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The Influence of Exchange Rate on Performance of Furniture Industry: The Case of Turkey

Utjecaj tečaja na uspješnost industrije namještaja: primjer Turske

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ABSTRACT • *In this study, the effect of the effective exchange rate on the industrial production index, capacity utilization rate, import and export of the furniture products sector was investigated. The analysis covers the period from 2007 to 2023, and the data consists of month observations. Since some of the variables are non-linear and not stationary at the same level, nonlinear autoregressive distributed lag limit test (NARDL), which takes into account asymmetric effects, was used as a method. According to the results of the research, it has been determined that in the short term, downward movements in the effective exchange rate increase the capacity utilization rate of the furniture sector with a significance of 5 %, while upward movements in the effective exchange rate decrease the industrial production index of the furniture sector with a significance of 1 %. Additionally, the downward movements in the effective exchange rate negatively affect the export of furniture products in the long term, while it positively affects the import of furniture in the short term.*

KEYWORDS: *effective exchange rate; foreign trade; capacity utilization rate; industrial production index; furniture sector*

SAŽETAK • *U ovom je radu istražen utjecaj efektivnog tečaja na indeks industrijske proizvodnje, stopu iskorištenosti kapaciteta te na uvoz i izvoz u sektoru namještaja. Analiza obuhvaća razdoblje od 2007. do 2023. godine, a podatci se sastoje od mjesečnih opažanja. Budući da su neke varijable nelinearne i nisu stacionarne na istoj razini, primijenjen je nelinearni autoregresivni distribuirani test vremenskih ograničenja (NARDL) koji uzima u obzir asimetrične učinke. Prema rezultatima istraživanja, utvrđeno je da silazna kretanja efektivnog tečaja povećavaju stopu iskorištenosti kapaciteta sektora namještaja u kratkom roku, sa značajnošću od 5 %, dok uzlazna kretanja efektivnog tečaja smanjuju indeks industrijske proizvodnje sektora namještaja, uz značajnost od 1 %. Osim toga, silazna kretanja efektivnog tečaja dugoročno negativno utječu na izvoz namještaja, dok kratkoročno pozitivno utječu na njegov uvoz.*

KLJUČNE RIJEČI: *efektivni tečaj; vanjska trgovina; stopa iskorištenosti kapaciteta; indeks industrijske proizvodnje; sektor namještaja*

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1 INTRODUCTION
1. UVOD

The manufacturing sector plays a catalytic role in the modern economy. This sector is a pathway for trade expansion, a source of competitiveness and a major contribution to exports and productivity growth. Additionally, the added value of the manufacturing sector has the highest economic multipliers because of its relationship with the industrial production sectors (mining and agriculture) and sub-service sectors.

The furniture sector in Turkey is included in the manufacturing industry and is classified under Code 31: Furniture Manufacturing according to NACE Rev. 2 classification (Anonymous, 2023a). The Turkish furniture sector is one of the important sectors of our country in terms of its capacity utilization rate, the number of employees it employs, its production volume and its contribution to the national economy.

Capacity utilization in the Turkish furniture sector may vary depending on factors such as demand in the sector, production volume and the performance of businesses. The annual average capacity utilization rate of the Turkish furniture manufacturing sector has been above 71 % in the last 9-year period, excluding 2020. The average capacity utilization rates of the furniture industry in Turkey were 77.3 % in 2022, 75.9 % in 2023 and 75.6 % in 2024. (Anonymous, 2023a; CBRT, 2024).

The Turkish furniture industry is generally dominated by SMEs, but the numbers of medium and large-scale enterprises have also been increasing in recent years. Turkey's furniture production capacity is quite high and is at a level that can feed both the domestic and foreign markets. The furniture sector in Turkey is concentrated in certain regions where the market and/or forest products are concentrated. Important furniture production regions are listed as follows: Istanbul, Ankara, Bursa (İnegöl), Kayseri, İzmir and Adana according to their share in total production (Anonymous, 2021; Anonymous, 2023b). Furniture production in Turkey reached 12 billion dollars in 2023. The furniture sector, which is expected to grow by an average of 10 % annually until 2030, is expected to reach approximately 29 billion dollars. The furniture industry plays a significant role in supporting the global economy. Moreover, it positively affects the general employment situation in the country by creating numerous job opportunities. The Turkish furniture sector provides direct and indirect employment to approximately 245000 people. (Damlayıcı and Arslan, 2024; Anonymous, 2024; TURKSTAT, 2023).

Turkey's revenue from furniture exports has increased by reaching over 5 billion dollars in 2023. Thus, Turkey has become the 11th largest furniture exporter in the world. Turkey has an important position in furniture exports, especially to European countries and the Middle East. The share of this sector in total exports was 2 % in 2023. Turkish Furniture sector import was 906 million dollars in 2022, and in 2023, it increased by 17 % compared to the previous year and reached 1 billion 67 million dollars. The furniture sector in Turkey has been one of the sectors with a foreign trade surplus since 2001 (TradeMap, 2023).

There are several macroeconomic factors that can affect the performance of the manufacturing sector. One of these factors is the exchange rate (Mlambo and McMillan, 2020). The exchange rate is a way of measuring the monetary competitiveness of a country. Since changes in the exchange rate tend to create a multiplier effect on macroeconomic variables, it is one of the important macroeconomic indicators used in determining the performance level of an economy. The depreciation or appreciation of the exchange rate, which is an important economic variable, affects the performance of all sectors of the economy, especially the manufacturing sector (Omolola *et al*., 2023). A decrease in the exchange rate causes a decrease in that country's exports and an increase in imports from foreign countries. As a result, there is an outflow of funds from the domestic economy and the amount of resources that domestic companies can use to invest and grow decreases. The increase in the exchange rate makes the country more attractive to foreign investment and makes its products more competitive in the international market. As a result, foreign companies tend to invest more in the country and increase local demand for goods and services (El Aboudi *et al*., 2023).

