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Foreign Trade Hysteresis: An Empirical Essay Turkish Case

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ABSTRACT

The permanent effects of temporary shocks in exchange rates on foreign trade flows through firms' sunk costs are defined as hysteresis. This study analyzes the foreign trade hysteresis in the Turkish economy for the period 2003Q1:2021Q2 on the basis of exchange rate, imports, and firm sunk costs with the asymmetry hypothesis. Empirical findings prove that there are hysteresis effects in foreign trade flows of the Turkish economy. According to the asymmetry hypothesis, an increase in import volume in exchange rate appreciation does not lead to a decrease in import volume in exchange rate depreciation. Here, the sunk costs incurred by importing firms when entering the market during exchange rate appreciation is the main dynamic that prevents them from exiting the market during exchange rate depreciation. This process defines the hysteresis in foreign trade flows of the Turkish economy. Firms' staying in the market at inefficient points due to sunk costs after exchange rate depreciation causes problems of resource allocation efficiency and persistence in the foreign trade deficit. As a matter of fact, foreign trade hysteresis caused by sunk costs is an important determinant in the sustainability of the current account deficit.

Keywords: Hysteresis; Foreign Trade, Sunk Cost, Imports, Asymmetry Hypothesis.

JEL Classification Codes: D22, F14, F31

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INTRODUCTION

Interdisciplinary relations in social sciences go back to ancient times. In this sense, it can be said that the interdisciplinary relationship between economics and physics dates back to Adam Smith. Adam Smith explained the movements of market makers with Newtonian mechanics while explaining market price formation (Buğra, 2016). The other physics-based form of hysteresis in economic activity was realized in foreign trade flows. Specifically, Cross (1993) argues that hysteresis in foreign trade flows arises from the sunk costs incurred by firms when entering the market as a result of the appreciation of the national currency of the country of investment. In case of a revaluation of the national currency (back to its previous level), firms stay in the market due to sunk costs. This asymmetric process between exchange rate fluctuations and foreign trade flows is hysteresis. On the other hand, Baldwin (1988), who modeled the hysteresis in trade flows, based the asymmetric process in hysteresis on the lagged behavior in market entry. High sunk costs in market entry delay market entry. This is because the higher the sunk costs incurred in market entry, the longer it will take to recover them. For the firm, this means continuing production at inefficient points due to possible exchange rate fluctuations in the long run. Axarloglou (2007) defines this area of inactivity in the market entry and exit process of firms as the hysteresis band. Setterfield (1993) argues that hysteresis is the best explanation for the current business cycle as mainstream economics moves away from the equilibrium phenomenon and equilibrium control becomes difficult.

Neoclassical theory holds the view that economic agents act rationally and the market will spontaneously come to equilibrium. Towards the end of the 20th century, structural changes in the global economy intensified criticism of the belief in the perfect functioning of the market mechanism. In this context, as a result of the abandonment of the Bretton Woods system and the floating of exchange rates, Dornbusch (1976) showed that the speed of adjustment of financial and real markets is different. With the financial liberalization process that started in the 1980s, capital movements became the

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determining factor in the structure of business cycle waves. Arnon (2022) argued that the argument that macro patterns are not detached from micro fundamentals has started to gain more ground in the literature. This strengthens the theoretical foundations of hysteresis.

When the behavior of investment decisions in foreign trade flows is examined, it is seen that traditional investment models are insufficient to explain firm behavior. Uncertainty is an important criterion in firms' market entry decisions. Firms consider exchange rate volatility as a measure of uncertainty in market entry and exit. When exchange rates are modeled according to the option theory in financial economics, uncertainty is an increasing function of the volatility range. Under dynamic optimization conditions, firms can better observe the return on their investments over time. Therefore, in cases of increased uncertainty, firms tend to wait for an overvalued exchange rate and act inertially to enter the market (Dixit, 1992; Dixit et al., 1994; Campa, 2004). However, the role of expectations in market exits differs. If firms are not pessimistic about the expectation of exchange rate uncertainty, they widen the band of inactivity and exhibit a stay in market behavior. Indeed, firms will exit the market sooner if they take positions according to the persistence of exchange rate volatility. This process shows that favorable expectations cause hysteresis by delaying exit decisions (Chavas, 1994). Another factor that exacerbates hysteresis effects in firms' decision-making processes is the cost and size of investments. Once firms decide to enter the market and start operations, they tend to make larger investments to compensate for sunk costs in order to maximize future profitability. Large investments, which increase uncertainty and costs, increase sunk costs and deepen hysteresis by widening the inertia band (Bragger et al., 1998).

