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The Effect of Changing Production Items Because of Covid-19 on Manufacturing Industry

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All studies, especially in the transportation, travel, tourism, energy, automotive and electronics sectors, show us that there is no sector that can come out of the Covid-19 epidemic process almost unaffected. In fact, together with the uncertainties in the markets, other sectors related to the said sectors were adversely affected by the pandemic process with the multiplier effect. All these aforementioned sectors have faced difficulties such as slowing down or halting production, as well as declining production quality, disruption of supply chains, and reduced demand for manufactured goods since the beginning of the epidemic. However, it has been observed that some sectors and some companies have been positively affected by this process due to the new needs and consumption behaviors brought by this pandemic and have started to rise in the said period. It is possible to say that worldwide retail and e-commerce companies, companies that market technology and games, companies that produce hygiene products, companies operating in the pharmaceutical industry and biotechnology companies with laboratories can benefit from the isolation period brought by the coronavirus epidemic. In the study, the relationship between the number of Covid-19 cases and the amount of production in the field of pharmacy was investigated. In the study in which time series were used, unit root test was applied to the variables and they were found to be stationary at level 1. Then, Regression and Correlation Analyzes were performed. With regression analysis; It was found that when the number of cases increased by 1%, the production amount increased by 1.12%.

Keywords : Covid-19, Manufacturing industry, Production sectors

Introduction

Covid-19 emerged in the city of Wuhan, China in the last months of 2019, and took the whole world under its influence in a short time. The World Health Organization (WHO) declared Covid-19 as a pandemic on February 11, 2020. The epidemic all over the world; It has led to the rapid production of policies in the economy, education, health and all other areas of social life. The negative economic, social and psychological effects of the Covid-19 pandemic have revealed the importance of social protection. Although the measures taken against the pandemic differ from country to country, these social protection mechanisms act as a buffer against the crisis in terms of economic and social crises that may arise (Aslan, 2020).

Since Covid-19 has many negative effects, countries have made efforts to treat and prevent the virus. It is also seen that Covid-19 does not only cause human deaths, but also destroys the social and economic order in the world (Bobdey and Ray, 2020: 9). The Covid-19 epidemic brings with it many different crises, especially financial and economic. Although financial and economic crisis are thought of as two similar concepts, they are defined in different ways. An economic crisis refers to a decline in growth rate or a recession. Financial

crisis, on the other hand, refers to the deterioration of the information flow in financial markets and the inability of financial markets to fulfill their duties (Sakarya, 2006: 52).

Covid-19 has adversely affected many sectors of Turkey as well as all countries of the world. The fact that Turkey is a food warehouse and adopts an export-based economic growth model has made Turkey strong in the fight against Covid-19. The flexible and strong manufacturing sector has the capacity to produce in a short time, from ventilators to masks, to medicines and disinfectants. In this way, it is seen that Turkey is able to provide medical assistance to more than 30 countries in such a crisis environment (ULISA, 2020).

As news of the COVID-19 outbreak spread and was officially declared a pandemic by the World Health Organization, people responded by stocking up. Consumers have started to show more demand for medical supplies such as hand sanitizers and surgical masks, as well as products such as toilet paper and bread (Meyer, 2020). According to experts, the most important measure in the fight against the COVID-19 epidemic is hygiene. This situation has led to significant increases in the sales of hand soap, disinfectant and hygiene products. The increase in the demand for these products has begun to force the stocks of e-commerce sites (Meral, 2020). As it has been determined that the coronavirus spreads like the flu, the demand for health-protecting and health safety items is increasing rapidly. Between 9-16 March in Turkey, the sales of cologne increased 34 times, sterile gloves 19 times, hand disinfectant 10 times, soap 4 times, medical masks 4 times, toilet paper sales 3.5 times compared to the previous week (Gunyol, 2020) . Similar sales trends have been experienced in the US. During the four weeks ending February 22, 2020, sales of medical masks increased significantly. Hand sanitizer sales increased 73% in the same four weeks (Nielsen, 2020). Data regarding this situation are given in Figure 1.

