Communication

E.U. and China Trends in Trade in Challenging Times

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Abstract: The sudden and abrupt rise of COVID-19 became a challenge for the world economy. In this paper, we investigate the changes in a trend of mutual trade between the EU-15 countries and China during the demanding times of the COVID-19 crisis. We use monthly data for Chinese exports to the E.U. (2018:01–2020:05) and imports from the E.U. (2018:01–2020:07) relying on the data from the open-source TradeMap developed by the International Trade Centre UNCTAD/WTO (ITC). Overall, there is an obvious decline of 13–32 percent in worldwide trade as predicted by the WTO. This affected China as the main trading partner of electronic devices and medical supplies. The trade between the E.U. and China has decreased, but the major change in demand brought an alteration in commodities structures and the reorientation of Chinese export production. In the first five months of 2020, we witnessed the strong engagement of the Chinese economy in the production of goods newly in high demand—mainly articles strongly related to healthcare and medical equipment. Thus, we have observed that the Chinese were very flexible in changing the structure of their exports triggered by the COVID-19 crisis. This flexibility is worth further exploration, especially because the COVID-19 crisis is still not over and new data and changing results can be expected.

Keywords: export; import; international trade; the flexibility of production; China; E.U.

1. Introduction

The aim of this paper is to investigate trade relations between the two largest world economic centers, the E.U. and China, and how they were affected by the COVID-19 crisis. Our motivation is to explore the changes in mutual economic relations resulting from the pandemic and to assess how the Chinese economy has reacted to this challenge. The theoretical framework of our analysis relies on the export-led growth theory, which suggests that exports generate economic growth by increasing efficiency in the allocation of production factors and also by growing their volume. Balassa's theory is especially relevant for emerging and developing countries (Balassa 1978; Berry 1984). Within the framework of the development policy, the import-substitution paradigm is replaced by the export-led growth paradigm. This paradigm started to form in the late 1970s (Palley 2012). In line with this thesis, increasing the efficiency of production factors generates economic growth (Ojaghlou 2019).

Palley (2012) states that there was a consensus among economists on the export-led growth hypothesis. It is based on three strains: Heckscher−Ohlin−Samuelson's comparative advantage theory, the benefits of openness for controlling rent-seeking behaviour, and benefits of openness for growth. The export-led growth strategy was first applied by Germany and Japan in the 1950s and 1960s. Then it was employed by East Asian Tigers during the 1970s and 1980s. In the 2000s, China started to apply it. However, Bello (2011) claims that China had adopted the export-led growth strategy already in 1984. In contradiction to this, Palley (2012) argues that no country or region can act as the lone locomotive of global growth. In this paper, we ask a question: "Does export from China dominate global trade?", "How has the arrival of COVID-19 transformed the situation?"

In developing economies, we can distinguish three periods of this process: an inward-oriented strategy in the 1940s−1970s, the outward-oriented strategy of export substitution in the 1960s to 1970s, and strongly outward-oriented trade in the export-led growth strategy (Jinjun 1995). Jinjun (1995) showed that Chinese strategy was changing: in the first period, China kept a balance of effective protection rates of imports and exports until 1987. Subsequently, in 1988, China applied the "Export Contract Responsibility System." The system gives more freedom to companies and individuals, and it partially takes away control from central government.

Several papers investigate the export-led growth hypothesis for different countries. Shan and Sun (1998) investigated the hypothesis and summarized the previous literature starting from Balassa (1978) to Bodman (1996). The majority of papers analyzed in Shan and Sun (1998) supports the hypothesis, although several of them offer an inverse conclusion. One of the latest articles by Liu, Dimitris and Yang (Liu et al. 2019) used the most recent available data and concluded that export has an important role in Chinese growth. Moreover, after the 2009 crisis, the Chinese economy was still export-oriented with growing GDP in both the short and long-run.

In our exploration, we use the E.U. 15 countries to represent Europe. We use monthly data on the bilateral trade between China and the E.U. 15 for the period 2018–2020. We found that China has reacted very flexibly to the challenges brought by COVID-19 and, up to now (December 2020), we have witnessed that the economy has been slowed down. Nevertheless, it seems that the Chinese have succeeded in avoiding the second and third waves of the pandemic, which are affecting the other world economic centers—the E.U. and the U.S.A.

Our paper offers three contributions to the literature. First, it is a paper that investigates international trade between trade centers, namely Europe and China. Secondly, our analysis shows that the reorientation of Chinese production patterns is due to COVID-19. Thirdly, the data we use for our analysis is the monthly bilateral trade data between E.U. and China.

In our analysis, we have verified that China has flexibly adjusted to the increased demand for protective medical equipment due to COVID-19 to satisfy the dramatically expanded requirements from various parts of the world, including Europe.

An economic slowdown has been apparent in all the major economic centers of the world, the E.U., the U.S.A., and China, since 2018. This has, inevitably, impacted the scope of trade among these three centers Xu (2019); Chen, Zhao, Lai, Wang, and Xia (Chen et al. 2019); Xu (2019); Civín and Smutka (2020); Oravský, Tóth, and Bánociová (Oravský et al. 2020) and Thorbecke (2020).

Before, world exports had been steadily increasing since the major financial crisis in 2009, when it reached a minimum level of 19,255 trillion USD. Subsequently, there was a slowdown, in 2016, following several events, starting with the January fall in the Chinese stock market, which was echoed in stock markets around the world due to the increased importance of the Chinese economy. Furthermore, the British government decided to leave the E.U., after 23 years, in June 2016. These factors had a significant impact on the OPEC countries as shown by their decision to cut crude oil production, which impacted the oil-producing countries.

Moreover, there was the end of sanctions against Iran. Several measures were put in place by President Trump affecting the U.S. market—modifications of the NAFTA agreement, which was perceived by President Trump as unfavourable to the U.S.A., complaints against the devaluation of Chinese Yuan and promises to tax more heavily American firms which placed production overseas and freeing funds to support the American economy. For more details, see The Economic Times News (2018).

Although world trade was growing in 2018, the growth of world merchandise trade was lower than predicted by the World Trade Statistical Review 2019 (WTO 2019). In 2019, the declining trend continued because of trade tensions. Growth had slowed because of weaker output growth in the major economies and "The loss of momentum in trade and