Traditional exchange rate theories (Mundell, 1960; Fleming, 1962) have emphasized the changes in trade volume caused by real changes in exchange rates. However, it has been ignored that shocks in real exchange rates may cause structural breaks in foreign trade flows and lead to deviations. These structural breaks are based on sunk costs. Sunk costs include fixed costs such as advertising, establishment of a communication network, feasibility costs, and legal costs that firms incur when entering the market. When real exchange rates are overvalued, the importing structure in the economy will be strengthened due to the increase in the marginal incomes of importing firms. When real exchange rates tend to depreciate, firms exhibit a loss-minimizing behavior of staying in the market in order to cover their sunk costs. If this behavior of firms is expressed with numerical data, there are market entries when revenues exceed marginal costs by 48%, while firms remain in the market until the point where revenues cover marginal costs by 31% (Baldwin, 1988a, Dixit, 1989, McCausland, 2000; Baldwin and Lyons, 1994). Based on this information, the two main behavioral patterns of hysteresis are firms' delayed entry into the market until a certain profit expectation target due to sunk costs and firms' attempt to compensate for the sunk costs they incur at the point of exit from the market by exhibiting the behavior of staying in the market.

In developing countries, real exchange rate appreciation is the main driver of import increases. In the 2007-2011 period of the Turkish economy, the real exchange rate was overvalued according to purchasing power parity (The Economist, 2019). Therefore, it is necessary to analyze the existence of hysteresis effects in the import structure after the 2007-2011 period. In this study, structural break unit root test and asymmetry hypothesis were used to test the hysteresis effect in foreign trade flows. In the literature, studies on the hysteresis effect have generally focused on structural breaks in import volume after a shock in real exchange rates. At this point, the fact that the volume of imports has not been empirically tested during the period of depreciation of the domestic currency constitutes a gap in the literature for the Turkish economy. Moreover, Amable et al. (1994) argue that unit root tests, unit root tests with structural breaks, asymmetry hypothesis, and mathematical foundations should be used more in the analysis of hysteresis effects in addition to unit root tests. In this context, the period after 2016, when the Turkish economy experienced a continuous depreciation of the domestic currency, constitutes an opportunity for the detection of hysteresis effects in foreign trade flows. For this reason, the study aims to determine the existence of hysteresis in foreign trade flows by using the asymmetry hypothesis as well as the structural break test, and moreover, to provide effective policy recommendations based on the behaviour of imports against the exchange rate. This empirical strategy is an important contribution of the study to the literature. Because beyond the permanent structural change in foreign trade flows, we also detect hysteresis from the resilient structure in the interaction of exchange rate and foreign trade.

Parsley and Wei (1994), using the asymmetry hypothesis developed to analyze the asymmetric structure between the real exchange rate and the volume of imports, found

