RESILIENCE OF THE EU EXPORTS TO UKRAINE UNDER THE COVID-19 PANDEMIC

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Abstract

The paper assesses vulnerability of the EU exports to Ukraine to the current COVID-19 pandemic, which became the major challenge for societies and economies. The main current trends affecting the bilateral trade are discussed. A regression analysis is used to estimate the effects of demand and supply shocks, and changes in price competitiveness. The EU exports of fuels and road vehicles are the most sensitive to changes in the Ukraine's GDP, the exports of chemical products and telecommunication equipment – to devaluation of hryvnia. The most resilient EU exports to Ukraine included medicinal and pharmaceutical products, beverages and tobacco. The changes in consumption patterns under the quarantine measures also favoured stability of food and IT-services exports. The post-factum verification of results with the resent data confirmed most sector-specific effects. On average the EU exports to Ukraine turned out to be more resilient than to other countries.

Keywords: EU-Ukraine relations, bilateral trade, COVID-19 pandemic economic effects, export resilience, devaluation

Introduction

In recent years the EU and Ukraine improved their bilateral foreign trade treatment by implementing the Association Agreement and the Deep and Comprehensive Free Trade Area. In 2014-2019 the EU became the number one trading partner for Ukraine with the share of 42% of the Ukrainian foreign trade. Ukraine occupies the 18th position in the EU foreign trade with the share of 1.1%. The EU-Ukraine trade increased from $38.0 billion to $45.8 billion, the EU export to Ukraine – from $21.1 billion to $25.0 billion and imports from Ukraine – from $17.0 billion to $20.8 billion (State Statistics Service of Ukraine, 2020[1]; European Commission, 2020; European Commission, 2020a).

The EU-Ukraine Association Agreement and the deep and comprehensive free trade area proved to be an efficient instrument of the EU neighbourhood policy. It

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[1] State Statistics Service of Ukraine (2020), (retrieved from http://ukrstat.gov.ua/).

helps both sides to create new workplaces, stabilize economic growth, increase and restructure mutual trade. It creates new trade in goods and services, and investment opportunities for companies from both sides.

Implementation of the deep and comprehensive free trade area will allow Ukraine to integrate into the EU internal market deeply without being a member. As stated in the Joint Communication of the European Commission "Eastern Partnership policy beyond 2020. Reinforcing Resilience – an Eastern Partnership that delivers for all"[2], selective and gradual economic integration into the EU's internal market is conditional on regulatory convergence with the EU acquis. E.g. in the midst of 2020 Ukraine already met 82% of its obligations within the Association Agreement for technical barriers in trade and 80% for public procurement, although still only 22% for intellectual property and 24% for financial cooperation with anti-fraud provisions (European Integration Portal, 2020).

But in 2020 the current COVID-19 pandemic became a major challenge for the global economy and obviously affects international trade. Most countries faced a double-digit decrease in their exports during the first pandemic wave. Production and exports of capital goods, durable consumer goods, passenger transport, accommodation and catering services turned out to be especially vulnerable.

In previous research literature several channels of the negative impact were discussed: increased medical expenditures, decrease in labour supply, social distancing, changes in consumer preferences away from non-essential goods, specialization of countries, as well as uncertainty and partial de-globalisation. It was a shock both on the demand and supply side.

The aim of this paper is to assess which EU exports to Ukraine are vulnerable to contraction of the importing and exporting economies as well as to real exchange rate changes affecting price competitiveness and which exporting industries remain resilient. In broad meaning, resilience of exports means their ability both to resist the influence of a negative shock and to recover afterwards. But since the pandemic is far from being over and the data for the indicators during the first wave was available at the time of research, a more narrow meaning of resilience as an ability to withstand a shock is applied in the paper.

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[2] European Commission (2020b), Eastern Partnership Policy beyond 2020. Reinforcing Resilience – an Eastern Partnership that Delivers for all. Joint Communication to the European Parliament, the European Council, the European Economic and Social Committee and the Committee of the Regions. SWD(2020)56 final, 18 March, Brussels (retrieved from https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/joint_communication_on_the_eap_policy_beyond_2020.pdf).

1. Previous research review on the pandemic's effects

Several years before the current crisis Verikios *et al.* (2011) summarized various economic effects that an epidemic may cause:
- increased medicals expenditures of patients or governments and increased workloads for a healthcare system;
- decrease in labour supply due to deaths (permanent losses), illness, absenteeism from work to avoid infection or necessity to care for children if schools are closed (temporary losses);
- decrease in public gatherings, closures of educational institutions;
- reduced demand for services that need face-to-face contact (tourism, transport, retail trade etc.).

Nowadays Kirk and Rifkin (2020) reviewed several trends affecting consumer behaviour during the pandemic:
- hoarding behaviour exacerbated by supply chain disruptions at the beginning (stocking up such goods as disinfectant and cleaning products or toilet paper);
- maintaining social connectedness in a time of social distance (virtual gatherings by video conferencing);
- coping by doing-it-yourself (cooking, making protective masks, gardening etc.);
- changing views of brands depending on how brands respond to the pandemic;
- longer-term adapting (acceleration of online retailing, tele-medicine, quick infection diagnostic tools) etc.

