RESEARCH ARTICLE

EXAMINING THE EFFECTS OF THE COVID-19 PANDEMIC ON TURKEY'S ECONOMY WITH MODERATION ANALYSIS

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ARTICLE INFO	ABSTRACT
	The Covid-19 pandemic has affected not only the entire world but also the economic indicators and growth rate of Turkey. As a developing economy, Turkey is susceptible to the fluctuations in the value of the United States Dollar (USD), which, in turn, impacts the Turkish Lira (TL) and consequently Turkey's external debt stock.The aim of this study is to reveal whether the USD/TL parity has any moderating effect on Turkey's external debt before and after the Covid-19 pandemic. It is aimed that the research results will be guiding for investors, banks and institutions that direct the economy and to predict the factors that affect the economy during crisis periods.

INTRODUCTION

The Covid-19 pandemic has completely altered the flow of the modern world from top to bottom. Its disruptive impact has been felt in every aspect, ranging from social life to education, from the business world to the economy. Particularly, it has yielded significant consequences in the field of economics, and its repercussions are being experienced globally. Developing and growing economies, such as Turkey, have been affected to a considerable extent in terms of their growth rates.One of the most significant challenges for developing countries is to maintain a balance between imports and exports. When resources such as technology, energy, and raw materials, essential for development, need to be imported, there must be a corresponding ability to offer products that can be sold. When this balance is disrupted, institutions like the World Bank, the International Monetary Fund (IMF), and the Organisation for Economic Co-operation and Development (OECD) provide financial support to countries under certain conditions. The concept of external debt was standardized in 1984 when organizations such as the World Bank, the Bank for International Settlements (BIS), the International Monetary Fund (IMF), and the Organisation for Economic Co-operation and Development (OECD) formed a working group to establish a standard for external debt data.

The definition of external debt from their 1988 study is as follows: "The total of a country's gross foreign liabilities contracted under a contract with non-residents for short, medium, and long-term obligations within a specified period" (1). The concept of financial fragility has emerged as a result of the indicators analyzed by investors in order to carry out their investments and the classifications they make (2). The external debts of developing countries also increase with the growth rate. Particularly, the increase in imports due to the rise in consumption as a result of the influence of free-market economy and liberalism increases the external debt burden of countries. While borrowing is necessary for growth, excessive borrowing leads to economic imbalances with the impact of exchange rates, borrowing interest rates, and inflation. The disruption of economic balances results in consequences such as unemployment, recession, and inadequate credit limits, affecting the fragility index. In another study conducted by Özyıldız (3), macroeconomic fragility indicators for Turkey were attempted to be explored, and the relationships between selected macroeconomic indicators and fragility score were examined using econometric testing methods. Within this context, various variables such as current account/Gross Domestic Product (GDP), international foreign exchange reserves/country's short-term external debt, international foreign exchange reserves/GDP, total external debt/GDP, total external debt/total annual exports were considered by examining the macroeconomic indicators identified for Turkey. With the Covid-19 pandemic, significant economic changes have occurred both globally and in Turkey.

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The pandemic process, which affects the growth rate of countries, has led to a significant depreciation of the Turkish lira. As a developing economy, Turkey immediately felt the effects of the pandemic process, significantly impacting Turkey's external debt stock. In this study, the effects of the USD/TL parity on the Turkish economy before and after the Covid-19 pandemic have been examined using "Moderation Analysis," a frequently used analysis in recent years. The direction, magnitude, and factors creating this effect constitute the content of the analysis. Care has been taken for the study to have guiding content in this field.

