



Analyzing the differential effects of COVID-19 on export flows: a focus on customs procedures

Omer Faruk Derindag¹ · Zaim Reha Yasar² · Caglayan Aslan³ · Salih Parmaksiz⁴

Accepted: 11 September 2024 / Published online: 24 September 2024

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2024

Abstract

COVID-19 has not only dramatically affected the ordinary course of social life, but also caused an idiosyncratic downturn in the global economy and created multidimensional effects on international trade and Cross-Border E-Commerce merchandise flows. This paper provides unique empirical evidence of how the consequences of the pandemic have distinctively diverged on conventional and simplified customs clearance, which includes Cross-Border E-Commerce orders, differed significantly. The Difference-in-differences (DiD) and Causal Inference estimates for the 2019:01–2021:06 interval suggest that simplified customs clearance shows more resilience to COVID-19 effects relative to conventional customs clearance and reduces the negative impact of COVID-19 influences on export performance in the case of Turkey. The fundamental outcomes remain consistent when the sample includes emerging markets and when the analysis employs the export of consumer goods as opposed to total exports in the conventional mode. Overall, the findings highlight the significant role of E-Commerce and simplified customs processes in enhancing export performance.

Keywords E-customs · Simplified customs procedure declaration · Cross-border e-commerce · Export · COVID-19 · Differences in differences

JEL Classification F1 · L81

1 Introduction

Information and Communication Technologies (ICT) constantly introduce novel tools and transform the way of doing business for companies (Ancillai et al. 2023; Zhu et al. 2023; Wang et al. 2023). The Internet is one of the most impressive

Responsible Editor: Harald Oberhofer.

Extended author information available on the last page of the article

breakthroughs in the world in terms of its economic and social effects. Thanks to the platform provided by the internet, E-Commerce has also caused radical changes in shopping and trading behavior since the early 1990s. E-Commerce and E-Export have increased the efficiency and competitiveness of companies in the commercial ecosystem (Karaboga and Gungor 2021). It has also positively contributed to the elimination of inequality of business opportunities by lowering the barriers to entering new markets and increasing visibility.

Cross-Border E-Commerce (CBEC) is getting easier day by day. In addition to the international organizations and countries' efforts, global online marketplaces continuously introduce innovations, tools, and programs to facilitate CBEC. The most important of these is enabling the customs duties can be collected at the online order stage. This considerably reduces the procedures and difficulties that the consumer is exposed to. In addition, CBEC platforms from all over the world have started to serve many countries through localized websites. The use of country-specific marketing techniques and showing the local currencies to the consumers improved the user experience. One of the most important developments in the reduction of delivery times is achieved by cargo companies through their superior ability to integrate digitalization into their business and logistics processes.

Another advantage of CBEC and simplified customs procedures is the increased flexibility they create for businesses. Such flexibility would be particularly useful when firms are hit by negative economic shocks, such as the recent COVID-19 pandemic. The COVID-19 pandemic has initiated drastic changes in international trade, particularly in global value/supply chains. Although its effects have not yet ended the COVID-19 coronavirus pandemic has already taken its position in the history of world economic crises. It emerged on December 1, 2019, in Wuhan, the capital of the Hubei province located in the middle eastern part of China. So much so that, similar to the crisis described as the Great Depression or the 1929 World Economic Depression (The Great Depression of 1929), the COVID-19 crisis was described by the IMF (International Monetary Fund) as The Great Lockdown (IMF 2020). The pandemic caused a supply and demand shock, as it both prevented products from being produced and marketed and restricted consumers' access to the market.

The COVID-19 pandemic has created a novel and diverse circumstances because of lockdown and quarantine restrictions both for consumers and sellers. It is known that that bricks-and-mortar (offline) style retailers, who could not complete digital transformation earlier, have exposed more difficulties than clicks-and-mortar (online and offline) and pure online retailers. The fact that consumers had to switch to the E-Commerce shopping channels as a result of the new emergencies significantly expanded the sector. For instance, with the spread of the COVID-19 virus, consumers have avoided visiting stores, and they have started to use retailers' web pages and online platforms more frequently. It can be inferred that those internet and digital technologies show their impact across borders. Beyond the annual turnover growth that people are used to, there has been an increase in the number of consumers shopping from different countries. Cross-border consumer spending increased by

Table 1 Growth rates of global GDP, global merchandise trade, global retail market size, global B2C e-commerce, and global B2C cross border e-commerce. (2017–2020)

Growth rates of...	2017 (%)	2018 (%)	2019 (%)	2020 (%)
Global GDP	3.80	3.60	2.80	−3.10
Global merchandise trade	10.77	10.24	−2.76	−7.58
Global retail market size	6.16	4.60	5.20	−5.70
Global B2C e-commerce	24.88	15.63	20.50	25.70
Global B2C cross border e-commerce	32.50	27.55	22.19	21.07

Source: Authors' calculation based on World Bank, UNCTAD, E-Marketer, Statista, Accenture, AliResearch, Invesp, and TD Insights data

approximately 25–30% in one year from March 2020 to February 2021 (Mastercard Economics Institute 2021).

Although E-Commerce and CBEC still has a modest share ($\approx 1.5\%$) in total trade flow, it has great potential with promising development rates. For a better understanding of the broad picture of macroeconomic indicators and international trade flows, the following table (Table 1) may help for a better future projection. For the conventional side, the trend of world GDP and retail market size decreases sharply in 2020 which is the pandemic process whereas a sharper decline is seen in merchandise trade flows during the same period. Unlike the GDP and retail market, merchandise trade volume shrank also in 2019. However, on the e-commerce side, although the increment of the CBEC trade volume shows a losing acceleration trend, its growth rate is still over 20%. For total e-commerce, it seems that the growth rate is considerably high and the increment from 2019 to 2020 implies that pandemic situations provide beneficial opportunities for this type of trade.

Customs processes inherently require different control mechanics depending on the characteristics of the goods and the mode of transport. Containers that are few in number but high in volume, and packages that are large in number but relatively low in value, physically move in and move out across the origin and destination customs borders with different operational structures. Both in the two scenarios, customs administrations and/or authorized customs clearance partners try to maintain a fine balance among their missions such as correct valuation, revenue generation, risk assessment (Al-Shbail 2020), safety, security, health, prevention of illicit trade, and trade facilitation. E-Commerce and CBEC encourage export flow, especially for MSMEs (Micro-, Small and Medium-Sized Enterprises) enabling them to cross border their goods with low-cost, less bureaucratic procedures and expedited processes. In this context, we consider that international organizations, countries, customs administrations, and express cargo carriers have implemented facilitating, accelerating, and capacity-building practices for CBEC. In

Table 2 Comparison between conventional commerce customs declaration (CCCD) and simplified custom procedure declaration (SCPD)

	CCCD	SCPD
Is it compulsory to establish a company to be an exporter?	Yes	No
Should customs consultancy service be obtained?	Yes	No
For exporting, is it obligatory to be registered with an exporters' association?	Yes	No
Is customs clearance performed only under the control of the customs administration?	Yes	No
Do authorization and power of attorney documents need to be notarized?	Yes	No
Do storage and warehouse exit fees charged?	Yes	No
Documents such as Conformity Certificate, Certificate of Analysis, Inspection Certificate, Sanitary Certificate, Brand Registry Certificate. Notarized translations, apostilles, etc. needed?	Yes	No

this paper, we focus on the Simplified Custom Procedure Declaration (SCPD)¹ practices. SCPD is a digital structure that simplifies the customs clearance procedures of inbound and outbound goods. The Republic of Turkey Ministry of Trade describes the exporting of goods whose gross weight is less than 300kg and invoice value does not exceed 15,000 Euros as micro export. Apart from some minor restrictions on health, security, and technical issues, almost all kinds of goods can be subject to special customs procedures within the scope of micro export with SCPD, if requested.