There are studies in the literature on the effects of exchange rate and effective exchange rate on foreign trade, capacity utilization rate and industrial production index with the help of the Linear Autoregressive Distributed Lag (ARDL) and the Nonlinear Autoregressive Distributed Lag (NARDL) approaches. Eren Sarıoğlu (2013) tried to determine the effect of real exchange rate change on the exports of chemical, automotive, electrical-electronics and iron-steel sectors with ARDL approach. It was found that the exchange rate change did not have a significant effect on the exports of the sectors within the scope of the study. Tutueanu (2015) investigated the dynamic effect of exchange rate on the trade balance of forest products (fibreboard, particleboard and pulp) in Romania. As a result of the study, it was observed that the exchange rate will affect Romania's pulp trade balance in the short term but will have no significant effect in determining the trade balance of fibreboard and particleboard in both the short and long term. Saraçoğlu *et al*. (2018) stated that the effects of exchange rate and exchange rate uncertainties on exports and imports vary depending on the sector. Habibi (2019) investigated the effect of exchange rate on industrial production in var-

ious sectors in the United States. According to research results, although exchange rate movements have short-term linear effects on electricity production in the United States, exchange rate movements have no effects on mining and production of energy materials. Simonyan (2020) showed that in both the long and short term, the exchange rate has an asymmetric effect on export and import prices in Turkey using NARDL approach. Bıtrak (2021) examined the effect of some macroeconomic variables on cellulose (pulp) imports. According to the findings of the study, it was determined that increases in the exchange rate negatively affected cellulose imports in the long term. Uche and Nwamiri (2022) stated that positive movements in exchange rates lead to lower output levels in the short term, whereas negative movements does not have any significant effect on productivity levels. Moreover, positive or negative changes in the exchange rate cannot be expected to have a significant impact on productivity in the economy in the long term. In the study conducted by Sylvanus *et al*. (2023), the effect of exchange rates on the agricultural industry was investigated in Nigeria. It was also determined that exchange rates affect agricultural capacity utilization. Hong Nga *et al*. (2024) denoted that although exchange rate movements significantly affect imports in Vietnam, it has an insignificant effect on exports in Vietnam.

The purpose of this research is to examine the effects of increases and decreases in the effective exchange rate on the capacity utilization rate, industrial production index and foreign trade in the furniture sector. In this context, the research questions (RQ) can be defined as follows:

RQ1: How the changes in effective exchange rate influence the capacity utilization rate in the furniture sector?

RQ2: How the changes in effective exchange rate influence the industrial production index in the furniture sector?

RQ3: How the changes in effective exchange rate influence the export in the furniture sector?

RQ4: How the changes in effective exchange rate influence the imports in the furniture sector?

2 MATERIALS AND METHODS
2. MATERIJALI I METODE

Capacity utilization rate, industrial production index, import and export values were used as selected indicators for the purpose of analyzing the relationship between effective exchange rate and selected indicators in the furniture sector. As seen in Table 1, effective exchange rate, capacity utilization rate and industrial production index data were obtained from the Central Bank of the Republic of Turkey (CBRT) Data Distribution System (EVDS), while export and import values of the wood and wood products sector were obtained from the TradeMap web address. The analysis covers monthly data from 2007 to 2023. All analyses were performed by taking the natural logarithm of all data except the capacity utilization rate.

Four different models were established to investigate the relationship between the effective exchange rate and the capacity utilization rates, industrial production indices and foreign trade (import and export) values of companies operating in the furniture sector.

NARDL 1: $CUR=\beta_1*InEER+\varepsilon$

NARDL 2: $IPI=\beta_2*InEER+\varepsilon$

NARDL 3: $IMP=\beta_3*InEER+\varepsilon$

NARDL 4: $EXP=\beta_4*InEER+\varepsilon$

Considering the determined targets and the results of the linearity tests, the NARDL test was selected as the analysis technique. The NARDL technique provides a dynamic framework that allows us to simultaneously test asymmetric and nonlinear relationships between variables (Shin *et al*., 2014). In this technique, it is not necessary for all variables to be stationary at

Table 1 Variables used in the study
Tablica 1. Varijable promatrane u istraživanju

Variables *Varijable*	**Descriptions** / *Opis*	**Symbols** *Simboli*	**Database** *Baza podataka*
Effective exchange rate *efektivni tečaj*	The effective exchange rate is a weighted average of a country's currency relative to a basket of other major currencies (Krugman and Obstfeld, 2003).	EER	CBRT
Capacity utilization rate *stopa iskorištenosti kapaciteta*	Capacity utilization is a ratio of the current level of output to full level of output, or capacity (Corrado and Mattey, 1997).	CUR	CBRT
Industrial production index *indeks industrijske proizvodnje*	The Industrial Production Index is an indicator that allows for the comparative tracking of the industrial sector's condition, reflecting the increase or decrease in production activities over the years (Koç *et al.*, 2016)	IPI	CBRT
Import / *uvoz*	Import is the process of goods produced in other countries being bought by buyers in the domestic market (Yurdakul, 2014).	IMP	TradeMap
Export / *izvoz*	Export is the sale of goods that are in free circulation within the country to a foreign country (Yurdakul, 2014).	EXP	TradeMap

the same level for cointegration. Another advantage of this technique is that short-term and long-term coefficients can be modeled simultaneously. Lastly, NARDL permits one to capture the dynamic effect of both upward and downward movements in an explanatory variable (ie. exchange rate) on a particular dependent variable (Adekunle *et al*., 2019; Mesagan *et al*., 2022). The NARDL method includes the following steps (Pesaran *et al*., 2001; Shin *et al*., 2014; Göksu and Balkı, 2023):

Step 1: Stationarity Test of Variables

First of all, it is necessary to determine whether the time series is stationary. For this purpose, tests such as ADF, PP, and KPSS are used. Moreover, the variables should be I(0) and/or I(1) but not I(2).