GDP [which] is partly due to tighter monetary policy, increased financial volatility and the raising of tariffs on widely traded goods in major economies. Trade tensions appear to have contributed significantly to the slowdown" see Figure 1.[1] Nevertheless, the major and more abrupt decline came early in 2020 with the arrival of the pandemic, which is having an impact on virtually all production sectors and slowing commerce in all the major centers of world trade.
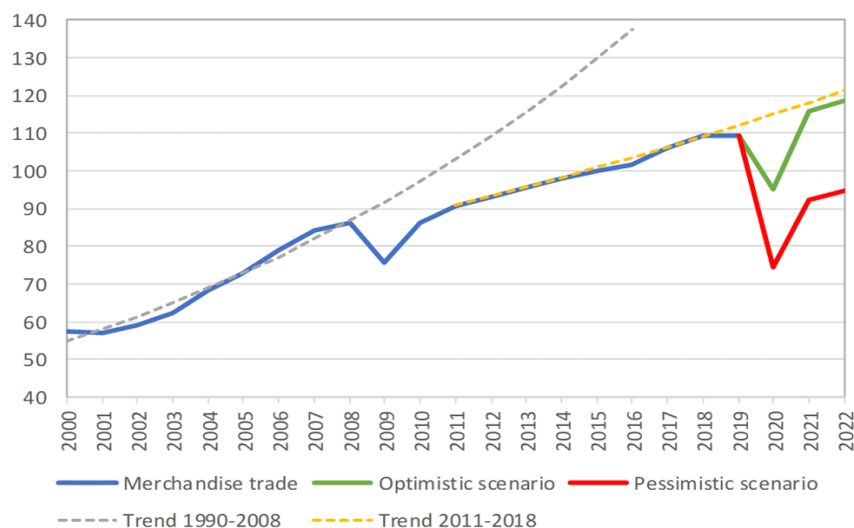

Figure 1. World merchandise trade volume, 2000–2022 Index, 2015 = 100, Source: WTO Secretariat. https://www.wto.org/english/news_e/pres20_e/pr855_e.htm (accessed on 31 October 2020).

The graph depicts world merchandise trade volumes, starting in 2000, including optimistic and pessimistic predictions. (It already included predictions of the COVID-19 crisis.) This graph was created by the World Trade Organization, early in 2020; see details in footnote 1.

In late December 2019, a previously unidentified coronavirus was reported in the Huanan Seafood Wholesale Market in Wuhan, Hubei, China. This virus is the cause of a disease officially named Coronavirus Disease−2019 (COVID-19), that has spread across the world (Wu et al. 2020; McAleer 2020). COVID-19 has had a major negative social and economic effect on the regions of the world regardless of income level, and it continues to do so. According to UNIDO (2020), the impacts are felt on industrial production, trade, international trade, manufacturing, education, etc., (Zhang et al. 2020; Wang et al. 2020). For this reason, countries all over the world have implemented both economic and social measures.

On 17 March 2020, the European Council and the European Commission announced some measures in response to the COVID-19 outbreak. On 14 March 2020, the export of "personal protective equipment" was restricted for destinations outside the E.U. The E.U. Member States endorsed "Guidelines for border management measures." Other restrictions came from the World Trade Organization; "WTO Appellate Body jurisprudence, it appears that the current measures may be justified on the grounds of Article XI:2 of the GATT as temporary measures because of critical shortages of essential goods" (Carreño et al. 2021).

This paper is structured as follows: Part one provides the introduction and motivation. Part two analyzes the previous literature. The third part concentrates on the background and macroeconomic conditions of China. Part four explains the methodology used and data limitations, whilst the fifth part explains the data and provides an analysis of international trade between the E.U. and China. Part six comments on our findings and provides the

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[1] 855PRESS RELEASE 8 April 2020. Trade Set to Plunge as COVID-19 Pandemic Upends Global Economy. Available online: https://www.wto.org/english/news_e/pres20_e/pr855_e.htm (accessed on 28 January 2021).

conclusions of the study. It concludes by explaining the limitations of the study and suggesting areas for future research.

2. Previous Literature

Earlier academic literature on world economic trade observed, even before 2020, that an economic slowdown was apparent in all the major economic centers of the world. Xu (2019) characterized the four major factors that impeded China's economic growth: the falls in consumption demand, investment demand, and export demand. Del Rio Lopez and Mora (2019) claimed, in the World Economic Outlook, that they saw behind the slowdown, among other factors, the possible proliferation of protectionist measures, and severe financial market adjustments. Similar analyses were also performed in the U.S.A. For example, authors Akcigit and Ates (2019) claimed that the heavy use of intellectual property protection by market leaders to limit the diffusion of knowledge contributed to the economic slowdown.

To understand the development of China, before the rapid expansion of its international trade coupled with its massive involvement in production value chains, we need to recall that China was often contrasted with developed Western economies (Rosenberg and Boyle 2019; Elia et al. 2020). Its strong position has been built over decades, starting from an unimportant Third World country to becoming a dominant production and trade centre. Nowadays, China is a key player in world international trade with a dominant impact on all continents (Baldwin and Freeman 2020; Vlados 2020; Gouvea et al. 2019). Its development can be witnessed by a theory of the international trade of developing countries as well as by world statistics. China is a special case, and its development was not even, e.g., Stiglitz (2008); Cimoli, Dosi and Stiglitz, (Cimoli et al. 2020).

Furthermore, China has been the origin of many innovations which are also supported by the government, as we point out in the section Background and Macroeconomic conditions, where we have highlighted a ten-year plan to strengthen the Chinese position in the manufacturing of high-value-added products (Bencivelli and Tonelli 2020). More on innovations in China can be found in (Babenko et al. 2020; Cheng et al. 2021). However, some authors also claim that the Chinese innovation process is being slowed down by institutional weaknesses (Rodríguez-Pose and Zhang 2020; Tian et al. 2019). These institutional weaknesses correlate with its particular form of a centrally organized economy and structured society. This characteristic, naturally, has both positive and negative features that are emerging as its strengths and weaknesses (Ang 2020).

Starting in January 2020, a wealth of new literature commenced being published dealing with COVID-19 and its effects on international trade in general, and on trade with China in particular. Our paper aspires to contribute to this stream of literature as well.

3. Background and Macroeconomic Conditions of China

China has become the largest nation in the international trade of goods since 2009 (Jin et al. 2016). China is the most important country in the world economy. China is also the second largest source and destination of FDI (Jin et al. 2016).

The top three world trading countries are: China, the U.S.A. and Germany. The E.U. was the largest exporter of manufactured goods in 2017 (Yüksel et al. 2019). However, now China is the largest exporter in the world, based on 2020 data (Bekkers et al. 2021). Lin (2011) determined the performance of China as "extraordinary" and "unprecedented."

In 2015, China started a program entitled "Made in China 2025", which includes a ten-year plan to strengthen the Chinese position in the manufacturing of high-value-added products (Bencivelli and Tonelli 2020). This program strives to integrate new technologies that are the outcome of the fourth industrial revolution into the Chinese economy. Moreover, in line with this plan, China has supported domestic producers. Besides its existing high share in the world economy, after this program and new supports are provided, it is expected that China will become an even more important actor in the world economy. China is, nowadays, a major trade partner for many countries.

The European Union (E.U.) is one of the important trade partners of China. The inflow of foreign direct investment is, however, much smaller compared to other regions, such as the U.S.A., with 0.3% of total GDP in 1995 to 2% of total GDP in 2015, and 3% of total GDP (which was $538 billion) in 2016. Direct investment by China, in Europe, rose by 72.7% ($18.46 billion) in 2017 (Bencivelli and Tonelli 2020). Furthermore, in 2013, the Chinese government launched its Belt and Road Initiative (BRI) and, thus, the trading volume between China and European countries increased by 15.2% in 2017 (Bekkers et al. 2021).

