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RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

Causal Relationship Between Transport Inflation with Oil Prices and Exchange Rates

Ulaştırma Enflasyonu ile Petrol Fiyatları ve Döviz Kurları Arasındaki Nedensellik İlişkisi

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ABSTRACT

The aim of this study is to examine the effects of oil prices and exchange rates on the inflation of the transportation sector between the years 2010 and 2022. The Toda-Yamamoto and Breitung- Candelon frequency domain causality test were employed as the methodologies for analysis. The variables used in the analysis are: the transportation services price index, European Brent oil prices, and dollar rate. In terms of the Toda-Yamamoto test results, a unidirectional causality relationship was found from oil prices and dollar rates to transportation prices over time. In terms of the Breitung and Candelon test results, short, medium, and long-term effects, both temporary and permanent, were determined from both oil prices and dollar exchange rates to transportation prices. When the results are evaluated in general, increases in energy prices and exchange rates cause inflation in the transportation sector. Reducing energy consumption, which is an important cost factor in the production and consumption channel of transportation, will not only reduce imports, but also reduce the need for foreign currency, while reducing prices in the transportation sector.

Keywords: Transportation Prices, Inflation, Oil Prices, Exchange Rate, Frequency Domain Causality
Jel Codes: E31, F31, C32

ÖZ

Bu çalışmanın amacı Türkiye'de 2010 ve 2022 döneminde petrol fiyatlarının ve döviz kurunun ulaştırma sektörü enflasyonu üzerindeki etkisini incelemektir. Analiz yöntemi olarak Toda-Yamamoto ve Breitung-Candelon frekans alanı nedensellik testi kullanılmıştır. Analizde kullanılan değişkenler ulaştırma hizmetleri fiyat endeksi, Avrupa brent petrol fiyatları ve dolar kuru kullanılmıştır. Toda-Yamamoto test sonuçlarında uzun dönemde petrol fiyatlarından ve dolar kurundan ulaşım fiyatlarına doğru tek yönlü bir nedensellik ilişkisi tespit edilmiştir. Breitung and

Candelon test sonuçlarında ise hem petrol fiyatlarından hem de dolar kurundan ulaştırma fiyatlarına doğru kısa, orta ve uzun vadede geçici ve kalıcı etkiler tespit edilmiştir. Sonuçlar genel olarak değerlendirildiğinde enerji fiyatları ve döviz kuru artışları ulaşım sektöründe enflasyona neden olmaktadır. Ulaşımın üretim ve tüketim kanalında önemli bir maliyet unsuru olan enerji tüketiminin azaltılması hem ithalatı düşürücü etki yaparken hem de dövize olan ihtiyacı azaltacak diğer yandan ulaşım sektöründe fiyatları düşürücü etki yapacaktır.

Anahtar Kelimeler: Ulaştırma Fiyatları, Enflasyon, Petrol Fiyatları, Döviz Kuru, Frekans Alanda Nedensellik
Jel Kodları: E31, F31, C32

1. Introduction

The transportation sector is an important service in every modern society, both socially and economically. The sector, which constitutes the transportation chain across the air, land, and sea, has been one of the leading indicators of many civil factors, such as national security, level of development, and the social and cultural dimensions of a society. The intertwining of the transportation sector with other sectors in the economy (foreign trade, tourism, construction, etc.) causes their mutual relations to be more connected in terms of the economy. Therefore, any negative situation experienced in the transportation sector can spread to other sectors. When considered economically, the most important indicator that should be emphasized in transportation services is the cost factor. Foreign-dependent countries, such as Turkey, can be particularly adversely affected by energy prices, which is an important cost factor. The limited supply of oil in the world causes oil prices to be affected very quickly, having a negative impact on the economies of countries. On the other hand, for a country that conducts its foreign trade in a foreign currency, the developments in the exchange rates directly affect the economy, either positively or negatively.