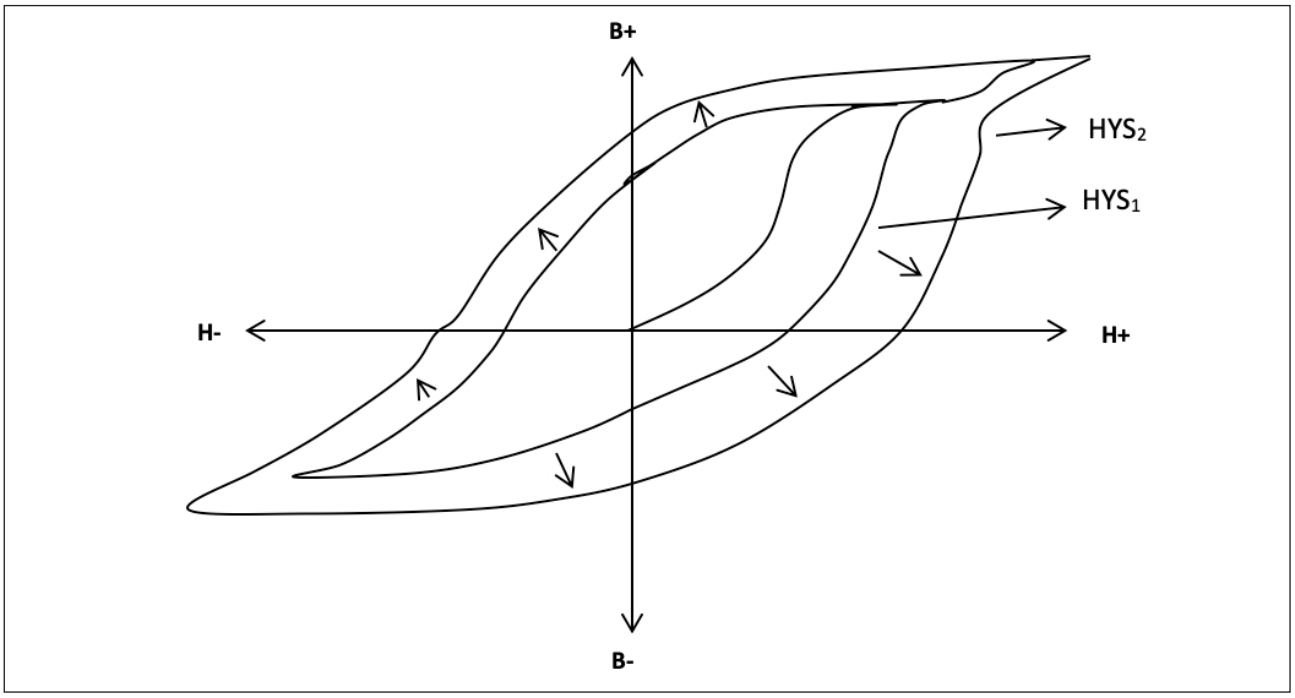

Figure 1. Hysteresis loop (potential gdp)
Source: Potential output hysteresis visualised by the researchers by taking physics hysteresis as an example.

evidence of hysteresis. Since volatility in real exchange rates is a general condition in the Turkish economy, the duration of appreciation beyond real exchange rate shocks is also important in terms of hysteresis. As a matter of fact, the fact that the structural break in the import volume of the Turkish economy took place in a certain period (2009Q2) after the period when the domestic currency started to be overvalued (2007) strengthens the validity of the wait-and-see hypothesis for firms. This situation, which is defined as the wait-and-see hypothesis, is among the psychological foundations of the hysteresis effects observed in firms' market entry. As a result, it is determined that the overvaluation of exchange rates in the 2007-2011 period caused a structural break in the import volume. The fact that there is no decline in the volume of imports in continuous exchange rate depreciations in the following periods constitutes evidence for the existence of asymmetric structure and hysteresis in foreign trade.

The structure of the rest of the paper is as follows: the theoretical foundations of the hysteresis effect in the second section, the literature review in the third section, the data set, methodology, and empirical findings in the fourth section, and the paper will be completed with the conclusion section.

Theoretical background

Although hysteresis is widely used in economics, it is theoretically a physics-based structure. In order to define the structure of the hysteresis effect, William Thomson first laid the theoretical foundations of this structure in 1850 by defining the magnetization process. The basis of the hysteresis structure is based on ferromagnetism. Ferromagnetism is defined as electrically charged substances (exposed to a magnet) that maintain their magnet properties even though they are physically disconnected from the magnet. Towards the end of the 19th century, the ferromagnetic properties of many substances were tested, and their ability to hold magnetism was determined. In all ferromagnetic materials, there is a delayed disappearance of the magnetizing effect after magnetization. This phenomenon is called hysteresis in physics (Dörries, 1991). Timbeau et al. (2012), who modelled the economy moving away from its potential (negative economic growth) based on hysteresis, examined the recovery path. However, the potential size of the economy affects the width of the hysteresis band. Taking into account all phases of the business cycle fluctuation, the economic hysteresis cycle on a physical basis is visualized in Figure 1.