Barua (2020) stated that the pandemic resulted in de-globalization in a form of closing borders at least temporarily. In the short run the COVID-19 favoured trade in essential goods at a higher price and reduced trade in non-essential goods causing price cutting. The likely local and international implications in the short and medium run were summarized: human lockdown, demand and production shocks, carrier crisis and port closure, delays in port clearance and shipment resulting in disruption of supply chains, trade and capital flows diversion, increased costs and prices, interruption of travels.

In April 2020 Maliszewska *et al.* (2020) provided a simulation of the COVID-19 pandemic effects related to underutilization of labour and capital, increased trade costs, a drop in travels and a switching demand away from activities that require proximity between people. They expected that global exports would decrease by 2.5-4.6% but also noted that they could underestimate the overall effect. Labour-intensive, tradable sectors and manufacturing depending on imported inputs would be among the most vulnerable. Services sector (especially transport services, recreational activities and accommodation) would be hit more than manufacturing and agriculture (but selected agricultural products, chemicals, electronics, refined oil would also be heavily affected). Also, earlier this year Oliveira *et al.* (2020) forecasted a 15-25% decrease in the global trade in 2020 followed by 4-10% growth in 2021.

Büchel *et al.* (2020) analysed the case of Switzerland. In the 1st half of 2020 the foreign trade fell by 11%, although product diversification smoothed the negative effect of the pandemic on exports due to resilience of chemical and pharmaceutical industry. They noted that the pandemic and contingency measures affected foreign trade both on the demand and supply side. In particular, the Swiss exports were negatively affected by the number of Covid-19 cases in foreign markets, while stringency of the government measures in exporting countries affected Swiss imports.

Hayakawa and Mukunoki (2020) analysed international trade in the 1st quarter of 2020. They concluded that the COVID-19 burden in terms of registered cases and deaths in exporting countries was the main factor supressing international trade (especially in textile, footwear and plastic industries) unlike the burden in importing countries. Thus the supply-side shocks turned out to be more important at the early stage of the pandemic. There also was a substitution effect as a country's exports positively correlated with the burden in its neighbouring countries. Also, the COVID-19 burden turned out to stimulate imports of foods at that time.

Economic Commission for Latin America and the Caribbean (2020) stated that the initial supply shock on global trade (due to closure of production of inputs in China that it had exported to factories in Europe, North America and Asia) was gradually compounded by a demand shock.

A cross-regional comparative study by Éltető (2020) showed that Iberian countries were seriously affected considering the role of tourism sector for their economy. The vulnerability of Central European countries is related to their integration in international production chains in automotive and electronic industry, but in the long run they may benefit from shifting production of European multinationals from China.

Some authors pay attention to sector-specifics effects of the pandemic for international trade. Kerr (2020) analysed the impact on food supply. Initial panic buying created extra demand for food, but later this effect was offset by decreasing income and shifting away from having meal away from home. As for regulation, at the beginning countries tried to ensure proper operation of these supply chains to prevent or cool down panic. Later governments either may wish to ensure institutional framework for international trade or may smooth internationalization of their food supply to avoid heavy dependence on foreign exporters.

Albulescu (2020) estimated that there was a marginal negative direct impact of daily reported cases on oil prices, although there could also be an indirect effect of amplifying the financial markets volatility on oil prices too.

Schuler (2020) noted that the lockdown measures had a substantial impact on sectors involving physical contact, including travel and passenger transportation services. The effect was much deeper than in September 2001 after the terrorist attacks. Almost all countries imposed restrictions on incoming travels, including complete bans. Even after easing the lockdown measures consumers often preferred risk aversion. In the euro area Cyprus, Malta, Greece, Portugal as well as

Luxembourg, Slovenia, Spain and Austria were the most exposed tourism exporting countries to the impact of the pandemic.

Pogorel (2020) mentioned air travels and automobile industry as examples of the most affected sectors and video streaming services as an example of a sector enjoying expansion.

Leibovici and Santacreu (2020) wrote that under growing number of the infected people the actual or potential scarcity of medical equipment forced many governments to apply export restrictions or reduce import tariffs on these goods. In order to avoid global shortages later, they suggested an option of creating a global reserve of essential medical equipment, where all countries may contribute. Under epidemic a country could get the necessary equipment from it, but once it recovers it should contribute again.

Espitia *et al.* (2020) estimated that in the short run exporting restrictions would raise prices of medical masks by 20.5% and prices of venturi masks by 9.1%. They also stated that such export restrictions for protective and medical equipment may be contagious causing a multiplier effect on prices. Some countries introduced import tariff exemption for medical and testing equipment, although as a temporary measure.

As for consequences in the long run, Pogorel (2020) noted that the pandemic may favour relocalising production in the technological, industrial, and digital areas. Thus, globalisation may have already reached a plateau. And if states may wish to relocalise production of strategic goods and services, there should be international coordination to avoid trade wars.

Barua (2020) expects such longer term implications for the world market as sourcing location shift, revising trade barriers, altered international competition and trade relations, renewed trade agreements and possible de-globalization.

Economic Commission for Latin America and the Caribbean (2020) expects that several trends will be reinforced later: less interdependence in production, trade and technology between the global powers; more geopolitical and national security considerations in trade, more frequent trade disputes, and regionalisation around production hubs in North America, Europe, and East and South-East Asia.