In our study, we chose the EU-15 countries to represent Europe. The reason is that the EU-15 is still a good statistical representation of the entire E.U. because it represents 91.4% of the EU-28's GDP (Halicioglu and Ketenci 2018).

China is one of the three chief economic centers of the world, together with the E.U. and the U.S.A. Most world trade traffic takes place between these three. China belongs to the group of five fast-growing economies (the BRICS) and it has been growing fast for several decades. China is now the world's second-largest economy. Table 1 shows macroeconomic development for the last nine years. The table presents the growing and increasing GDP and exports which can be seen at first glance. This illustrates the export-led growth hypothesis. Our aim is to check whether this trend continued after the arrival of COVID-19, and therefore we perform the analysis using monthly data.

Table 1. Macroeconomic Characteristics of Recent Development (China).

Variable	2011	2012	2013	2014	2015	2016	2017	2018	2019
Economic growth of GDP intra year	9.5	7.9	7.8	7.3	6.9	6.8	6.9	6.7	6.1
GDP (USD billion)	7.592	8.575	9.694	10.480	10.925	11.247	12.313	13.837	14.298
Population in millions	1.347	1.354	1.361	1.368	1.375	1.383	1.390	1.395	1.400
GDP per capita	5.635	6.333	7.124	7.662	7.948	8.134	8.858	9.916	10.212
Export (USD billion)	1.898	2.049	2.209	2.342	2.272	2.098	2.263	2.487	2.499
Import (USD billion)	1.744	1.819	1.952	1.959	1.681	1.588	1.844	2.136	2.078
Balance (export/import)	1.088	1.126	1.132	1.196	1.352	1.321	1.227	1.164	1.206
Inflation rate (CPI)	5.4	2.6	2.6	2.0	1.4	2.0	1.6	2.1	2.9
Consumption (annual variation)	11.0	9.1	7.3	7.7	7.5	8.6	6.8	9.5	6.8
Public debt (% of GDP)	14.7	14.4	14.6	14.9	15.5	16.1	16.2	16.3	17.0

Source: China statistical yearbook and own elaboration https://www.focus-economics.com/countries/china (accessed on 31 October 2020).

China has experienced uninterrupted trade surpluses since 1993. It has become the world's biggest trading nation since 2013. China is now the second-biggest economy and has been doing quite well since the financial crisis in 2008; its public debt has reached 17% of the country's GDP. China's external position is very stable, and it has a positive trading balance. Its current account has recorded a surplus in every year since 1994.

In 2020, a slowdown was expected. This slowdown is a result of several influences, including the COVID-19 pandemic and continuing economic sanctions from the U.S.A. However, according to the latest results, it seems that the downturn will not be as bad as previously expected because of its relatively fast recovery from the pandemic.[2]

Recovery is apparent in all sectors and started with the reopening of the global economy and robust demand for health products. The economic outlook is better than expected. China has prepared well for the second and third waves of COVID-19 and has increased the production of necessary health products. Since the second quarter, China has been able to deliver medical equipment to other parts of the world, including Europe.[3]

In 2020, the expected GDP growth is 3.20% and 5.6% for 2021, according to the economic forecasts China—Economic Forecasts—2020–2022 Outlook, which is a drop compared with 6.1% in 2019. (China-Economic Forecasts-2020–22 Outlook 2020) According

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[2] China Economic Outlook. Available online: https://www.focus-economics.com/countries/china (accessed on 31 December 2020).

[3] Ensuring the Availability of Supplies and Equipment. Available online: https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/public-health_en#ensuring-the-availability-of-supplies-and-equipment (accessed on 12 December 2020).

to IBIS World (2020), the fastest growing industries, in 2020, in China are solar power generation 32.2%; internet services 30.7%; online games 27.2%; online shopping 22.0%; and optical fibre and cable manufacturing 20.3%.

According to data and reports in 2020, one of the most prominent export industries was medical goods and drugs. The private sector also helped to increase growth. As to trade, exports decreased in January, but the slump in exports then became a rise to an even higher level, shortly after, due to specific export items like "textile face masks, surgical masks disposable face masks and single-use drapes". Therefore, even though the decline had been expected and visible since the beginning of 2020, the trend seemed to be returning to a growth trajectory. However, we witnessed a specific shift from Chinese traditional export articles. These were, until the time of COVID-19, mainly telecommunications and I.T. devices and their spare parts, semiconductors and, of course, toys and baby carriages. This rapid development, in early 2020, shows that Chinese producers are able to convert their production facilities very quickly to meet new demand in new market segments.

Gruszczynski (2020) states that, at first, COVID-19 was seen as a problem of the South-East Asian countries but, later on, it was understood to be a worldwide problem. According to Baldwin and Mauro (2020), COVID-19 caused both a supply and a demand shock and had an impact on the international trade in goods and services. The data show that about 55% of world supply and demand (GDP), about 60% of world manufacturing and 50% of world manufacturing exports decreased. We aim to see if COVID-19 has had an effect on the imports of the European Union from China. COVID-19 is expected to have an impact on the European Union's economy and international trade because of the lockdown of the economy or "social lockdown".

The first social lockdown for COVID-19 was initiated, in China, in the last week of January 2020, in Wuhan city, and was continued in Beijing, China (McAleer 2020). The second country which adopted a social lockdown was Italy, on 21 February 2020 (Paital et al. 2020). The chronology of lockdowns could be evidence of the trading relationship between China and Europe. Because of the high number of COVID-19 cases in Italy, in other words in Europe, the second lockdown was in Europe.

4. Methodology and Data Limits

In this paper, we aim to analyze the effect of COVID-19 on the international trade of two major trade centers, the E.U. and China. With respect to the data, we face the following limitation: because COVID-19 emerged in December 2019, we have only one year of data to investigate, which is the year 2020.

The highest frequency of the relevant data is the monthly values of international trade. For one year we can have only 12 values. Unfortunately, in our case, the data published by TradeMap contain only seven months and, therefore, we have only seven data values for each product.

If we consider the gravity model, which is frequently used in the research of international trade, we face many limitations in estimating it. The gravity model represents the relationship of bilateral trade between two countries and their GDPs and relevant distance. In this type of model, independent variables must be at least the countries' GDP and geographic distance (Ugurlu and Jindrichovska 2019). Theoretically, we have to use GDP data, and GDP data is published quarterly and yearly (Lee 2018). GDP data is not published monthly, that is why if we estimated the gravity model, we would have to use quarterly GDP data, and in our case, we can obtain four data values at most. Moreover, because the last quarter of 2020 has not yet been published, we have only three data for one variable. Because of all these limitations, we have decided to use basic descriptive statistics.

Additionally, the gravity model is a kind of a panel data model, with N units and T time periods, degrees of freedom is NT-k (Park 2009). Suppose that we have minimum independent variables, which are the GDP of the host country, the GDP of the partner country, and the distance; then we have three independent variables and thus k = 4. We

have two units N = 2 (China and the EU-15), and we have only three-quarterly data points for GDP) thus T = 3. The degrees of freedom of our model are a very low value to estimate a panel data regression model. Furthermore, if we include some control variables, it will decrease the degrees of freedom and we cannot estimate the model mathematically. As our aim is to examine the effect of COVID-19, we have a very limited number of observations and, therefore, our analysis types are restricted.

