0.000)	−3.13 (0.000)	−3.45 (0.000)	−4.16 (0.000)	−3.89 (0.000)	−4.49 (0.000)	−3.97 (0.000)	−5.38 (0.000)	−4.74 (0.000)
AR(2)	0.87 (0.382)	1.01 (0.314)	−0.44 (0.658)	1.04 (0.297)	1.48 (0.140)	0.14 (0.888)	1.24 (0.215)	−1.44 (0.149)	−0.27 (0.789)
Sargan test (1958)	10.11 (0.606)	12.01 (0.445)	7.49 (0.824)	13.82 (0.312)	72.90 (0.854)	4.80 (0.964)	55.64 (0.858)	5.82 (0.925)	80.90 (0.136)

Note: Column (1) is live Animals, Animal products and Vegetable products; Column (2) is Food & Drinks; Column (3) is Mineral products; Column (4) is Chemical products; Column (5) is Plastics, Rubber and articles thereof; Column (6) is Base metals and articles of base metal; Column (7) is Instruments, Apparatus; Column (8) is Textile and Footwear and Column (9) is Machinery and Vehicles. Absolute value of t statistics in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

TABLE 6 The direct effects of the COVID-19 pandemic on exports of the most traded goods in the case of the European countries, 2019–2021.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	(10)	(27)	(29)	(30)	(72)	(73)	(84)	(85)	(87)	(88)	(90)
HS 2 digit variables	**EXPP**	**EXPP**	**EXPP**	**EXPP**	**EXPP**	**EXPP**	**EXPP**	**EXPP**	**EXPP**	**EXPP**	**EXPP**
L.	0.955	0.969	0.878	0.927	1.001	0.833	0.940	1.012	0.590	0.951	0.938
	(18.83)***	(11.98)***	(11.58)***	(16.13)***	(13.14)***	(14.86)***	(17.86)***	(21.38)***	(4.03)***	(22.45)***	(20.08)***
IPI	0.0013	0.0021	−0.0005	0.0017	0.0038	0.0032	0.0053	0.0041	0.0052	0.0086	0.0061
	(1.55)	(3.33)***	(0.38)	(3.17)***	(4.19)***	(3.53)***	(4.82)***	(4.71)***	(1.79)*	(10.80)***	(5.95)***
WPUI	−0.0003	−0.0007	−0.0004	−0.0006	−0.0032	−0.0030	−0.0028	−0.0008	−0.0060	−0.0008	−0.0012
	(0.36)	(0.99)	(0.48)	(1.42)	(4.86)***	(2.42)**	(2.35)**	(0.88)	(2.50)**	(1.64)*	(1.82)*
STR	−0.0015	−0.0042	0.0012	0.0010	−0.0014	−0.0003	−0.0016	−0.0007	−0.0027	−0.0068	−0.0008
	(1.13)	(3.43)***	(1.46)	(1.78)*	(2.09)**	(0.17)	(4.50)***	(1.80)*	(2.47)**	(6.23)***	(1.66)*
EC_SUP	0.1127	0.4414	0.4328	0.0135	0.3930	−0.0571	0.1939	0.6473	0.0064	0.0354	−0.0421
	(0.71)	(3.04)***	(1.19)	(0.09)	(1.68)*	(0.17)	(0.70)	(4.14)***	(0.01)	(1.06)	(0.98)
CPI	0.0591	0.0811	0.1610	0.1136	0.0944	0.1906	0.1169	0.0112	0.1563	−0.0278	−0.0310
	(1.67)*	(2.61)***	(2.49)**	(4.16)***	(3.32)***	(3.14)***	(2.07)**	(0.35)	(1.26)	(0.76)	(0.64)
Constant	0.3205	0.2391	0.9372	0.5603	0.0723	1.1592	0.4809	−0.0996	3.2948	0.4075	0.5686
	(1.54)	(1.12)	(1.71)*	(3.05)***	(0.39)	(3.03)***	(1.32)	(0.36)	(3.05)***	(1.54)	(1.65)
Observations	980	980	980	980	980	980	980	980	980	980	980
AR(1)	−4.35 (0.000)	−3.97 (0.000)	−3.37 (0.000)	−4.12 (0.000)	−5.13 (0.000)	−4.43 (0.000)	−4.19 (0.000)	−4.20 (0.000)	−5.13 (0.000)	−4.65 (0.000)	−4.40 (0.000)
AR(2)	1.03 (0.305)	0.46 (0.279)	−1.05 (0.292)	0.79 (0.428)	1.05 (0.293)	−0.51 (0.611)	0.12 (0.908)	−1.25 (0.212)	0.79 (0.430)	1.13 (0.259)	−0.69 (0.490)
Sargan test (1958)	9.47 (0.488)	15.49 (0.115)	8.13 (0.616)	15.99 (0.100)	1.36 (0.998)	4.46 (0.924)	5.40 (0.863)	6.56 (0.767)	8.62 (0.569)	(7.95) (0.634)	8.41 (0.589)

Note: Column 1 is cereals (10); Column 2 Mineral fuels (27); Column 3 Organic chemical (29); Column 4 is pharmaceutical products (30); column 5 is Iron and steel (72); column 6 is Articles of Iron and steel(73); column 7 is Machinery and mechanical appliances (84); column 8 is Electric machinery and Equipment (85); column 9 is Vehicles other than railway (87); column 10 is Aircraft, spacecraft and parts 88); column 11 is Optical, photographic. Cinema (90). Absolute value of *t* statistics in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