The global experience during the Covid-19 pandemic has underscored the vital significance of facilitating international trade and eliminating tariff and non-tariff barriers, enabling people to access essential products. This study demonstrates how Cross-Border E-Commerce (CBEC) plays a critical role in potential crisis scenarios in the future.

In this study, the primary focus lies not on the capacity and efficiency of e-commerce, but rather on the impact of simplification in customs procedures on online trade flows. Therefore, it is possible to outline the paper's research question as follows: 'How effectively do streamlined customs procedures alleviate the negative impact of COVID-19 on export flows in an emerging market, and what is its causal effect on fostering economic resilience during times of crisis?'

The advantages provided by micro exports to companies and individuals with a single tax number are shown in Table 2 comparatively.

As it can be seen from Table 2, the SCPD regime provides numerous advantages for exporters that are not fully available in the CCCD regime. One of the most important conveniences of this regime is that the exporter does not have to deal with customs procedures that are done by specially authorized shipping companies. In this case, we think that exporters would want to shift their export

¹ In Turkey SCPD is called as ETGB which is Turkish abbreviation for Electronic Commerce Customs Declaration. In spite of this type of declaration is mostly characterized for cross-border e-commerce, it can be used for non-e-commerce operations.

supplies from the CCCD regime to the SCPD regime to get rid of getting infected. In other words, our hypothesis states that the export volume of SCPD would be more resistant than the export volume of CCCD against negative pandemic conditions decreasing economic activity. The pandemic may even be considered a golden opportunity for the SCPD regime to boost export flows and thus economic activity.

2 Background

Regardless of being SMEs or MNEs, exporting is a first step means of internalization and foreign market entry strategy as a non-equity mode (Pan and Tse 2000). Considering various factors such as investment costs, financial metrics, market conditions, competition structure, distance, adaptation cost, cultural differences, etc., (Buckley and Casson 1998; Laufs and Schwens 2014) companies also show export behavior to be in a networking circle, transferring new technologies (Aitken et al. 1997) and learning from export (Wu and Chiou 2021). In addition to the positive effects listed above for companies, international trade is one of the most important economic, commercial, and strategic instruments for the growth of countries. While development classifications vary based on country disparities and sectoral/regional distinctions, a substantial body of research lends support to export-oriented growth theories and hypotheses (Greenaway et al. 1999; Siliverstovs and Herzer 2006; Mookerjee 2006; Ozturk and Acaravci 2010; Dreger and Herzer 2013; Kumar et al. 2020). The removal of tariff and non-tariff barriers to international trade and the facilitation of customs processes have positive effects on export/import flow and economic development (Wilson et al. 2003; Shepherd and Wilson 2009; Safaeimanesh and Jenkins 2021).

Various economic theories, such as Adam Smith's classical theory, David Ricardo's comparative advantage theory, Heckscher-Ohlin factor proportions theory, and Paul Krugman's new trade theory, provide support for the facilitation of international trade and the removal of trade barriers. While Cross-Border E-Commerce (CBEC) encompasses theoretical underpinnings, practical and operational dimensions also significantly contribute to this research. In this context, the study utilizes International Trade Theories. Considering that CBEC is a nascent field, scholars and global institutions diligently monitor recent advancements in the literature on online international trade.

2.1 Cross-border e-commerce

As a way of exporting, CBEC introduces new opportunities especially for SMSs (Tolstoy et al. 2021) to reach the final consumer by eliminating the intermediaries which causes an increase in profit margin. In CBEC, basically the parties; consist of the consumer, the marketplace or shopping site/app, and fast cargo companies authorized by customs administrations. While large companies establish their own CBEC platforms, MSMEs (Micro-, Small and Medium-Sized Enterprises) have

limited sources and capabilities for international presence (Li et al. 2018; Afolayan and de la Harpe 2020).

Although the COVID-19 influences the conventional trade flows' direction and severity based on many factors such as countries, markets, sectors, supply and demand balance; E-Commerce has generated dramatic increases triggered by consumers' online shopping behavior during the COVID-19 period (Masoud et al. 2021; Afridi et al. 2021; Gu et al. 2021). It is known that in almost all countries, the international trade volume is negatively affected by the number of cases and deaths. However, severity of negative effects in the countries is mitigated through imports processed under CBEC (Hayakawa et al. 2023).

2.2 Simplified customs clearance

Reducing customs procedures is an integral part of international trade facilitation efforts. Since customs digitalization and facilitation of E-Commerce is an operational issue that is managed and practiced in the field, the main efforts taken by the directly affected stakeholder such as trade-related international organizations or committees, customs administrations, express cargo companies, and online retailers. Because the failure of even one of the rings of this chain to perform its mission properly may bring about the collapse of the whole system. For this direction, it is obvious that a strong ICT infrastructure, technology-driven architecture, and effective coordination are needed. In today's world where almost, all systems are digital and connected, naturally, customs processes are also digitalized. However, the fact that the transactions are carried out in the digital environment does not guarantee that we will encounter fast and easy customs procedures in the field. Therefore, besides SCPD in Turkey, there are various initiatives called E-Customs, paperless customs, paperless trade, online clearance, single-window, etc. to ensure a seamless clearance experience in the field. In this vein, both the suppliers and buyers on the B2B side and the consumers on the B2C side are directly affected by whether the customs procedures are easy and fast.

Besides regular and typical customs clearance processes such as declaration, inspection, and fund collection (Blegen 2020), the central aim of a customs administration is to establish a good balance between safety/control and speed/facilitation. Surely, there is a need for a multilateral and multinational support mechanism to remove the barriers to international trade and facilitate the clearance of direct-to-customer good sales operated via conventional and simplified customs declarations.

Although there are several studies examining the effects of COVID-19 on exports, (Qian and Yu 2020; Lin and Zhang 2020; Zhao et al. 2021; Barichello 2021; Kumari and Bharti 2021; Grassia et al. 2021; Sharma and Khanna 2022) the comparative and empirical studies focused on how the COVID-19 pandemic influences differ in the simplified customs clearance regime and the traditional customs clearance regime are not available yet in the literature. It is projected that in China in the first quarter of 2020 the exports flow would be lower than the previous year between 15 and 20% (Qian and Yu 2020). This rate is calculated at around 15% for the second quarter.

In the prediction made for the whole year, which allows us to better understand the effects of COVID-19, it is estimated that this decrease will recover in the third and fourth quarters and the contraction will be limited to 3–8% when 2020 is evaluated as a whole year. The positive or negative impact of Chinese exports from the pandemic differs according to the trading partner country (Zhao et al. 2021). In another study (Barichello 2021) conducted in Canada, specific to agricultural trade, it was determined that the pandemic had a positive impact on these product groups in terms of exports, with the effect of increasing commodity prices and increasing demand. Similar results have been found for agricultural products in China also (Lin and Zhang 2020). In another study (Kumari and Bharti 2021) using increased gravity and examining South Asian countries, it was found that COVID-19 had negative effects on exports. India and Nepal emerged as the countries least affected by the negative effects of COVID-19.

In addition, it should be noted that CBEC is more efficient than traditional commerce with a shorter delivery time (Abudurehman and Nilupaer 2021). While companies that adapt the E-Business models to their sales processes are successful to some extent, it is obvious that this potential is much more promising with E-Commerce (Madarac et al. 2021). E-Commerce has also provided a development opportunity for companies that have difficulties in realizing their value propositions due to the pandemic (Masoud et al. 2021).