The hysteresis loop may vary according to the structure of the ferromagnetic material. When the magnetization process of steel and pure iron is compared, since steel can carry more electrical charge, the hysteresis path (HYS_2) follows a wider and delayed course compared to the hysteresis path (HYS_1) of iron. When this situation is compared with the hysteresis effect in foreign trade, similar structures are observed. The output gap in the

economy is the determining factor for the width of the hysteresis loop. A high output gap in the economy indicates that the production potential is high. In case of market entry, labour and capital can be increased without any productivity problem in the production process. At this point, if the appreciation in exchange rates continues, the market reaching the saturation point is a more delayed process. Schmitt-Grohe et al. (2008) argue that more resources should be allocated to factors of production for the growth of the economy. In this process, GDP is a constraint in terms of output growth. Because output growth cannot exceed GDP growth. When this situation is evaluated in terms of exchange rates, although real exchange rates continue to appreciate, there is no entry into the market at the point where the production capacity of the market is insufficient and the economy has reached the saturation point. Until the economy reaches the saturation point (full employment), there are market entries in the form of structural breaks. The hysteresis process in import volume is shown in Figure 2.

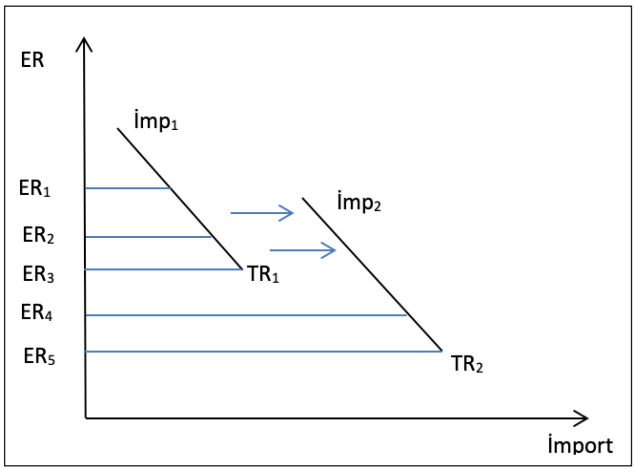

Figure 2. Hysteresis effect (import volume)
Source: Zengin and Vergil (2011).

The asymmetry hypothesis used to measure the hysteresis effect is based on the acquisition of an importing structure (structural break) as a permanent effect of shocks in real exchange rates. When the period before and after the structural break in the economy is compared, the response of imports to real exchange rates exhibits an asymmetric structure. Until the overvalued levels of the real exchange rate (ER_1-ER_2), the quantity relationship with imports is symmetric. If the real exchange rate continues to be overvalued after (ER_3), which is accepted as the threshold value for causing the hysteresis effect in foreign trade, it causes a structural break in imports and results in hysteresis. The acquisition of an importing structure in the economy is due to the fact that the domestic currency, which has become more valuable, increases the profitability of firms. As the market becomes more profitable, it triggers market entries (TR_1) and increases the volume of imports. In this case, the import line shifts to the right and represents a higher import volume at (ER_4-ER_5) levels. Firms incur many sunk costs from fixed costs when entering the market. Therefore, even if the real exchange rate enters a depreciation trend, there is a range of real exchange rates in which firms remain immobile due to sunk costs. This is referred to as the hysteresis effect. For firms to decide to exit the market, it is possible with the persistence of undervalued levels (Parsley and Wei, 1994; Dixit, 1989a). The effects of the hysteresis effect in import volume shown in Figure 2 on foreign trade and the external adjustment mechanism are presented in Figure 3.

Figure 3 coordinate system (vertical axis: trade balance, horizontal axis: real effective exchange rate) is constructed to characterize the hysteresis effect in trade. The origin (center) of the coordinate system represents the situation where there is no external imbalance at the equilibrium exchange rate. As a result of the real exchange rate appreciation, the TR_1 and TR_2 points for firms represent the trigger point, which is the market entry threshold for firms. As the real exchange rate appreciation continues, the market reaches the saturation point SP1, where it can provide production factors. After this point, even though the real exchange rate appreciation continues, price increases in factor markets reduce profitability and limit market entry at the saturation point. When the real exchange rate returns to its initial equilibrium level, firms remain in the market due to the sunk costs they incurred in entering the market and continue their activities with profit minimization. As a result of the return of the real exchange rate to the initial level, firms that continue their activities due to sunk costs cause a foreign trade deficit R_1 at the retention point. This level of production, where rationality conditions are not taken into account, causes welfare losses by disrupting the efficiency in resource allocation. As a result of the continuation of the undervaluation of the real exchange rate, the foreign trade deficit becomes permanent with the continuation of the importing structure at undervalued points. When the real exchange rate continues to depreciate, SP_2 becomes minimum at the saturation point, which is the level at which import volume can decrease due to autonomous imports. Due to the hysteresis structure, the lagged adjustment process of the external adjustment mechanism in the economy shows the same effect in real exchange rate appreciations. At the retention