Step 2: Decomposition of the Independent Variable

The positive (X^+) and negative (X^+) changes of the independent variable are decomposed.

$$X_t^+ = \sum_{j=1}^{t} \max(\Delta X_j, 0);\ X_t^- = \sum_{j=1}^{t} \min(\Delta X_j, 0)$$

Step 3: Determine the Appropriate Lag Length

Optimal lag lengths are determined according to criteria such as LR, FPE, AIC, SIC, HQ. This step is valid for both dependent and independent variables.

Step 4: Estimate the NARDL Model

The model is generally set up as follows:

$$\Delta Y_t = \alpha + \sum_{i=1}^{p} \theta_i \Delta Y_{t-i} + \sum_{j=0}^{q} (\theta_j^+ \Delta X_{t-j}^+ + \theta_j^- \Delta X_{t-j}^-) + \lambda_1 \Delta Y_{t-i} + \lambda_2 \Delta Y_{t-i}^+ + \lambda_3 \Delta Y_{t-i}^- + \varepsilon_t$$

Step 5: Bound Test

If there is a long-term relationship, it is tested with the Bounds Test (Pesaran *et al*., 2001) and the test is performed with the F-statistic.

Step 6: Calculation of Long and Short Term Coefficients

Long term coefficients are calculated as $\frac{-\lambda_2}{\lambda_1}$ and $\frac{-\lambda_3}{\lambda_1}$. Also, short-term dynamics are evaluated based on lagged differences.

Step 7: Asymmetry Tests

Wald tests are conducted for short- and long-run symmetry. H_0 hypotheses of short- and long-term asymmetries are as follows.

Long-term asymmetry: H_0: $\frac{-\lambda_2}{\lambda_1} = \frac{-\lambda_3}{\lambda_1}$

Short-term asymmetry: H_0: $\theta_j^+ = \theta_j^+$

If H_0 is rejected, there are asymmetric effects.

Step 8: Diagnostic & Stability Tests

The following tests are used to test the validity and robustness of the estimations:

Autocorrelation: Breusch-Godfrey test

Heteroskedasticity: White or Breusch-Pagan test

Normality: Jarque-Bera test

Functional Form Test: Ramsey-RESET test

Model stability: CUSUM and CUSUMSQ graphics

3 RESULTS AND DISCUSSION
3. REZULTATI I RASPRAVA

First, Wald linearity test was performed to determine whether the variables used in the analysis were linear. The results obtained from the Wald linearity test are given in Table 2. When the Walds linearity test results in Table 2 are examined, it is determined whether the capacity utilization rate, import and export series of the furniture sector are linear, while the effective exchange rate and industrial production index series are non-linear. Since some variables to be included in the analysis are non-linear, an econometric method that allows the analysis of non-linear series should be preferred in the study.

Determining whether the series are stationary and the degree of stationarity is also very important in choosing the method to be used in the analysis. In this context, the stationarity of the series used in the analysis was investigated with the Augmented Dickey-Fuller (ADF) and Philipps-Perron (PP) tests. The results obtained from the stationarity tests are given in Table 3.

As shown in Table 3, the EER variable is not stationary at the level, and it has become stationary at the first difference. The CUR and EXP variables are stationary at the level of 1 % according to both unit root tests. While the IPI and IMP variables become stationary at the first difference at the level of 1 % according to the ADF unit root test, they are stationary at the level of 1 % according to the PP unit root test. Thus, all the variables used in the analysis are either stationary at the level or become stationary at the first difference. The absence of any variable becoming stationary at

Table 2 Wald linearity test results
Tablica 2. Rezultati Waldova testa linearnosti

Effective exchange rate (EER) *Efektivni tečaj*		**Capacity utilization rate (CUR)** *Stopa iskorištenosti kapaciteta*		**Industrial production index (IPI)** *Indeks industrijske proizvodnje*		**Import (IMP)** *Uvoz*		**Export (EXP)** *Izvoz*	
Constant	39.4*	Constant	-0.01	Constant	43.2*	Constant	193	Constant	47.1
EER(-1)	-25.7*	CUR(-1)	2.16	IPI(-1)	-28.9*	IMP (-1)	-48.6	EXP(-1)	-14.6
EER^2(-1)	6.02*	CUR^2(-1)	-2.94	IPI^2(-1)	6.92**	IMP^2(-1)	4.26	EXP^2(-1)	1.59
EER^3(-1)	-0.45*	CUR^3(-1)	1.87	IPI^3(-1)	-0.53**	IMP^3(-1)	-0.12	EXP^3(-1)	-0.05

*, **, and *** indicate 10 %, 5 %, and 1 % significance levels, respectively
, ** i * označavaju razinu značajnosti od 10 %, 5 % i 1 %*

Table 3 Stationarity test results
Tablica 3. Rezultati testa stacionarnosti

	ADF		PP	
	Level	**First difference**	**Level**	**First difference**
InEER	0.299	- 9.389***	0.375	- 11.27***
CUR	- 5.279***	-	- 5.362***	-
InIPI	- 0.539	- 6.142***	- 3.681***	-
InIMP	- 2.799*	- 22.46***	- 4***	-
InEXP	- 3.476***	-	- 4.784***	-