3 Identification strategy, model, data, empirical specifications and empirical findings

3.1 Identification strategy

Assessing whether COVID-19 effects differentiated with respect to conventional and simplified customs operations is a challenging task. It is expected that exporters have switched from conventional procedures to simplified customs operations due to the unfavorable conditions during the COVID-19 period. This hypothesis is difficult to test and may be influenced by three sources of bias that must be addressed to accurately determine the impact of COVID-19 conditions.

The first source of bias comes from companies' export behavior of firms that use SCPD for smaller shipments and CCCD for larger shipments. That is, the use of SCPD instead of CCCD may have increased to the extent that the volume of export shipments from companies whose supply and demand weakened due to COVID-19 conditions decreased. This scenario is unlikely as the SCPD right of use is limited. A company has the right to export with SCPD only 5 times per month.² To extend

² Article 10/10 of the Communiqué on Customs Procedures for Goods Transported by Post and Express Cargo (serial number: 1) states: "Within the framework of the first and third subparagraphs of Article 126 (1)(a) of the Decision, goods may be released for free circulation for the same person under no more than five consignment notes in any one calendar month, whether they are of the same or different types. Please see <https://www.resmigazete.gov.tr/eskiler/2022/04/20220422-5.htm> for more details.

that, a company whose profit level has already decreased would not prefer SCPD over CCCD as the freight cost for SCPD is higher.³

The second source of bias comes from product heterogeneity. The impact of Covid-19 on exports would be different for different types of products. For example, a trader exporting raw materials or investment goods and a trader exporting consumer goods may react differently to COVID-19 conditions. In this respect, the export of SCPD, which is mainly characterized by the micro-export of consumer goods, would be less affected than that of CCCD, which is mainly characterized by the export of raw materials. This situation could lead to endogeneity. Therefore, we re-estimated the model with consumer goods exports for both modules and found that the baseline results remained unchanged.

The third source of bias comes from country heterogeneity. The main exporting countries are mostly developed countries. This could prevent Turkey's exports from declining, especially for micro exports during COVID-19. To test this potential endogeneity, we re-estimated the model with emerging markets and found that the baseline results remained consistent.

3.2 Model

The empirical models are established to reveal the role of the SCPD regime in reducing negative COVID-19 pandemic effects on export flows. In this context, we have two dummy variables that form our DiD framework. The first is the time dummy variable, which specifies the time before COVID-19 and the time after COVID-19. The second one is a custom-type dummy variable indicating SCPD and CCCD. According to our identification strategy, SCPD and CCCD demonstrate treated and control groups respectively while COVID-19 is the treatment.

We estimated the models step by step given in Eqs. (1–4) to test our hypothesis by employing the Difference in Difference (Eq. 1) and Causal Inference Methods (Eqs. 2, 3 and 4).

$$\ln rex_{ipym} = \beta_1 + \beta_2 cp_p + \beta_3 covid_{ym} + \beta_4 (cp_p \times covid_{ym}) + \beta_5 \ln r_{er_{iym}} + \gamma_{iy} + \delta_m + \varepsilon_{ipym} \quad (1)$$

$$\ln rex_{ipym} = \beta_6 + \beta_7 cp_p + \beta_8 cases_{iym} + \beta_9 (cp_p \times cases_{iym}) + \beta_{10} \ln r_{er_{iym}} + \gamma_{iy} + \alpha_{pym} + \varepsilon_{ipym} \quad (2)$$

$$\ln rex_{ipym} = \beta_{11} + \beta_{12} cp_p + \beta_{13} death_{iym} + \beta_{14} (cp_p \times death_{iym}) + \beta_{15} \ln r_{er_{iym}} + \gamma_{iy} + \alpha_{pym} + \varepsilon_{ipym} \quad (3)$$

$$\begin{aligned} \ln rex_{ipym} = & \beta_{16} + \beta_{17} cp_p + \beta_{18} cases_{iym} + \beta_{19} (cp_p \times cases_{iym}) + \beta_{20} death_{iym} \\ & + \beta_{21} (cp_p \times death_{iym}) + \beta_{22} \ln r_{er_{iym}} + \gamma_{iy} + \alpha_{pym} + \varepsilon_{ipym} \end{aligned} \quad (4)$$

³ SCPD transactions are performed by authorized airline cargo companies. This type of export is made by just air transportation, which is the most expensive mode of transportation.

where i stands for Turkey's importer country, p indicates the type of customs declaration, y and m denote the annual and monthly time series dimensions. $\ln rex_{ipym}$,⁴ the dependent variable, indicates the monthly export time series of two different types of customs declarations, namely conventional and simplified. cp_p is the dummy variable taking the value of one for simplified custom declarations and zero for conventional custom declarations. $covid_{ym}$ is a dichotomous variable separating pre-outbreak conditions and outbreak conditions and it assumes the zero for before Mar-2020 and alternatively one. $\ln rer_{iym}$ is the series of real exchange rates between Turkey and the country to which Turkey exports. $cases_{iym}$ and $death_{iym}$ are proxies of COVID-19 severities, which are confirmed cases and death statistics of countries to which Turkey exports. γ_{iy} is country-year fixed effects, δ_m is the month fixed effects and α_{pym} is custom declaration type-year-month fixed effects. ε_{ipym} are the error terms assumed zero means, constant variance, identically and independently distributed.

In our study, we direct our attention to specific coefficients—namely β_4 , β_9 , β_{14} , β_{19} , and β_{21} which are assigned to the interaction terms ($cp_p \times covid_{ym}$, $cp_p \times cases_{iym}$, and $cp_p \times death_{iym}$) composed of custom declaration type and COVID-19 variables. Our primary focus lies in understanding export behavior in response to the customs procedures under pandemic conditions.

These coefficients serve as quantitative barometers, providing insight into how export flows respond to the intricate interplay of custom declaration practices and the prevailing COVID-19 landscape.

Specifically, we seek to address a fundamental research question: To what extent do streamline customs procedures mitigate the adverse effects of COVID-19 on export flows?

We hypothesize that these interaction terms will yield coefficients favoring export activity. Because streamlined customs procedures—by reducing administrative friction at borders—play a pivotal role in alleviating the disruptive impact of pandemic condition.

Lastly, we explore the influence of exchange rates (represented by $(\beta_5, \beta_{10}, \beta_{15}$, and $\beta_{22})$ on export flows. Economic theory guides us here: An appreciating national currency (resulting from an increasing exchange rate) tends to enhance export competitiveness. The depreciation effect, in turn, encourages greater export activity. Our investigation thus weaves together the threads of custom practices, pandemic variables, and exchange rates—an essential endeavor for policymakers, practitioners, and researchers navigating the complexities of international trade.

3.3 Data

In our empirical analysis, we draw upon panel data encompassing 86 countries that constitute Turkey's export destinations (see Table 12 in the Appendix). This dataset spans 30 monthly time series, covering the period from January 2019 to June 2021.

⁴ The “ln” operators show logarithmically transformed variables.

Our primary interest lies in examining international trade variables, specifically the export values associated with Simplified Customs Procedure Declaration (SCPD) and Conventional Customs Clearance Declaration (CCCD). To ensure robustness and accuracy, we sourced this data from the database maintained by the Republic of Turkey Ministry of Trade.

The COVID-19 case and death statistics covering 86 countries were collected from the Oxford database. Oxford Covid data were used for the study. The OxCOVID19 Database endeavors to establish connections between diverse data modalities, as reported at both the national and regional levels. The OxCOVID19 Database integrates diverse data streams, including information on confirmed cases, fatalities, recoveries, and hospitalizations. Additionally, it captures government responses, such as school closures and economic interventions. The database also tracks human mobility trends across various locations. Furthermore, it incorporates weather-related data, encompassing factors like temperature, humidity, and precipitation. Lastly, it includes socioeconomic statistics and attitudinal surveys to provide a comprehensive view of the pandemic's impact and societal dynamics (Mahdi et al. 2021).