After the COVID-19 epidemic, increasing global supply problems, due to pent-up demand and the chip shortage in the automobile market, caused supply-side problems in both the new and second-hand markets. On the other hand, the Russia-Ukraine crisis, which broke out in February 2022, led to an increase in energy and food prices. The price increases have spread to all sectors, with the transportation sector also facing its share through such channels as automobile, transportation, freight, and passenger transportation. At such a conjuncture where inflation has reached historical peaks, measuring the effect of changes in oil and exchange rates on transportation services prices should contribute to the literature in a unique way. This is because both oil prices and exchange rates represent the most basic and most important indicators of prices in the transportation sector, whether directly or indirectly. The fact that Turkey is a country with a high dependence on foreign energy (imports), as well as the fact that imports are made in foreign currency, contribute to the increase in the general level of prices in Turkey. Similar results have been obtained in many studies on the sources of inflation (Such as; Köse & Unal, 2021; Ha, Stocker, & Yılmazkuday,

2020; Salisu, Isah, Oyewole, & Akanni, 2018; Çelik & Akgül, 2011). The contribution of the present research to the literature is twofold. First, there are few studies on the determinants of transport inflation in the literature, with there being no such study on this field in Turkey yet. The second aspired contribution of this study is the determination of the causal relationship between the price increases in transportation services, oil prices, and the dollar exchange rate. The effect of energy prices on price increases in the transportation sector, how long the exchange rate effect covers, and how this affects prices should be taken into account in the economic policies to be implemented in Turkey in the upcoming period. On the other hand, this study contributes to the literature on the determinants of inflation with current data.

In this study, the effects of oil prices and exchange rates on the transportation prices in Turkey between January 2010 and September 2022 were examined. The varibales used in this study are the transport services consumer price index, European Brent oil prices, and dollar rate. The reason why 2010 was chosen as the starting year is because it represents a post-crisis period, when the economic effects of the 2008 USA Mortgage crisis diminished. Augmented Dickey Fuller (1979) and Phillips Perron (1988) unit root tests were used for the stationarity tests of the variables. In addition to the traditional unit root tests, the Lee Strazezich unit root test, which allows two structural breaks in the variables, was used. Afterwards, the causality test developed by Toda-Yamamoto (1995) was conducted. After determining the causality between the variables, the frequency domain causality test developed by Breitung and Candelon (2006) was used to analyze the causality between variables in the short, medium, and long term and to determine the temporary or permanent effects. In the last stage of the analysis, the relationship between oil prices and exchange rates and the price of transportation services was interpreted through comparative analysis.

This study consists of four parts. The first part is the introduction of the study. In the section after the introduction, national and international literature on the subject is provided. In the third part, the data used and the preferred method are elaborated. Finally, the analysis results are included in the fourth part.

2. Literature Review

There are many national and international studies on inflation in the literature. Zelka and Yıldırım (2022) examined the impact of economic growth, oil prices, and exchange rates on the transportation sector in Turkey. As a result of the research, a one-way causality relationship has been determined from economic growth, oil prices, and exchange rate to the transportation sector. On the other hand, Kozlovska and Ciziuniene (2022) examined the relationship between the transport sector and the per capita income of the Baltic countries. The research found a negative relationship between per capita income and the transportation