TABLE 7 The direct effects of the COVID-19 pandemic on imports of the most traded goods in the case of the European countries, 2019–2021.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	10	27	29	30	72	73	84	85	87	88	90
Hs2 code variables	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP
L.	1.017	0.899	1.036	0.776	0.387	0.722	0.935	0.834	0.432	0.316	0.930
	(7.89)***	(19.59)***	(13.04)***	(14.49)***	(5.20)***	(17.55)***	(36.50)***	(24.56)***	(8.77)***	(2.32)**	(25.73)***
IPI	0.0004	0.0024	0.0026	0.0019	−0.0005	0.0031	0.0023	0.0025	0.0042	0.0009	0.0025
	(0.66)	(3.60)***	(4.42)***	(5.88)***	(1.52)	(9.57)***	(7.01)***	(4.76)***	(6.34)***	(0.62)	(5.47)***
WPUI	0.0004	−0.0033	−0.0004	0.0003	−0.0021	−0.0016	−0.0009	−0.0016	−0.0045	−0.0049	−0.0013
	(0.46)	(5.68)***	(1.31)	(2.21)**	(3.36)***	(6.90)***	(4.09)***	(5.10)***	(7.69)***	(3.23)***	(5.17)***
STR	−0.0005	−0.0017	−0.0002	0.0010	−0.0008	−0.0004	−0.0005	−0.0003	−0.0009	−0.0037	−0.0002
	(0.60)	(6.08)***	(1.65) *	(2.23)**	(1.83)*	(2.43)**	(1.84)*	(0.80)	(3.65)***	(6.65)***	(1.73)*
EC-SUP	0.2149	−0.0644	0.0345	0.1075	−0.1146	−0.0261	0.0020	−0.0499	−0.0901	−0.2491	−0.0322
	(4.19)***	(1.66)	(2.38)**	(4.50)***	(3.51)***	(2.49)**	(0.25)	(3.06)***	(4.11)***	(2.90)***	(1.85)*
CPI	−0.1295	0.0578	−0.0387	−0.0464	0.1281	0.0269	0.0089	−0.0098	−0.0239	−0.0419	−0.0312
	(3.37)***	(3.17)***	(3.77)***	(3.28)***	(6.95)***	(2.85)***	(1.12)	(1.11)	(1.35)	(0.51)	(3.34)***
Constant	−0.0564	0.9820	−0.2526	1.9135	5.1021	2.2834	0.5865	1.5131	5.2176	5.3511	0.6211
	(0.06)	(2.35)**	(1.03)	(4.16)***	(8.30)***	(6.73)***	(2.57)**	(4.92)***	(11.80)***	(5.43)***	(2.09)**
Observations	980	980	980	980	980	980	980	980	980	980	980
AR(1)	−3.57	−3.94	−3.45	−3.76	−4.16	−3.53	−3.62	−4.37	−3.58	−3.88	−4.27
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AR(2)	0.88	0.23	0.92	−0.70	1.54	1.34	1.41	1.33	0.59	0.42	−1.14
	(0.381)	(9.816)	(0.355)	(0.484)	(0.124)	(0.181)	(0.159)	(0.184)	(0.556)	(0.673)	(0.255)
Sargan test (1958)	15.52	11.82	4.48	13.70	5.10	4.52	2.34	2.60	6.97	11.97	4.15
	(0.114)	(0.297)	(0.923)	(0.187)	(0.885)	(0.921)	(0.993)	(0.989)	(0.729)	(0.287)	(0.940)

Note: Column 1 is cereals (10); Column 2 Mineral fuels (27); Column 3 Organic chemical (29); Column 4 is pharmaceutical products (30); Column 5 is Iron and steel (72); Column 6 is Articles of Iron and steel (73); Column 7 is Machinery and mechanical appliances (84); Column 8 is Electric machinery and Equipment (85); Column 9 is Vehicles (87); Column 10 is Aircraft, spacecraft and parts 88); Column 11 is Instruments and apparatus (90). Absolute value of *t* statistics in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