Analysis of the bilateral trade between the EU and Ukraine is rather a new specific aspect within the research of the COVID-19 pandemic effects.

2. Methodology

The empirical analysis is started with the review of the current COVID-19 pandemic situation and its effects for macroeconomic situation in the world and Ukraine in particular. Considering the availability of data, the period of the first wave of the epidemic in Europe is considered (spring and early summer of 2020). On the demand side we provide the recent statistical trends in the Ukrainian GDP and imports. The industrial and services production and exports of the EU to the rest of the world are described on the supply side. Factors of the hryvnia's real exchange

rate are mentioned to account for trends in price competitiveness. Total values and sectoral break-down are provided. New regulatory barriers to international trade can also be an important factor affecting specific industries.

Then we apply correlation and regression analysis of the past data to estimate the vulnerability of the EU exports to Ukraine to the current economic crisis under the COVID-19 pandemic. Correlation analysis was used for the primary selection of variables after considering significance of the correlations. The initial specification of the tested regression model was:

$$Exp_{EUUA} = b_0 + b_1\ GDP_{UA} + b_2\ GDP_{EU} + b_3\ RER \qquad (1)$$

Exp_{EUUA} is the merchandise exports growth in a particular year (from the EU to Ukraine, all products), GDP_{UA} is the growth of the Ukrainian GDP in dollars (conversion with exchange rate, current prices) in the same year, GDP_{EU} is similarly the EU GDP growth, and RER is the real appreciation of Ukrainian hryvnia vis-à-vis the euro. All the variables are measured in %, therefore the regression coefficients can be interpreted as elasticities. The number of cases is 23 (1996-2018). The data source is UNCTADStat[3]. We checked the initial model for homoscedasticity, normality of residuals, linearity and absence of outliers. Stationarity of data is largely ensured by applying growth values instead of static ones.

The regression coefficients can be used to assess the effects of demand shock (GDP decrease in the importing economy) and supply shock (GDP decrease in the exporting economy) corrected for exchange rate and inflation trends, which themselves also may be attributable to difference in the phases and amplitude of economic cycles in the EU and Ukraine. All these shocks are possible under the current pandemic, when the economies experience losses in labour supply under infection and social distancing, and structural and absolute changes in consumption. We must note that the GDP of the EU and Ukraine correlate quite a lot (0.66). Therefore, the effects of demand and supply shocks sometimes are not easy to distinguish, unless one of the correlations with the exports growth is substantially larger.

In this paper we also considered the possible effects for particular EU exports to Ukraine – by large product groups and sometimes smaller groups if consumption patterns may differ for them under the pandemic and the relevant mitigation measures. In order to assess robustness of results we use alternative calculation method for regression analysis, when the years are weighted (the weight 3 is attributed to 1996, 4 to 1997, … , 25 to 2018). Such an approach can help to find out changes in relationships between variables across time. Finally, the regression coefficients are multiplied by the shares of the particular product groups in the bilateral exports to assess which industries may be of a particular concern due to temporary shrinking of the market in Ukraine.

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[3] UNCTADStat (2020), *Data Center* (retrieved from http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en).

Post-factum verification of results is based on the available statistical data for the EU exports to Ukraine during the first wave of the pandemic. Besides the sectoral break-down for merchandise trade, sector-specific trends for services exports are described too.

3. Macroeconomic trends and trade regulation changes under the COVID-19 pandemic

In 2020 the COVID-19 pandemic itself and the measures to contain it became the major event affecting the global economy. According to Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU) (2020), on October 1, 2020 there were more than 34 million confirmed cases of the disease worldwide and more than 1 million deaths[4].

Despite China seems to be the country of origin, it has contained the epidemic within few months. The negative effects for its economy were mainly in the 1st quarter of 2020. Western Europe and Iran became the next hotbeds of the disease with more severe consequences. Later the sickness rate soared in the US. The next epicentres included Russia and the Arabic world, and later Latin America. At this moment India has reached the 2nd place after the US by the disease cases, followed by Brazil. Nowadays the EU experiences the 2nd wave of the epidemic. The pandemic dynamics and the market reaction remain far from being purely predictable.

As a result of early launch of mitigation measures in March 2020, the epidemic situation in Ukraine was relatively good for half a year and only by October the number of registered cases reached 4 thousand per day. The contraction of economy in the 2nd quarter was rather caused by the national quarantine measures, which were fine-tuned later, and downward trends in the global markets than by the epidemic itself (the number of 1 thousand cases per day in Ukraine was reached only in August).

According to Trading Economics[5], the Ukrainian GDP decreased in the 2nd quarter 2020 by 9.9% (the unemployment rate increased to 9.9% (from 7.8% in July 2019) and in April the wages decreased by 8.9%). After easing the mitigation measures in summer Ukraine experienced economic revival and the GDP growth in the 4th quarter of 2020 is expected to be 1.6%.

Similar or even more pessimistic trends in the GDP took place in other economies in the 2nd quarter: Japan -7.9%, Poland -8.9%, Brazil -9.7%%, Germany -9.7%, Turkey -11%, Canada -11.5%, EU -11.9, Romania -12.3%, Mexico -17.1%, India -25.2%, US -31.4%, South Africa -51%. GDP contraction took place in the majority of countries, which negatively affected demand for imports. In December

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[4] Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU) (2020), COVID-19 Dashboard (retrieved from https://www.arcgis.com/apps/opsdashboard/ index.html#/bda7594740fd40299423467b48e9ecf6).