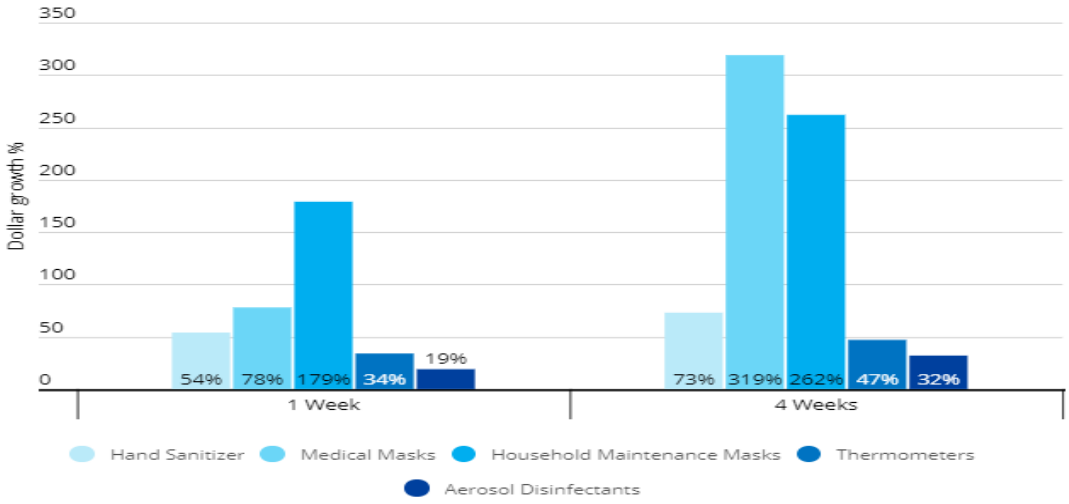

Figure 1: E-Commerce Data Related to Health Care Kaynak: Nielsen, 2020

Many measures have been announced by all world governments fighting the epidemic in order not to stop production in the manufacturing industry. In other countries other than Turkey, employees in the manufacturing industry are also subject to the general quarantine processes, as it is considered important to prevent the spread of the virus. For this reason, workers were asked to stay at home. In our country, this method has not been applied and the burdens that may occur for businesses have been tried to be reduced or postponed. Therefore, most of the companies operating in the manufacturing industry in Turkey were not closed and

continued their business. However, due to slowing exports and decreasing demands, there has been a large contraction in production (TURMOB, 2020: 68-69).

1. Literature

Although there are many studies conducted during the Covid-19 pandemic period, econometric studies with economic indicators are not very common. In this section, the studies on the subject during the pandemic period will be discussed.

Servi et al. (2020), in their study examining whether the VIX Index (Fear Index) has an impact on Turkey's manufacturing industry; They detected a structural break in April 2019, when the Covid-19 epidemic occurred, and concluded that this breakage had a negative impact on manufacturing industry production.

Sari and Kartal (2020) conducted a study to show that COVID-19 has significant effects on financial markets and commodity markets. In the analysis, daily data were used, taking into account the period of January 22, 2020 and April 20, 2020. They examined the possible impact of the daily number of COVID-19 cases on gold prices, oil prices and the VIX Index using the ARDL Boundary Test. According to the results obtained from the study; while a similar relationship was found between the number of cases and gold prices, and between the number of cases and the VIX Index, no cointegration relationship was found between the number of cases and oil prices. In addition, the other result obtained from the study is that the number of COVID-19 cases significantly affects gold prices and the VIX Index.

Adiguzel (2020) investigated the effects of the Covid-19 outbreak on the Turkish economy in his study. Covid19 crisis in Turkey's economy; Production, Employment, Person and Business Revenues, Exports, Current Account Deficit, Budget Deficit and Central Government Total Debt Load were negatively affected depending on the duration of the pandemic, resulting in recession.

