A Preliminary Analysis of the Reasons behind the Coronavirus Pandemic's Varying Impacts on Different Economies

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Abstract: In the spring of 2020, COVID-19 outbreaks began to spread globally, thereby impacting the economies of various nations. Major enterprises were forced to suspend their businesses, resulting in a stagnation of import and export trade, as well as negative economic growth. The aims of this paper are: to provide an overall understanding of the macroeconomic impacts of the pandemic in various countries, to generate a comprehensive description of global economic trends during COVID-19, and to map out three plausible hypotheses to account for these trends. The paper first presents a general plot of monthly and standardized monthly export data to demonstrate the various extents to which Coronavirus has affected each country. Countries whose main exports comprise the manufacturing and the automobile sector, including Japan, South Korea, and some European countries, have seen significant reductions in their respective exports. Then, a basic linear regression model is utilized to evaluate the significance of the virus' impact on each country. Next, this paper illustrates the likely correlation between the degree of severity of COVID-19 in each country and three factors: population density, GDP per capita, and the socio-cultural aspect of individualism. The paper's first hypothesis is that a country with a strong economy, as represented by GDP, will be less affected. Second, the spread of Coronavirus is largely dependent on a country's population density, with India, for example, being more particularly vulnerable to outbreaks. Finally, those countries with a strong individualistic ideology have a more extensive moving range than non-individualistic countries. Consequently, it is suggested that all countries should strictly control the epidemic and formulate policies to deal with trade issues as soon as possible, so as to promptly resume the development of imports and exports in international trade.

1. Introduction and Literature Review

1.1 Introduction

On February 23, 2020, Frank Tang forecasted that "it is unavoidable that the novel Coronavirus epidemic will have a considerable impact on the economy and society" [1]. Coronavirus, or COVID-19, has developed into a global crisis that has caused a high number of fatalities and significant suffering around the world. It was first identified in Wuhan, China, in December 2019, and subsequently spread throughout the world [2]. Accelerated by human migration, a growing number of newly-confirmed cases were reported in various regions of the world, such as Italy, the UK, and the United States. The existing interdependence among countries has inevitably facilitated the spread of the pandemic.

In order to minimize the rapid growth in COVID-19 cases, various countries have implemented travel restrictions, border controls, and business lockdowns. The effectiveness of travel restrictions and quarantine measures to limit the spread of the pandemic has frequently been a heated subject of debate. During the 2002-2003 SARS (Severe Acute Respiratory Syndrome) epidemic, screening at various entry points was shown to have only limited effectiveness [3]. Given this precedent, when

facing a pandemic, such as COVID-19, and with no vaccine currently available, many countries decided to reduce the volume of travelers crossing their borders drastically.

However, limited transportation and the lockdown of large companies has weakened global economic activity to a near standstill. How did a health crisis transform into an economic crisis? The health crisis began to have an economic impact when it started to disrupt international trade, shaping both the supply and demand sides of the global economy. As The Wall Street Journal reported, "containership operators have canceled nearly 60 trans-Pacific shipments to the ports of Los Angeles and Long Beach, California"; usually, approximately 200 container ships cross the Pacific Ocean each month [4]. Moreover, the closure of cities and travel restrictions are detrimental to production, creating supply shock. The China Manufacturing Purchasing Managers' Index (PMI), an essential production index, fell by about twenty-two points in February [5]. In other words, the supply side of the world trade fell by nearly two percent. The demand side of the world's economy has also been drastically impacted. The "panic," which has been directly caused by the distortion of consumers' spending behavior, has created market anomalies [6]. Most importantly, the dramatic increase in unemployment rates has resulted in consumers fearing a loss of income, and therefore an overall unwillingness to spend their money. Whilst the decline in the volume of international trade has been unavoidable, the extent of the damage has yet to be calculated. Consequently, it is needed to determine how to measure the size of the impact of COVID-19 on international trade, and to determine the severity of its influence.

While some countries, such as China, are gradually adapting to the situation, other countries (including Italy and Spain) are still attempting to limit the spread of the infectious disease, or are in the early stages of containing it, such as the US and Poland [7]. Countries are beginning to regulate traveling, impose trade barriers, and enforce export restrictions. In order to provide constructive policies and to avoid unnecessary barriers to international trade or disruptive consequences for global supply chains, it is necessary to examine COVID-19's impact on international trade. This measure will assist countries to both ensure the supply of necessities and send a signal of confidence to the global market.