sector. Alıcı (2021) examined the effects of interest rates and exchange rates on the BIST transportation index. The study concluded that interest rates do not affect the transportation index in Turkey, and that the negative and positive shocks in the exchange rate affect the transportation index. Ozer, Canbay, and Kırca (2021) did not find a relationship between rail container transportation and economic growth for Turkey, but found a positive relationship between sea container transportation and economic growth in both the short and long run. Kiracı (2020) examined the effect of the dollar index and oil prices on the transportation sector in Turkey, concluding that shocks in oil prices and dollar exchange rates affect the transportation sector, negatively and positively. Riaz, Hongbing, Hashmi, and Khan (2018) examined the impact of uncertainty on the transport sector. He concluded that the increase in uncertainty affects the transportation sector negatively, while a decrease in interest rates and increases in oil prices positively affect the shares of the transportation sector in the stock market. Suparti, Prahutamam, and Santosol (2018), in his analysis for Indonesia, determined that price increases in the transportation sector produce an inflation rate close to 50%. Tong and Yamamoto (2018) examined the relationship between the transportation sector and economic growth in China. As a result of the research, it has been determined that while freight transport and road transport affect economic growth positively, rail transport does not affect economic growth. Shively and Thapa (2017), in his analysis for Nepal, concluded that the increase in transportation prices has an increasing effect on food prices. Rasasi and Yılmaz (2016) examined the effect of exchange rate and oil prices on inflation for the period 1987-2015 in Turkey. An analysis of the results determined that while increases in oil prices and the exchange rate also cause an increase inflation, oil price increases affect inflation more than exchange rate increases. Erdoğdu (2014) examined fuel prices in Turkey in the period of 2006-2010. According to the research findings, the presence of high tax rates and the oil black market (oil smuggling) causes an increase in fuel prices and adversely affects road transport. On the other hand, Çiçek and Akgül (2013), in their analysis for Turkey in the 1994-2013 period, determined that positive shocks in the sub-sectors of inflation (transportation, food, and housing) have a decreasing effect on inflation. Aggarwal, Akhigbe, and Mohanty (2012), in his study for the USA, found that oil price increases negatively affect shipping returns, while decreases in oil prices increase risks in the transportation sector. Berument and Tascı (2002), in their analysis according to the 1990 input-output table of Turkey, determined that increases in oil prices and in the general price level depend on increases in wage, profit, interest, and rent rates. Woodward and Rolfe (1993), in his study for the USA, concluded that the increase in costs in the transportation sector negatively affects the investments entering the country. Fuller (1981), in his study for the USA, concluded that inflation and increases in energy prices increase the costs of the transportation sector. Baer, Kerstenetzky and Simonsen (1965) determined that flawed economic policies implemented in Brazil during the 1950s and 1960s caused an increase in prices in the

transportation sector. Stanisławska (2019) conducted research on inflation increases in Poland and European Union countries during the 2004-2017 period. In the results of the research, it has been determined that consumers care more about decreases in transportation prices than increases and that the role of transportation prices in general consumer price index increases is minimal.

Apart from the studies on price increases in the transportation sector, there are many other studies which examine the relationship between price increases of other sectors and general price increases with macro variables. On the other hand, Akçağlayan and Gemicioğlu (2022) examined the effect of the consumer and producer price indices on the real exchange rate and oil prices in Turkey, determining that increases in the exchange rate and oil prices caused increases in both producer and consumer inflation. Güngör and Erer (2022) found that increases in the real exchange rate and average real oil prices in Turkey cause increases in food prices and inflation in the price of food. Hatipoğlu (2021) found that housing price increases in some regions in Turkey do not cause inflation in the short, medium, and long term. According to Paksoy, Yöntem, and Büyükçelebi (2014), on the other hand, while housing prices cause inflation in certain regions of Turkey, housing price increases do not cause inflation in other regions. Şahin Kutlu (2021) identified the exchange rate as the most important cause of food inflation in Turkey, leading to the conclusion that an effective exchange rate policy should be implemented. Ulusoy and Şahingöz (2020) concluded that price increases in food products increase inflation. Mukhtarov, Mammadov, and Ahmadov (2019), in his study for Azerbaijan, found that oil prices and exchange rates have a positive and statistically significant effect on inflation in the long run. Asghar and Naveed (2015) examined the effect of world oil prices and nominal exchange rate on inflation for Pakistan, finding that inflation has a positive relationship with oil prices and a negative relationship with exchange rates. Tay Bayramoğlu and Yurtkur (2015) found that oil prices and exchange rates affect the food and agricultural product prices in Turkey. Nazariyan and Amiri (2014) found the asymmetrical pass-through of positive and negative oil shocks into inflation. Alvarez, Hurtado, Sanchez, and Thomas (2011) examined the effect of oil prices on the consumer price index for Spain and the Euro Area and found that oil prices cause inflation for both regions. Başkaya et al. (2008), in their study to determine the determinants of processed food prices in Turkey, found that temperature increases and exchange rates increase these prices. Kıvılcım (1995) examined the inflationary process in Turkey during the 1950 and 1988 periods. As a result of the research, it has been determined that in Turkey, excessive demand for money affects inflation positively in the short term, but excessive demand for imported goods and capital assets has some effect on inflation, with a possibility to redeuce inflation by removing the fiscal deficit.