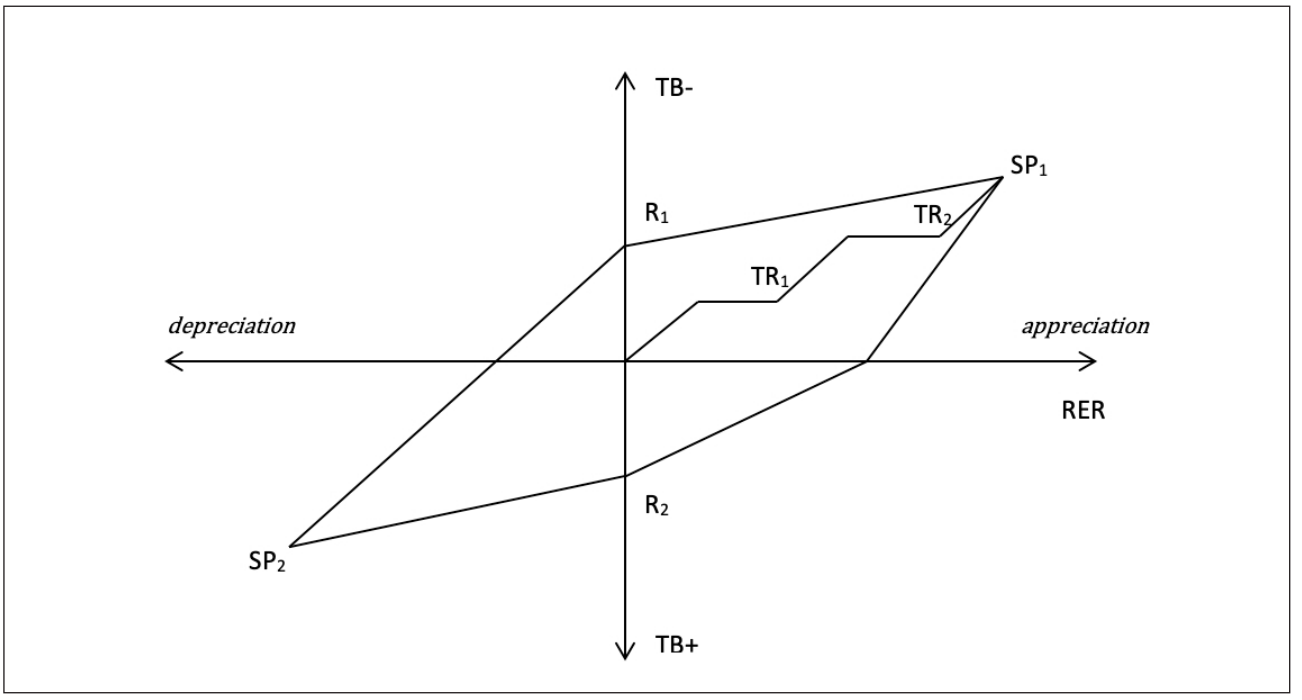

Figure 3. Linearized foreign trade hysteresis loop
Source: On the basis of the balance of trade, hysteresis is visualised by the researchers.

point, which represents the equilibrium level of the real exchange rate, there is a foreign trade surplus R_2. The late acquisition of the importing structure in this appreciation process stems from the fact that in markets with high exchange rate volatility, firms perceive exchange rate changes as temporary and adopt a wait-and-see policy for market entry. Firms that wait for a certain profit rate to enter the market based on the real exchange rate cause a foreign trade surplus at the equilibrium level of the real exchange rate at point R_2 due to the retention effect in the hysteresis structure. This process ends again at SP_1 with the completion of the hysteresis loop. Even if the completion of the hysteresis loop leads to a return to the starting point, welfare losses will be incurred due to delays in the external adjustment mechanism and irrational conditions.