[5] Trading Economics (2020), (retrieved from https://tradingeconomics.com/).

2019 – May 2020 exports of the euro area dropped by 22.0%, US – 30.8%, China – 7.7%, Eastern Europe and CIS – 4.4%, Latin America and the Caribbean – 26.1%, Africa and the Middle East – 13.9%, the world – 18.3% (Economic Commission for Latin America and the Caribbean, 2020).

According to State Statistics Service of Ukraine, in January – July 2020 the total Ukrainian merchandise imports in goods decreased by 14.7%[6], especially the imports of mineral products (-35%), base metals and preparations thereof (-19%), ground, air and water transport facilities (-16%), machines, equipment and mechanisms, electric and technical equipment (-15%), paper bulk from wood or other vegetable fibres (-14%), products from stone, gyps and cement (-13%), and products of chemical and allied industries, polymeric materials, plastics and articles of them (-9%). Meanwhile, the imports of some products increased: live animals and livestock products (19%), plant products (15%), optical and cinematographic apparatus (15%), food industry products (14%), soap and surface active agents (14%), pharmaceutical products (12%), and furniture (9%). The imports of textiles materials, articles of textiles and toys remained almost unchanged.

In January – July 2020 the Ukrainian total exports decreased by 7.4%. The metal exports decreased by 19% as they are more procyclical than average exports. But despite this and overall economic contraction, return of seasonal labour migrants and other weaknesses, devaluation of the Ukrainian hryvnia by autumn 2020 turned out to be very mild in comparison to the previous local crises. We assume that several factors helped to stabilize the national currency:

- falling prices for fuel imports (after the Brent crude oil price peaked in January 2020 to reach $69 per barrel it decreased to $19 in April and partially restored to $39 in early October (Trading Economics, 2020));
- relative resilience of food and agricultural product exports;
- financing from the IMF and the EU;
- restrictions on the mobility of individuals (the trade deficit in travel services was $500 million in the 2nd quarter of 2020 in comparison to $1800 million in the 2nd quarter 2019[7]);
- necessity for some individuals to spend foreign currency savings to buy essential goods under the lockdown;
- only minor increase in the external debt by $1 billion in the 1st half of 2020.

According to National Bank of Ukraine, the real effective exchange rate of hryvnia decreased by 10% in August 2020 in comparison to February, mostly because of the exchange rate change with only minor effect of the difference in foreign and domestic inflation. We also used the data of National Bank of Ukraine (2020) and European Central Bank[8] to calculate the bilateral nominal and CPI-based

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[6] Here and below in comparison to the same period in 2019.

[7] National Bank of Ukraine (2020), Statistics (retrieved from https://bank.gov.ua/ ua/statistic).

[8] European Central Bank (2020), Statistical Data Warehouse (retrieved from https://sdw.ecb.europa.eu/browseSelection.do?node=1496).

real devaluation of hryvnia. The hryvnia devalued in March – August 2020 nominally to the euro by 18.1%. The real devaluation was by 17.4%. Similar devaluations took place to the Romanian leu: 17.6% and 17.2%.

The potentially negative devaluation effect on the EU exports to Ukraine could vary by industries considering the difference in demand elasticities and prices changes for particular goods and services. E.g. the effect was partially offset by relatively faster growing prices in Ukraine in March – August 2020 for alcoholic beverages and tobacco (4.5%), food and non-alcoholic beverages (1.3%), healthcare (5.2%), communications (2.7%) and restaurants and hotels (1.4%), although the latter three sectors are rather non-tradable with only indirect effect on imports (authors' calculations based on the data of National Bank of Ukraine).

Meanwhile, in the EU during the 1st wave of the epidemic the sectoral trends in domestic production were mostly negative too (see tables 1-3). The most severely affected industries were the manufacture of vehicles, textiles, wearing apparel, leather and related products, furniture and metals. These products are largely capital goods, durable consumer goods or medium-technology products. The chemical and especially pharmaceutical industry, manufacturing of medical equipment, computer and electronic products, food and beverages industry, and utility supply proved to be the least affected. They include mostly high-technology manufacturing and non-durable consumer goods.

Table 1. Growth of the EU industrial production in March – June 2020, sectoral break-down, %

Industry	Growth rate
Mining and quarrying	-15
Manufacture of food products; beverages and tobacco products	-7
Manufacture of textiles, wearing apparel, leather and related products	-35
Manufacture of wood, paper, printing and reproduction	-12
Manufacture of coke and refined petroleum products	-13
Manufacture of chemicals and chemical products; basic pharmaceutical products and pharmaceutical preparations	-1
Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	-10
Manufacture of basic pharmaceutical products and pharmaceutical preparations	8
Manufacture of rubber and plastic products	-21
Manufacture of other non-metallic mineral products	-17
Manufacture of basic metals and fabricated metal products, except machinery and equipment	-24
Manufacture of computer, electronic and optical products; manufacture of electrical equipment	-11
Manufacture of computer, electronic and optical products	-6

Manufacture of irradiation, electromedical and electrotherapeutic equipment	-2
Manufacture of electrical equipment	-16
Manufacture of machinery and equipment n.e.c.	-21
Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment	-43
Manufacture of furniture	-27
Other manufacturing	-17
Repair and installation of machinery and equipment	-18
Electricity, gas, steam and air conditioning supply	-7

Note: in comparison to the same period in 2019.
Source: authors' calculations based on Eurostat (2020).