TABLE 8 The direct effects of the COVID-19 pandemic on exports of the most traded goods in the case of the European countries during the first wave.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	10	27	29	30	72	73	84	85	87	88	90
Hs2 code variables	EXPP	EXPP	EXPP	EXPP	EXPP	EXPP	EXPP	EXPP	EXPP	EXPP	EXPP
L.	0.265	0.724	1.016	0.811	0.907	0.832	0.998	0.926	0.706	0.563	0.980
	(1.62)	(5.52)***	(15.46)***	(13.15)***	(12.02)***	(9.44)***	(17.13)***	(14.80)***	(7.20)***	(3.00)***	(17.55)***
IPI	0.0030	−0.0010	0.0021	0.0003	0.0028	0.0073	0.0060	0.0009	0.0094	0.0074	0.0029
	(1.05)	(0.66)	(2.28)**	(0.38)	(3.53)***	(4.23)***	(9.62)***	(0.68)	(4.05)***	(2.24)**	(3.32)***
WPUI	−0.0008	−0.0042	0.0003	−0.0004	−0.0013	0.0011	0.0000	−0.0030	−0.0088	−0.0019	−0.0030
	(0.26)	(1.76)*	(0.28)	(0.54)	(1.52)	(0.98)	(0.05)	(3.00)***	(4.76)***	(0.57)	(2.11)**
STR	−0.0021	−0.0078	−0.0023	−0.0006	−0.0022	−0.0006	−0.0065	−0.0026	−0.0090	−0.0115	−0.0042
	(1.79)*	(2.34)**	(2.04)**	(0.27)	(2.38)**	(1.65)*	(2.44)**	(3.11)***	(2.89)***	(3.82)***	(2.19)**
EC_SUP	0.5750	0.8783	0.7946	−0.1283	0.1737	−0.5244	0.2693	0.8254	1.0426	−1.3993	0.3849
	(1.75)*	(1.53)	(1.79)*	(0.48)	(0.62)	(2.26)**	(1.83)*	(3.44)***	(1.96)**	(0.79)	(1.53)
CPI	0.1837	0.2749	0.0705	0.1253	0.0785	−0.0122	−0.0236	0.1057	0.1793	0.2630	0.1030
	(1.26)	(3.10)***	(1.25)	(3.78)***	(1.99)**	(0.33)	(0.76)	(2.79)***	(2.16)**	(1.83)*	(2.43)**
Constant	0.4523	0.2789	−0.1363	1.5943	0.7660	1.3089	0.0407	0.6637	0.7346	0.0783	0.2206
	(4.38)***	(2.06)**	(0.27)	(3.13)***	(1.24)	(1.82)*	(0.17)	(1.22)	(3.12)***	(2.18)**	(0.49)
Observations	168	168	168	168	168	168	168	168	168	168	168
AR(1)	−3.97	−3.73	−4.16	−3.60	−4.29	−5.45	−4.13	−3.88	−3.71	−4.24	−3.50
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AR(2)	1.14	−0.84	0.93	−0.17	0.30	−1.16	0.14	0.71	−0.10	1.08	−1.32
	(0.256)	(0.403)	(0.352)	(0.869)	(0.701)	(0.246)	(0.888)	(0.479)	(0.923)	(0.282)	(0.187)
Sargan test (1958)	4.97	6.03	10.56	8.13	12.10	6.56	4.80	7.52	4.46	8.32	3.99
	(0.836)	(0.737)	(0.307)	(0.616)	(0.203)	(0.767)	(0.964)	0.583)	(0.879)	(0.503)	(0.912)

Note: Column 1 is cereals (10); Column 2 Mineral fuels (27); Column 3 Organic chemical (29); Column 4 is pharmaceutical products (30); Column 5 is Iron and steel (72); Column 6 is Articles of Iron and steel (73); Column 7 is Machinery and mechanical appliances (84); Column 8 is Electric machinery and Equipment (85); Column 9 is Vehicles (87); Column 10 is Aircraft, spacecraft and parts 88); Column 11 is Instruments and apparatus (90). Absolute value of *t* statistics in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

TABLE 9 The direct effects of the COVID-19 pandemic on imports of the most traded goods in the case of the European countries during the first wave.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	10	27	29	30	72	73	84	85	87	88	90
Hs2 Code variables	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP	IMPP
L.	1.082	0.588	0.929	0.804	0.738	0.982	0.993	1.030	0.680	0.113	1.006
	(15.78)***	(4.39)***	(17.93)***	(8.49)***	(8.00)***	(36.18)***	(20.75)***	(20.83)***	(7.01)***	(0.61)	(21.96)***
IPI	0.0006	−0.0012	0.0002	0.0004	0.0006	0.0043	0.0028	0.0027	0.0066	0.0004	0.0020
	(0.85)	(1.30)	(0.22)	(0.59)	(0.85)	(7.05)***	(5.13)***	(4.23)***	(4.54)***	(0.15)	(3.39)***
WPUI	−0.0004	−0.0024	−0.0015	−0.0009	−0.0021	−0.0033	−0.0034	−0.0024	−0.0078	−0.0075	−0.0026
	(0.35)	(2.05)**	(1.39)	(1.03)	(2.07)**	(6.84)***	(3.56)***	(3.62)***	(5.39)***	(2.12)**	(3.43)***
STR	−0.0002	−0.0040	−0.0006	−0.0012	0.0047	−0.0013	−0.0036	−0.0014	−0.0081	−0.0142	−0.0026
	(0.44)	(2.89)***	(1.69)*	(0.35)	(3.09)***	(1.78)*	(3.04)***	(2.10)**	(4.67)***	(2.87)***	(4.47)***
EC_SUP	0.8417	0.5273	0.0372	0.6289	−0.1464	0.0857	0.3913	0.7852	1.2015	−2.3490	0.7006
	(3.23)***	(1.54)	(0.15)	(3.45)***	(0.98)	(0.57)	(2.33)**	(4.80)***	(3.30)***	(2.29)**	(3.72)***
CPI	0.0123	0.2183	0.1096	0.2137	0.0896	0.0296	0.0861	0.0962	0.1733	0.5105	0.1131
	(0.30)	(4.35)***	(2.45)**	(5.84)***	(3.11)***	(1.57)	(2.47)**	(3.90)***	(2.93)***	(3.57)***	(4.36)***
Constant	−0.5394	3.6067	0.5856	1.7163	2.2322	0.2196	0.1118	−0.2818	2.9639	6.9483	−0.0096
	(1.09)	(3.06)***	(1.44)	(2.19)**	(2.99)***	(0.98)	(0.27)	(0.66)	(3.46)***	(4.98)***	(0.03)
Observations	168	168	168	168	168	168	168	168	168	168	168
AR(1)	−3.76	−3.96	−3.81	−3.89	−3.71	−4.18	−3.77	−3.83	−4.30	−4.16	−3.84
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AR(2)	−0.59	1.49	−1.37	−1.33	1.10	1.37	0.45	1.47	0.59	0.62	1.37
	(0.557)	(0.135)	(0.169)	(0.184)	(0.272)	(0.172)	(0.652)	(0.142)	(0.556)	(0.537)	(0.170)
Sargan test (1958)	11.83	11.62	12.56	11.30	5.80	12.00	5.88	8.67	8.16	9.21	9.49
	(0.223)	(0.236)	(0.183)	(0.255)	(0.760)	(0.213)	(0.751)	(0.468)	(0.519)	(0.418)	(0.393)