MODERATION ANALYSIS

Moderation Analysis is a statistical method used to explain the impact of an independent variable (X) on a dependent variable (Y). It not only reveals when the effect of X on Y will increase or decrease but also determines the direction of the effect. Conceptually, in multiple regression analysis, moderation occurs when the "boundary association" between two variables and "depends on a third variable" (4). The moderating variable can be either continuous or categorical. Continuous variables like age, income, height, etc., can serve as moderating variables, and categorical variables such as gender, loyalty, region, education level, etc., can also be used as categorical moderating variables. In this study, the moderating variable used will be a categorical time variable, specifically, "before pandemic" and "after pandemic," and this variable will be included in the model as a moderator. The effects of the changes in the value of the USD/TL parity before and after the pandemic on the Turkish economy will be examined by establishing a moderation model. In the presence of such a change, the level, direction, and significance of the effect will be investigated. The variable serving as a moderator (W) is included in the simple linear regression model ($Y = b_0 + b_1X$) to examine the effect of the independent (explanatory) variable X on the dependent variable (outcome) Y. In addition to the direct effect of X on Y, the interaction effect (XW) in conjunction with the moderator variable is also included in the model. This allows the evaluation of the combined effect of the independent variable X and the moderator variable W, providing insight into how the total effect on the dependent variable Y is altered. The statistical representation of the Simple Moderation Model is as follows:
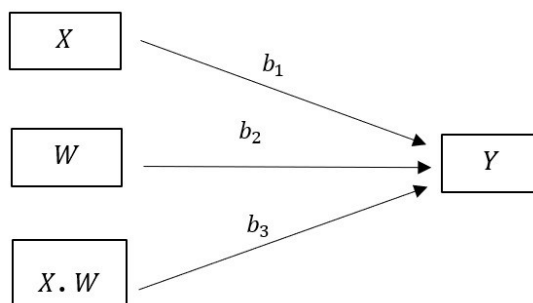

Figure 1. Simple Moderation Model

With the inclusion of the moderator variable in the simple linear regression model, the model can be expressed as follows (4):

$$Y = b_0 + b_1X + b_2W + b_3 XW \qquad (1)$$

The presence of the interaction variable in the product is crucial in detecting the existence of the moderator variable. If the effect of the interaction variable on the dependent variable is significant, then it is possible to speak of a moderating effect. In other words, the impact of the independent variable on the dependent variable will be shaped in the presence of the moderator variable. In other words, as the moderator variable (W) takes different values (low, moderate, high), the impact of the independent variable on the dependent variable will also vary according to these values. When using a research model that includes a moderator variable, it is possible to understand whether there is a moderator effect by examining the interaction. In the analysis, after controlling for the effects of the predictor variable (b_1X) and the moderator variable (b_2W), if the interaction variable's ($b_3 XW$) effect on the dependent variable is significant, it is said that there is a moderator effect. Once the presence of the moderator effect is determined, it should be examined under which conditions the effect is significant (for example: female-male; low-medium-high). In moderator analysis, a crucial aspect is the necessity to centralize or standardize (z-score) values of both the dependent variable (X) and the moderator variable (W) to mitigate linearity issues and facilitate interpretation. Otherwise, the impact of the interaction term on the dependent variable may become undetectable due to the problem of multicollinearity. Centralization is performed using a scaling function that subtracts the mean of a variable from each of its values. Standardization, on the other hand, involves subtracting the mean from the variable's value and dividing the obtained result by the standard error.

USD- Turkish Lira Parity: According to data released by the Federal Reserve (FED), unexpected events worldwide and sudden events in our country create instant fluctuations in the TRY-USD exchange rate. If the magnitude of the influencing event is not long-term, it does not impact import and export figures, and therefore, it does not affect external debt. In this study, USD/TL parity have been observed since January 2005, and monthly averages have been included in the study. The purpose of taking the monthly average value is to track the monthly changes in the USD/TL exchange rate and ensure temporal integrity in the data. Despite fluctuations within the month due to the daily changing exchange rate, taking the monthly arithmetic average eliminates the impact of sudden rises or falls in the daily data set. As a natural consequence, this allows for working with a more reliable data set.

External Debt: External debt is the borrowings with a maturity period taken by countries and public institutions from specific organizations or other countries to realize their investments or meet cash needs. In another perspective, external debts can be considered as a capital flow from developed countries to developing countries (5). The most crucial aspect to consider in external borrowing is the ability to transform the borrowed funds into value-added and ensure sustainability by evaluating the obtained credit. Otherwise, credits used in non-productive investments or in places that do not yield high returns increase the countries' debt stock. Since the borrowed credit is usually in U.S. Dollars, fluctuations in the exchange rate can cause an increase or decrease in the debt stock. As long as the borrowing level remains within reasonable terms, it contributes to the development and progress of countries. Especially in developing countries, the funds required for investments are often not met by the domestic market. In such cases, organizations like the World Bank and IMF provide loans to countries, encouraging investments. External borrowing, which significantly

influences the economic structures of countries, has been studied by economists since the 1960s. Numerous scientific studies on external borrowing, initiated by the first empirical study conducted by Rosentein-Rodan in 1962, have entered the economic literature.