Table 2. Growth of the EU industrial production by product types in March – June 2020, %

Product type	Growth rate
High-technology manufacturing	-3
Medium high-technology manufacturing	-25
Low-technology manufacturing	-14
Medium low-technology manufacturing	-21
Intermediate goods	-16
Energy (except section E)	-10
Capital goods	-27
Consumer goods	-10
Consumer goods (except food, beverages and tobacco)	-12
Durable consumer goods	-25
Non-durable consumer goods	-8

Note: in comparison to the same period in 2019.
Source: authors' calculations based on Eurostat (2020).

As we see in table 3, the COVID-19 crisis was the most devastating for the air transport, accommodation and food service activities, which means large losses for tourism exporting countries. Other heavily affected services included publishing activities, motor vehicle trade and repair, audiovisual production, advertising and employment services. The sectors of computer programming, consultancy and related activities even managed to increase production. Telecommunications experienced a stable demand and showed a flat trend. Relatively resilient services sectors with minor contraction of production included postal and courier activities, architectural and engineering activities, technical testing and analysis, security and investigation activities and wholesale trade (except sales of motor vehicles).

Table 3. Growth of the EU services production in March – June 2020, %

Industry	Growth rate
Services required by STS regulation	-18
Wholesale and retail trade and repair of motor vehicles and motorcycles	-27
Wholesale trade, except of motor vehicles and motorcycles	-5
Transportation and storage	-17
Land transport and transport via pipelines	-16
Water transport	-10
Air transport	-57
Postal and courier activities	-4
Accommodation	-73
Food and beverage service activities	-56
Publishing activities	-30
Motion picture, video and television programme production, sound recording and music publishing activities	-25
Telecommunications	0
Computer programming, consultancy and related activities	1
Information service activities	4
Real estate activities	-10
Professional, scientific and technical activities required by STS regulation	-10
Legal, accounting and management consultancy activities	-9
Architectural and engineering activities; technical testing and analysis	-6
Advertising and market research	-23
Administrative and support service activities	-16
Rental and leasing activities	-11
Employment activities	-23
Security and investigation activities	-6
Services to buildings and landscape activities	-7
Cleaning activities	-8
Office administrative, office support and other business support activities	-18
Construction	-13

Note: in comparison to the same period in 2019.
Source: authors' calculations based on Eurostat (2020).

As for external trade, according to Eurostat (2020), in the 2nd quarter 2020 the extra-EU27 merchandise exports dropped by 20%, the services exports decreased by 27%. In March – June 2020 both extra-EU27 and intra-EU27 merchandise trade decreased almost evenly (by 36% and 35%), therefore there was no trade diversion effect. Exports of goods to China decreased only by 1% and to the US by 15%. The tourism industry was probably the most affected services exporting sector. In April – June 2020 the number of arrivals of foreigners to the EU-27 at tourist accommodation establishments dropped by 80% (in Romania by 98%).

In March – July 2020 Romanian intra-EU-27 merchandise exports decreased by 24% and extra-EU27 exports – by 22%. The services exports dropped by 17%. In March – June 2020 Romanian exports of intermediate goods were the most affected as they decreased by 44% in comparison to capital goods (40%) and especially consumption goods (32%).

As for regulatory environment transformation, 80 countries and separate customs territories have launched export prohibitions or restrictions due to the COVID-19 pandemic, including 72 WTO members (if EU member states are counted individually). As of 21 September 2020, WTO members had submitted 245 notifications related to COVID-19 (World Trade Organization, 2020b). Such notifications are submitted in line with the WTO rules which allow member state to impose export-restricting measures necessary to protect human, animal or plant life or health.

The EU had adopted 9 regulating documents affecting trade in goods related to COVID-19. Two of them included export authorization for third countries. Exports of personal protective equipment (HS 39; 40; 61; 62; 63; 90) were subject to the temporary production of an export authorization. As from 19 March 2020, the exports to EFTA members, the Faroe Islands, Andorra, San Marino and the Vatican City and the overseas countries and territories listed in Annex II of the Treaty were exempted. The new regulation was more targeted, coverings three product categories, instead of the five in the original export authorization scheme mentioned above (only protective masks, spectacles and garment exports will require an export authorization: HS 9004.90.10; 9004.90.90; 6307.90.98; 9020.00.00; 3926.20.00; 4015.90.00; 6113.00; 6114; 6210.10.10; 6210.10.92; 6210.10.98; 6210.20.00; 6210.30.00; 6210.40.00; 6210.50.00; 6211.32.10; 6211.32.90; 6211.33.10; 6211.33.90; 6211.39.00; 6211.42.10; 6211.42.90; 6211.43.10; 6211.43.90; 6211.49.00). The new scheme explicitly required member States to authorize exports of emergency supplies in the context of humanitarian aid and to process the relevant applications in an expedite manner. It asked the Member States to positively assess exports to state agencies in charge of distributing personal protective equipment or involved in combating the COVID-19 outbreak (World Trade Organization, 2020a).