1.2 Literature Review

Gross Domestic Product (GDP) is used to capture the aggregate economic well-being of a market. GDP is the market value of all final goods and services produced within a country in a given period. The Bureau of Economic Analysis (BEA) provides a standard calculation of GDP as "the sum of personal consumption expenditures, gross private domestic investment, net exports of goods and services, government consumption expenditures, and gross investment" [8]. Personal consumption expenditures consist of services, non-durable goods, and durable goods. Earlier this year, COVID-19 led to a dramatic change in GDP's component of the exporting of goods and services, primarily through travel restrictions and the lockdown of cities. A simple Google search provides approximate forecasts of present and future economic outlooks [9][10][11].

Recently, the International Monetary Fund (IMF) has predicted that the Coronavirus outbreak will lead to a financial crisis comparable to that of the economic crisis of 2008[12]. However, the 2020 global recession differs from previous recessions, in that it has been triggered by an unprecedented new disease. Specifically, the 2008 global economic crisis was caused by a real estate crisis and the housing bubble in the United States, resulting in a sudden drop in sky-high housing prices [13]. Additionally, structural fragilities in the Greek economy and a lack of flexibility in monetary policies led to the 2010 recession in Greece [14].

In this paper, the problems of how the Coronavirus outbreak led to spillovers in over thirty different countries, and how their respective economic conditions triggered and prolonged the recession while they sought to protect the lives of their citizens are illustrated. The rest of the paper is structured as follows: Section 2 introduces data and methods. Section 3 illustrates the main findings and three potential hypotheses. Section 6 concludes.

2. Data and Method

2.1 Data, Variables, and Trends

The main export data used are from the website of the Organization for Economic Co-operation and Development (OECD). The export data ranges from January 2019 to May 2020, and includes over thirty countries. The Gross Domestic Product (GDP) and population density data for each country from the website of the World Population Review are obtained. The data regarding the individualism indicator are from the website of Geert Hofstede. All the data are summarized in Table 1 (below):

Table.1. Statistical Summary

Data	Observations	Mean	Std. Dev.	Min	Max
GDP per Capita	43	37691.12	26462.93	2361	117725
Population Density	43	129.001	136.11	3.313	511.6175
Individualism	40	55.6	22.47711	13	91

Since the duration of COVID-19 has thus far been only seven months, any related economic research is necessarily still at an early stage. The losses caused by the outbreak of the pandemic will eventually become evident at both the macro and micro levels. The closure of many multinational companies has suspended production in many countries, particularly in China. Even though the possible outcome of the pandemic may be a long-term recession, the effect mechanism is likely to be different from that of past economic recessions. However, the direct consequences will undoubtedly increase in severity in the long term if the spread of the pandemic is not halted soon.

The impacts of the pandemic may be evident over different time frames, with many visible in the short term and others visible in the longer term. The first phase consists of localized, direct impacts. To prevent the rapid increase in confirmed COVID cases, several governments employed the strategy of shutting down cities and business premises, thereby creating the initial supply and demand shock. Then subsequent policies, such as travel restrictions and quarantine, distorted the supply chain, which later developed into the second phase: an internationalized impact. With the reduction in the labor force and the closure of cities, Coronavirus disrupted global trade and capital flow. Figure 1 features the monthly exports of three major manufacturing countries: China, the United States, and Japan. Since the pandemic first broke out in China in December 2019, there was a sharp decrease in exports there around January 2020. The pandemic began around February and March for both Japan and the United States, so their monthly exports both fell in February 2020. To better compare the impact of COVID-19 on three countries' exports, the data are standardized, and a graph is plotted for the second part. Figures 2, 3, and 4 illustrate the monthly and standardized monthly exports in billions of US dollars for 27 other countries, which exhibit a similar decline to those of the United States and Japan. The third phase includes aggregate supply and demand shock, price-level shock, loss of employment and income, and financial instability, which lead to the fourth phase: a slowdown in economic growth. If governments fail to prevent the further spread of the pandemic in time, this economic instability will develop into a global economic downturn and may cause changes to international cooperation.