LITERATURE REVIEW

Hysteresis effects in foreign trade flows manifest themselves in the form of permanent effects of exchange rate shocks on the importing structure. In this process, it is known that there are many transmission mechanisms from exchange rates to the real economy. Among the prominent transmission mechanisms, the import structure is an important dynamic that determines the degree of hysteresis. Therefore, grouping empirical studies on foreign trade hysteresis according to these transmission mechanisms will provide a comprehensive perspective.

Regarding exchange rate volatility, exchange rates have been allowed to float since the early 1980s in order for Turkey to adapt to the financial liberalization process implemented on a global scale. Saatçioğlu and Karaca (2011) argue that the increase in uncertainty during the 1981-2001 period, when exchange rate volatility increased, had a negative impact on exports. On the other hand, De Grauwe (1988) drew attention to the effect of income and substitution effect on exports. Firms' attitudes towards risk and uncertainty may affect exports positively or negatively by differentiating according to income and substitution effects. Since the expected benefit of export revenues will decrease in a risk environment, firms may act according to the income effect by increasing their resources in the export sector in order to compensate for this loss. When firms' attitude towards risk is to act cautiously, they tend to turn to domestic markets due to the substitution effect. This process, in which firms move away from acting according to the equilibrium exchange rate in foreign trade due to uncertainty, is a hysteresis behavior pattern. Backus (1994) argues that with the introduction of a floating exchange rate regime, movements in exchange rates have made price fluctuations more pronounced. At this point, fixed costs become an important factor in price movements as they delay firms' quantity adjustment. Aslan and Kula (2010) argue that the black market has a significant trading volume in foreign exchange markets. While an increase in the volatility of the real exchange

rate leads to a depreciation of the Turkish Lira, it also leads to an appreciation of the Turkish Lira in the black market. With the increase in volatility, firms act more cautiously and widen the inactivity band, which is a form of hysteresis.

Studies on purchasing power parity; McCausland (2002) Short-term adjustments after a shock in real exchange rates are common firm behaviour. In this context, overshooting in exchange rates and short-run behaviour of firms not conforming to the long-run exchange rate path deepen the hysteresis effect in foreign trade. Rapach (2001) argues that in the long run, the view of the neutrality of money states that nominal distortions have no effect on real exchange rates. However, empirical studies show that changes in wealth and competitiveness arising from short-term real exchange rate movements weaken the money neutrality theorem in the short run. Therefore, the formation of hysteresis in real exchange rates requires strong shocks. Rogers and Jenkins (1995) explained the hysteresis effect in real exchange rates through purchasing power parity conditions. Purchasing power parity real exchange rate changes are explained by international relative price movements. Disaggregating the prices of 11 OECD countries, the findings show that in the long run, price stickiness is weak for non-tradable goods, while there is stronger evidence for sticky prices for tradable goods. In this context, the hysteresis effect in real exchange rates is also determined by the degree of tradability of goods.

Studies on the employment structure by Belke and Göcke (1999) show that real exchange rate shocks cause hysteresis effects in trade flows and are also linked to hysteresis effects in the labour market. In case of an increase in volatility, the relationship between employment and its determinants weakens and the band of inactivity in employment operations widens. Thus, the hysteresis structure in trade flows increases its effect. Moreover, Baily (2003) shows that the hysteresis effects of exchange rate shocks on trade flows are also related to R&D expenditures and wages. With the appreciation in the US dollar, firms reduced their R&D shares. When the value of the US dollar returns to its previous level, the competitive structure lost due to R&D expenditures becomes a dynamic that prevents the volume of foreign trade from returning to its previous level. On the other hand, the impact of exchange rate shocks on labour force differs according to the quality of the labour force. While an increase in the value of the US dollar increases the income of those with higher education levels, it decreases the income of those with lower education levels. The asymmetric structure between exchange rate fluctuations and income distribution is one of the consequences of hysteresis. Analyzing the impact of capital movements, Baldwin and Krugman (1989) argue that large shocks in real exchange rates create permanent effects on trade flows. Continued capital flows following exchange rate shocks prevent the exchange rate from returning to previous levels. In this case, the effects of exchange rate shocks cause exchange rate shocks again. This cyclical process in exchange rate shocks deepens the hysteresis by causing permanent effects on the industrial structure.