THE EFFECT OF THE COVID-19 PANDEMIC ON TURKISH ECONOMY

In this study, monthly averages of the USD/TL parity data were taken and included in the model. Since external debt data in our country is announced in 3-month periods, it was converted into monthly data by taking the average for the sake of integrity in the study. The data in the study were observed from January 2005 to March 2023 and 219 observations were reached. The data was obtained from the accessible websites of the Presidency of the Republic of Turkey, Strategy and Budget Presidency and the Central Bank of the Republic of Turkey. The main question researched in this study is whether the Covid-19 pandemic is a moderator in the effect of the USD/TL parity on Turkey's foreign debt. The study categorizes the periods as before-pandemic (W=0) and after-pandemic (W=1) and includes only one moderator variable (W) in the model. An assessment will be made in four stages for variables believed to be effective on Turkey's external debt. Firstly, the relationship between the USD/TL parity and Turkey's external debt will be examined, and the extent to which the USD/TL parity (independent variable) explains Turkey's external debt (dependent variable) will be observed without including the moderator variable in the model. Then, it will be determined whether there is a strong relationship between the USD/TL parity (independent variable) and the moderator categorical variable, the Covid-19 pandemic. If a strong relationship exists, both variables will be standardized and transformed into z-scores. In the third step, the interaction term (X.W) obtained by multiplying the independent variable (X) with the moderator variable (W) will be examined and evaluated. In the final stage, moderator analysis will be conducted to examine the measurement levels of the variables.

Examination of the Relationship Between Variables

A simple linear regression model depicting the relationship between the independent variable, the USD/TL parity, and the dependent variable, Turkey's external debt, was obtained as $\hat{Y} = 306.069 + 12.139X$. The significance level for the USD, denoted as $p = 0.000 < 0.05$, indicating that this variable is statistically significant in the model. The coefficient of the USD/TL parity variable in the model ($b_1 = 12.1399$) suggests that a one-unit increase in parity leads to a 12.14-unit increase in Turkey's external debt. The determination coefficient, $R^2 = 0.334$, was obtained, indicating that 33.4% of the variability in Turkey's external debt is explained by the USD/TL parity.

Examination of Interaction Variable: The significance of the effect of the interaction variable, obtained by multiplying the USD/TL parity and moderator variables, on the dependent, or in other words, outcome variable needs to be tested. If the moderator variable, referred to as the moderator effect, is found to be significant, an analysis of the slope is conducted, and the results are evaluated together. The significance of the moderator variable is determined using the Process macro, an SPSS add-on developed by Andrew F. Hayes. To guide

researchers interested in this topic, the steps of the analysis conducted with the Process Macro are provided below:

- Firstly, open the .sav file using the SPSS program.
- Go to "Analyze-Regression-Process" add-on.
- Define variables (Independent, Moderator, and Dependent Variables are placed in the respective boxes).
- In the Model section, select Model "1" and click on the "Options" tab. Clicking on the "Generate code for visualizing interactions" option provides the command for the slope graph that will be obtained after the analysis. The simple slope analysis would be visualized in a plot to intuitively display the strength or direction of the moderation effect. In the past, these steps were to be conducted by typingin complex and troublesome syntax (6).
- Additionally, in the "Mean center for construction of products" tab, centralization of variables is done using the option "All variable that defines products."