5. Data and Analysis

To investigate the bilateral trade between the two major economic centers, we analyze and discuss both directions of trade flows: imports to Europe from China for January 2018 to May 2020 and imports to China from Europe for January 2018 to July 2020. The data were collected from TradeMap.org. For the analysis of Europe, imports from China, we use the import data of the EU-15 countries and analyze the effect on the European zone. On the TradeMap website, data is presented in the Harmonized System (H.S.), which is the classification based on the World Customs Organization. The H.S. uses different levels of digits for the products to classify traded goods on a common basis for customs purposes. In this research, we use 99 chapters (groups of products; hereafter, we use "a product" instead of "a chapter"), which are consolidated from the 5300 products. The H.S. for classifying goods is a six-digit code system which consists of headings and subheadings, arranged in 99 chapters, and grouped in 21 sections. The six digits can be broken down into three parts. The first two digits we use to identify the chapter of the goods, the next two digits to identify groupings within that chapter, and the last two digits to identify more specific groupings (TradeMap 2020).

The source data represent the values of 99 products from 2018:01 to 2020:05 for imports and 2020:07 for exports. We use the monthly data to see the effects more clearly. To present our analysis in a broader context, we have started our exploration from January 2018 to see the movement of bilateral trade before the COVID-19 outbreak. The data set finishes with the last published data at the time of performing this analysis.

Since we explore the movements of data in a period shorter than one year, we need to analyze more frequent data. Thus, we have used monthly data, which was the shortest period that could be found.

5.1. Import to Europe from China

For the analysis of Chinese Exports to Europe, we use the import data of the EU-15 countries and analyze the effect on the European zone. In the TradeMap website, data is presented in the Harmonized System (H.S.), which is the classification based on the World Customs Organization. The H.S. uses a six-digit system for classifying goods (TradeMap 2020).

In this section, we use 99 chapters (groups of products; hereafter we use "a product" instead of "a chapter") of imports from China to the European Union (E.U. 15) from 2018:01 to 2020:05. We use monthly data to see the effect more clearly. To present our analysis in a broader context, we have started our exploration from January 2018 to see the movement of bilateral trade before the COVID-19 outbreak. The data set finishes with the last published data, which is May 2020 for exports from China and July 2020 for imports into China.

The difference between the values of the imports of the EU-15 of each product is very divergent; the values are not homogenous. The amount of some products was ten times greater than others. To organize our analysis, we had to choose the main products. To find the main trade products of bilateral trade, we calculated the proportion of each product in the total trade. Figure 2 shows the share of each product in total trade.
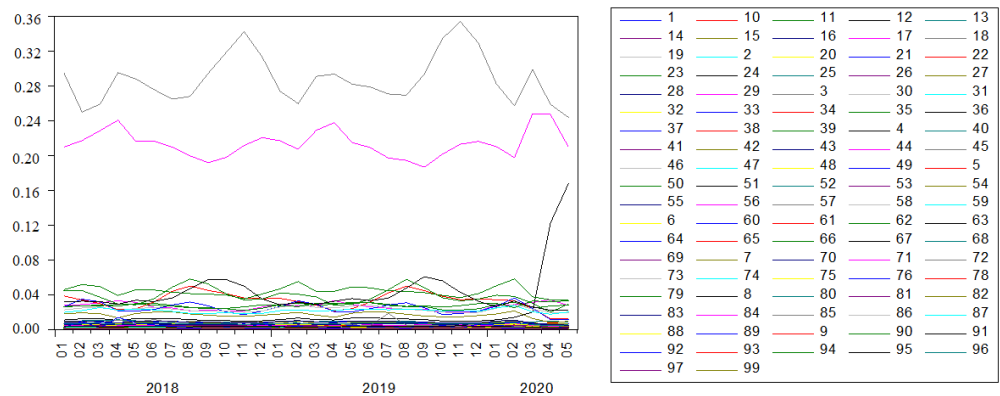
Figure 2. E.U. Import Shares of Products by year. Source: own investigation.

In many cases, the share of the given product of total exports was less than 1%. Therefore, we have omitted some products for greater clarity. We have selected the products which had a greater share than 5% of total trade in any month except apparel knitted products. The highest value of apparel knitted is 4.9%, but we have included this article because it is very close to 5%. Seven products fulfilled this criterion. From 99 products, we have chosen the products with H.S. codes 61, 62, 63, 84, 85, 94, and 95. Hereafter, we will use short names for the products. These are apparel knitted for 61, apparel not knitted for 62, other made-up textiles for 63, machinery for 84, electrical machinery for 85, furniture for 94, and toys for 95. Figure 2 shows that machinery and electrical machinery were the main imported products of the EU-15 countries from China. Two of them always had a higher proportion than 20% of total trade and, furthermore, electrical machinery reached, and exceeded, 30% of the total trade.

To demonstrate our method of selection, we first present Figure 2 to show all products. Here, it can be seen that it is hard to recognize the values of the main products, which we have identified above. Therefore, we separated these main products in Figure 3.
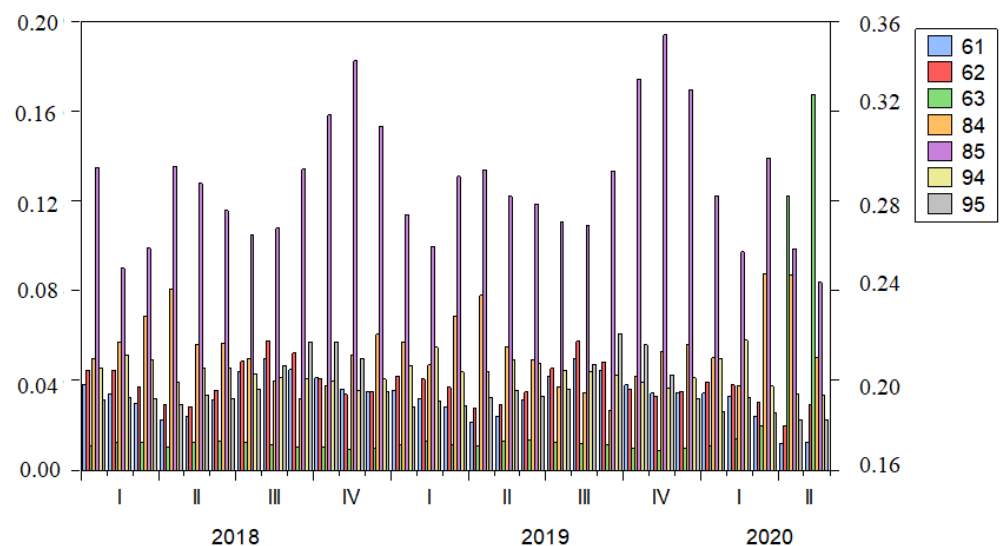

Figure 3. E.U. import shares of the selected articles by year. Source: own investigation.