To understand the impact of COVID-19, we calculated normalized confirmed case and death statistics relative to the population. Additionally, we leveraged nominal dollar exchange rate and consumer price index data from the International Monetary Fund-International Financial Statistics (IMF-IFS) and Bureau of Industry and Security (BIS) databases to compute real exchange rates.

3.4 Empirical specification

In this section, we delve into the temporal dynamics of SCPD and CCCD, examining their growth patterns before and after the onset of the COVID-19 pandemic. To achieve this, we scrutinize the growth rates associated with these declaration types over specific time intervals. Tables 3 and 4 present the monthly and annual percentage growth rates for SCPD and CCCD, measured in dollar terms. Notably, in Table 3, SCPD exhibits superior growth performance in 8 out of 12 months during 2019. Conversely, CCCD outperforms SCPD in the 4 months of the same year. However, when considering the annual growth trend (Table 4), a different picture emerges. In 2019, CCCD demonstrates more successful growth than SCPD. Despite the annual growth rates for both declaration types being closely aligned in 2019 (0.42% for SCPD vs. 1.13% for CCCD), a pivotal shift occurs with the advent of 2020. Starting in 2020, SCPD experiences a remarkable turnaround. Its annual growth rate surpasses that of CCCD significantly. Specifically, in 2020, SCPD achieves a growth rate of 37.47% compared to CCCD's decline of -5.98% . This trend continues into 2021, where SCPD's growth rate (80.76%) far exceeds CCCD's (39.06%). Notably, from January 2020 to June 2021, SCPD consistently outperforms CCCD in terms of growth, demonstrating resilience even amidst pandemic-induced disruptions.

Figure 1 illustrates the growth rates of SCPD and CCCD trends, suggesting that their performance remained relatively similar until 2020. In subsequent periods, the

Table 3 Monthly growth trend (%)

Year	Month	SCPD	CCCD
2019	1	12.83	5.26
2019	2	23.37	3.17
2019	3	3.95	−1.77
2019	4	−6.97	3.79
2019	5	16.84	11.70
2019	6	−53.95	−15.40
2019	7	−5.00	7.05
2019	8	−3.09	0.72
2019	9	11.12	−2.30
2019	10	0.90	−2.20
2019	11	1.40	−0.12
2019	12	17.66	3.91
2020	1	12.47	4.75
2020	2	31.41	1.57
2020	3	6.20	−18.78
2020	4	−20.38	−42.20
2020	5	−9.57	−40.09
2020	6	151.22	15.48
2020	7	40.54	−6.82
2020	8	59.05	−5.33
2020	9	48.23	5.91
2020	10	59.79	6.81
2020	11	38.69	−1.44
2020	12	79.16	18.08
2021	1	51.64	2.78
2021	2	33.28	7.68
2021	3	78.04	42.78
2021	4	197.06	111.45
2021	5	86.60	61.55
2021	6	80.94	44.88

Growth rates are calculated based on the same month of the previous year

Table 4 Annually growth trend (%)

Year	SCPD	CCCD
2019	0.42	1.13
2020	37.47	−5.98
2021	80.76	39.06

The comparison is made with six months for 2021

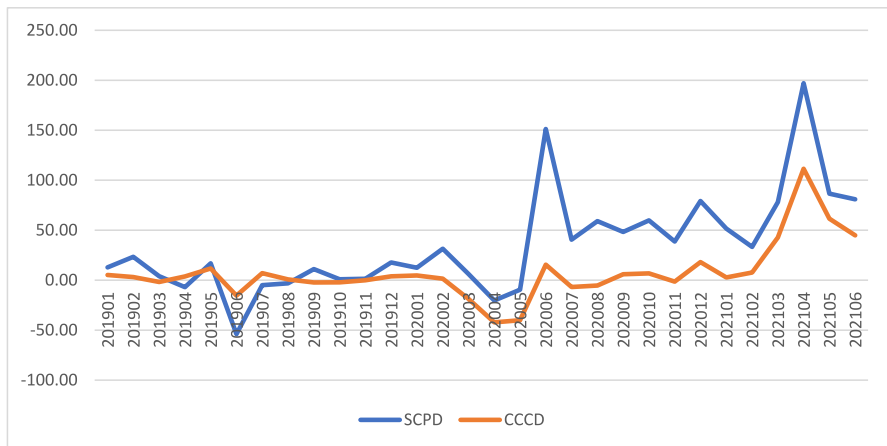


Fig. 1 Growth rate trends (%)

growth trend of SCPD consistently surpassed that of CCCD. Specifically, exports facilitated through SCPD exhibited a notably swifter increase compared to CCCD during the COVID-19 pandemic. These outputs support our story implying that the growth rate of export flow of SCPD becomes more prominent than CCCD with pandemic conditions.

Empirical literature also supports the fact that E-Trade operations restrict the negative COVID-19 effects during the pandemic period. Hayakawa et al. (2023) found that higher number of confirmed COVID-19 cases or deaths in both importing and exporting countries significantly reduced international trade. However, the development of E-commerce helped mitigate this negative impact. Similarly, using Ali International Station as a case study, Kučera and Zhang (2023) highlighted how support policies, digital trade investments, and other measures helped e-commerce sellers navigate this challenging period. Che et al. (2024) reached those provinces with more CBEC pilot zones experienced faster export growth and lower export prices post-pandemic. The study demonstrated that CBEC helped overcome the challenges of offline exports during the pandemic by shifting existing products to online platforms.

To sum up, both descriptive statistics and empirical literature support our hypothesis that E-Trade tools might be important to compensate unfavorable conditions raised from COVID-19.

3.5 Empirical findings

We predicted our model using the DiD and Causal Inference frameworks combined with high-dimensional fixed effects, which is an iterative approach throughout the estimation process. DiD estimation is a kind of experimental analysis comparing two different groups, in our case simplified and conventional custom regimes. Our empirical design is based on investigating the comparison of the impact of the

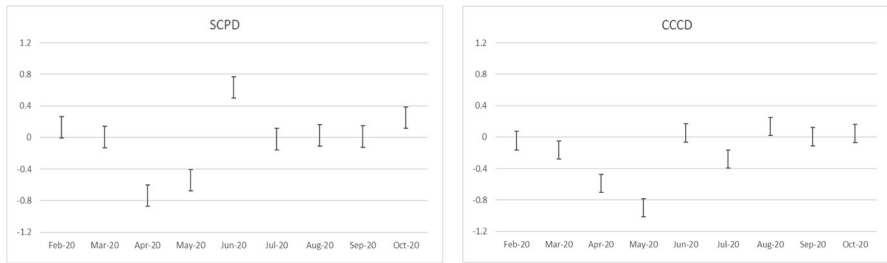


Fig. 2 Historical export trends

COVID-19 pandemic on the export flows of simplified and conventional types. Utilizing high-dimensional fixed effects, unobserved heterogeneity shared by the units in the panel cross-section can be absorbed as much as desired by creating a set of dummy regressors. In this way, we have taken into account intergroup variability, however, it can be computationally intensive and complicated. Fortunately, it provides minimal memory requirements with iteration processes rather than using an inverse matrix that contains large dimensions (Guimarães and Portugal 2010).⁵

We have conducted empirical analysis to observe the change in model results when different variables were added. Before applying the DiD and Causal Inference estimates, we first control for country group-year, and month fixed effects and estimate the models for both SCPD and CCCD, by taking into account real exchange rate movements, to investigate the export trends in 2020, which is assumed to be the start of the COVID-19 pandemic. The export trends of SCPD and CCCD presented in Fig. 2 have illustrated that they follow similar trends, although SCPD's export has been more resilient to the adverse pandemic shocks than CCCD's. The devastating impact of COVID-19 on the export level is felt deeply in the first and second quarters of 2020. After the second quarter, the downward trend of export died out and the growth trend resumed. These results are in line with the outputs of Qian and Yu (2020).