*, **, and *** indicate 10 %, 5 %, and 1 % significance levels, respectively
, ** i * označavaju razinu značajnosti od 10 %, 5 % i 1 %*

Table 4 Lag lengths of NARDL models
Tablica 4. Duljine zaostajanja NARDL modela

	Lag	**LogL**	**LR**	**FPE**	**AIC**	**SIC**	**HQ**
NARDL 1	0	305.13		0.0001	-3.047	-3.013	-3.033
	1	793.37	961.76	1.25e-06	-7.913	-7.814	-7.873
	2	804.36	21.43	1.17e-06	-7.984	-7.818	-7.917
	3	815.57	21.64*	1.09e-06*	- 8.056*	- 7.824*	- 7.962*
	4	817.32	3.34	1.11e-06	-8.033	-7.735	-7.913
NARDL 2	0	24.149		0.0027	- 0.223	- 0.19	- 0.209
	1	473.84	885.82	3.11e-05	-4.702	-4.603	-4.662
	2	489.57	30.673	2.77e-05	- 4.82	-4.654	-4.753
	3	509.58	38.605*	2.35e-05*	- 4.981*	- 4.749*	- 4.887*
	4	512.22	5.034	2.39e-05	-4.967	-4.669	-4.846
NARDL 3	0	-29.987		0.005	0.321	0.355	0.335
	1	484.12	1012.72	2.81e-05	-4.805	-4.706	-4.765
	2	508.36	47.26	2.29e-05	-5.009	-4.843	-4.942
	3	520.45	23.338*	2.11e-05*	- 5.09*	- 4.858*	- 4.996*
	4	521.81	2.581	2.17e-05	-5.063	-4.765	-4.943
NARDL 4	0	- 325.31		0.092	3.29	3.323	3.303
	1	183.72	1002.7	0.00057	-1.786	-1.687	-1.746
	2	193.42	18.908	0.00054	-1.843	-1.678	-1.776
	3	205.48	23.268*	0.0005*	- 1.924*	- 1.693*	- 1.831*
	4	208.88	6.489	0.000503	-1.918	- 1.62	-1.798

* indicates the lag length selected by the criterion; LogL – Log-Likelihood; LR – Likelihood Ratio; FPE – Final Prediction Error; AIC – Akaike Information Criterion; SIC – Schwarz Information Criterion; HQ – Hannan-Quinn Criterion
** označava duljinu zaostajanja odabranu kriterijem; LogL – log-vjerojatnost; LR – omjer vjerojatnosti; FPE – konačna pogreška predviđanja; AIC – Akaikeov informacijski kriterij; SIC – Schwarzov informacijski kriterij; HQ – Hannan-Quinnov kriterij*

second or higher orders and the fact that some of the variables are linear and some are non-linear indicates that the variables used in the analysis are in a suitable form for the NARDL model in terms of stationarity and linearity. Then, suitable lag lengths were determined for the NARDL models. Accordingly, for all four models, the appropriate lag length was identified as three lags. The detailed information about the suitable lag lengths for the NARDL models is shown in Table 4.

Then, it was denoted that the models would be predicted with the NARDL technique. The prediction results of the models found with the NARDL method is given in Table 5.

Before providing information about the results obtained in the first model, it should be noted that the capacity utilization rate series show a structural break in the period 2015 – 2020. Within this framework, a dummy variable was added to the model in order to explain and correct the breakage. Based on the results obtained from the NARDL l model, in the long term, it was observed that changes in the effective exchange rate do not significantly affect the capacity utilization rate of firms operating in the furniture manufacturing industry. The main reasons why changes in the effective exchange rate do not significantly affect the capacity utilization rate of firms in the furniture sector in the long term may be as follows: high domestic input use, demand being the determinant, firm strategies developed against exchange rate changes, structural characteristics of the sector, and the balancing effects of export advantages. However, it was observed that the dummy variable added to the model positively affected the capacity utilization rate with a significance level of 5 %. Additionally, it was observed that in the short term, positive movements in the effective exchange rate did not significantly affect the capacity utilization

Table 5 NARDL test results
Tablica 5. Rezultati NARDL testa

	Short run coefficients (Std. Error)		Long run coefficients (Std. Error)		NARDL bound tests	
NARDL 1	ΔInEER (+)	- 0.028	ΔInEER (+)	- 0.097	F- Statistic	10.519*
		(0.05)		(0.174)		
	ΔInEER (-)	0.24**	ΔInEER (-)	0.075	10 %	LB =3.588
		(0.094)		(0.103)		UB =4.605
	CUR (-1)	0.708*	Dummy	0.029**	5 %	LB = 4.203
		(0.049)		(0.012)		UB = 5.32
	ECT (-1)	- 0.292*			1 %	LB =5.62
		(0.045)				UB =6.908
NARDL 2	ΔInEER (+)	-1.315*	ΔInEER (+)	0.112	F- Statistic	20.046*
		(0.477)		(0.267)		
	ΔInEER (-)	- 0.168	ΔInEER (-)	- 0.253	10 %	LB =2.474
		(0.12)		(0.18)		UB =3.312
	ΔInIPI(-1)	0.335*	Dummy	0.115*	5 %	LB = 2.92
		(0.068)		(0.036)		UB = 3.838
	ECT (-1)	- 0.665*			1 %	LB =3.908
		(0.066)				UB =5.044
NARDL 3	ΔInEER (+)	- 1.772*	ΔInEER (+)	- 0.523	F- Statistic	3.743***
		(0.566)		(1.56)		
	ΔInEER (-)	1.134*	ΔInEER (-)	- 0.277	10 %	LB = 3.26
		(0.436)		-1.076		UB = 4.247
	ΔInIMR(-1)	- 0.364*			5 %	LB = 3.94
		(0.064)				UB = 5.043
	ECT (-1)	- 0.122*			1 %	LB = 5.407
		(0.036)				UB = 6.783
NARDL 4	ΔInEER (+)	- 0.356	ΔInEER (+)	-1.334	F- Statistic	4.84**
		(0.218)		(0.976)		
	ΔInEER (-)	- 0.117	ΔInEER (-)	- 0.81***	10 %	LB =3.588
		(0.392)		(0.467)		UB =4.605
	ΔInEXP (-1)	- 0.432*	Dummy	- 0.43**	5 %	LB =4.203
		(0.081)		(0.177)		UB =5.32
	ECT (-1)	- 0.267*			1 %	LB =5.62
		(0.06)				UB =6.908