Figure 3 shows the increase or decrease in the share of the products by month. Except for apparel knitted, all articles had at least one 5% share. In the figure, we can identify machinery and electrical machinery from the right axis and the rest of them from the left axis. However, we present Figure 3 here to show why we have chosen these products. For detailed research, we use the values of the products instead of their shares.

If a seasonality effect were identified, we could adjust for the seasonality, but in our situation, we did not know what volume of data was affected by seasonality and what volume of data came from the effect of COVID-19. That is why we used three subsamples to identify seasonality using a graph. Our procedure is described here:

As the next step, we attempted to separate the effect of seasonality from the effect of COVID-19. The first subsample represents 2018 to see the usual pattern of imports of articles from China to the E.U. The second sample covers 2019 to see the variation from month to month in one year, and the last subsample captures 2020 to see the effect of the COVID-19 outbreak.

Figure 4 presents imports from China to Europe by value and, because there are high differences among the values, we used two axes for better visibility. Machinery and electrical machinery are on the right axis, and the rest of the articles are on the left axis. The monthly values in 2018 and 2019 were similar. Thus, we cannot see any increasing or decreasing trend between these years. If we do not consider the COVID-19 outbreak, the expectation for 2020 is approximately comparable to 2019. The graph shows that there were decreases in all products except other made-up textiles. The product 63 (other made-up textiles) was 569,370 in February 2020, 4,280,354 in March 2020, and 6,848,965 in April 2020.
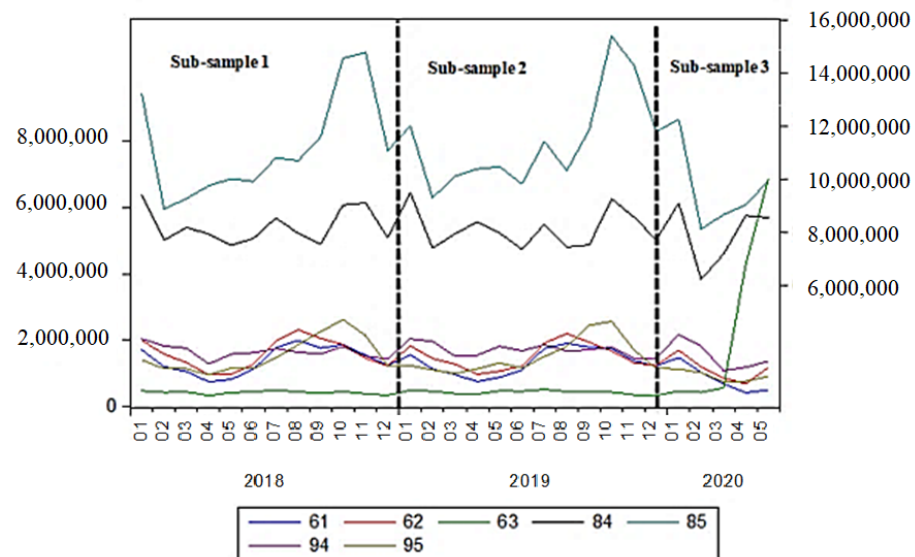

Figure 4. E.U. import values ($) of the selected articles. Source: own investigation.

From February 2020 to March 2020, there was an approximately six times increase in the value of articles of apparel and clothing accessories, knitted, or crocheted. Table 2 shows the growth of the import values year over year for the monthly data. In the months of 2020, a generally negative trend occurred, but some positive growth values can also be seen. Except for the growth in other made-up textiles of April and June, they were under 1%. The most important result was that other made-up textiles increased by more than 10%. Although there was a decrease in all selected products, except other made-up textiles in March, we can see increases in some products in April.

As has been pointed out, there was an excessive demand for critical medical equipment and already before 2020 "according to U.N. Comtrade (2020) statistics, 44% of the world's exports of face masks originated from China in 2018, whereas the next largest exporters, Germany (7%) and the United States (6%), play a comparatively minor role" (Fuchs et al. 2020, p. 2). In the same direction, the previous decreasing trend of the imports of these products from China changed to an increase in March and skyrocketed in April and continued in June. We have no data after June. Nonetheless, our data show us that countries had to import these products from China because of the scarcity. Consequently, a big new market was born for China to fill the export gap.

Table 2. Growth of imports year over year by month.

Article	2020M01	2020M02	2020M03	2020M04	2020M05
61	−0.054	−0.090	−0.283	−0.440	−0.426
62	−0.070	−0.174	−0.324	−0.295	0.101
63	−0.036	−0.069	0.453	10.239	13.260
84	−0.042	−0.158	−0.097	0.027	0.073
85	0.020	−0.126	−0.142	−0.130	−0.051
94	0.062	−0.069	−0.284	−0.233	−0.248
95	−0.081	−0.074	−0.254	−0.326	−0.301

Source: own investigation.

Another comparison can be performed using the descriptive statistics of the data, year by year. Using these descriptive statistics, we can see whether a decrease started before the outbreak. This analysis showed that the outbreak was not the only reason for the decrease. As explained above, in Table 3, we investigated the full sample and three subsamples. The shortcoming of the subsamples was that the last subsample comprised five months only. Therefore, it was hard to compare subsamples as such, but in Appendix A Table A2, we present data for five months for each year, and we can see that we have nearly similar results in the five months. In Table 2, we saw a monthly decrease. However, if the reductions are taken into consideration cumulatively, we can see that the yearly decrease is very significant, and this is shown in Table 3. However, we still must not forget that the last sub-sample consists of five months only. Therefore, we use the values in Table A1 in the Appendix A to compare.

Table 3. Descriptive statistics ($) of imports of EU-15 for samples and subsamples.

	NUM61	NUM62	NUM63	NUM84	NUM85	NUM94	NUM95
Full Sample: 2018M1–2020M5							
Mean	1,285,428	1,476,925	792,090.5	8,140,256	11,036,792	1,658,351	1,425,262
Median	1,229,408	1,327,073	452,994	7,975,091	10,487,219	1,677,890	1,164,118
Maximum	1,988,541	2,309,169	6,848,965	9,523,103	15,399,976	2,167,602	2,618,489
Minimum	422,081	691,252	336,282	6,251,098	8,141,200	1,087,124	746,971
Subsample 1: 2018M1–2018M12							
Mean	1,407,178	1,585,570	426,874.2	8,221,273	11,222,301	1,656,535	1,546,398
Median	1,396,908	1,519,353	437,501.5	7,964,327	10,761,701	1,636,406	1,318,125
Maximum	1,988,541	2,309,169	502,077	9,396,193	14,776,106	2,042,685	2,618,489
Minimum	747,201	963,059	336,282	7,526,866	8,887,623	1,287,016	958,312
Subsample 2: 2019M1–2019M12							
Mean	1,353,785	1,512,676	436,980.2	8,136,009	11,442,748	1,714,300	1,514,464
Median	1,302,985	1,386,272	454,031.5	7,975,481	10,960,053	1,696,231	1,275,664
Maximum	1,903,140	2,203,444	522,960	9,523,103	15,399,976	2,041,324	2,567,207
Minimum	754,189	980,167	339,827	7,372,026	9,315,948	1,468,159	1,000,972
Subsample 3: 2020M1–2020M5							
Mean	829,170.4	1,130,372	2,520,875	7,956,009	9,617,274	1,528,431	920,450.6
Median	697,866	1,184,598	569,370	8,574,588	9,048,216	1,369,158	917,360
Maximum	1,480,600	1,704,720	6,848,965	9,119,727	12,261,592	2,167,602	1,138,412
Minimum	422,081	691,252	433,576	6,251,098	8,141,200	1,087,124	746,971

Source: own investigation.