The results of the historical estimation model summarized in Table 5 also confirm the fact that the deterioration of export levels for both SCPD and CCCD starts in March 2020 and continues until June 2020. It should be noted that March 2020 can be nominated as the beginning of public awareness and sensitivity to the COVID-19 virus, which is spreading almost everywhere in the world. Hence, the unexpected shock from the COVID-19 virus, which hit almost every aspect of daily life including economic activities, highlights this devaluation at the export level. Although the export flows show recovery trend in June 2020, it can be observed that this recovery is statistically significant only for the export of SCPD. Furthermore, the export of CCCD is again declining in July 2020 and August 2020. The export of SCPD, on the other hand, does not show a significant positive

⁵ In the implementation of the estimation procedures, a dollar-based weighting is applied to increase the importance of countries to which Turkey exports and whose export share is higher.

Table 5 Historical estimations

Dependent variable (ln)	(1)	(2)
	SCPD	CCCD
Feb-20	0.128 [0.156]	−0.045 [0.117]
Mar-20	0.006 [0.130]	−0.163 [0.121]
Apr-20	−0.740*** [0.190]	−0.590 *** [0.127]
May-20	−0.544*** [0.173]	−0.901*** [0.128]
Jun-20	0.631*** [0.127]	0.053 [0.116]
Jul-20	−0.024 [0.108]	−0.278** [0.098]
Aug-20	0.025 [0.064]	−0.136* [0.092]
Sep-20	0.011 [0.075]	0.004 [0.095]
Oct-20	0.246* [0.144]	0.044 [0.088]
Inrer	0.515 [0.430]	−0.480 [0.362]
countryxyear FE	Yes	Yes
month FE	Yes	Yes
Observations	1978	1978
R2	0.928	0.951

*, ** and *** show at %10, %5 and %1 significance levels respectively

or negative trend during the same period and even underwent a significant positive trend in Oct-2020. The coefficients of the real exchange rate are insignificant.

In the second step, we re-estimated our model by adding a dummy variable covid starting in March 2020 and ending in June 2021. The findings presented in Table 6 indicate that the covid dummy encumbers the export of CCCD, whereas it does not significantly affect the export of SCPD. In contrast to the initial model results, the impact of real exchange rate movements is significantly felt for both types of customs declarations. As expected, real exchange rate movements influence export flows in a positive direction and appear to be stronger, especially for SCPD.

To deepen the empirical analysis, we employed the DiD and Causal Inference models. Table 7 presents baseline estimations of these models. The first column in Table 7 shows the DiD estimates with the interaction term cpxcovid. The first equation uses the country-year group and month as fixed effects. The remaining columns in Table 7 contain estimates for the causal inference analysis with cpx-cases and cpxdeath interaction terms.

Table 6 Estimations for Covid Dummy Variable

Dependent variable (ln)	(1)	(2)
	SCPD	CCCD
Covid	− 0.057 [0.072]	− 0.167*** [0.054]
lnrer	1.212*** [0.338]	0.820*** [0.207]
countryxyear FE	Yes	Yes
Month FE	Yes	Yes
Observations	1978	1978
R2	0.920	0.945

*, ** and *** show at %10, %5 and %1 significance levels respectively

Table 7 Baseline estimations

Dependent variable (ln)	(1)	(2)	(3)	(4)
Cpxcovid	0.261*** [0.066]			
Covid	− 0.242*** [0.077]			
Cp	− 5.551*** [0.037]			
Cases		− 0.00027** [0.000216]		− 0.000289 [0.000295]
Death			− 0.098 [0.00817]	0.000206 [0.0113]
Cpxcases		0.00054** [0.000194]		0.00084** [0.000383]
Cpxdeath			0.0121* [0.00701]	− 0.0150 [0.0153]
lnrer	1.016*** [0.314]	0.241 [0.541]	− 0.197 [0.536]	0.0214 [0.541]
countryxyear FE	Yes	Yes	Yes	Yes
cpxyearxmonth FE	No	Yes	Yes	Yes
Month FE	Yes	No	No	No
Observations	3956	3956	3956	3956
R2	0.950	0.953	0.953	0.953

The results in Table 7 in the first column show that the interaction term of cpx-covid is significant and positive. This implies that the export of SCPD is stronger than the export of CCCD against COVID-19 conditions such as lockdowns and fear of infection. The output is in line with our basic hypothesis mentioned in the introduction part. As in the second model, real exchange rate effects are significantly effective on export flows when the model is estimated by adding a covid dummy variable. The coefficients of covid and cp variables are significant and negative.

For the sake of robustness of the results obtained in the previous models and to elaborate the analyzes, we employed confirmed cases and deaths from COVID-19 virus instead of the covid dummy variable for each of the 86 countries to which Turkey exports. Moreover, country-year and custom declaration type-year-month fixed effects are employed in these estimations. According to the results of the second and third columns presented in Table 7, the coefficients of the interaction terms of *cpxcases* and *cpxdeath* have significant positive signs. However, when these two interaction variables *cpxcases* and *cpxdeath* are added and estimated in the model presented in column 4, we observed that the coefficient of *cpxcases* is significantly positive, while the coefficient of *cpxdeath* is not significant. Therefore, the interaction term of *cpxcases* appears to be stronger than the interaction term of *cpxdeath* on the export level. This result seems reasonable given the current circumstances. Since a person who gets infected has to leave the workforce until he/she completes the recovery time, economic activities such as export flows are expected to be affected by *cpxcases* rather than *cpxdeaths*.

The empirical findings related to COVID-19 reaffirm our initial hypothesis: export flows facilitated through the SCPD regime offer a safer method for exporters. The SCPD regime's streamlined processes, reduced paperwork, and digital interfaces prove advantageous, especially during pandemic circumstances. Importantly, SCPD minimizes close physical interaction during the export process, contributing to preventing the spread of the COVID-19 virus. In a time when health and safety are paramount, this becomes a critical advantage. While the pandemic has deeply impacted conventional export flows, SCPD emerges as a golden opportunity—adaptable, resilient, and positioned favorably in an ever-evolving global trade landscape.

3.5.1 Robustness check

Up to this stage, we have drawn a picture highlighting that export flows transacted through the SCPD regime exhibit strong resistance to adverse COVID-19 attacks. It should be noted, however, that trade is very heterogeneous in the face of COVID-19 shocks and is affected differently in terms of products and sectors. The COVID-19 pandemic has led to diverse responses across industries and product groups from the fashion and tourism sectors to global supply chains and stock markets. Each industry's approach to mitigating the impacts and enhancing resilience highlights the need for tailored strategies to navigate such unprecedented disruptions. COVID-19 pandemic had mixed effects on creative industries, with IT and software sectors benefitting while music and cultural events suffered (Khlystova et al. 2022).

Pandemic's effect on service sector growth and sustainability, highlighting the vital role of Information Technology and digitization in supporting economies and suggesting IT-based solutions to enhance responsiveness and mitigate losses (Xiang et al. 2021). In the hospitality sector, COVID-19 reduced consumer demand, job demand and affected the job structure (Bakar and Rosbi 2020; Yang and Han 2021). In California, about 60% of COVID-19 outbreaks in nonresidential, nonhealthcare worksites occurred in manufacturing, retail trade, and transportation/warehousing (Contreras et al. 2021). The construction industry faced significant disruptions,

leading companies to downsize, halt expansion, and invest in new technologies to remain competitive (Rhodes et al. 2022). In India, (Nayak et al. 2022) there has been reduced demand alongside operational challenges and halted infrastructure investments in the energy and power industry.