Koyuncu and Mecik (2020), in their study investigating the effects of the pandemic on sectors and between sectors in Turkey, examined how the shocks caused by the Covid-19 pandemic affected the sectors with VAR analysis. Using monthly data for the 2015 M:1- 2020 M:5 period, they used the manufacturing industry capacity utilization rate, industrial production index, retail trade and service sector, construction sector cost index, export and import sector index, employment rate variables. After all; Among the sectors, it was found that the construction sector was the last to react to a negative shock, and the industrial sector, retail trade and service sector, and the manufacturing sector were the sectors that reacted the fastest to possible shocks.

Yucel and Durak (2021) investigated the financial effects of COVID-19 on BIST Manufacturing Sector Firms. Eighteen financial ratios were calculated under four headings in the study, in which the first 6-month financial statements of the manufacturing sector companies traded in Borsa Istanbul for the years 2019 and 2020 were examined. In the study, the financial ratios for the first six months of 2019 for the pre-COVID-19 period and the financial ratios for the first six months of 2020, which is the post-COVID-19 period, were used. The researchers performed the "Wilcoxon Signed Ranks Test" to determine whether there is a difference between the two periods in terms of financial ratios. As a result of the study, when the changes in the average financial ratios of the two periods and the revenues of the companies were examined, it was observed that while a significant change was observed in terms of liquidity ratios in the manufacturing sector in general, there was a negative change in

terms of profitability ratios. In addition, it was concluded from the study that "Basic Metal Industry" and "Textile, Clothing and Leather Sector" were adversely affected by the epidemic, and companies in other sectors were affected differently from each other according to the characteristics of the epidemic period.

2. Methodology

2.1. The Concept of Stationarity in Time Series and Unit Root Tests

Before analyzing the causal relations among variables, the order of stationarity of the series must be determined. In the studies made with non-stationary time series, spurious regressions may occur. Although high R^2 and significant t statistics value can be found in spurious regressions, the parameter predictions are not economically significant. In that case, the stationarity of the time series to be used requires to be tested with the aim of avoiding spurious regressions in the studies made with time series analysis (Gujarati, 1999: 713).

$$X_t = c_o + j.X_{t-1} + e_t \qquad (1)$$

In the equation (1), if $|j|<1$, Xt series is stationary; if $|j| =1$, Xt series is non-stationary. It is favorable for autoregressive coefficient "j" to be equal to one or to be smaller than 1 in many economic time series. If j>l, it is not economically significant. In the autoregressive equation #(1), j=1 is known as "the process with stationary differences" and most of the economic time series are observed as the processes with stationary differences. In such a process, when j=1, Xt series is said to be integrated in the first order. In the equation (1), Dickey and Fuller (1987) suggested an easy and favorable method for the test of the order of integration of Xt and it is known as Dickey Fuller (DF) test (Utkulu, 1993: 309).

2.2. Regression and Correlation Analysis

While the forms of the relationships between variables are determined numerically in regression, the degrees of these relationships are revealed in correlation. The linear relationship between two variables -one as dependent and one as independent- can be formulated as follows:

$$Y = \alpha + \beta X + \varepsilon \quad \ldots\ldots \qquad (2)$$

In the equation (2), Y is dependent variable, X is independent variable and ε is error term. In order to decide which variable will represent dependent variable and which variable will represent the independent variable, it is required to determine which one affects the other. This can only occur by having information about observations. The method which is generally used in obtaining regression equation is Least Squares Method. The core of Least Squares Method is based on the minimum totals of the squares of the deviations of value Y from regression line. In that sense, Least Squares Method regression line expresses the same result with aritmetic mean.

On the other hand, correlation coefficient is a measure indicating the degree of the relationship between variables. If its value is between 0 and 1, the correlation is positive; if its value is between 0 and -1, the correlation is negative. When the correlation coefficient is 0, there is no relation between variables and when the correlation is 1 or -1, there is a complete correlation. If the correlation coefficient is between 0 and 0.49, the relationship is weak; if it is between 0.5 and 0.74, the relationship is average and if it is between 0.75 and 1, the relationship is strong. The mark of the correlation coefficient depends on the mark of the β

coefficient in the regression equation. If β is positive, the correlation is positive; and if β is negative, the correlation is negative (Akkaya ve Pazarlioglu, 1998: 85-86).