When comparing the mean of the first five months of 2019 (see Appendix A Table A2) with the mean of the first five months of 2020; the mean value of apparel knitted decreased by 22%, apparel not knitted by 14.7%, machinery by 3.7%, electrical machinery by 8%, furniture by 14%, and toys by 20%. We also observe significant decreases in all the other products. However, the group of other made-up textiles (code 63) increased four times.

This increase in the whole group 63 was a result of the imports of COVID-19 medical supplies. To understand this in more detail, the product number for COVID-19 medical supplies was investigated. The World Customs Organization presents the HS/CN8 classification reference list for the dataset (WCOOMD 2020). In the list "Facemasks (excl. paper surgical masks—under B6)" the section's H.S. code is 63079010. On the TradeMap website, the COVID-19 articles are coded 630790. The definition of 630790 is made-up articles of textile materials, incl. dress patterns, n.e.s. This subproduct had a proportion of 97% of the value of article 63 in the fifth month of 2020 and its proportion was increasing during the previous months (see Appendix A Table A3). This data then proves that the increase in article 63 is a result of COVID-19 medical supplies. The increase is shown by the shift in the demand curve to upright (an increase in the demand curve). Fuchs, Kaplan, Kis-Katos, Schmidt, Turbanisch, and Wang (Fuchs et al. 2020) stated that "the demand for critical medical equipment has skyrocketed" and, based on this demand, the supply of these goods has increased. The data show that China has a great share of the international trade in protective masks.

5.2. Imports to China from Europe

To investigate bilateral trade, we also have to discuss the imports into China from the EU-15. The data was collected from the same source but, in this case, the published data has included two more months. Therefore, our data set finishes in the seventh month of 2020.

Following the COVID-19 crisis, China reported January and February 2020 in a consolidated dataset, and it is not possible to allocate trade data to January and February separately. For this reason, the two months are missing in the TradeMap website of China. We also checked the data from The General Administration of Customs of the People's Republic of China (GACC 2020)[4] in this source, there is no data for January, but we can find data for February. Unfortunately, there is no data for the EU-15 country group. The data are given country by country, but some countries are missing from the group of E.U. 15 countries. Based on this situation and to use data from the same source, we use TradeMap data, and there are no data for these two months.

Figure 5 shows the share of the products in the total imports of China from the EU-15. We chose the products with the codes 38, 88, 30, 84, 85, and 87 because their shares are 5% or higher in at least one month. The label of the codes can be seen in the Appendix A. For simplicity, we use pharmaceutical products for 30, chemical products for 38, machinery for 84, electrical machinery for 85, vehicles for 87, and aircraft for 88.
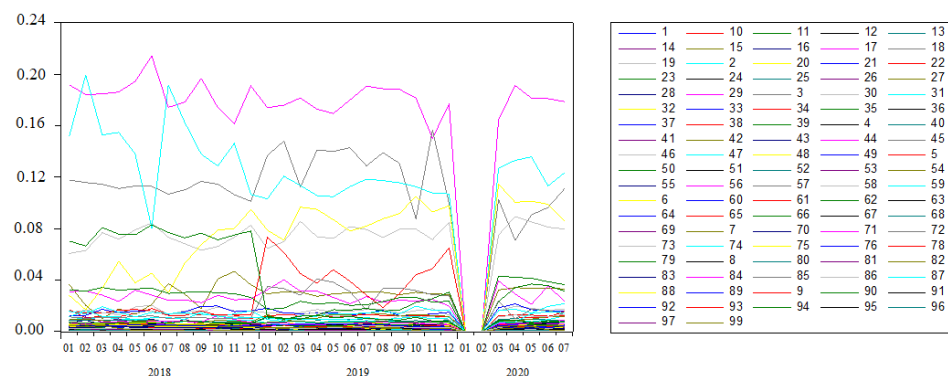

Figure 5. China import shares of the articles by year. Source: own investigation.

The first thing we need to explain is that there was an absence of any imports from the E.U. to China in January 2020. There was a negative balance of trade between the regions

in January, according to Eurostat. This was a result of a combination of COVID-19 and the Lunar Holiday.

"China's foreign trade dropped sharply in January and February, affected by the combined effects of an extended Lunar New Year holiday and COVID-19 that disrupted the output and the supply chain."[5]

Figure 6 shows the monthly movement of the shares of imported products on total imports organized in products, similarly as for exports above.
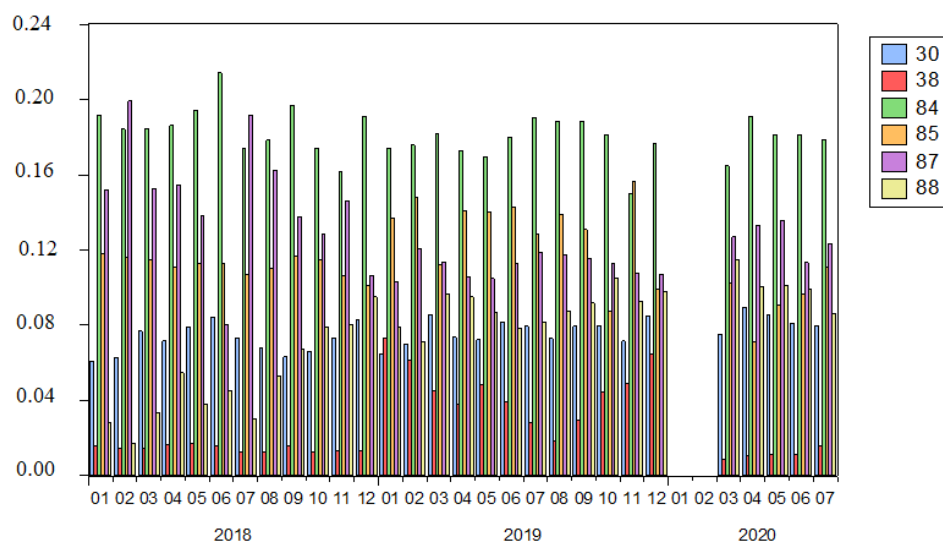

Figure 6. China imports—shares of the selected articles. Source: own investigation.

Figure 7 shows imports from the EU-15 countries to China by value. The first difference between the imports to the EU-15 and the imports to China is that there was no trade shown in two months. The figure has no pattern; thus, we can say that Chinese trade preferences are not stationary. Preferences are very varying except for pharmaceutical products. The graph of the pharmaceutical products is very smooth and varies in the range from $1,000,000 to $1,500,000. In such a case, it would be better to use descriptive statistics to analyze the trend of selected variables. Nevertheless, there is still the problem that we have no trade numbers for two months, and it is difficult to compare the results with the last year because of this gap.