What happens to the overall macroeconomic performance of a country when such key factors are negatively impacted? The sector of international trade will be analyzed, mainly from the perspective of exports, and the factors that result in any differences between nations will be examined. A linear regression model is utilized, combined with the data from the OECD, to test the degree to which COVID-19 impacted each nation. Then the p-value is checked to establish whether the influence is significant or not. Then, according to the results, three possible hypotheses are proposed to account for the differences between various countries: Gross Domestic Product (GDP), population density,

and their degrees of individualism. Then correlation graphs are proceeded to show the three factors' relation with year-on-year and month-on-month rates of exports.

Figure 1. Monthly Exports in billion US Dollars in the United States, China, and Japan

Note. Data from the OECD.

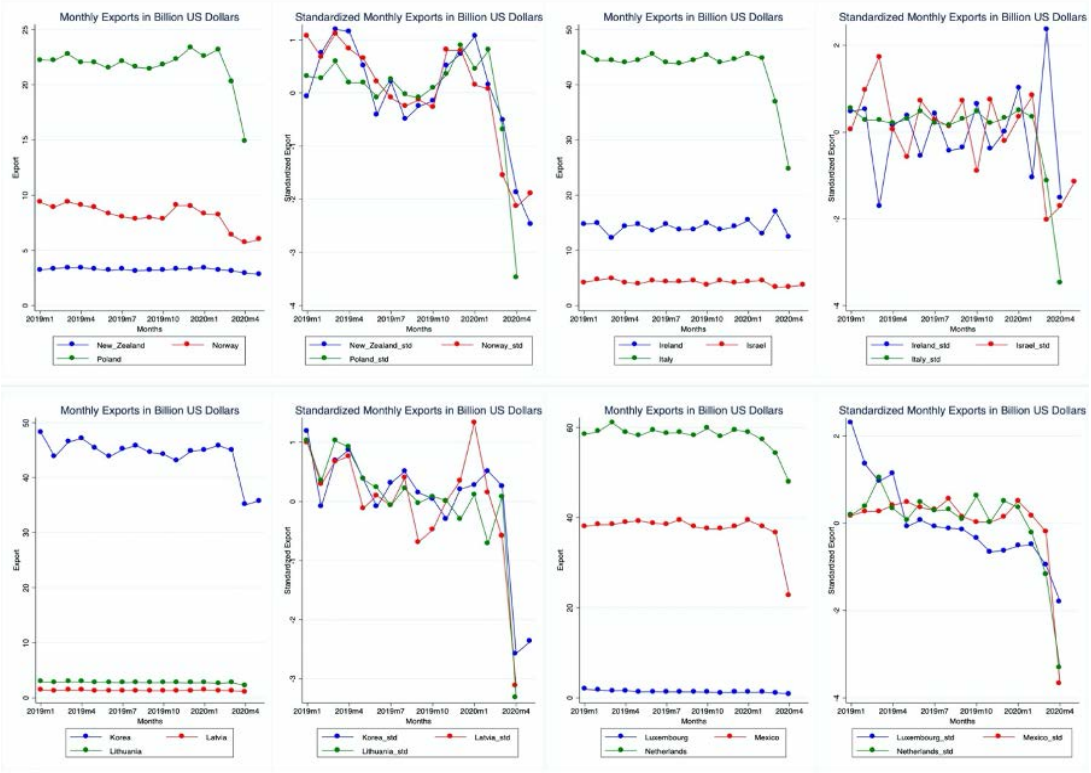

Figure 2. Monthly and Standardized Monthly Exports in billion US Dollars in Other Countries

Note. Data from the OECD.