Note: Column 1 is cereals (10); Column 2 Mineral fuels (27); Column 3 Organic chemical (29); Column 4 is pharmaceutical products (30); Column 5 is Iron and steel (72); Column 6 is Articles of Iron and steel (73); Column 7 is Machinery and mechanical appliances (84); Column 8 is Electric machinery and Equipment (85); Column 9 is Vehicles (87); Column 10 is Aircraft, spacecraft and parts 88); Column 11 is Instruments and apparatus (90). Absolute value of *t* statistics in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

TABLE 10 The indirect effect of stringency on total exports through sectors.

Variables	(1) EXPT	(2) EXPT	(3) EXPT	(4) EXPT	(5) EXPT	(6) EXPT	(7) EXPT	(8) EXPT	(9) EXPT
L.	0.660	0.656	0.654	0.652	0.657	0.645	0.628	0.627	0.641
	(11.25)***	(8.78)***	(5.06)***	(9.93)***	(4.31)***	(9.86)***	(4.85)***	(11.97)***	(6.99)***
IPI	0.0042	0.0061	0.0078	0.0097	0.0043	0.0083	0.0037	0.0040	0.0061
	(11.36)***	(8.50)***	(5.24)***	(10.18)***	(4.42)***	(10.08)***	(4.83)***	(11.66)***	(7.19)***
WPUI	−0.0018	−0.0010	−0.0049	−0.0012	−0.0022	−0.0027	−0.0009	−0.0036	−0.0058
	(0.52)	(0.68)	(2.93)***	(0.91)	(2.47)**	(6.02)***	(1.19)	(7.97)***	(4.22)***
STR-EXPS	−0.0004	−0.0006	−0.0010	−0.0007	−0.0011	−0.0016	−0.0006	−0.0015	−0.0025
	(0.95)	(0.17)	(2.69)***	(1.05)	(2.97)***	(3.12)***	(0.56)	(3.04)***	(2.45)**
EC-SUP	0.1728	0.1963	−0.1733	0.1791	−0.1949	0.1644	0.1711	0.1683	0.1723
	(2.73)***	(2.33)**	(1.31)	(2.43)**	(1.11)	(2.26)**	(1.19)	(3.00)***	(1.75)*
CPI	0.0062	0.0059	0.0068	0.0047	0.0055	0.0033	0.0049	0.0062	0.0030
	(0.54)	(0.46)	(1.69)*	(0.41)	(0.22)	(0.44)	(1.25)	(1.73)*	(0.35)
Constant	3.1537	3.1879	3.2127	3.2297	3.1806	3.2990	3.4627	3.4777	3.3430
	(5.54)***	(4.39)***	(2.55)**	(5.07)***	(2.15)**	(5.19)***	(2.75)***	(6.84)***	(3.76)***
Observations	13,720	8820	2940	10,780	1960	10,780	2940	18,620	5880
AR(1)	−5.04	−3.99	−4.95	−4.45	−4.77	−3.89	−3.65	−5.66	−4.17
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AR(2)	−0.84	−0.67	−0.40	−0.77	−1.50	−0.76	−0.40	−0.97	−0.57
	(0.400)	(0.501)	(0.687)	(0.439)	(0.134)	(0.445)	(0.687)	(0.330)	(0.572)
Sargan test (1958)	1.88	1.30	0.41	1.53	0.27	1.57	0.47	0.27	0.87
	(0.170)	(0.253)	(0.523))	(0.216)	(0601)	(0.211)	(0.492)	(0.601)	(0.350)

Note: Column (1) is live Animals, Animal products and Vegetable products; Column (2) is Food & Drinks; Column (3) is Mineral products; Column (4) is Chemical products; Column (5) is Plastics, Rubber and articles thereof; Column (6) is Base metals and articles of base metal; Column (7) is Instruments, Apparatus; Column (8) is Textile and Footwear and Column (9) is Machinery and Vehicles. *t* statistics in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Europe is the second-largest chemicals producer in the world and accounts for 16.9% of total global sales (Eurostat, 2021). The chemical industry plays a crucial role for almost all value chains and it is an essential part of the European economies, since most industries rely on chemicals. Some of its products or subsectors were classified as essential during the pandemic given their strategic role in producing the necessary health care materials and equipment. Therefore the overall impact of the health crisis was not as pronounced as in the case of other sectors (see Figure 1b). The two factors explaining this finding are the priority given to this industry by national governments in order to ensure the availability of essential chemicals during the pandemic, and the increase in demand for some chemical products such as disinfectants during this period.