Table 4 shows the value of imports into China from the EU-15 countries. When we run a comparison of 2018, 2019, and 2020 using descriptive statistics, we arrive at the same results as shown in Figure 6. While the imports of the EU-15 countries from China by products had more or less stable values, the imports of China from the EU-15 countries by products were very volatile. These bilateral data showed that the E.U. had a persistent volume by products, but China changed its import volume by products.

The decrease in imports into China was very high compared to that of imports into the EU-15 countries. The reason for this difference is the two months, January and February, of 2020, which had no imports from the EU-15 countries. In these two months, Chinese imports from the world were recorded as zero, too.

If we take into consideration bilateral data, China had not cut exporting products to the World after COVID-19, but it had cut importing products from the world, including the E.U. Although China's exports to the EU-15 decreased, the exports of surgical masks, disposable face masks, and single-use drapes increased four times after the outbreak. We

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[5] See China January–February Imports and Exports Drop Dragged by Coronavirus Disruption CGTN 08-Mar-2020. Available online: https://news.cgtn.com/news/2020-03-07/China-Jan-Feb-imports-and-exports-drop-due-to-coronavirus-disruption-OEWZfoIWn6/index.html (accessed on 27 September 2020).

expect that the missing link explaining the decrease in imports can be found in a severe reduction in production in the first months of the year.
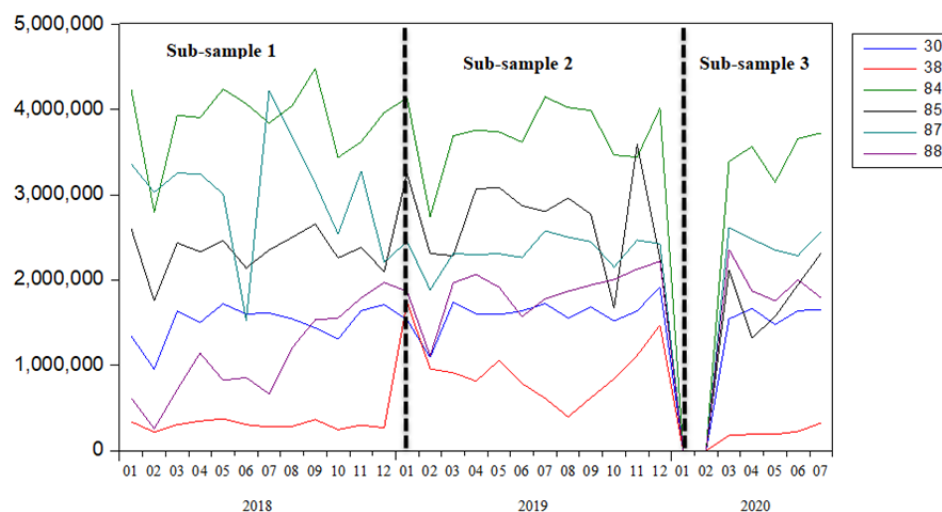

Figure 7. China import values ($) of the selected articles. Source: own investigation.

Table 4. Descriptive statistics ($) of imports of EU-15 for sample and subsamples.

	NUM30	NUM38	NUM84	NUM85	NUM87	NUM88
Full Sample: 2018M1–2020M5						
Mean	1,459,678	518,176.1	3,510,942	2,263,949	2,480,467	1,463,185
Median	1,601,644	339,343	3,737,261	2,331,764	2,468,119	1,780,512
Maximum	1,923,510	1,744,547	4,480,002	3,592,016	4,224,355	2,358,516
Minimum	0	0	0	0	0	0
Subsample 1: 2018M1–2018M12						
Mean	1,501,560	301,640.2	3,880,981	2,332,115	3,041,179	1,094,295
Median	1,574,215	300,993.5	3,948,032	2,368,840	3,190,941	1,000,459
Maximum	1,721,508	373,008	4,480,002	2,656,162	4,224,355	1,970,217
Minimum	955,347	218,077	2,798,245	1,759,266	1,526,977	256,271
Subsample 2: 2019M1–2019M12						
Mean	1,603,821	944,961.4	3,731,426	2,744,238	2,341,251	1,870,302
Median	1,619,598	878,009	3,748,640	2,837,042	2,368,507	1,929,143
Maximum	1,923,510	1,744,547	4,149,695	3,592,016	2,577,854	2,218,981
Minimum	1,091,655	395,332	2,746,431	1,672,875	1,884,365	1,108,927
Subsample 3: 2020M1–2020M5						
Mean	1,140,776	157,748.4	2,498,614	1,323,742	1,757,901	1,397,652
Median	1,543,766	189,105	3,391,672	1,572,577	2,354,924	1,793,891
Maximum	1,665,898	322,685	3,724,381	2,313,849	2,613,641	2,358,516
Minimum	0	0	0	0	0	0

Source: own investigation.

A further issue that is worth analyzing is the effect of the interruption of Chinese production, due to COVID-19, on the environment. This issue deserves a particular study for which there is no room in this paper. Looking briefly at the impact on the environment, we can see the effect of the COVID-19 outbreak on environmental issues. Authors Chen, Zhao, Lai, Wang, and Xia (Chen et al. 2019) studied the impact of economic growth and renewable and non-renewable energy consumption on CO_2 emissions at the regional level in China. The authors showed that there were bidirectional causalities between renewable energy consumption, CO2 emissions, and economic growth in the long-term

between Chinese regions. Further environmental effects were documented by Zambrano-Monserrate, Ruano and Sanchez-Alcalde (Zambrano-Monserrate et al. 2020) and Wang and Su (2020). Further links need to be explored between the interruption of Chinese production and imports.

6. Conclusions, Limitations and Further Research

In this paper, we have explored the trends of trade between China and the EU to understand whether export-led growth continued after the COVID-19 outbreak. Our findings show that the Chinese economy was very flexible in these challenging times, and it was able to reorient its production of export articles very quickly; thus, the growth could continue based on the increased exports. We are tempted to recall the term, Creative Destruction, coined by J.A. Schumpeter (1942) back in 1942 in his book, "Capitalism, socialism, and democracy". Nevertheless, this destruction was not caused by disruptive innovations, like the invention of new technology. This reorientation was simply caused by necessity—survival needs, the objective circumstances of the world pandemic.

Up to now, in the first five months of 2020, we have witnessed the reorientation of the Chinese economy to producing new highly demanded goods, mainly articles which are strongly linked with healthcare and related medical equipment. Chinese production and exports changed their commodity structure. The main export articles became products classified in the group H.S. 63 (other made-up textile articles; sets; worn clothing and worn textile articles; rags) as the result of enabling the production of medical goods in high demand. Concerning Chinese imports, we have witnessed the break in January due to the combined effects of COVID-19 and the Lunar Holiday. This will, undoubtedly, call for further exploration when more data is available. However, the explanation may be that, since Chinese production almost stopped because of COVID-19, imports decreased sharply as well. Furthermore, judging from the stream of literature devoted to the environmental effects of the interruption of Chinese production, we can expect significant effects in the long term. The effects of Chinese flexibility can also be seen in the behaviour of Chinese capital markets, which correlates with the real economy, see Chong, Wu and Su (Chong et al. 2020).