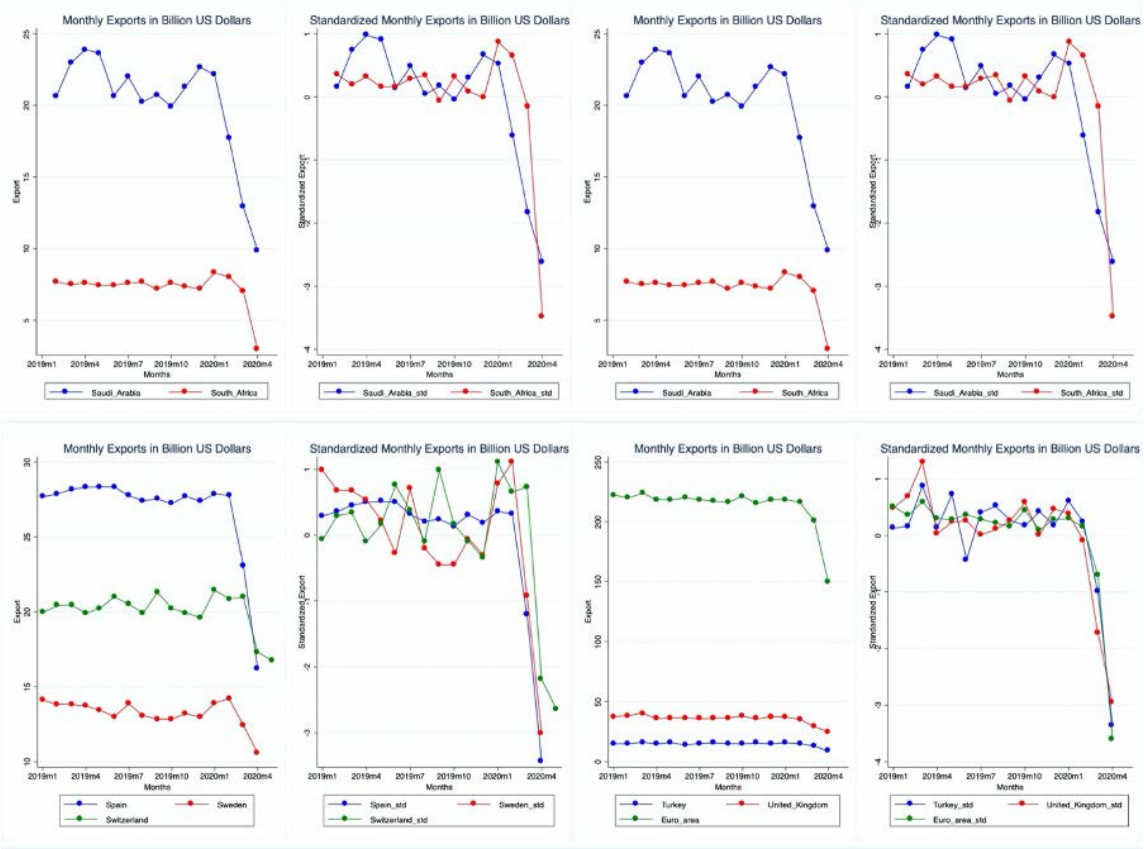

Figure 3. Monthly and Standardized Monthly Exports in billion US Dollars in Other Countries

Note. Data from the OECD.

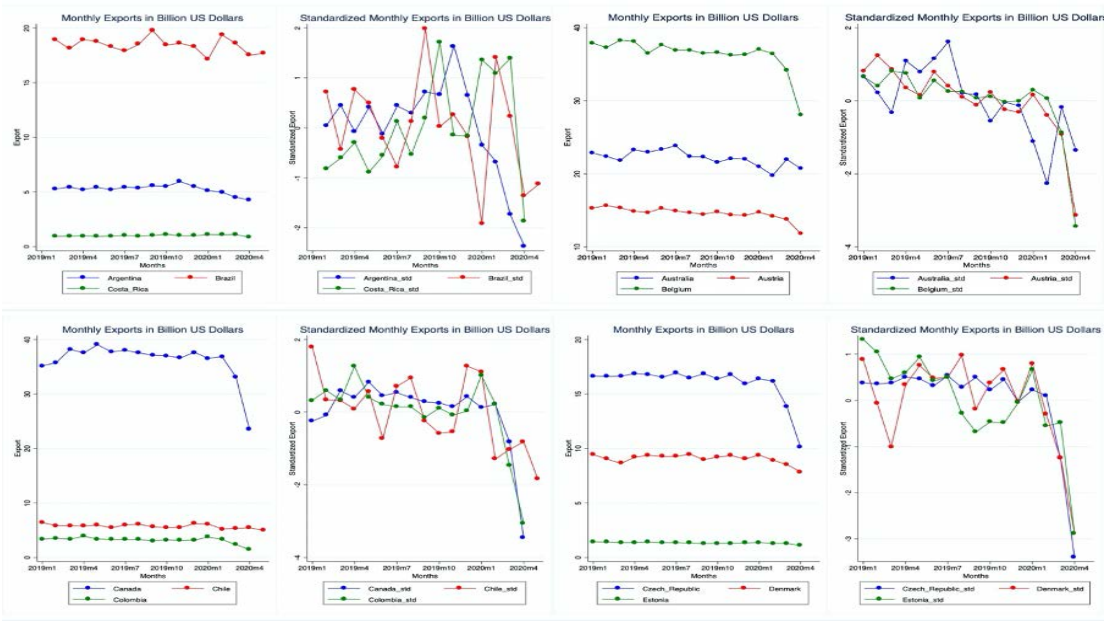

Figure 4. Monthly and Standardized Monthly Exports in billion US Dollars in Other Countries

Note. Data from the OECD.