The sector most affected by the pandemic appears to have been the machinery and vehicles one, these being durable products (see column 9 in Tables 2 and 3). Specifically, there was a large drop in both exports and imports at the beginning of 2020, during the first wave of the pandemic, which was followed by a quick recovery starting in the third quarter of 2020 (see Figure 1c). The initial decline can be explained by short-term input supply shortages resulting from the closures of factories in Europe and elsewhere, but also by changes in consumer behaviour. In particular, durable non-essential goods were more affected in the presence of the greater uncertainty associated with the health crisis. Note that in comparison to the Global Financial Crisis (GFC), the impact of the pandemic on both exports and imports was smaller and the recovery quicker (see Figure 2). This reflects some key differences between the two crises: in the case of the GFC liquidity and solvency problems in the banking and financial sector were the main challenges, and both monetary and fiscal policy were required to tackle

TABLE 11 The indirect effect of stringency on total imports through sectors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	IMPT	**IMPT**	**IMPT**	**IMPT**	**IMPT**	**IMPT**	**IMPT**	**IMPT**	**IMPT**
L.	0.744	0.747	0.728	0.730	0.722	0.725	0.723	0.726	0.701
	(12.79)***	(10.29)***	(5.57)***	(10.97)***	(4.56)***	(10.84)***	(5.54)***	(14.05)***	(7.39)***
IPI	0.0041	0.0030	0.0034	0.0027	0.0019	0.0040	0.0013	0.0039	0.0037
	(12.04)***	(9.56)***	(5.48)***	(10.50)***	(4.28)***	(10.36)***	(5.06)***	(13.10)***	(6.74)***
WPUI	−0.0023	−0.0054	−0.0050	0.0041	−0.0052	−0.0037	−0.0024	−0.0050	−0.0062
	(0.84)	(2.08)**	(2.39)**	(1.55)*	(2.21)**	(2.26)**	(2.68)***	(6.82)***	(3.79)***
STR-IMPS	−0.0006	−0.0007	−0.0013	−0.0009	−0.0008	−0.0012	−0.0005	−0.0014	−0.0018
	(1.12)	(1.39)	(1.79)*	(1.45)	(1.86)*	(2.03)**	(3.44)	(2.48)**	(2.68)***
EC-SUP	0.1486	0.1604	−0.1561	0.1451	−0.1487	−0.1490	−0.1503	0.1468	−0.1390
	(2.63)***	(2.26)**	(1.27)	(2.26)**	(0.97)	(2.30)**	(1.19)	(3.00)***	(1.57)
CPI	−0.0036	−0.0038	−0.0021	−0.0020	−0.0008	−0.0020	−0.0023	−0.0026	0.0002
	(0.31)	(1.66)*	(0.08)	(0.15)	(0.02)	(0.15)	(0.09)	(1.76)*	(0.01)
Constant	2.3597	2.3262	2.5166	2.4940	2.5717	2.5490	2.5655	2.5364	2.7821
	(4.14)***	(3.27)***	(1.97)*	(3.83)***	(1.66)	(3.90)***	(2.01)**	(5.02)***	(3.00)***
Observations	13,720	8820	2940	10,780	1960	10,780	2940	18,620	5880
AR(1)	−5.21	−4.17	−4.52	−4.56	−5.01	−4.44	−3.97	−5.95	−4.21
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AR(2)	−1.02	−0.82	−0.48	−0.91	−1.50	−0.92	−0.49	−1.20	−0.68
	(0.308)	(0.413)	(0.631)	(0.361)	(0.134)	(0.357)	(0.625)	(0.230)	(0.498)
Sargan test (1958)	1.11	0.71	0.27	0.54	0.18	0.97	027	1.71	0.61
	(0.291)	(0.401)	(0.602)	(0.333)	(0.671)	(0.325)	(0.601)	(0.191)	(0.436)

Note: Column (1) is live Animals, Animal products and Vegetable products; Column (2) is Food & Drinks; Column (3) is Mineral products; Column (4) is Chemical products; Column (5) is Plastics, Rubber and articles thereof; Column (6) is Base metals and articles of base metal; Column (7) is Instruments, Apparatus; Column (8) is Textile and Footwear and Column (9) is Machinery and Vehicles. *t* statistics in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

them and support businesses and households; by contrast, in the case of the recent crisis restrictions aimed at limiting the spread of the virus affected mobility and the labour supply. Concerning the other sectors, the lockdown measures (captured by the stringency variable) also had negative effects. These restrictions disrupted the supply of inputs and the transport of goods, and caused labour shortages as well. As a result, both exports and imports declined, especially during the first period of the pandemic.

As expected, the world pandemic uncertainty index is generally found to have had a negative impact. Uncertainty related to the pandemic peaked during the first wave (see Figure 3), especially in the case of the European countries with a higher number of COVID-19 cases. This affected the food and drink sector through panic buying, and also the durable sectors. As for economic support, its impact is generally found to be positive but its size depends on sectoral characteristics. Concerning the other variables, the effects of the industrial production index are positive and significant in most cases. Similar conclusions are reached in all cases when the wider measure for the policy responses (i.e., the government response index) is used, which confirms the robustness of our results (see Tables 4 and 5).

Next we repeat the analysis at a higher level of disaggregation by estimating Equations (5) and (6) for 11 goods at the HS2 digit level. As already mentioned, their selection is based on their trade volumes, these being the most traded products, with their exports and imports exceeding 60 billion dollars in 2021.