Both schemes were effective for short period of time to impact considerably on the export of personal protective equipment to third countries including Ukraine. The second scheme made an exemption for Western Balkans, but both schemes did not provide it for the European countries in association with the EU.

4. Empirical results of modelling resilience of the EU-Ukraine exports

As we see from the table 4 and Appendix 1 (by comparing correlations or elasticities), the EU bilateral exports are likely to be more demand-driven (either directly by the Ukrainian GDP growth or indirectly through better price competitiveness under expensive hryvnia in calm periods) than supply-driven by growth of capacities in the EU. The results are robust enough considering that coefficients calculated for weighted cases are similar to the ones for unweighted

cases. This evidences that there were no major changes in the relationships between the exports and their factors in the considered period.

Appendix 1 also shows the correlations for the EU exports of particular product groups. A great majority of correlations with the GDP growth are significant. Thus, all the sectors seem to be demand-driven and most are also supply driven, unless there is a minor effect of multicollinearity to be treated during the regression analysis phase. We also must note specific situation due to COVID-19 pandemic as the traditional vulnerability of medicinal, pharmaceutical and IT-products to the demand shock may not materialize this time, because nowadays there is an increased demand for healthcare activities, online working and entertainment at home.

Only half of industries depend on real exchange rate trends. These are probably products, which rely on price competitiveness (e.g. chemical and pharmaceutical products, food, telecommunication equipment – after devaluation consumers in Ukraine may switch to domestic products or products imported from emerging markets), unlike other products which rely more on quality competitiveness and therefore are less dependent on exchange rate fluctuations (e.g. beverages, fuels, wearing apparel etc.).

Table 4 provides sector-specific models for the EU exports to Ukraine. Alternative specifications were used when it was necessary to treat minor multicollinearity.

Table 4. Regression models for growth of the EU exports to Ukraine

Product group	b_0	b_{GDPUA}	b_{GDPEU}	b_{RER}	R^2	F-test
AP	1.54/0.935 (1.96)	0.783/0.852 (0.138) ***	0.773/0.636 (0.346)**	0.371/0.297 (0.162)**	0.90/ 0.91	55.38***
FLA	2.03/2.19 (3.62)	0.842/0.981 (0.176)***		0.596/0.105 (0.257) **	0.66/ 0.75	19.60***
FLA	-2.45/-0.69 (3.29)		2.355/2.384 (0.374)***	1.312/1.182 (0.214)***	0.76/ 0.72	30.92***
BT	1.38/5.60 (8.19)	0.842/0.861 (0.380)**			0.19/ 0.27	4.91**
BT	-2.70/3.34 (7.56)		2.928/2.546 (0.871)***		0.35/ 0.33	11.28***
ARM	4.73/2.74 (2.44)*	0.698/0.752 (0.113)***			0.64/ 0.77	37.95***
ARM	4.76/3.17 (3.30)		1.382/1.436 (0.381)***		0.38/ 0.40	13.12***
OSF	11.20/8.98 (6.86)	0.974/1.027 (0.318)***			0.31/ 0.37	9.38***
OIS	8.18/2.70 (6.50)	0.712/0.912 (0.302)**			0.21/ 0.51	5.58**
OIS	0.28/-1.45 (5.13)		2.374/2.441 (0.582)***	1.508/1.454 (0.334)***	0.60/ 0.71	14.86***

FUE	4.78/7.79 (7.98)	1.787/1.747 (0.370)***			0.53/ 0.57	23.33***
CHP	3.56/2.75 (1.87)	0.434/0.654 (0.131)***	1.093/0.627 (0.330)***	0.806/0.361 (0.154)***	0.89/ 0.89	49.72***
MPH	7.58/4.34 (3.36)	1.042/1.029 (0.156) ***			0.68/ 0.79	44.83***
TFY	4.05/1.08 (2.09) *	0.598/0.686 (0.097) ***			0.65/ 0.79	38.32***
FP	-1.35/-4.60 (3.48)	0.859/0.974 (0.161) ***			0.57/ 0.75	28.31***
FP	-6.42/-7.69 (2.95) **		2.302/2.537 (0.335) ***	0.989/0.906 (0.192) ***	0.75/ 0.75	29.91***
MTE	5.83/3.73 (3.48)	1.248/1.262 (0.162)***			0.74/ 0.76	59.63***
MTE	2.11/0.78 (4.97)		2.509/2.714 (0.564)***	1.149/1.580 (0.323)***	0.57/ 0.66	13.11***
OMA	5.86/1.95 (4.65)	1.014/1.208 (0.216)			0.51/ 0.65	22.04***
TSR	3.61/-1.64 (5.30)	1.103/1.143 (0.256)***		0.784/0.842 (0.376)*	0.61/ 0.67	15.71***
RV	11.01/9.66 (6.98)	1.587/1.584 (0.323)***			0.53/ 0.53	24.12***

Notes. The coefficients for unweighted and weighted cases are separated with a slash (/).The significance according to t-and F-test is for unweighted cases: *** at $p<0.01$, ** at $p<0.05$, * at $p<0.01$. Standard errors are in brackets.
Source: authors' calculations based on UNCTADStat (2020).