Some reservations about our results need to be acknowledged. We acknowledge that the results of this research are being created during the times of an on-going pandemic when the source data is not yet fully settled and statistically verified and adjusted. However, we think that this cannot be soberly expected. Consequently, we still might expect some changes in results during the course of 2020.

A topic for future research may be the further exploration of Chinese production flexibility. In this paper, we have stressed that the Chinese were very flexible in changing the structure of exports, which was triggered by this COVID-19 crisis. To verify the flexibility of the Chinese economy, we suggest looking into Chinese reactions to previous crises, e.g., the financial crisis in 2008, or the earlier Asian crisis in 1997–1998, and comparing the results.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Names of export articles.

No	Article Definition
1	Live animals
2	Meat and edible meat offal
3	Fish and crustaceans, molluscs, and other aquatic invertebrates
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere . . .
5	Products of animal origin, not elsewhere specified or included
6	Live trees and other plants; bulbs, roots, and the like; cut flowers and ornamental foliage
7	Edible vegetables and certain roots and tubers
8	Edible fruit and nuts; peel of citrus fruit or melons
9	Coffee, tea, maté and spices
10	Cereals
11	Products of the milling industry; malt; starches; inulin; wheat gluten
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds, and fruit; industrial or medicinal . . .
13	Lac; gums, resins and other vegetable saps and extracts
14	Vegetable plaiting materials: vegetable products not elsewhere specified or included
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal . . .
16	Preparations of meat, of fish or of crustaceans, molluscs, or other aquatic invertebrates
17	Sugars and sugar confectionery
18	Cocoa and cocoa preparations
19	Preparations of cereals, flour, starch, or milk; pastrycooks products
20	Preparations of vegetables, fruit, nuts, or other parts of plants
21	Miscellaneous edible preparations
22	Beverages, spirits, and vinegar
23	Residues and waste from the food industries; prepared animal fodder
24	Tobacco and manufactured tobacco substitutes
25	Salt; sulphur; earths and stone; plastering materials, lime, and cement
26	Ores, slag, and ash
27	Mineral fuels, mineral oils, and products of their distillation; bituminous substances; mineral . . .
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, . . .
29	Organic chemicals
30	Pharmaceutical products
31	Fertilizers
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments, and other colouring . . .
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial . . .
35	Albuminoidal substances; modified starches; glues; enzymes
36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations
37	Photographic or cinematographic goods
38	Miscellaneous chemical products
39	Plastics and articles thereof
40	Rubber and articles thereof
41	Raw hides and skins (other than furskins) and leather
42	Articles of leather; saddlery and harness; travel goods, handbags, and similar containers; articles . . .
43	Furskins and artificial fur; manufactures thereof
44	Wood and articles of wood; wood charcoal
45	Cork and articles of cork
46	Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork

Table A1. *Cont.*

No	Article Definition
47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or . . .
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard
49	Printed books, newspapers, pictures, and other products of the printing industry; manuscripts, . . .
50	Silk
51	Wool, fine, or coarse animal hair; horsehair yarn and woven fabric
52	Cotton
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn
54	Man-made filaments; strip and the like of man-made textile materials
55	Man-made staple fibres
56	Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof
57	Carpets and other textile floor coverings
58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery
59	Impregnated, coated, covered, or laminated textile fabrics; textile articles of a kind suitable . . .
60	Knitted or crocheted fabrics
61	Articles of apparel and clothing accessories, knitted or crocheted
62	Articles of apparel and clothing accessories, not knitted or crocheted
63	Other made-up textile articles; sets; worn clothing and worn textile articles; rags
64	Footwear, gaiters, and the like; parts of such articles
65	Headgear and parts thereof
66	Umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops, and parts thereof
67	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles . . .
68	Articles of stone, plaster, cement, asbestos, mica, or similar materials
69	Ceramic products
70	Glass and glassware
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad . . .
72	Iron and steel
73	Articles of iron or steel
74	Copper and articles thereof
75	Nickel and articles thereof
76	Aluminium and articles thereof
78	Lead and articles thereof
79	Zinc and articles thereof
80	Tin and articles thereof
81	Other base metals; cermets; articles thereof
82	Tools, implements, cutlery, spoons, and forks, of base metal; parts thereof of base metal
83	Miscellaneous articles of base metal
84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television . . .
86	Railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures . . .
87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof
88	Aircraft, spacecraft, and parts thereof
89	Ships, boats, and floating structures
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical . . .
91	Clocks and watches and parts thereof
92	Musical instruments; parts and accessories of such articles
93	Arms and ammunition; parts and accessories thereof
94	Furniture: bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; . . .
95	Toys, games, and sports requisites; parts and accessories thereof
96	Miscellaneous manufactured articles
97	Works of art, collectors' pieces, and antiques
99	Commodities not elsewhere specified

Table A2. Comparison of the first five months of exports.

	NUM61	NUM62	NUM63	NUM84	NUM85	NUM94	NUM95
2018M1–2018M5							
Mean	1,109,953	1,370,011	423,097	8,158,951	10,237,934	1,700,424	1,164,220
Median	1,063,323	1,327,073	432,193	7,953,563	9,768,318	1,759,653	1,148,836
Maximum	1,717,022	1,993,574	478,563	9,396,193	13,214,381	2,042,685	1,404,459
Minimum	747,201	963,059	336,282	7,526,866	8,887,623	1,287,016	958,312
2019M1–2019M5							
Mean	1,063,365	1,326,123	441,647.2	8,262,721	10,467,730	1,779,002	1,161,496
Median	973,579	1,288,951	465,476	7,991,856	10,396,900	1,820,083	1,143,198
Maximum	1,565,175	1,833,292	489,775	9,523,103	12,018,003	20,41,324	1,312,633
Minimum	754,189	980,167	380,832	7,422,726	9,315,948	1,517,852	1,000,972

Table A3. Proportion of specification 630790 in product 63.

	63	630790	630790/63
2019M01	489,775	153,409	0.313223
2019M02	465,476	134,854	0.289712
2019M03	391,869	115,517	0.294785
2019M04	380,832	111,539	0.292882
2019M05	480,284	136,707	0.284638
2019M06	466,901	134,050	0.287106
2019M07	522,960	163,014	0.311714
2019M08	455,069	152,969	0.336145
2019M09	452,994	157,314	0.347276
2019M10	439,513	145,793	0.331715
2019M11	358,262	120,512	0.336380
2019M12	339,827	115,992	0.341327
2020M01	472,108	153,868	0.325917
2020M02	433,576	127,763	0.294673
2020M03	569,370	396,780	0.696875
2020M04	4,280,354	4,109,009	0.959969
2020M05	6,848,965	6,660,971	0.972551

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