These results confirm that the effects of pandemic varied by product type. In particular, there was a negative impact of the restrictions on trade in the case of durable goods such as machinery and mechanical appliances (84); electric machinery and equipment (85); vehicles

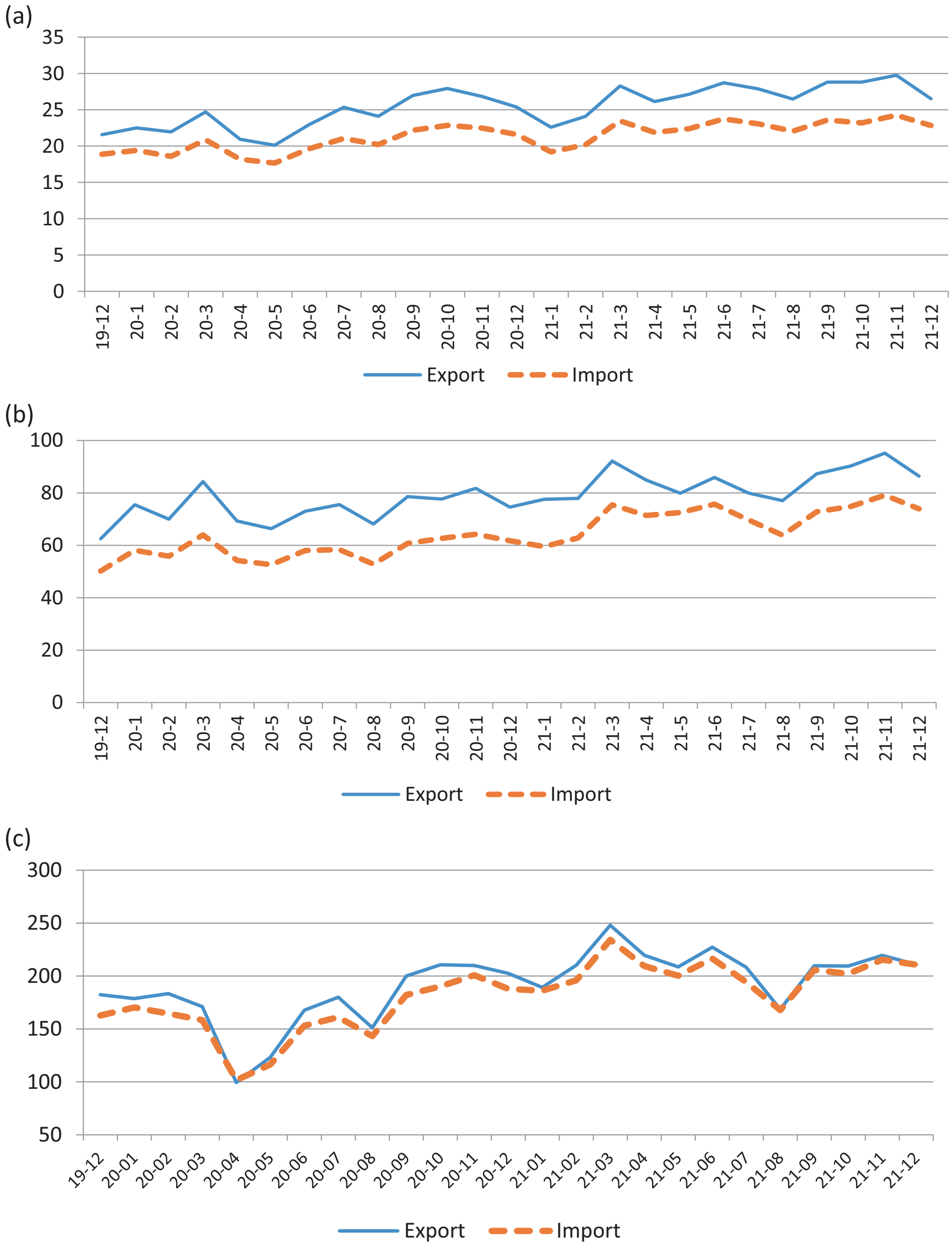

FIGURE 1 (a) Monthly European trade for the Food and Drinks sector, 2019–2021. (billion dollars) (b) Monthly European trade for the Chemicals sector, 2019–2021 (billion dollars). (c) Monthly European trade for the Machine and Vehicles sector, 2019–2021 (billion dollars). *Source*: Comtrade database. [Colour figure can be viewed at wileyonlinelibrary.com]

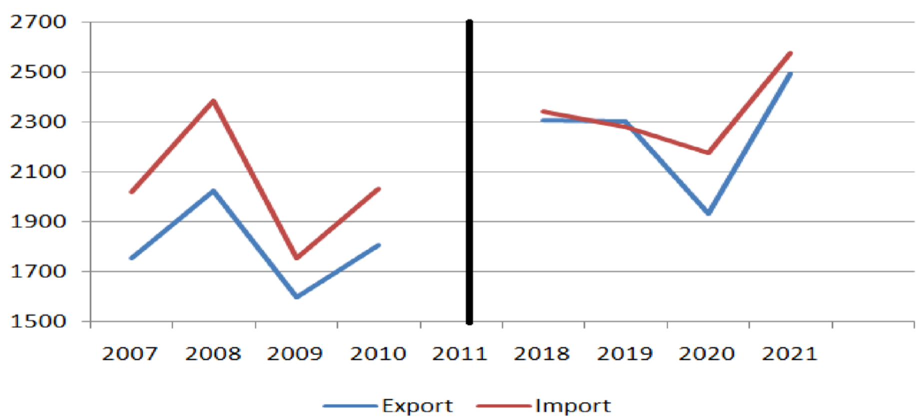

FIGURE 2 Monthly European trade for the Machine and Vehicles during the GFC and COVID-19 Pandemic (billion dollars). *Source*: Comtrade database. [Colour figure can be viewed at wileyonlinelibrary.com]