Once all these steps are completed, the output obtained is evaluated from a statistical perspective. The analysis results obtained for the significance of the interaction term are summarized in Table 1. as follows:

Table 1. Analysis Results for Moderator Model

	Model Coefficients	Standard Error	t	Significance "p"	LLCI	ULCI
Constant	408.4037	6.0653	67.3344	.0000	396.4497	420.3588
US Dollar	37.3445	2.5425	14.6883	.0000	32.3331	42.3558
Pandemic	7.0710	18.9424	0.3733	.7093	-30.2656	44.4075
Interaction term	-41.4475	3.6212	-11.41.54	.0000	-48.4752	-34.1999

The analysis results, conducted with 216 observations, consist of standardized non-regression coefficients that demonstrate the effects of each variable on the dependent variable. These coefficients can be evaluated with the significance levels represented by "p" values and confidence intervals. To understand whether there is a moderator effect, the significance of the "b" value for the "Interaction Term" variable is examined. The coefficient and significance of the moderator variable in the model were found to be "$b = -41.4475; p = .000$" and since $p = .000 < 0.05$, it is observed that the interaction term is significant. Additionally, the confidence interval (-48.4752, -34.1999) not containing the "0" value is another indicator of the significance of the interaction term.

If the moderator effect is found to be significant, it needs to be further examined in detail, and the results of the slope analysis should be evaluated. The effects of the moderator variable, included in the model before and after the pandemic, are as follows: (.1689) before the pandemic and (-.8311) after the pandemic. Additionally, with the inclusion of the pandemic moderator variable in the model, there has been a 24.75% increase in the explanatory power of the dependent variable. This indicates the impact of the USD/TL parity on external debt explanation, showing that when included in the model,

external debt can be explained 24.75% more effectively. Moreover, the "p" value for the inverse relationship between external debt and before the pandemic is ".000," indicating significance. However, the relationship after the pandemic, despite being in the same direction, yields a "p" value of ".1321," which is not statistically significant. To visually observe the moderating effect, graphs should be drawn using the data generated through the SPSS Process macro. The impact of the pandemic moderator variable (0=before pandemic; 1=after pandemic) on the dependent variable, external debt, can be observed in the slope, as obtained in Figure 2.
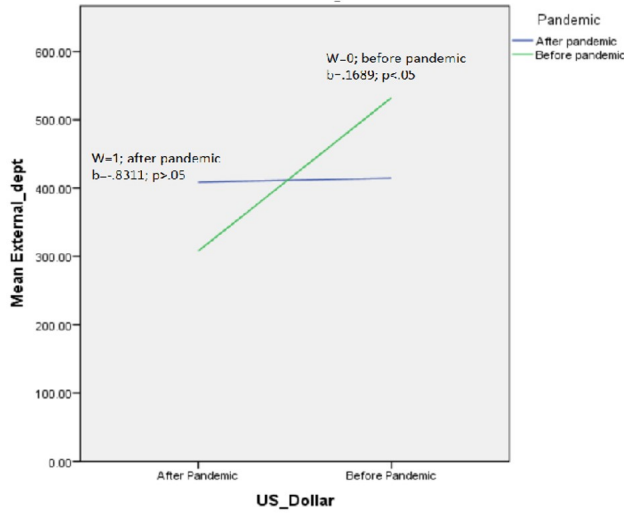

Figure 2. Graph of the Moderator Variable's Effect on External Debt

When examining the graph, the most noticeable aspect is the effectiveness of the employed moderator variable in differentiation. If the slopes for pandemic categories were parallel, it would suggest that the discriminatory power of the categories is not very effective. However, in this study, it is evident from the graph that the pandemic is a robust moderator. The impact of the moderator variable on external debt is significant before the pandemic, whereas it is not possible to speak of a significant relationship after the pandemic.

CONCLUSION

The Covid-19 pandemic has played a decisive role in the economy of the whole world. While countries with strong economies easily recovered from the effects of the pandemic, it was not possible for developing countries to avoid being affected by the pandemic. In this study, it was concluded that the USD/TL parity had a moderating effect on Turkey's external debt by interacting with the Pandemic categorical variable before and after the pandemic.

It was observed that this effect was increasing before the pandemic, and this situation was tried to be conveyed to the researchers with the help of both models and graphics. After the pandemic, the pandemic categorical variable, which interacted with the USD/TL Parity, lost its effect on external debt, and as a result, external debt was no longer affected positively or negatively by this interaction. In the continuation of this research, it is planned to examine the effects of other variables affecting external debt and even include mediator effects in the model.

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