The literature is ripe with studies on general price increases to explain the relationship between sectoral inflation, as well as studies in areas such as food, housing, construction,

and general inflation with macro variables. This study represents an examination to explain transportation inflation, which is less common in the literature. Thus, this study is thought to fill a gap in the literature.

3. Data and Methodology

In order to measure the effect of oil prices and exchange rate on transportation services prices, a stationarity test was carried out in the first stage. Monthly data was used for the period beginning from January 2010 and endingin September 2022. For the stationarity test, Augmented Dickey Fuller (1979) and Phillips-Perron (1988) unit root tests were performed. In addition, the Lee Strazicicih (2003) unit root test with double structural break was performed. The logarithmic transformations of the variables were used and the seasonality effect determined in the transportation prices was eliminated by the Tramo / Seats method. The trend effect has been determined in the model, with the trend being added. Data for all variables were obtained from the Central Bank of the Republic of Turkey (CBRT). Figure 2 displays the time graphs of the variables.

Table 1: Variable Definition

Variable	Symbol	Source
Transport Services Consumer Price Index	transp	CBRT
European Brent Oil Price (Dollar)	oilp	CBRT
Exchange Rate	dolar	CBRT

Figure 1. Time Series Graph of the Variables
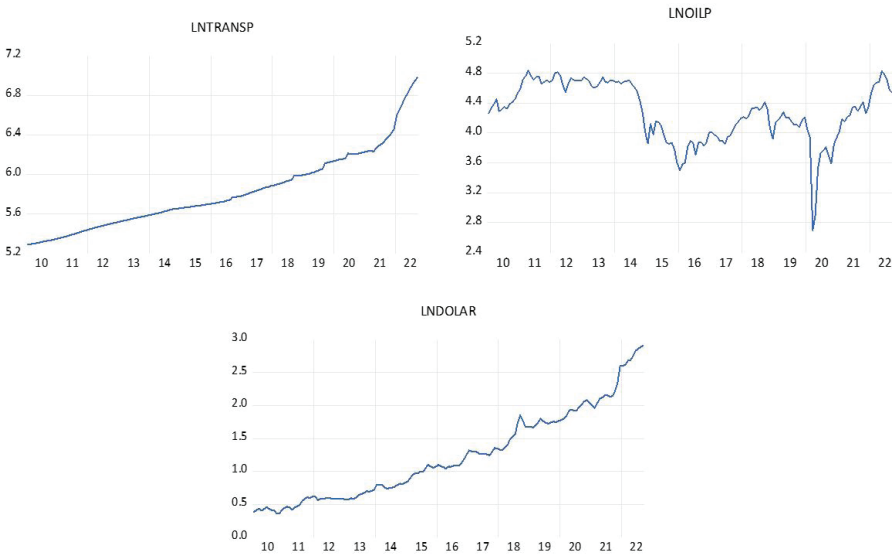
For the determination of causality between variables, the causality test developed by Toda-Yamamoto (1995) was used in the first stage. In this method, although the condition of being stationary is not required, it is a causality test based on the VAR model, which ignores the existence of a cointegrated relationship. The long-term causality relationship between variables can be determined via the Toda-Yamamoto test. In the Breitung and Candelon Frequency Domain Causality test, on the other hand, whether the variables are in short, medium, and/or long-term relationships can be determined. This test can also provide an idea about whether these relationships are temporary or permanent.