2.2 Method

The dependent variable is monthly exports in billion US Dollars for each nation, and the independent variable is Coronavirus, represented by months. Thus, the base model is a univariate regression. After constructing the basic model, months are introduced as dummy variables. A dummy variable can be defined as a numeric variable representing categorical data. In order to further

investigate the influence of months on the slope, an interaction term needs to be added to the term *COVID-19*. Hence, the model can be written as follows:

$$Export = \beta_0 + \delta_1 months + \varepsilon \quad (1)$$

In the equation, δ_1 represents the difference between China and other countries in terms of the time difference of the outbreak of COVID-19. If the country is experiencing Coronavirus, δ_1 will be computed as 1; if not, δ_1 will be computed as 0.

3. Results and Discussion

3.1 Main Results

Table.2. The Effects of COVID-19 on Export in 44 Countries

Country	Coefficient	p-value	Country	Coefficient	p-value
United States	-16.572	0.157	China	-11.782	0.370
Japan	-8.147***	0.003	Norway	-2.062***	0.002
Austria	-1.597**	0.028	Belgium	-4.175*	0.079
Russia	-7.486**	0.003	India	-7.958**	0.032
Colombia	-0.978*	0.052	Czech Republic	-3.215*	0.055
Denmark	-0.766**	0.018	Estonia	-.126**	0.040
Australia	-1.608**	0.017	France	-10.158*	0.062
Korea	-4.746*	0.098	Greece	-0.502*	0.065
Israel	-0.587*	0.051	Italy	-9.149*	0.094
Ireland	-0.090	0.944	United Kingdom	-7.194**	0.018
Luxembourg	-0.327***	0.007	Argentina	-0.834**	0.001
Netherlands	-5.905**	0.030	Lithuania	-0.262*	0.093
Turkey	-2.922*	0.089	New Zealand	-0.242**	0.018
Portugal	-1.171*	0.064	Saudi Arabia	-8.229**	0.001
Slovak Republic	-1.615*	0.070	Spain	-5.469*	0.083
Sweden	-1.018	0.290	Latvia	-0.086	0.120
Slovenia	-0.434	0.194	Switzerland	-1.413	0.199
Hungary	-1.477	0.226	Mexico	-5.994	0.180
Costa Rico	0.020	0.790	Brazil	-0.191	0.675
Indonesia	-0.166	0.791	Germany	-18.551	0.111
South Africa	-1.528	0.282	Iceland	-0.0388	0.228
Poland	-2.696	0.228	Canada	-6.091	0.103

Note: *p < .1, **p < .05, ***p <.01.

Table 2 presents the main results of equation (1). In the model, the coefficient for every nation is negative, indicating that almost all the countries around the world suffered a loss in their monthly exports due to Coronavirus. The data for twenty-seven of forty-four countries provide significant evidence that Coronavirus did indeed shape their nations' export data. Japan, Korea, and European countries show a significant decrease in their exports. The main exports from Japan, Korea, and European countries are machinery, equipment, motor vehicles, electronics, and semiconductors, which are not in emergent need during the outbreak of the pandemic (Grossman, 2014)[15]. Consequently, it is no surprise that the rates of production and exports of these nations fell drastically. Moreover, Russia and India also experienced export falls during Coronavirus, possibly because they are both highly populous countries. This factor can accelerate the spread of infectious diseases and thereby cause further reductions in the labor force and exports. However, China and the United States are considered to be two exceptions to this. Firstly, China is a major global manufacturing country. After being first identified in Wuhan, China, in December 2019, the COVID-19 rapidly spread throughout the world. The pandemic emerged in most countries around January and February 2020, which led to a sharp decrease in export around January, as shown in Figure 1. Over the same period, China's export data shows a significant increase, particularly in January and February, because most masks and other related resources are produced by China and shipped to other nations. Therefore, the initial decrease and later increase in exports result in an insignificant p-value when using the linear regression model to approximate the impact.

Secondly, until now, the number of confirmed cases in the United States has continued to rise. Since COVID-19 has not entirely stopped spreading in the United States, it is difficult to accurately estimate its impact on this country's export data.