*, *, **, and *** indicate 10 %, 5 %, and 1 % significance levels, respectively; ECT – Error correction term
, ** i * označavaju razinu značajnosti od 10 %, 5 % i 1 %; ECT – oznaka za korekciju pogreške*

rate, whereas it was observed that the negative movements in the effective exchange rate increased the capacity utilization rate with a significance level of 5 %. Negative EER movements increase capacity utilization because export demand can rise quickly, firms can respond by increasing output, and higher profitability and competitiveness can drive short-term production increases. Positive EER movements have no effect because: input cost savings can take time to influence output, import competition and demand substitution can do not materialize quickly, and production planning can be rigid in the short term. Yenigün and Azizi (2022) reported that the exchange rate positively affects the capacity utilization rate. One-period lagged values of the capacity utilization rate have a significant and positive impact on the capacity utilization rate. In other words, a negative change in the capacity utilization rate one period ago negatively affects the current capacity utilization rate, whereas a positive change one period ago positively affects the current period. Finally, shocks occurring in the capacity utilization rate are quickly dampened with a coefficient of approximately -0.292.

There is also a structural break in the industrial production index series. In this context, a dummy variable was added to the model. According to the results obtained from the NARDL 2 model, in the long term, both positive and negative movements in the effective exchange rate do not have a significant impact on the industrial production index, as well as the dummy variable positively affected the industrial production index with a significance level of 1 %. In the long run, both appreciation and depreciation of the effective exchange rate tend to lose their power to influence industrial production significantly. This can due to a combination of structural adjustments, policy responses, strategic firm behavior, and the dominance of other macroeconomic factors that drive industrial output

over time. Additionally, it was determined that in the short term, positive movements in the effective exchange rate had a negative effect on the industrial production index with a significance level of 1 %, whereas negative changes in the effective exchange rate did not have a significant effect on the industrial production index. The negative effect of a positive movement in the exchange rate on industrial production in the short term can be attributed to factors such as reduced export demand, increased competition from imports, and challenges in quickly adjusting production strategies. Meanwhile, negative changes in the exchange rate did not have a significant impact, potentially because the positive effects on export competitiveness could outweighed the costs of higher import prices, or the impact on input costs was manageable. These dynamics can suggest that industries in this particular context may be more sensitive to appreciation-induced external market shifts than to depreciation-induced internal cost pressures. One-period lagged values of the industrial production index have a significant and positive impact on the industrial production index. Finally, shocks occurring in the capacity utilization rate are quickly dampened with a coefficient of approximately -0.665.

According to the results obtained from the NARDL 3 model, in the long term, both positive and negative movements in the effective exchange rate do not have a significant impact on the import of furniture products. This may be because of market adaptation, contractual stability, hedging practices, and persistent consumer demand. Exchange rate changes may cause short-term price adjustments, but they may not significantly alter the volume of furniture imports over time due to these balancing and structural effects. Additionally, in the short term, increases and decreases in the effective exchange rate have a negative and positive impact on the import of furniture products, respectively, with a significance level of 1 %. In the short term, this is because appreciation of the effective exchange rate can have a positive effect on import volumes by making imported furniture cheaper, whereas depreciation of the effective exchange rate can have a negative effect by making imports more expensive. These effects can be mainly driven by price sensitivity, consumer behavior, import financing costs, and the absence of long-term hedging mechanisms, all of which can cause furniture imports to react quickly and visibly to exchange rate movements. One-period lagged values of the imports of furniture products have a significant and negative impact on the imports of furniture products with a significance level of 1 %. In other words, if one-period lagged values of the import are positive, they affect the current furniture import negatively, and if one-period lagged values of the import are negative, they affect the current import negatively. Finally, shocks occurring in the import are quickly dampened with a coefficient of approximately -0.122.

There is also a structural break in the furniture exports series. In this context, a dummy variable was added to the model. According to the results obtained from the NARDL 4 model, both upward and downward movements of the effective exchange rate do not significantly affect furniture exports in the short term. In the short term, both appreciation and depreciation of the effective exchange rate may not significantly affect furniture exports because: export contracts may be fixed in advance, production and logistics are inflexible in the short term, currency risks are often hedged, and demand for furniture exports is relatively inelastic and brand- or quality-driven. These factors may ensure that exchange rate movements do not quickly translate into changes in export volume, resulting in statistically insignificant short-term effects on furniture exports. In the long term, negative movements in the effective exchange rate negatively affect the export of products with a significance of 10 %. In the long term, currency depreciation (negative EER movement) may have a significant negative effect on exports due to a combination of rising production costs from imported inputs, macroeconomic instability, reduced investment and innovation, inflationary pressures, and loss of international trust and market share. Thus, even though depreciation is expected to support exports, its adverse side effects may dominate in the long run, particularly in economies with structural weaknesses or limited export competitiveness. The result of the research conducted by Bilgin (2020) is compatible with the result of this study. Bilgin (2020) said that the depreciation of the local currency caused an increase in furniture sector exports. One-period lagged values of the furniture export have a significant and negative impact on the furniture export with a significance level of 1 %. In other words, if one-period lagged values of the export are positive, they affect the current furniture export negatively, and if one-period lagged values of the export are negative, they affect the current export negatively. Finally, shocks occurring in the export are quickly dampened with a coefficient of approximately -0.276.