For the Toda-Yamamoto causality test, a VAR model was established again by adding the maximum stationarity order of the series to the appropriate lag length determined in the first stage. [1] The established VAR model is as follows;

$$Y_t = \alpha_0 + \sum_{i=1}^{p+d_{max}} \alpha_{1i} Y_{t-1} + \sum_{i=1}^{p+d_{max}} \alpha_{2i} X_{t-i} + u_t \tag{1}$$

$$Y_t = \alpha_0 + \sum_{i=1}^{p+d_{max}} \alpha_{1i} Y_{t-1} + \sum_{i=1}^{p+d_{max}} \alpha_{2i} X_{t-i} + u_t \tag{2}$$

The hypotheses established for the obtained equation;

H_0 = There is causality from Y to X.

H_1 = There is no causality from Y to X.

The WALD statistic was calculated from the constrained and unconstrained VAR model obtained according to the established null hypothesis. Therefore, a causality test could be performed for variables that are not stationary but have a cointegrating relationship (Taştan, 2015). Since the Breitung-Candelon causality test was based on the Toda-Yamamoto causality test, the level value (I0) of the variables was used and the Breitung-Candelon test was applied.

Breitung and Candelon (2006) contributed to the creation of different frequency values for each period. As in the studies of Taştan (2015) and Ciner (2011), the short-middle and long-term frequency values between the variables were established as follows;

ω= 0.05   Short-term causality relationship frequency value

ω= 1.50   Mid-term causality relationship frequency value

ω= 2.50   Long-term causality relationship frequency value

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[1]   Since the appropriate lag length is 2 and the maximum stationarity level i is 1 in the study, the appropriate lag number of the VAR model is taken as 3. (p+ d_{max} formula)

In the last stage of the analysis, the time period corresponding to the detected "ω" values was calculated. The formula used in the time zone calculation is:

$$T = \frac{2\pi}{\omega}$$

T= the period to which the frequency corresponds

ω = Frequency value

π = Pi Number (3.14)

The equation established for the analysis is as follows;

$$\text{Lntransp} = \beta_0 + \beta_1 \text{lnoilp} + \beta_2 \text{lndolar} + u_{it}$$

4. Analysis Results

In Table 2 below, the unit root test results of the variables is provided given. According to the results, all variables in both tests are not stationary at I (0) level values, but become stationary at I (1) level.

Table 2: Traditional Unıt Root Test Results

	ADF				PP			
	Constant		Trend & Constant		Constant		Trend & Constant	
Variables	t-Stat.	Prob.	t-Stat.	Prob.	t-Stat.	Prob	t-Stat.	Prob
lntransp	2.77	1.00	1.184	0.99	3.50	1.00	2.37	1.00
lnoilp	-2.28	0.17	-2.41	0.37	-2.26	0.18	-2.44	0.35
lndolar	2.34	1.00	-0.53	0.98	2.78	1.00	-0.26	0.99
Δlntransp	-3.69	0.00	-7.50	0.00	-7.38	0.00	-7.79	0.00
Δlnoilp	-9.94	0.00	-9.91	0.00	-11.22	0.00	-11.24	0.00
Δlndolar	-8.58	0.00	-8.91	0.00	-8.00	0.00	-9.10	0.00

After the traditional unit root tests, the Lee Strazicich unit root test, which detects two structural breaks, was performed. The test results are provided in Table 3 below.

Table 3: Lee Strazicich Unıt Root Test Results

		Critical Value			
	Min.Test Statistic	%10	%5	%1	Break Dates
lntransp	-8.4590	-5.3211	-5.6259	-6.1808	2016:M09; 2020:M05
lnoilp	-4.8623	-5.3029	-5.5970	-6.1674	2014:M10; 2021:M02
lndolar	-5.6056	-5.3785	-5.6740	-6.3397	2015:M01; 2021:M01