3.2 Other Factors

As discussed above, three hypotheses have been generated to explain why Coronavirus has had varying degrees of impact on different countries:

H1. A country with strong economic strength, as represented by a higher Gross Domestic Product (GDP), will experience less of an impact from the epidemic, and the negative impact on exports will be reduced.

H2. A country with a lower population density will experience less of an impact from the epidemic, and the negative impact on exports will be reduced.

H3. A country with a strong ideology of individualism will experience a more significant impact from the epidemic because the range of personal moving areas will be relatively wide, and the negative impact on exports will be reduced.

A matrix is used to correlate the three explanations with the export data. To illustrate the extent of the impact, two different rates are utilized, which are calculated as follows:

$$rate1 = \frac{Export_{202001} - Export_{201901}}{Export_{201901}} \text{ if the country is not China} \tag{2}$$

$$rate1 = \frac{Export_{202004} - Export_{201904}}{Export_{201904}} \text{ if the country is China} \tag{3}$$

$$rate2 = \frac{Export_{202004} - Export_{202002}}{Export_{201902}} \text{ if the country is not China} \tag{4}$$

$$rate2 = \frac{Export_{202001} - Export_{201912}}{Export_{201912}} \text{ if the country is China} \tag{5}$$

Figure 3 shows the correlation between rate 1 and GDP per capita, population density, and individualism separately, while Figure 4 shows the correlation between rate 2 and these three variables. Since only the correlation between the two rates and the variables is examined, only the plots in the first column are useful. The smaller the number on the x-axis for the first column is, the

less negative an impact the country will experience. The results for both rates are consistent with the three hypotheses.

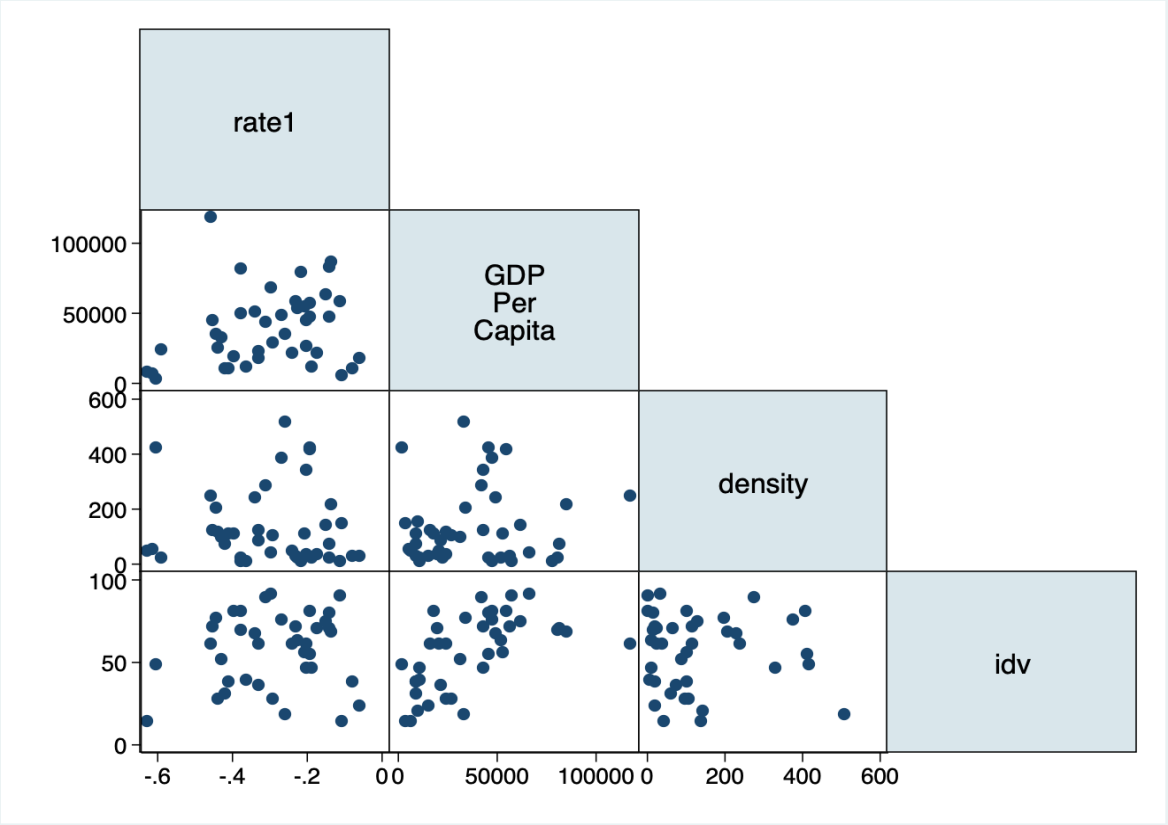

Figure. 5. The Correlation between Rate 1 and GDP per Capita, Density, and Individualism

Note. Data from the World Population Review and Geert Hofstede.