After presenting the results of the econometric forecasts, diagnostic tests were conducted to measure the robustness of the forecasts. The results of the diagnostic tests are given in Table 6.

F tests and Ramsey Reset tests regarding the validity and stability of the forecasting show that all four forecastings made with the NARDL method are valid and stable forecasting. According to the results obtained from Breusch Godfrey Lagrance Multiplier (BG LM) and Breusch Pagan Godfrey (BPG) tests, it was

Table 6 Robustness checks
Tablica 6. Provjere robusnosti

	NARDL 1	NARDL 2	NARDL 3	NARDL 4
R^2	0.6019	0.7917	0.7687	0.9095
Adjusted R^2	0.5896	0.7864	0.7616	0.9025
F-Statistic	48.89 (0.000)	148.27 (0.000)	107.48 (0.000)	130.57 (0.000)
Log-Likelihood	415.16	106.27	117.96	149.21
Ramsey Reset	0.332 (0.7404)	1.065 (0.288)	0.914 (0.3618)	1.671 (0.1909)
BG LM	1.97 (0.14) HAC	0.004 (0.9959)	0.326 (0.7224)	2.75 (0.06)HAC
BPG	1.18 (0.32) HAC	1.094 (0.3651)	0.502 (0.8065)	2.77 (0.00)HAC
Jarque – Bera	11344 (0.00) HAC	20.61 (0.0000)	16.84 (0.0002)	21.59 (0.00)HAC

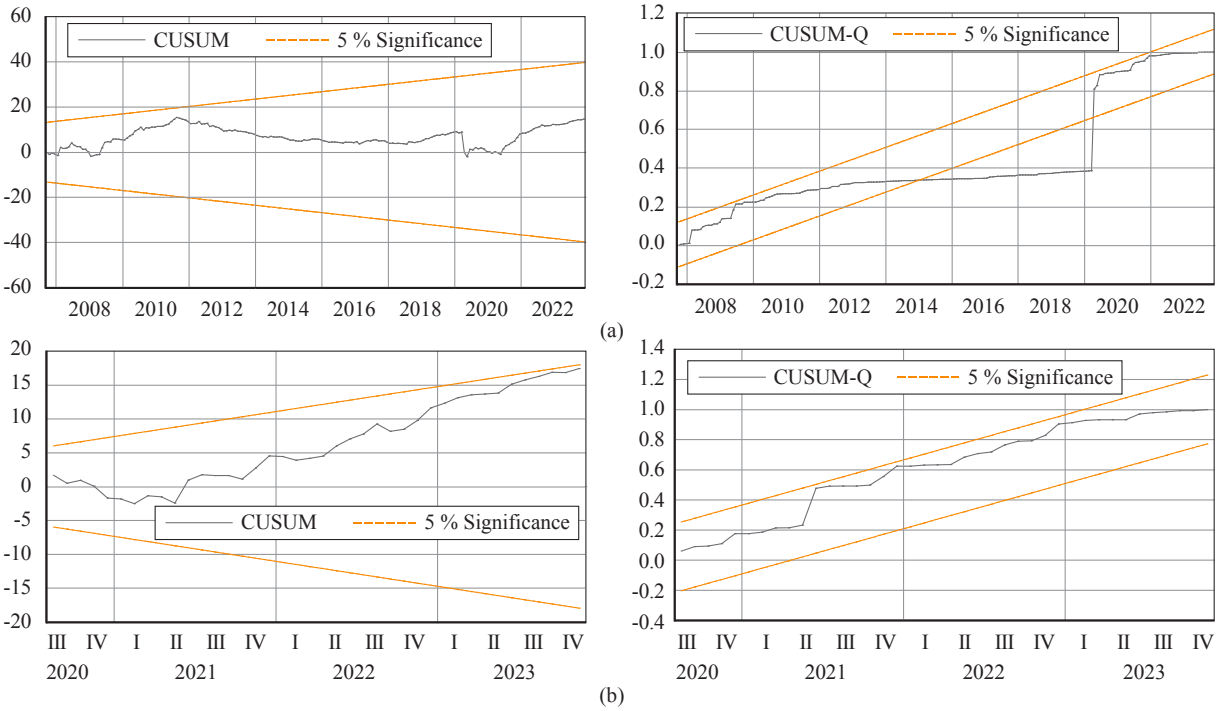

Figure 1 outcome of NARDL 1 cusum and cusum-q tests without dummy variables (a) and with dummy variables (b)
Slika 1. Rezultat NARDL 1 *cusum* i *cusum-q* testova bez lažnih varijabli (a) i s lažnim varijablama (b)

determined that there was no heteroscedasticity and autocorrelation problem in NARDL-2 and NARDL-3 models. Additionally, it was observed that there was a heteroscedasticity and autocorrelation problem in NARDL-1 and NARDL-4 models; therefore, the heteroscedasticity and autocorrelation consistent (HAC) variance-covariance matrix was used in NARDL-1 and NARDL-4.