Market structure is also an important criterion in the entry and exit of firms. Market price and profitability are the determining criteria for market entry. Bain (1949), who analyzed the pricing behaviour of firms, observed that contrary to the studies that traditionally model the profit maximization behaviour of firms, entry to the market is prevented by applying limit prices. The reason why firms exhibit this behaviour is that they are aware that the competitive structure will change after the entry into the market. Heflebower (1957) argues that the uncertainty in the market price and factor market cost conditions after possible entry into the market causes firms to be more willing to bar entry. Adamonis (2018) argues that beyond competition, firms' market entry leads to a permanent reduction in costs through a learning-by-doing process. As a result of this process, firm profitability, which increases with the decrease in costs, delays exits from the market. Institutionalization is also a component of hysteresis. Elsner (2021) argues that the asymmetric structure of institutional collapses is due to sunk costs and regulations during the emergence of institutions.

Studies analyzing the immobilization processes of firms for market entry and exit in real exchange rate changes by Ansic and Pugh (1999) found that firms remain immobile between certain threshold values in real exchange rates, Baldwin (1988b) modeled the changes in real exchange rates and firms' profitability and found that there is an asymmetry between market entries and exits. It is observed that the behaviour that proves the asymmetric form is the behaviour of staying in the market when the profit margin decreases. Ljungqvist (1994) shows that positive demand shocks temporarily increase profitability. Under inter-period optimization conditions, the fact

that the profitability of the current period is higher than the future period shows that the expected income is also taken into account in the continuation of the importing structure. Christophe (1997), who analyzed the US corporate behaviour in the 1980s when the US dollar was strong, observed that companies were reluctant to reduce their presence in foreign markets even if their profitability in international operations decreased. It is observed that companies consider the future reasonable levels of exchange rates more than the current period profitability in their market entry and exit decisions.

Moreover, it also manifests itself in the behaviour of firms to reduce their presence in foreign markets. Observing that hysteresis is a cause of price rigidities beyond trade flows, Delgado (1991) analyzed menu costs. He observed that firms do not reflect the price changes arising from exchange rate fluctuations to their international customers, and when they do, the volume of trade lags behind the change in the exchange rate. This behaviour of firms is a reason for price rigidities. Dixit (1991), who analyzed menu costs by developing an analytical model, observed that the area of inertia in price adjustments is very large. In this context, price rigidity in the market contributes to the behaviour of staying in the market since it does not bring additional costs. Moreover, Fedoseeva and Werner (2016), who analyze pricing behaviour according to the structure of the target market, observe that firms do not react in the same way to different price and exchange rate shocks of different directions. Firms behave more cautiously in markets with large trade volumes in order not to lose market share. Kulatilaka and Kogut (1996) argue that real exchange rate shocks may change the speed of adjustment of markets as well as the limits of investment in the economy. In the period before the hysteresis structure, when the real exchange rate appreciated, firms waited for a certain limit to exit the market, while this process was observed to be prolonged after exchange rate shocks. This situation points to the existence of a causal relationship between hysteresis effects and the persistence of the current external imbalance.

Indeed, Belke and Kronen (2016) observed in the Greek economy that immobilization is a better option for firms in terms of market entry and exit. Göcke (2002) argues that the hysteresis effect differs in terms of micro and macro fundamentals. While the hysteresis structure in micro fundamentals is based on the input-output relationship, the change at the macro level is possible only if the aggregated changes in micro fundamentals are sufficiently realized. At this point, whether the instability in the behaviour of firms or a movement in the context of market entry and exit turns into a general trend is a determining factor in hysteresis effects. On the other hand, Gocke (2001) argued that the hysteresis effect in foreign trade flows may be related to political variables as well as economic variables. When activist policies implemented by the government serve political objectives rather than economic objectives, the delay in implementation leads to policy inefficiency. In this context, micro, macro, and political patterns seem to be related in the hysteresis effect. However, Bagnai and Ospina (2015) show that the lack of an inertia band in the Italian economy in the face of real exchange rate shocks may also occur in exceptional cases where the lack of an inertia band is due to the fact that it is reflected in retail prices without being reflected in crude oil prices.