The agriculture sector is grappling with labor shortages, market access issues, and increased costs due to transportation restrictions. The education sector has faced closures of institutions and struggles in transitioning to online learning. Travel, tourism, and transport sectors have witnessed significant drops in demand, resulting in economic losses and operational difficulties due to social distancing measures. Meanwhile, the consumer electronics industry is dealing with shipment delays, a rise in counterfeit products, and disruptions in its supply chain. The fashion industry (Brydges and Hanlon 2020) responded swiftly to COVID-19 but unevenly, exacerbating existing inequalities. Brands closed retail stores, transitioned to E-Commerce sales, and began manufacturing personal protective equipment.

A similar differentiation may exist between SCPD and CCCD. That is, the SCPD regime has limited use, especially suitable for micro exports.⁶ By nature, micro exports are mostly specialized with consumer goods.⁷ In this context, on one hand, in 2021, approximately 67% of the total export of SCPD is consumer goods whereas only nearly 37% of the total CCCD export flows are composed of consumer goods. The lion share belongs to intermediate goods for the export of CCCD with 52%. This means that the outputs of our models would be biased because the product types of SCPD and CCCD are different. Therefore, we equated the product type of both declarations as the dominant consumer goods in the CCCD. With another saying, to check the robustness of our findings, we reestimated the model by using the total export flows of SCPD and the export flows of consumer goods of CCCD.

The findings presented in Table 8 closely mirror those reported in Table 6. Notably, the exchange rate coefficients for Conventional Customs Clearance Declaration (CCCD) remain positive and significant across both models. However, their responsiveness to exchange rate fluctuations differs: elastic for consumer goods and inelastic for total exports. Turning to the DiD (Difference-in-Differences) and Causal Inference models, which incorporate interaction terms (summarized in Table 9), we observe consistent patterns akin to the previous models in Table 7. These results reinforce our baseline conclusion: exports under the Simplified Customs Procedure Declaration (SCPD) regime exhibit greater resilience than those under the conventional regime. Moreover, the SCPD regime displays a robust recovery trend. In summary, our findings validate the hypothesis that pandemic conditions do not hinder SCPD export volumes relative to CCCD. Instead, they present an opportunity for export expansion, given SCPD's streamlined processes that reduce face-to-face interactions. From an alternative perspective, COVID-19 has catalyzed shifts in export behavior, creating meaningful avenues for SCPD trade expansion—a result consistent with

⁶ SCPD offers considerable simplifications for custom procedures as mentioned in Table 2 in the introduction part, however, it is limited to 15,000 Euro and 300 kg for exportation.

⁷ The export of consumer and intermediate goods are calculated based on Broad Economic Classification (BEC).

Table 8 Estimations of consumption goods for covid dummy variable

Dependent variable (ln)	(1)	(2)
	SCPD	CCCD
Covid	− 0.022 [0.429]	− 0.143*** [0.036]
lnrer	0.946*** [0.173]	1.141*** [0.151]
countryxyear FE	Yes	Yes
Month FE	Yes	Yes
Observations	1978	1978
R2	0.974	0.973

*, ** and *** show at %10, %5 and %1 significance levels respectively

Table 9 Estimations for Consumption Goods

Dependent variable (ln)	(1)	(2)	(3)	(4)
cpxcovid	0.322*** [0.088]			
Covid	− 0.244** [0.115]			
cp	− 5.021*** [0.054]			
Cases		− 0.000466 [0.000390]		− 0.000269 [0.000399]
Death			− 0.023 [0.0153]	− 0.0150 [0.0152]
cpxcases		0.00125** [0.000507]		0.00119** [0.000383]
cpxdeath			0.034* [0.0188]	0.00402 [0.0189]
lnrer	1.043*** [0.377]	− 0.233 [1.232]	− 0.263 [1.277]	0.0201 [1.235]
countryxyear FE	Yes	Yes	Yes	Yes
cpxyearamonth FE	No	Yes	Yes	Yes
Month FE	Yes	No	No	No
Observations	3956	3956	3956	3956
R2	0.945	0.947	0.947	0.947

*, ** and *** show at %10, %5 and %1 significance levels respectively

prior research in the existing literature (Madarac et al. 2021; Masoud et al. 2021; Afridi et al. 2021; Abudurehman and Nilupaer 2021; Hayakawa et al. 2023).

Turkey's main trading partners are mostly developed countries. For example, more than 40% of Turkey's total exports go to the European Union region. In this scenario, the results might be biased because Turkey's importing countries already have strong economic conditions. To overcome this problem, we eliminated developed countries from the data set and estimated the models only for emerging market

Table 10 Estimations of emerging markets for Covid dummy variable

Dependent variable (ln)	(1)	(2)
	SCPD	CCCD
Covid	− 0.060 [0.093]	− 0.147** [0.064]
lnrer	1.371*** [0.471]	0.825*** [0.262]
countryxyear FE	Yes	Yes
Month FE	Yes	Yes
Observations	1173	1173
R2	0.902	0.935

*, ** and *** show at %10, %5 and %1 significance levels respectively

Table 11 Estimations for emerging markets

Dependent variable (ln)	(1)	(2)	(3)	(4)
cpxcovid	0.248*** [0.079]			
Covid	− 0.228** [0.091]			
cp	− 5.724*** [0.044]			
Cases		− 0.000564** [0.000277]		− 0.000640* [0.000367]
Death			− 0.0183* [0.0095]	0.00213 [0.0133]
cpxcases		0.00114*** [0.000248]		0.00163*** [0.000461]
cpxdeath			0.0275*** [0.0075]	− 0.02357 [0.0180]
lnrer	1.098*** [0.383]	0.190 [0.592]	0.127 [0.580]	0.155 [0.592]
countryxyear FE	Yes	Yes	Yes	Yes
cpxyearxmonth FE	No	Yes	Yes	Yes
Month FE	Yes	No	No	No
Observations	2346	2346	2346	2346
R2	0.948	0.951	0.951	0.951

*, ** and *** show at %10, %5 and %1 significance levels respectively

economies.⁸ The results shown in Tables 10 and 11 for the export flows of emerging markets show that the results are consistent with our baseline results. This means that our results are also robust for emerging markets.

⁸ The country classifications are based on International Money Fund (IMF) classification.

4 Conclusion, results and discussion

The unexpected pandemic has affected the daily habits of households and businesses, as well as the way business is done. New business opportunities such as e-commerce, which adapts to the conditions of the outbreak, have emerged. Accordingly, the simplified customs procedure, also known as the e-commerce customs procedure, can be nominated as another harmonized option with the COVID-19 processes, as it provides the chance to make exports without the need for close interactions. To this end, we empirically examined the role of the simplified customs procedure in the COVID-19 framework by using the DiD and Causal Inference approaches in combination with high-dimensional fixed effects. The panel data set used in this study consists of 86 countries that Turkey exports to (via conventional and simplified forms) and monthly time series covering the period 2019:01–2021:06.

To test our hypothesis, we estimated the multiple models. The results suggest that the simplified custom procedure is more resilient to the devastating effects of COVID-19 and helps to compensate for the loss of Covid. We further estimated the models by switching the Covid dummy variable with the number of cases and deaths caused by COVID-19. Both interaction terms show significantly positive coefficients, implying that the simplified mode of transport plays an important role in the growth of export volume. Since micro export is generally appropriate for the export of consumer goods, we estimated the models by altering the total export of conventional goods with the export of consumer goods. Furthermore, considering that the results could be biased as Turkey's export partners are mainly industrialized countries, the estimates were conducted with developing countries to check the robustness of the baseline findings. Our baseline findings are verified in these equations highlighting that the results are robust depending on the different product types and emerging markets.