3. Results

3.1. Data Set and Variables

In this study, 15-month data from March 2020 to May 2021 in Turkey were used. As a variable; Number of cases and Manufacturing Industry Capacity Utilization Rate (%) Manufacturing of basic pharmaceutical products and pharmaceutical materials was used. Time series were used to reveal the relationship between the two variables. In this study, Augmented Dickey Fuller (ADF) test was used to determine whether the values of two variables are stationary. Then, Regression and Correlation Analysis were applied to determine the direction and degree of the relationship. The NC used in the analysis represents the number of cases; PQ represents the pharmaceutical production quantity.

3.2. Unit Root Test Results

Time series used in the model must be tested in order to determine if they are stationary or not. As Granger and Newbold (1974) showed, in case of studying with time series that are non-stationary, the spurious regression problem occurs. As it is, the result obtained by regression analysis does not reflect the actual relationship.

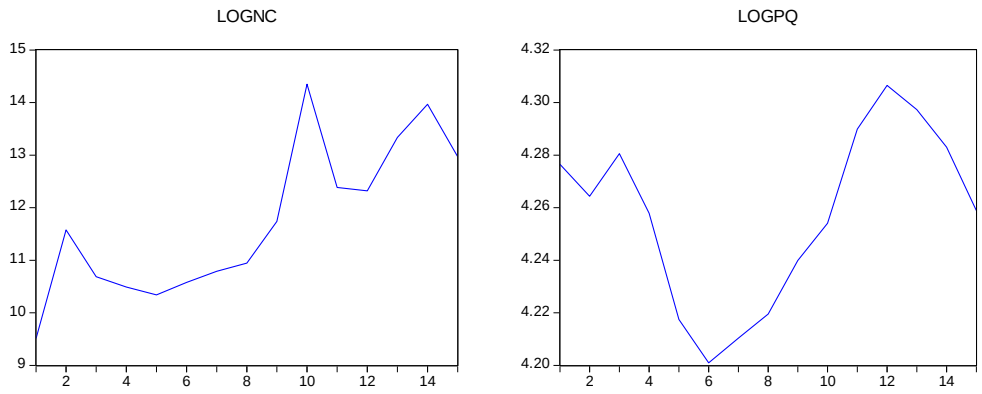

Figure 2. The Graphics of NC and PQ Series

If the series has unit root, it means that it is non-stationary. When the fixed data of ADF test statistic are examined, the following can be said related to NC and PQ series: that they are not in the form of stationarity in the level and that they do not display distribution around a certain average. When their first differences are taken, it is seen that test statistics are bigger than the critical values determined by Mackinnon in terms of absolute value. As a result, when the first differences of NC and PQ series are taken, that is in I(1), it can be said to provide with stationarity hypothesis (see. Table 1).

Table 1: ADF Unit Root Test Results

		ADF – t Statistics	
Variables	**MacKinnon Critical Values**	**Level Values**	**First Difference**

		ADF – t Statistics	
Variables	**MacKinnon Critical Values**	**Level Values**	**First Difference**
NC	%1=- 4.004 %5 = -3.098 %10= -2.690	-1.937 (0)	-3.830 (1)**
PQ	%1 = -2.845 %5 = -3.175 %10= -2.728	-1.845 (3)	-3.119 (0)*
NOTE: The values in brackets give the lagging length chosen according to SCI criteron. The critical values for ADF were obtained by MacKinnon (1996). ***p<.01,			

3.3. Correlation and Regression Analysis Results

Before starting correlation and regression analysis, the causality relationship between NC and PQ must be revealed. If there isn't any causality relationship between these two series, the results of the correlation and regression analysis can be statistically significant; however, it won't have any significance in terms of economics.