To determine the stability of ARDL models, Cusum and Cusum-Q graphs, which examine structural breaks in variables using reversible error terms, were used. When Figures 1, 2 and 4 are examined, it is seen that there is a structural break in the variables with a significance of 5 % according to the Cusum-Q test. It is seen that the structural break disappears when a dummy variable is added. When Figure 3 is examined, it is seen that the long-term coefficients of the variables in the ARDL 3 model move between critical values. In other words, it is seen that no dummy variable is used in the model, and the long-term coefficients of the variables are stable.

4 CONCLUSIONS
4. ZAKLJUČAK

This study examines the relationship between the upward and downward movements in the exchange rate and some indicators in the furniture products sector in the long and short term. According to the results of linearity and stationarity analysis in this study, it was concluded that the NARDL method is the most appropriate method to determine how the changes in the exchange rate affect the furniture sector.

As a result of the analysis, it has been determined that there is a structural break in the capacity utilization rate, industrial production index and exports of the furniture sector. Structural breaks refer to radical and permanent changes in the capacity utilization rate, industrial production and exports in the furniture sector.

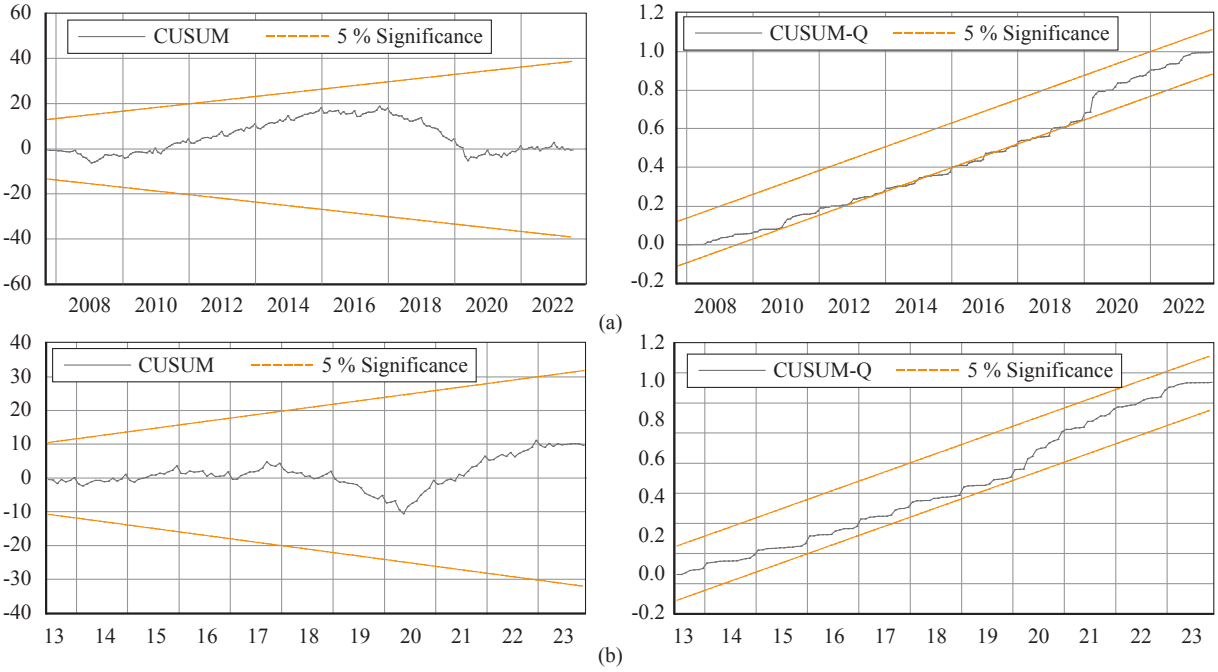

Figure 2 Outcome of NARDL 2 cusum and cusum-q tests without dummy variables (a) and with dummy variables (b)
Slika 2. Rezultat NARDL 2 *cusum* i *cusum-q* testova bez lažnih varijabli (a) i s lažnim varijablama (b)

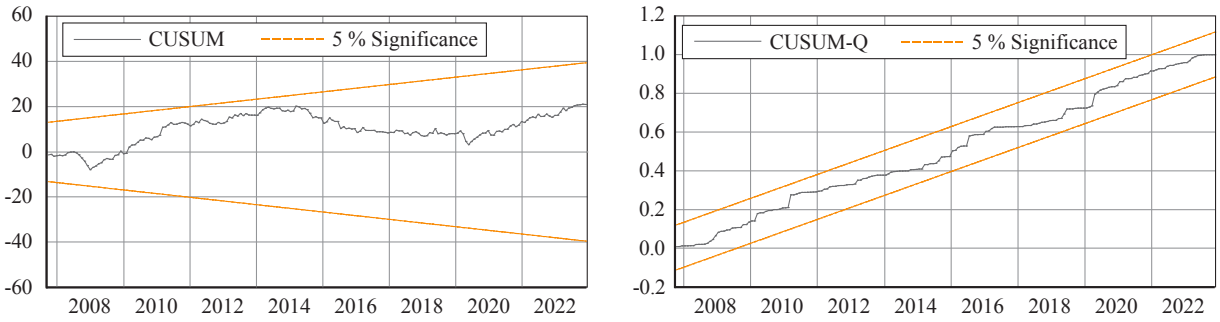

Figure 3 Outcome of NARDL 3 cusum and cusum-q tests
Slika 3. Rezultat NARDL 3 *cusum* i *cusum-q* testova