This study proposes some policy implications. The findings point out that the pandemic of COVID-19 has pushed households and companies to apply improved solutions that help to continue to export operations. Simplified custom regime is an example of these solutions and this regime could be seen as one of the repairing opportunities for COVID-19 damages. Moreover, it should be noted that simplified custom regime is generally used for CBEC type trade. Therefore, policymakers had better focus on facilitating e-commerce and they should make considerable investments to achieve this goal. Comprehensive and qualified education programs could be employed for companies to encourage them to use e-commerce trade. Policymakers should prioritize support, especially for B2B operations since their trade volume is much larger than B2C operations.

This paper explores whether simplified custom clearance regime, mostly used in e-commerce transactions, blocks the negative effects of outbreak conditions generally arising from comprehensive lockdowns and breaking supply chains. Notwithstanding, this is a recent topic and there are a lot of ways to go for researchers. While our findings warrant empirical validation through additional studies, including examples from different countries, there is also room to deepen the analysis by considering various product types. Exploring the heterogeneous responses of different products would enhance our understanding.

The COVID-19 pandemic has stressed the vital importance of facilitating international trade and removing tariff and non-tariff barriers for accessing goods, especially essential products. Similarly, in potential crisis scenarios akin to COVID-19, CBEC emerges as a valuable trade mechanism that can be swiftly and effectively deployed. This study highlights the critical role that CBEC plays in facilitating trade, as recognized by policymakers, market professionals, and all other CBEC stakeholders. Consequently, stakeholders' competencies in areas such as customs procedures, digitalization, logistics and supply chain, and international payment systems present an opportunity for improvement.

Appendix

See Table 12.

Table 12 Country list

	Country name		Country name		Country name
1	France	31	Moldova	62	Argentina
2	Netherlands	32	Russia	63	Iraq
3	Germany	33	Azerbaijan	64	Israel
4	Italy	34	Kazakhstan	65	Jordan
5	United Kingdom	35	Slovenia	66	Saudi Arabia
6	Ireland	36	Croatia	67	Kuwait
7	Denmark	37	Bosnia and Herzegovina	68	Bahrain
8	Greece	38	Serbia	69	Qatar
9	Portugal	39	Morocco	70	UAE
10	Spain	40	Algeria	71	Oman
11	Belgium	41	Tunisia	72	Pakistan
12	Luxembourg	42	Egypt	73	India
13	Iceland	43	Burkina Faso	74	Bangladesh
14	Norway	44	Ghana	75	Nepal
15	Sweden	45	Cameroon	76	Thailand
16	Finland	46	Kenya	77	Indonesia
17	Austria	47	Rep. of South Africa	78	Malaysia
18	Switzerland	48	USA	79	Singapore
19	Malta	49	Canada	80	Philippines
20	Estonia	50	Mexico	81	China
21	Latvia	51	Honduras	82	South Korea
22	Lithuania	52	Costa Rica	83	Japan
23	Poland	53	Panama	84	Hong Kong
24	Czechia	54	Bahamas	85	Australia
25	Slovakia	55	Dominican Rep	86	New Zealand
26	Hungary	56	Colombia		
27	Romania	57	Peru		
28	Bulgaria	58	Brazil		
29	Albania	59	Chile		
30	Ukraine	60	Bolivia		

Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article.

References

- Abudurehman A, Nilupaer A (2021) Optimization model design of cross-border e-commerce transportation path under the background of prevention and control of COVID-19 pneumonia. *Soft Comput* 25:12007–12015
- Afolayan AO, de la Harpe AC (2020) The role of evaluation in SMMEs' strategic decision-making on new technology adoption. *Technol Anal Strateg Manag* 32:697–710. <https://doi.org/10.1080/09537325.2019.1702637>
- Afridi FEA, Jan S, Ayaz B, Irfan M (2021) The impact of Covid-19 on E-business practices and consumer buying behavior in a developing country. *Rev Amazon Invest* 10:97–112. <https://doi.org/10.34069/ai/2021.38.02.9>
- Aitken B, Hansonb GH, HarrisonCSd AE (1997) INTERNATIONAL ECONOMICS Spillovers, foreign investment, and export behavior. *J Int Econ* 43(1–2):103–132
- Al-Shbail T (2020) The impact of risk management on revenue protection: an empirical evidence from Jordan customs. *Transform Gov People Process Policy* 14:453–474. <https://doi.org/10.1108/TG-02-2020-0025>
- Ancillai C, Sabatini A, Gatti M, Perna A (2023) Digital technology and business model innovation: a systematic literature review and future research agenda. *Technol Forecast Soc Change* 188:122307. <https://doi.org/10.1016/J.TECHFORE.2022.122307>
- Bakar NA, Rosbi S (2020) Effect of Coronavirus disease (COVID-19) to tourism industry. *Int J Adv Eng Res Sci* 7:189–193. <https://doi.org/10.22161/ijaers.74.23>
- Barichello R (2021) Revisiting the effects of the COVID-19 pandemic on Canada's agricultural trade: the surprising case of an agricultural export boom. *Can J Agric Econ/revue Canadienne D'agroéconomie* 69:251–260. <https://doi.org/10.1111/cjag.12285>
- Blegen BC (2020) Re-examining border clearance in the age of e-commerce. *World Cust J* 14:81–98
- Brydges T, Hanlon M (2020) Garment worker rights and the fashion industry's response to COVID-19. *Dialog Hum Geogr* 10:195–198
- Buckley PJ, Casson MC (1998) Analyzing Foreign Market Entry Strategies: Extending the Internalization Approach. *J Int Bus Stud* 29:539–561. <https://doi.org/10.1057/palgrave.jibs.8490006>
- Che Y, Yuan M, Zhang Y, Zhao L (2024) Cross-border E-commerce and China's Exports during the COVID-19 Pandemic. *Chin World Econ* 32:215–242. <https://doi.org/10.1111/cwe.12537>
- Contreras Z, Ngo V, Pulido M et al (2021) Industry sectors highly affected by worksite outbreaks of coronavirus disease, Los Angeles County, California, USA, march 19–September 30, 2020. *Emerg Infect Dis* 27:1769–1775. <https://doi.org/10.3201/eid2707.210425>
- Dreger C, Herzer D (2013) A further examination of the export-led growth hypothesis. *Empir Econ* 45:39–60. <https://doi.org/10.1007/s00181-012-0602-4>
- Grassia M, Mangioni G, Schiavo S, Traverso S (2021) (Unintended) Consequences of export restrictions on medical goods during the Covid-19 pandemic. *J Complex Netw.* <https://doi.org/10.1093/comnet/cnab045>
- Greenaway D, Morgan W, Wright P (1999) Exports, export composition and growth. *J Int Trade Econ Dev* 8:41–51. <https://doi.org/10.1080/09638199900000004>
- Gu S, Ślusarczyk B, Hajizada S et al (2021) Impact of the covid-19 pandemic on online consumer purchasing behavior. *J Theor Appl Electron Commer Res* 16:2263–2281. <https://doi.org/10.3390/jtaer16060125>
- Guimarães P, Portugal P (2010) A simple feasible procedure to fit models with high-dimensional fixed effects. *Stata J Promot Commun Stat Stata* 10:628–649. <https://doi.org/10.1177/1536867X1101000406>
- Hayakawa K, Mukunoki H, Urata S (2023) Can e-commerce mitigate the negative impact of COVID-19 on international trade? *Jpn Econ Rev* 74:215–232. <https://doi.org/10.1007/s42973-021-00099-3>
- IMF (2020) World economic outlook: the great lockdown. International Monetary Fund, Washington DC