All the EU exports may be affected by the shrinking demand in Ukraine under quarantine. The exports of fuels and road vehicles are the most vulnerable. In most other industries the elasticity of exports to the Ukrainian GDP are closer to unity. And despite the results of our empirical analysis based on the historical data, we assume that exports of products for medical purposes and possibly IT-equipment may be the most stable under the current pandemic. Beverages and tobacco, agricultural raw materials, metal products and clothing traditionally were among the least affected exporting categories, although correction should be made for current downward changes in demand patterns for investment (metal products) and relatively durable goods (clothes) under the quarantine.

The effect of currency appreciation for food exports is robust only in the model with the EU GDP, while in in a model with the importing country's GDP (Ukraine) it decreased to become miserable (shifting from price competitiveness to quality competitiveness). The effect of currency appreciation for exports of medicinal and pharmaceutical products turned out to be nonrobust too. The effect is significant in some specifications of models for ores, iron, steel or other metals; furniture and parts; and machinery and transport equipment. And it is definitely significant for chemical products, telecommunication and sound recording apparatus after controlling for

GDP in Ukraine. Therefore, these EU industries are the most vulnerable to losses in price competitiveness in case of devaluation of hryvnia.

The EU exports of machinery, metal products, furniture, beverages, tobacco and food may be the most disrupted on the supply-side, although the effect is significant mainly only if no control for the importing country's GDP is applied. Considering the difference in correlation coefficients for demand and supply, beverages and tobacco products are traditionally probably the most dependent exports on supply capacities. These exporting categories are less dependent on supply capacities in the EU (which have shrunk due to the coronavirus disease and the mitigation measures): vegetable oils, metal products, fuels, pharmaceutical products, wearing apparel, IT-equipment and road vehicles, although corrections for labour supply disruption should be made in comparison to historical trends as well as export restrictions for protective equipment.

If we account for both elasticities and product shares in the EU exports to Ukraine, the main sources of vulnerability may be the exports of:
- machinery and transport equipment in general and road vehicles in particular, and fuels due to the direct effect of the GDP contraction in Ukraine;
- machinery and transport equipment, and chemical products due to the real exchange rate trends;
- machinery and transport equipment, chemical products and food due to the contraction of the GDP in the EU and the disrupted labour supply.

5. Post-factum verification

According to State Statistics Service of Ukraine (2020), in 1st and 2nd quarter of 2020 Ukraine imported goods worth $10.3 billion from the EU including $270 million from Romania. In comparison to the same period in 2019 imports of goods from the EU decreased by 12.5%, from Romania by 7%.

Ukraine also imported services worth $1.25 billion from the EU (20% of them were transport services, 15% royalty and other intellectual property charges, 13% telecommunication, computer and information services, 24% business services, 16% financial and insurance services) including $12 million from Romania. Similarly, the services imports from the EU decreased by 24% (transport decreased by 34%, air transport by 58%, sea transport by 8%, travels by 66%, royalty and other intellectual property charges by 8%, financial services by10%, business services by 22%, while the telecommunication, computer and information services increased by 9%). Services imports from Romania dropped by 50%.

According to Eurostat (2020), in March – July 2020 the EU-27 merchandise exports to Ukraine decreased by 12% (to the rest of the world by 17%). Ukrainian exports to the EU drooped even deeper by 21%. Therefore, despite the falling demand in Ukraine, the EU increased its 5-month merchandise trade balance from €2.1 to €2.6 billion.

The actual sectoral trends (see table 5) show that the EU exports of food, beverages and tobacco, animal and vegetable oils, fats and waxes to Ukraine proved to be the least affected.

Table 5. Growth of the EU exports in March – July 2020, %

Products	To Ukraine	Extra-EU27
Total - All products	-12	-17
SITC0_1 - Food, drinks and tobacco	25	1
SITC0 - Food and live animals	23	6
SITC1 - Beverages and tobacco	33	-14
SITC2_4 - Raw materials	-9	-13
SITC2 - Crude materials, inedible, except fuels	-10	-17
SITC3 - Mineral fuels, lubricants and related materials	-36	-50
SITC33 - Petroleum, petroleum products and related materials	-37	-62
SITC4 - Animal and vegetable oils, fats and waxes	0	16
SITC5-8 - Manufactured goods	-13	-17
SITC5 - Chemicals and related products, n.e.s.	-6	3
SITC6_8 - Other manufactured goods	-13	-21
SITC6 - Manufactured goods classified chiefly by material	-15	-20
SITC7 - Machinery and transport equipment	-18	-24
SITC8 - Miscellaneous manufactured articles	-10	-22
SITC9 - Commodities and transactions not classified elsewhere in the SITC	13	-9

Note: in comparison to the same period in 2019.
Source: authors' calculations based on Eurostat (2020).

The most severely affected ones were exports of fuels as well as machinery and transport equipment and some other manufactured goods. Adjusting for difference in depth of product classification (e.g. lack of data for exports of pharmaceutical products and IT equipment) and low vulnerability of chemical product exports (which can be explained by only minor devaluation of hryvnia until late summer 2020), we can conclude that in general the actual trends in bilateral exports proved efficiency of our modelling based approach to assess relative sector-specific vulnerability or resilience of the EU exports to Ukraine.