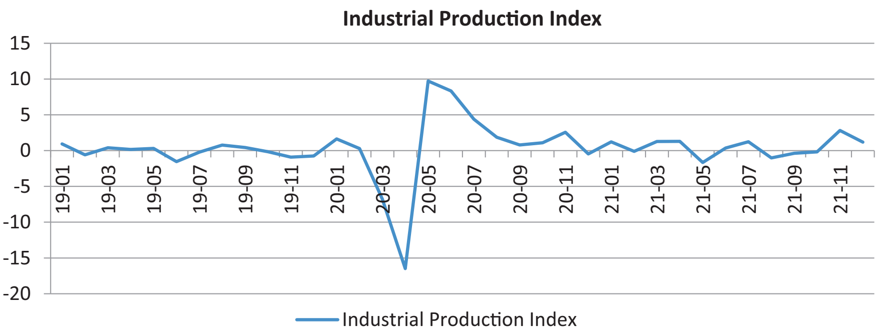

FIGURE 3 The Industrial Production Index (IPI) in the European countries, 2019–2021. *Source*: Eurostat database. [Colour figure can be viewed at wileyonlinelibrary.com]

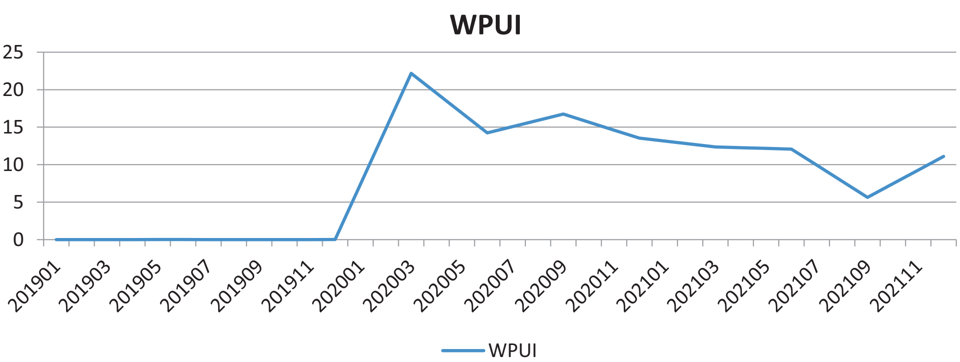

FIGURE 4 The World Pandemic Uncertainty index (WPUI) for the European countries, 2019–2021. *Source*: https://worlduncertaintyindex.com. [Colour figure can be viewed at wileyonlinelibrary.com]

other than railway (87); aircraft, spacecraft and parts (88). The most affected were the latter two (87, 88), which had not yet fully recovered by the end of 2021. In general demand for non-essential goods initially dropped but then gradually picked up again, especially in the case of products (such as computers) required for remote work. The recovery in spending on durable goods was caused by a shift in consumer demand from services towards them and by the higher disposable income resulting from the fiscal stimulus (Tauber & Van Zandweghe, 2021). By contrast, the impact of the restrictions was not significant in the case of pharmaceutical and organic products, demand increasing in the first semester of 2020 for the former and also in some cases (e.g., disinfectants) for the latter. As already mentioned, pharmaceutical products were given priority during the pandemic, even in the presence of lockdown measures and border closures, which explains this finding.

On the whole, there is clear evidence of heterogeneity in the impact of the pandemic and also in the extent of the rebound in the case of both exports and imports, at both the sector and the product level, depending on sectoral characteristics (such as the level of digitalization) and the degree of resilience. Almost all industries (the exception being pharmaceutical products) were significantly affected in early 2020, during the first wave, when uncertainty was higher and restrictions tighter (see Tables 8 and 9) and industrial production as a whole fell sharply, before starting to recover in the following months (see Figure 3). The production of durable consumer goods and capital goods was most affected (Eurostat, 2022). European industries then tried to adapt to the pandemic and therefore the next waves had a milder impact on trade.

In the final part of the analysis we examine further the impact of the pandemic on trade using an interaction term (STR × TRDS) between the restrictive measures and sectoral trade flows; this captures changes in the contribution of the main sectors to total trade resulting from the restrictions. These results are displayed in Tables 10 and 11.

It can be seen that the interaction term has a negative impact on both exports and imports in the case of machinery and vehicles, mineral products, and base metals, whilst there is no significant effect in the case of agriculture, food and drinks and chemicals. It is clear, therefore, that the restrictions affected the contribution of the various sectors to international trade. More precisely, their impact was more pronounced in the case of manufacturing sectors such as machinery and vehicles than in the agri-food one. These findings are consistent with the previous ones concerning the direct effects of the pandemic on sectoral trade through the adopted policy measures.