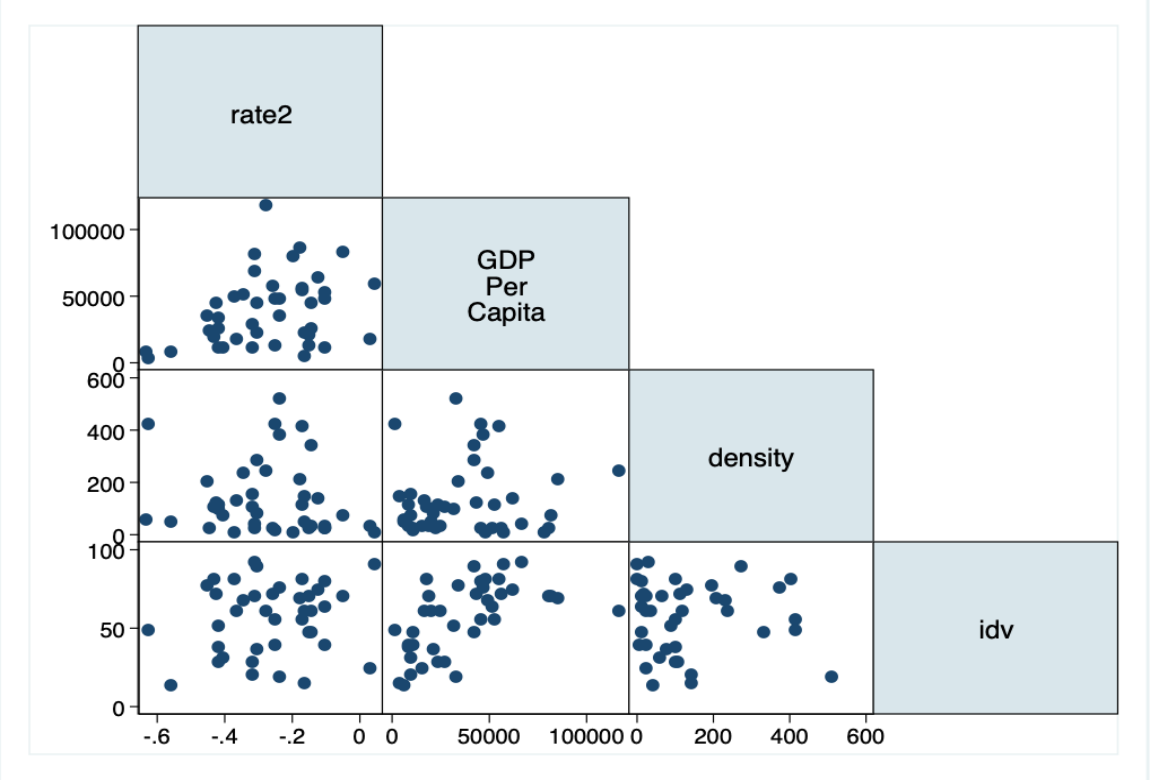

Figure. 6. The Correlation between Rate 2 and GDP per Capita, Density, and Individualism

Note. Data from the World Population Review and Geert Hofstede.

4. Conclusion

Coronavirus is damaging all types of economies, whether large or small, developed, or developing, as demonstrated by the results from the linear regression model. At the time of writing, the end of COVID-19 is uncertain, resulting in distorted international trade and services. On the one hand, the macroeconomic impacts are highly likely to be magnified if governments do not implement appropriate policies to restrict the extent of demand and supply-side shock. For those countries with a higher population density, lower Gross Domestic Product, or a high rate of individualism, restricting the spread of the pandemic is the primary concern. On the other hand, if the pandemic is well-controlled in one country, economic recovery from the disease is the primary concern. If a country waits for the pandemic to end of its own accord without taking effective measures, then an economic depression might be unavoidable.

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