- Karaboga K, Gungor MA (2021) Cross-Border E-Commerce (E-Export) Methods and problems encountered. In: Ene S (ed) Current marketing studies and digital developments. Livre de Lyon, Lyon, pp 73–96
- Khlystova O, Kalyuzhnova Y, Belitski M (2022) The impact of the COVID-19 pandemic on the creative industries: a literature review and future research agenda. *J Bus Res* 139:1192–1210. <https://doi.org/10.1016/j.jbusres.2021.09.062>
- Kučera J, Zhang Y (2023) Research on the development path of China's cross-border e-commerce industry under the COVID epidemic. *SHS Web Conf* 160:01009. <https://doi.org/10.1051/shsconf/202316001009>
- Kumar M, Nargis BA (2020) Export-led growth hypothesis: empirical evidence from selected South Asian countries. *Asian J Econ Model* 8:1–15. <https://doi.org/10.18488/journal.8.2020.81.1.15>
- Kumari M, Bharti N (2021) Estimating the impact of COVID-19 on South Asia's exports: does trade facilitation matter now more than ever? *Transnatl Corp Rev* 13:406–421. <https://doi.org/10.1080/19186444.2021.1911280>
- Laufs K, Schwens C (2014) Foreign market entry mode choice of small and medium-sized enterprises: a systematic review and future research agenda. *Int Bus Rev* 23:1109–1126. <https://doi.org/10.1016/j.ibusrev.2014.03.006>
- Li L, Su F, Zhang W, Mao JY (2018) Digital transformation by SME entrepreneurs: a capability perspective. *Information systems journal*. Blackwell Publishing Ltd, pp 1129–1157
- Lin B, Zhang YY (2020) Impact of the COVID-19 pandemic on agricultural exports. *J Integr Agric* 19:2937–2945. [https://doi.org/10.1016/S2095-3119\(20\)63430-X](https://doi.org/10.1016/S2095-3119(20)63430-X)
- Madarac SM, Filipovic Z, Eljuga M (2021) E-commerce in trade companies during the conditions of a pandemic crisis – case studies. In: *EU 2021 – The Future of The EU in and after the Pandemic*. pp 728–745
- Mahdi A, Błaszczyk P, Dłotko P et al (2021) OxCOVID19 Database, a multimodal data repository for better understanding the global impact of COVID-19. *Sci Rep* 11:9237. <https://doi.org/10.1038/s41598-021-88481-4>
- Masoud T, Khaled N, Ali S, Abdullah S (2021) The evolution of the e-business value cycle through value co-creation during the COVID-19 pandemic: an empirical study from Iran. *Mojtaba MOSHTAGHI/J Asian Finance* 8:19–0028. <https://doi.org/10.13106/jafeb.2021.vol8.no10.0019>
- Mastercard Economics Institute (2021) Economic Outlook 2021: The 'E-Economy' is here to stay
- Mookerjee R (2006) A meta-analysis of the export growth hypothesis. *Econ Lett* 91:395–401. <https://doi.org/10.1016/j.econlet.2005.12.020>
- Nayak J, Mishra M, Naik B et al (2022) An impact study of COVID-19 on six different industries: automobile, energy and power, agriculture, education, travel and tourism and consumer electronics. *Expert Syst*. <https://doi.org/10.1111/exsy.12677>
- Ozturk I, Acaravci A (2010) Testing the export-led growth hypothesis: empirical evidence from Turkey. *J Dev Areas* 44:245–254. <https://doi.org/10.1353/jda.0.0079>
- Pan Y, Tse DK (2000) The Hierarchical Model of Market Entry Modes. *J Int Bus Stud* 31:535–554
- Qian W, Yu Z (2020) The impact of the COVID-19 pandemic on China's imports and exports in 2020 and countermeasures. *J Shandong Inst Adm* 2020:96–104
- Rhodes O, Rostami A, Khodadadyan A, Dunne S (2022) Response strategies of UK construction contractors to COVID-19 in the consideration of new projects. *Buildings*. <https://doi.org/10.3390/buildings12070946>
- Safaeimanesh S, Jenkins GP (2021) Trade facilitation and its impacts on the economic welfare and sustainable development of the ecowas region. *Sustainability* 13:1–22. <https://doi.org/10.3390/su13010164>
- Sharma C, Khanna R (2022) Assessing asymmetric determinants of commodity-level exports: the role of policy responses to the COVID-19 pandemic. *Appl Econ* 54:5176–5189. <https://doi.org/10.1080/00036846.2022.2041179>
- Shepherd B, Wilson JS (2009) Trade facilitation in ASEAN member countries: measuring progress and assessing priorities. *J Asian Econ* 20:367–383. <https://doi.org/10.1016/j.asieco.2009.03.001>
- Siliverstovs B, Herzer D (2006) Export-led growth hypothesis: evidence for Chile. *Appl Econ Lett* 13:319–324. <https://doi.org/10.1080/13504850500407293>
- Tolstoy D, Nordman ER, Hånell SM, Özbek N (2021) The development of international e-commerce in retail SMEs: An effectuation perspective. *Journal of World Business* 56. <https://doi.org/10.1016/j.jwb.2020.101165>

- Wang W, Ning Z, Shu Y et al (2023) ICT interaction with trade, FDI and financial inclusion on inclusive growth in top African nations ranked by ICT development. *Telecomm Policy* 47:102490. <https://doi.org/10.1016/j.telpol.2023.102490>
- Wilson JS, Mann CL, Otsuki T (2003) Trade facilitation and economic development: a new approach to quantifying the impact. *World Bank Econ Rev* 17:367–389. <https://doi.org/10.1093/wber/lhg027>
- Wu R, Chiou JR (2021) Retesting the learning-by-exporting theory: an investigation of chinese manufacturers' productivity under globalization. *Atl Econ J* 49:71–85. <https://doi.org/10.1007/s11293-021-09696-4>
- Xiang S, Rasool S, Hang Y et al (2021) The effect of COVID-19 pandemic on service sector sustainability and growth. *Front Psychol* 12:633597
- Yang M, Han C (2021) Revealing industry challenge and business response to Covid-19: a text mining approach. *Int J Contemp Hosp Manag* 33:1230–1248. <https://doi.org/10.1108/IJCHM-08-2020-0920>
- Zhao Y, Zhang H, Ding Y, Tang S (2021) Implications of COVID-19 pandemic on China's exports. *Emerg Mark Financ Trade* 57:1716–1726. <https://doi.org/10.1080/1540496X.2021.1877653>
- Zhu Z-Y, Xie H-M, Chen L (2023) ICT industry innovation: Knowledge structure and research agenda. *Technol Forecast Soc Change* 189:122361. <https://doi.org/10.1016/j.techfore.2023.122361>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.

Authors and Affiliations

Omer Faruk Derindag¹  · Zaim Reha Yasar² · Caglayan Aslan³ · Salih Parmaksiz⁴

✉ Omer Faruk Derindag
omer.derindag@inonu.edu.tr

Zaim Reha Yasar
reha@kku.edu.tr

Caglayan Aslan
c.aslan3@ticaret.gov.tr

Salih Parmaksiz
salihparmaksiz@isparta.edu.tr

¹ International Trade, Inonu University, Malatya, Türkiye

² Economics, Kirikkale University, Kirikkale, Türkiye

³ Republic of Turkey Ministry of Trade, Foreign Trade Statistics and OSTIM Technical University, Ankara, Türkiye

⁴ Rectorate, Isparta University of Applied Science, Isparta, Türkiye