Conclusions

In recent years the EU and Ukraine improved the treatment for their bilateral foreign trade. But in 2020 the current COVID-19 pandemic became a major challenge for the global economy and obviously still affects international trade. Most countries experienced a GDP contraction at least in the 2nd quarter of 2020. It

became a shock both on the demand and supply side due to changes in consumption patterns and disruption of labour supply.

The EU exports to Ukraine became vulnerable to contraction of the importing and exporting economies as well as to real depreciation of hryvnia. The total imports of Ukraine form the rest of the world dropped by almost 15%. A mix of negative and positive factors resulted in only a mild devaluation of hryvnia, although the real devaluation specifically against the euro was 18% in March – August 2020. Its effect varied by industries because of the difference in price trends for specific consumer goods. On the supply side the EU had a drop in production of industrial goods by 15% (especially capital goods, durable consumer goods and medium-technology products) and services by 18%. Despite this, manufacture of pharmaceutical products, information service activities, computer programming, consultancy and related activities showed positive trends. In March – June 2020 both extra-EU27 and intra-EU27 merchandise trade decreased almost evenly (by 36% and 35%) without a trade diversion effect. Export authorization became a new sector specific barrier for the EU exports of personal protective equipment.

According to our modelling results based on the past data, the EU exports of fuels and road vehicles may be the most sensitive to changes in the Ukrainian GDP. The issue of price competitiveness in Ukraine under exchange rate fluctuations is important for the EU exports of chemical products, telecommunication equipment and some other goods. These EU sectors are the most interested in the economic and exchange rate stability in Ukraine. Exports of beverages and possibly some other industries are the most vulnerable under contraction of the EU as a supplying economy.

The most resilient EU export products under the shrinking demand in Ukraine may include beverages, tobacco and agricultural raw materials; under devaluation of hryvnia – medicinal and pharmaceutical products. Regardless the empirical results, we also assumed that the specific changes in the consumption behaviour under the quarantine may favour a relatively stable demand for food and some IT-equipment.

The actual available data for bilateral exports in March – July 2020 during the 1st wave of COVID-19 proved in general the modelling based approach to assess relative sector-specific vulnerability or resilience of the EU exports to Ukraine with certain reservations. The most severely affected ones were exports of fuels as well as machinery and transport equipment, while the EU exporters of food, drinks and tobacco managed even to increase their sales in Ukraine. In March – July 2020 EU-27 merchandise exports to Ukraine decreased by 12%, thus, despite the negative change under the COVID-19 pandemic these exports turned out to be more resilient than to the rest of the world. The EU was also able to increase its bilateral trade surplus in goods. The EU services exports to Ukraine (decrease by 24% in 1-2 quarters 2020 especially in travel and air transport services) were less resilient except for telecommunication, computer and information services.

Several policy recommendations may be provided. Macroeconomic risk assessment should consider both traditional sector-specific vulnerabilities to business

cycles and the new vulnerabilities related to changes in consumption preferences under new challenges such as pandemics. The business support measures under the COVID-19 crisis should contain sector-specific components too.

Relative resilience of the EU exports to Ukraine under the Association Agreement provides additional evidence in favour efficiency of this integration tool, although further research is necessary to check whether this conclusion can be generalized for other free trade areas. If the tariff elimination under the Deep and Comprehensive Free Trade Area is to be accelerated specific needs of the less resilient sectors of both parties should be considered.

Since some of the EU exports depend on the price competitiveness, larger devaluation of hryvnia should be avoided. Our previous research with similar methods also suggested that hryvnia devaluation would not provide benefits for Ukrainian exports to the EU too. Thus, subject to further pessimistic pandemic scenario, a reasonable financial assistance for macroeconomic stabilization in Ukraine may benefit both parties.

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Appendix 1. Correlations of factors with growth of the EU exports to Ukraine and their product structure in 2018

Product group	GDP_{UA}	GDP_{EU}	RER	Share in Exp_{EUUA}, %
All products (AP)	0.93***	0.65***	0.37*	
Food and live animals (FLA)	0.76***	0.55***	0.52**	6.9
Beverages and tobacco (BT)	0.44**	0.59***	-0.12	1.6
Agricultural raw materials (ARM)	0.80***	0.62***	0.33	1.4
Oil seeds and oleaginous fruits, animal and vegetable oils, fats and waxes (OSF)	0.56***	0.39*	0.23	0.9
Ores, iron, steel or other metals (OIS)	0.46**	0.43**	0.51**	2.9
Fuels (FUE)	0.73***	0.29	0.30	7.2
Chemical products (CHP)	0.85***	0.55**	0.56***	19.7
- Medicinal and pharmaceutical products (MPH)	0.83***	0.43**	0.48**	5.8
Textile fibres, yarn, fabrics and clothing (TFY)	0.80***	0.65***	0.27	5.4
Furniture and parts (FP)	0.76***	0.65***	0.40*	0.7
Machinery and transport equipment (MTE)	0.86***	0.54**	0.37*	37.0
- Office machines and automatic data processing machines (OMA)	0.72***	0.49**	0.22	1.5
- Telecommunication and sound recording apparatus (TSR)	0.73***	0.42*	0.50**	1.8
- Road vehicles (RV)	0.73***	0.30	0.39*	8.6

Note: *** means significance (unweighted cases) at p<0.01, ** at p<0.05, * at p<0.01.
Source: authors' calculations based on UNCTADStat (2020).