On the whole, our evidence for the European countries is consistent with our priors as specified in Section 3.3 and also that reported in other studies examining possible shifts in trade patterns resulting from the

COVID-19 pandemic. Specifically, as already mentioned, heterogeneous effects had also been found by Liu et al. (2021) for China and by Hayakawa and Mukunoki (2021b) for a large panel of countries. Both these studies had reported that essential sectors such as the chemical one and/or those with a higher 'work-from-home' share had exhibited greater resilience to the exogenous shock represented by the pandemic.

5 | CONCLUSIONS

The main contribution of this article is to provide new evidence on the effects of the Covid-19 pandemic on European trade patterns by estimating dynamic panel models at both the sector and the product level. The key message arising from our analysis is that the lockdown restrictions and the other policies adopted by national governments to contain the spread of the virus had a heterogeneous impact across sectors and types of products depending on their characteristics and degree of resilience. Specifically, agriculture, chemicals and food and drinks were less affected than machinery and vehicles and other manufacturing industries. As in the case of the GFC, trade of durable products dropped more sharply since consumers reduced their spending on this category of goods in response to the higher uncertainty generated by the pandemic. Pharmaceuticals were the least affected category and their production and trade flows even increased during the health crisis. These findings are consistent with previous ones also carrying out within product analysis (e.g., Hayakawa & Mukunoki, 2021b and Liu et al., 2021), but shed new light on the specific case of the European countries using a dynamic modelling framework. Studies examining the impact of stringency measures and lockdowns on European trade using aggregate trade data have typically found a negative impact of those policies (see, e.g., Cengiz & Manga, 2022) but are less informative than ours since they do not shed light on their sectoral and product effects and in addition their country coverage is more limited.

It is noteworthy that the recovery was also different across sectors and products depending on the degree of digitalization, but in all cases trade had fully recovered or even exceeded pre-COVID levels by the end of 2021. This is because European industries adapted to the pandemic by introducing remote work and resorting to e-commerce whenever possible and thus restrictions had a milder impact (Caporale et al., 2022 and Espitia et al., 2021), with trade actually increasing in the case of laptops, logiciels, wifi, and internet connection. National governments also adopted other measures to provide financial support and facilitate access to credit in order to mitigate the effects of the crisis (Caporale et al., 2021).

On the whole, the COVID-19 pandemic revealed weaknesses and vulnerabilities, with many businesses experiencing difficulties and being initially unable to cope with supply shortages caused by border and manufacturing site closures. There are clearly lessons to be learned for the future. The heterogeneous impact of the pandemic on trade flows and thus on patterns resulted in high uncertainty and adjustment costs, which provided incentives to firms and governments to adopt appropriate risk mitigation strategies. In particular, European industries should invest to reach a high level of digitalization since this increases the possibility of working remotely and thus reduces the impact of measures restricting mobility in the event of a pandemic (Caporale et al., 2022). Further, the resilience of value chains should be enhanced through the diversification of suppliers, thus reducing dependency on individual ones and the risks related to partners in third countries.

This study has some limitations, mainly due to the unavailability of some series at the monthly frequency. For instance, for this reason an industrial production index was used as a proxy for output, despite the fact that the share of this sector in total output has declined significantly over the years in developed economies such as the European ones. Future research could extend the analysis by incorporating additional variables such as a remote work index and transportation costs. Further, the impact of the COVID-19 pandemic on the competitiveness of each sector could be investigated. Finally, the sample could be extended to include non-EU countries for comparison purposes, and appropriate econometric methods could be used to shed light on both the short- and long-run impact of the pandemic on trade patterns.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

[1] The EU's main partners for trade in goods are the US, China, and Switzerland; since April 2020, China has overtaken the US as the largest partner of the EU for both exports and imports (Eurostat, 2021).

[2] The EU is the second largest exporter and the third largest importer of goods in the world, with extra-EU trade accounting for 16.9% of global exports and 15.1% of global imports in 2020 (Eurostat, 2021).

[3] Here are a few examples of cross-section dependence (CD) test statistics (xtcsd test) for Table 2: 0.025 (p-value 0.980) for col (1); 0.833 (p-value 0.406) for col (2); 0.154 (p-value 0.877) for col (3); 1.173(p-value 0.241) for col (4); 0.800 (p-value 0.424) for col (5); 0.366 (p-value 0.0.714) for col (6); 1.634 (p-value 0.102) for col (7); 0.830 (p-value 0.401) for col (8); and 1.422 (p-value 0.155) for col (9). The complete set of results is available upon request.

[4] The test results are not included but are available upon request.

[5] For the estimation we use the STATA xtabond2 routine developed by Roodman (2009) extended to include Windmeijer's (2005) finite sample correction to the standard errors reported in the two-step estimation, (without which standard errors tend to be heavily biased downwards); the automatic Sargan/Hansen difference tests for the validity of the instrument subsets; the forward orthogonal gap transformation, which preserves the sample size in panels with gaps; the appropriate autocorrelation tests for linear GMM panel regressions, especially important when lags are used as instruments.

[6] The stringency index is calculated using nine indicators, namely: school and workplace closing, cancel public events, close public transport, stay-at-home requirements, restrictions on gathering size, on internal movement, on international travel and public information campaign (*Source*: OXCGRT).

[7] The government response index includes testing policy, contact tracing and facial coverings in addition to the policies already included in the stringency and economic support variables. (*Source*: OXCGRT).

[8] More precisely, it is 'the percent of the word 'uncertain', and its variants, that appear near the pandemic terms in EIU country reports, multiplied by 1000' (Ahir et al., 2022).

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