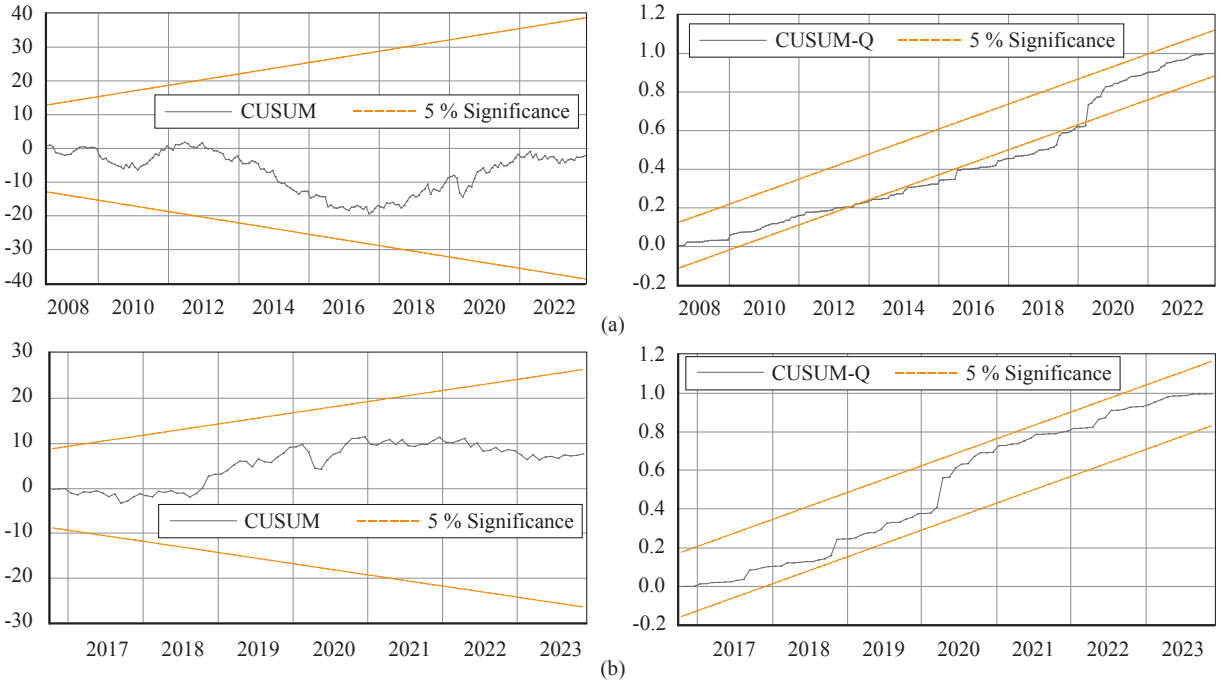

Figure 4 Outcome of NARDL 4 cusum and cusum-q tests without dummy variables (a) and with dummy variables (b)
Slika 4. Rezultat NARDL 4 *cusum* i *cusum-q* testova bez lažnih varijabli (a) i s lažnim varijablama (b)

Such changes indicate that the current structure and functioning of the sector is no longer the same as before. While the break in the capacity utilization rate and industrial production index started in 2015, the break in exports started in 2014. In addition, all the breaks ended in 2020. Due to this break, a dummy variable was added to the capacity utilization rate, industrial production index and export variables. Following the 2008 Mortgage Crisis, the US central bank, the FED, implemented quantitative easing by reducing policy interest rates from 5.25 % to 0.25 %. This process continued until the end of 2015, and the US central bank began increasing interest rates at the end of 2015. This situation affected Turkey's foreign trade, as it did all countries in the world, and thus also the production volume of sectors with foreign trade activities in the Turkish economy. Additionally, in the world economy, where there was dollar abundance during the period in question, the relevant abundance gradually ended with the FED's interest rate increases compared to the 2008-2015 period. This also affected the effective exchange rate. Therefore, it can be said that the source of the breaks detected in the Cusum and Cusum-Q tests of our study was the FED's interest rate increases during the period in question. However, it would not be realistic to say that such long-term breaks are only due to the FED's interest rate increases. In this context, the coup attempt, political instabilities and exchange rate shocks experienced in Turkey may also have caused the breaks to spread over a long period. Based on this, the source of these breaks may be factors outside Turkey, but the reason why the breaks are so long-lasting may be due to Turkey's own dynamics. While this dummy variable positively affects the capacity utilization rate and industrial production index of the furniture sector, it negatively affects furniture exports. When the relationship between the exchange rate and the capacity utilization rate is analyzed, in the short term, there is a direct proportion between the appreciation of the Turkish lira and the capacity utilization rate of the furniture industry. Considering the relationship between the effective exchange rate and the industrial production index of the furniture sector, the depreciation of the Turkish lira negatively affects the industrial production index of the furniture sector. Considering the relationship between the effective exchange rate and foreign trade of furniture products, when the Turkish lira loses value, furniture product imports decrease, and when it gains value, it increases. In the long term, the appreciation of the Turkish lira significantly reduces the export of furniture products. These situations are consistent with our theoretical expectations. In the short term, the appreciation and depreciation of the Turkish lira do not significantly affect the export of furniture products. It is theoretically expected that the appreciation of the Turkish lira will significantly reduce the exports of furniture products, and the depreciation of the Turkish lira will significantly increase the exports of furniture products, but it is seen that the results obtained on the subject do not coincide with theoretical expectations. As a result, the exchange rate is an external variable that seriously affects the indicators of the furniture sector. Therefore, it is necessary to follow economic policies that will minimize exchange rate fluctuations.

There are many studies in the literature on the effect of exchange rate and exchange rate volatility on foreign trade, but there is a limited number of studies on the effect of both the exchange rate on foreign trade on a sectoral basis and on the capacity utilization rate and industrial production index. There is no study on this subject, especially for furniture products. In this context, this study will contribute to the literature.

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