The structural break dates for transportation prices have been determined as September 2016 and May 2020. In the first months of 2016, the dollar rate exceeded 3 TL for the first time in Turkey, and in the same period, the Brent oil barrel prices increased from 35 dollars to 49 dollars. Therefore, this time represents a period in which transportation prices increased. May 2020, on the other hand, represents a period in which the effects of the COVID-19 Outbreak were yet to be observed. October 2014 and February 2021 were determined as the breaking dates in oil prices. As for September 2014, this is when the European Brent oil prices began to decline due to excess supply. Among the reasons for the breaking dates in both oil prices and the dollar rate at the beginning of 2021 are the continuation of the effects of the COVID-19 pandemic, the rise in oil prices from a low course, and the historical peak of the dollar rate in Turkey (reaching 8 TL). Another breaking date in the dollar rate is January 2015. In the third and fourth quarters of 2014, the Turkish economy grew below expectations. From this time onward, the dollar began on an upward trajectory.

Table 4: Toda-Yamamoto Causality Test Results

Independent Variable	lntransp t stat. (prob)	lnoilp t stat. (prob)	lndolar t stat. (prob)	All
Dependent Variable				
lntransp	-	8.29 (0.01)*	18.17 (0.00)*	27.4 (0.00)*
lnoilp	1.43 (0.48)	-	3.05 (0.21)	3.51 (0.47)
lndolar	2.58 (0.27)	3.92 (0.14)	-	7.46 (0.11)

In the test results provided in Table 4 above, a one-way causality relationship was found from oil prices and dollar exchange rates to transportation sector prices in the long run at a 5% significance level. No causality relationship was found from transportation sector prices to oil prices and dollar exchange rates.

Table 5: Breitung and Candelon Frequency Domain Causality Test Results

Hypotheses	Long Term (ω =0.05)	Medium Term (ω =1.5)	Short Term (ω =2.5)
lntransp $\rightarrow$ lnoilp	4.03 (0.13)	2.32 (0.31)	2.46 (0.29)
Lnoilp $\rightarrow$ lntransp	3.49 (0.17)	7.51 (0.02)*	6.71 (0.03)*
lntransp $\rightarrow$ lndolar	0.70 (0.42)	1.10 (0.57)	1.04 (0.59)
Lnedolar $\rightarrow$ lntransp	26.72 (0.00)*	24.5 (0.00)*	31.0 (0.00)*

* It shows that there is a significant causality relationship at the 5% significance level. The values in the brackets are the probability value of the F statistics calculated for the relevant ω values.

Table 6: Breitung and Candelon Frequency Domain Causality Test Results (With Structural Breaks)

Hypotheses	Long Term (ω =0.05)	Medium Term (ω =1.5)	Short Term (ω =2.5)
lntransp $\rightarrow$ lnoilp	3.84 (0.14)	1.71 (0.42)	1.70 (0.42)
Lnoilp $\rightarrow$ lntransp	4.94 (0.08)*	20.91 (0.00)*	27.86 (0.00*)
lntransp $\rightarrow$ lndolar	1.53 (0.46)	0.82 (0.66)	0.77 (0.67)

Lnedolar → lntransp	27.7 (0.00)*	20.9 (0.00)*	27.86 (0.00)*

* It shows that there is a significant causality relationship at the 5% significance level. The values in the brackets are the probability value of the F statistics calculated for the relevant ω values.

Two tables were prepared for the Breitung and Candelon frequency domain causality test results. While the break dates of the variables are not included in Table 5, the results were obtained by adding the break dates of each variable in the test results in Table 6. According to the results in Table 5 and Table 6, no causality emerged from transportation prices to oil prices and dollar exchange rates. In other words, the results did not change in both the model with breaks and the model without breaks. According to Table 5, while no long-term relationship can be found from oil prices to transportation prices, both permanent and temporary effects have been identified in the short-term and medium-term. Short-term, medium, and long-term permanent effects were found from the dollar rate to transportation prices. In the results presented in Table 6, which includes structural breaks, the temporary and permanent effects of both oil prices and dollar exchange rates on transportation prices in the short, medium, and long-term have been determined.