Table 2. Correlation Analysis Results

Variables	LOGNC	LOGPQ
LOGNC	1.000	0.434
LOGPQ	0.434	1.0000

When the data in Table 2 are evaluated, it is seen that the correlation between NC and PQ is positive (0.434) and that there is a strong level of relationship between them. The regression analysis results between these two variables for the sample period are shown below.

Table 3. Regression Analysis Results (Dependent Variable = PQ)

Variables	Coefficient
C	0.612
NC	1.123 (5.197)*
R^2	0.812
DW	1.712
F Stat. (Prob.)	0.010

*Note: The numbers in brackets are t statistics. * indicates % 5 significance level.*

By using equation (2), regression analysis results are given in Table 3. When the regression analysis results obtained as a result of solving equation (2) are evaluated; as the probability values of coefficients are smaller than 5%, H_0: rejected, H_1: accepted and the coefficients are significant. F probability is considered for the total significancy of the model and as it is smaller than 5%, H_0: rejected, H_1: accepted and the model can be accepted as significant. It is obvious that the "t" value belonging to NC is statistically significant at a level which is close to 5% and that the relationship is in the negative direction. Also, it is found that the determination coefficient (R^2) of the model is close to a high rate such as 0.81. On the other hand, the D.W (Durbin-Watson) statistic value obtained from regression analysis (1.71)

refers to the situation that there isn't any sequential dependency problem between error terms of the model. When the results of regression analysis are economically evaluated, it is understood that in Turkey NC-PQ relationship is in the positive direction. The mark of the NC coefficient is positive and this situation supports the statement. In period, 1% increase in NC in Turkey is expected to create a 1.12% increase in PQ. Also, when NC is fixed, PQ is expected to be 0.61.

4. Conclusion

Epidemics have caused important health problems that have to be tackled throughout history and that threaten human life. These diseases, which have caused the death of millions of people, have caused great dangers for societies. Black Plague, Cholera, Spanish Flu, Ebola etc., which have been mentioned in the world from past to present. In addition to the epidemics, Covid-19, or the new Coronavirus, which emerged in December 2019, has also been declared as a global epidemic (pandemic) due to its spread rate and severity. This epidemic will go down in history as one of the major epidemics (Çınar and Oğuz, 2020: 3). In the global world order, it can be said that this epidemic shows a higher rate of transmission compared to previous epidemics in history.

The economic costs of the Covid-19 crisis are not the same for different countries around the world. Unemployment, which already exists globally, has increased even more. As in previous crises, younger and less educated workers will be more likely to lose their jobs in this crisis. Unfortunately, it is not possible to clearly reveal the economic effects of Covid-19 under these conditions. This will depend on the pace at which the pandemic progresses over the coming time, its severity, the response of countries, and the policies and measures that governments will implement.

In the face of all these developments, financial expansion programs were implemented to save households and companies, and wage subsidies were given to prevent contagion. In the face of increasing uncertainty, the deepening of the destabilizing effect was prevented with timely financial aid and emergency financing support. Financial stability has been tried to be achieved with the policy of expanding liquidity and low interest rate. Social, economic and political stability was preserved, albeit in the short term, by preventing the evolution of uncertainty into economic and social unrest.

In the study, the relationship between the number of Covid-19 cases and the amount of production in the field of pharmacy was investigated. In the study in which time series were used, unit root test was applied to the variables and they were found to be stationary at level 1. Then, Regression and Correlation Analyzes were performed. With regression analysis; It was found that when the number of cases increased by 1%, the production amount increased by 1.12%. In addition, with the correlation analysis, it was found that there was a positive and moderate relationship between the variables. The findings obtained from the study show parallelism with the results of the research of the financial effects of COVID-19 on BIST Manufacturing Sector Firms by Yücel and Durak (2021). As a result of the aforementioned study, the researchers concluded that companies producing products such as pharmaceuticals, disinfectants, packaging, and basic food products, whose demand increased during the epidemic period, were positively affected by the crisis.

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