Figure 2: Breitung and Candelon Frequency Domain Causality Test Results
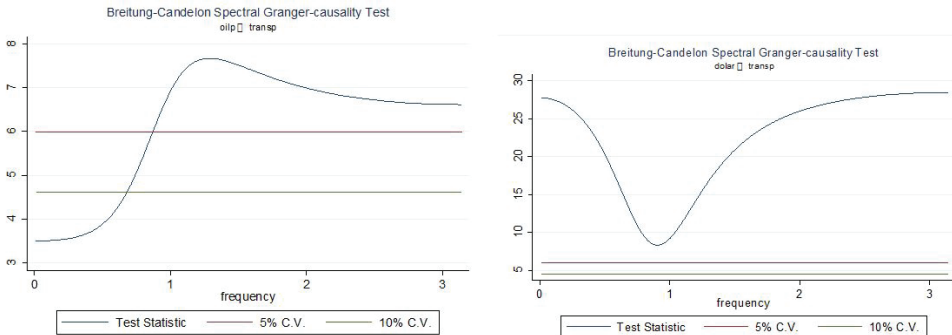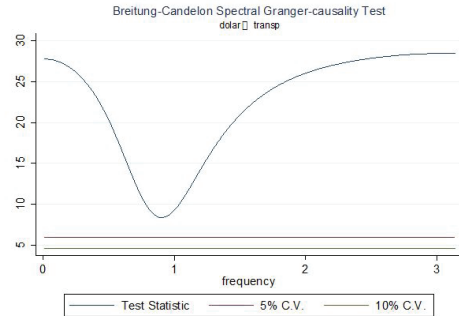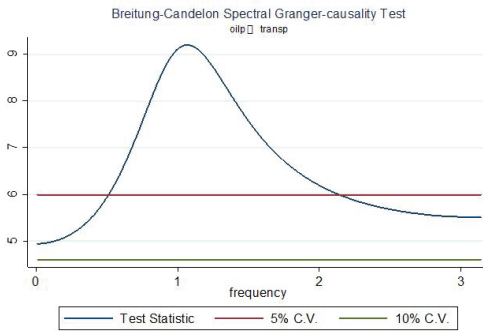

Figure 3: Breitung and Candelon Frequency Domain Causality Test Results (With Structural Breaks)

If the structural break dates are not included, the effect of oil prices on transportation prices lasts for the shortest two months (w=3.14)[2] and the longest seven months (w=0.87). When the structural break dates are included, the shortest effect on the transportation sector from oil prices is three months (w=2.14), while the longest effect lasts 12 months (w= 0.51). When structural breaks are included, the short-term effect of oil prices does not change much, while the long-term effect is prolonged. The effect of the dollar rate on the prices of the transportation sector leaves permanent effects for the short and long-term, both in the model with structural breaks and in the model without structural breaks. In other words, price increases caused by the dollar exchange rate permanently affect transportation prices.

5. Conclusion

In this study, the effects of oil prices and exchange rates on transportation inflation in Turkey were examined for the period between 2010 and 2022. In terms of the research method, the Toda-Yamamoto causality test and Breitung-Candelon frequency domain causality test were used. In the Toda-Yamamoto causality test, the Breitung-Candelon causality test was applied to strengthen the evidence, since only the long-term relationship of the variables could be determined. With the Breitun-Candelon causality test, it was determined whether the effects between variables were temporary or permanent. It also found both the short-middle and long-term relationships between the variables. The main findings of the research are as follows:

- Oil prices affect transportation sector prices in the short, medium, and long term.

- Oil prices affect transportation sector prices, both temporarily and permanently.

- Exchange rate affects transportation sector prices in the short, medium, and long term.

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[2] Monthly time periods are calculated with the help of $2\pi/w$ formula.

- Exchange rate affects transportation sector prices, both temporarily and permanently.

- Increases in oil prices and exchange rates increase inflation in Turkey both in the short and long term.

- Changes in transportation prices in Turkey do not affect oil prices and exchange rates.

As a result, this study supports the hypothesis that increases in oil prices and exchange rates causes inflation in Turkey. The studies of Zelka et al. (2022), Buyer (2021), Tenant (2020), Aggarwal et al. (2012), and Fuller (1981) showed similarities with the results of their studies on the transportation sector. On the other hand, studies on other sectors in the economy (Such as; Akçağlayan et al., 2022; Güngör et al., 2022; Şahin Kutlu, 2021; Ulusoy et al., 2020; Mukhtarov et al., 2019; Tay Bayramoğlu et al., 2015; Nazariyan et al., 2014; Alvarez et al., 2011; and Başkaya et al., 2008) have reached parallel results.

Increasing interest rates, worker wages, and other economic factors due to inflation around the world has increased the costs of technology companies. Considering the impact of oil and exchange rate on transportation sector prices, economic makers can minimize cost factors that do not originate from within the country. When the results are evaluated in general, the following items are listed for the measures that can be taken against inflation in the transportation sector:

- The most important cost factor in the transportation sector is undoubtedly energy consumption. Measures can be taken to reduce domestic energy dependence. For example, environmental friendly energy systems (solar, wind, etc.) policies should be given priority. In many countries in Europe, steps are being taken towards energy self-sufficiency (including Germany's studies on solar energy and England moving towards wind energy). If foreign dependency in energy is reduced, it will have a positive effect on prices. Energy imported from abroad makes up 77% of Turkey's total energy.[3] As a result, enacting steps to reduce the import dependency of energy will have a reducing effect on the country's dependence on the exchange rate.

-Another important step that can be taken in the transportation sector may be to reduce the rate of vehicle use in transportation. If the demand side of transportation can be reduced in this way, it will have a negative impact on inflation.

- If the domestic production of the inputs used for transportation services can be achieved, it can have positive results, in terms of both imports and foreign exchange dependency.

Turkey is a foreign-dependent country, both in imports and in the production of export

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[3] https://www.trade.gov.tr/data/602cd44013b876f918da9c8c/Economic%20Outlook%20December%202022.pdf

goods. The first conclusion that can be drawn is that foreign dependence on energy causes a major problem in Turkey. Therefore, the first step as a solution will be to reduce this dependency. It is important to support policies that reduce dependency on energy, such as turning to alternative energy sources and developing projects to become self-sufficient in energy. Many scientific studies (such as Shahbaz et al., 2017; Squalli, 2007; Lee, 2005; and Cheng, 1999) have proven the existence of a positive relationship between economic growth and energy consumption. An increase in production in the economy will have positive effects for a country with a foreign exchange deficit. Reducing dependence on energy and minimizing the need for foreign exchange will ultimately have disinflationary effects.

New studies can be conducted by including different variables and using different methods to explain the determinants of price increases in the transportation sector. In this study, the effect of external factors on transportation prices has been examined.

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APPENDICES

Table 1: Descriptive Statistics of the Variables

	Transp	Oilp	Dolar
Mean	368.2	77.4	4.45
Median	306.8	74.1	2.96
Maximum	1063	126.5	18.3
Minimum	198.6	14.8	1.43
Std.Dev.	177	26.9	3.69
Jarque-Bera	282	8.34	189

Table 2: Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	242.7483	NA	7.66e-06	-3.265494	-3.142319	-3.215444
1	775.8141	1029.368	5.56e-09	-10.49399	-10.18605	-10.36886
2	**806.0692**	**57.17166**	**4.15e-09***	**-10.78716***	**-10.29446***	**-10.58696***
3	814.5144	15.60910	4.18e-09	-10.77951	-10.10205	-10.50423
4	819.4664	8.947719	4.43e-09	-10.72367	-9.861448	-10.37332

Table 3: LM Test Results

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	13.67895	9	0.1342	1.534928	(9, 336.0)	0.1342
2	14.20660	9	0.1152	1.595385	(9, 336.0)	0.1152
3	6.772148	9	0.6608	0.752181	(9, 336.0)	0.6609