Generally, shocks in economic variables are followed by deterioration of expectations. Economic agents also consider inter-period optimization in this process. Studies within the scope of inter-period optimization by Alfaro et al. (2018), who evaluated in terms of the composition of total costs, found that when R&D sunk costs are higher than fixed costs, firms consider the net present value of their innovative structures more than the impact of negative shocks. While depreciation contributes positively to firms' R&D profitability, appreciation affects it negatively. Therefore, depreciation is more a determinant of total factor productivity. Ljungqvist (1994) observes that temporary positive demand shocks leading to appreciation in real exchange rates are followed by permanent depreciation. Depreciation is a necessary condition for households to balance consumption under budget constraint conditions in order to ensure the balance of foreign trade between countries. Firms experience an increase in the value of equity due to demand shocks. With the withdrawal of the demand shock, temporary profits will tend to decrease. As a result of these developments, firms will remain in the market, but their future profitability will decrease. As a result, in addition to real exchange rates, import prices, and trade flows, firms' equity values also come to the fore as a determining factor in the hysteresis effect.

Table 1: Summary of Selected Empirical Studies on Hysteresis in Foreign Trade

Study	Methodology	Country	Finding
Bošnjak, (2021, June)	Structural Break Tests (ADF, PP, DF-GLS, ERS, KPSS)	Croatia, Slovenia, Serbia	Hysteresis was not detected. However, it is observed that negative endogenous shocks are more persistent than positive endogenous shocks. There are limited asymmetries.
Bošnjak vd. (2020)	Structural Break Tests (ADF, PP, DF-GLS, ERS, KPSS, Zivot-Andrews, Arfima), Setar Model	Czech Republic, Latvia, Hungary, Slovakia, Slovenia	Hysteresis applies to the Czech Republic and Latvia, but not to Hungary, Slovakia, Slovenia.
Campbell (2020)	Panel Regression	United States, Canada	In both countries, the validity of trade hysteresis and its underlying causes are found to be temporary exchange rate shocks and sunk costs.
Werner (2020)	Preisach Model	Germany, United Kingdom	Hysteresis is detected in the foreign trade flows of both countries. While hysteresis is based on sunk costs, it is driven by the financial crisis and the Brexit process. As a result, significant welfare losses were experienced.
Rauscher ve Willert (2020)	Nash Bargaining Model	African and European Countries	Institutional deterioration (corruption, bribery) has been found to affect economic activity. Economies with slow economic activity cannot recover due to institutional deterioration. There are also hysteresis effects in foreign trade.
Bhat ve Bhat (2021)	Nonlinear Asymmetric Cointegration	United States	The increase in demand due to the appreciation of the national currency (temporary exchange rate shock) distorted the trade balance more than the decrease in demand. Hysteresis is in asymmetric form.
Bilgin (2020)	NARDL Model	Turkey	Asymmetric structure and hysteresis were found in foreign trade sectors except basic metal sector. In exchange rate fluctuations, appreciation of the national currency distorts the current account deficit more than depreciation.
Dinçer vd. (2020)	Extended Gravity Model	Turkey	In exchange rate fluctuations, depreciations have more positive effects than appreciations of the national currency. This situation observed in the service sector points to hysteresis with an asymmetric form.

Selected studies for the current empirical literature on hysteresis are presented in Table 1.

Studies on the Turkish economy by Zengin and Vergil (2011) concluded that there is no hysteresis effect in foreign trade flows of the Turkish economy in the 1994-2001 period. The decline in import volume during the period of depreciation of the domestic currency in the analyzed period proves that sunk costs are not effective and market exits prevent the hysteresis effect. The absence of a shock that would cause permanent effects for the tested period prevented the formation of an importer structure. On the other hand, Baydur and Atasever (2016) found the existence of hysteresis effects in foreign trade flows of the Turkish economy on a sectoral basis. They attributed the hysteresis effects to the price rigidities caused by long-term contracts in the energy sector together with the shocks in exchange rates. Hysteresis effects became stronger as long-term contracts prevented the use of relatively cheaper alternative energy sources and turned into sunk costs. This process is effective in the chronicisation of the current account deficit.

In conclusion, when empirical studies are analyzed, hysteresis as the permanent effects of exchange rate shocks and structural changes caused by these shocks on foreign trade flows is a common result in the empirical literature. However, the results for some countries are complex, and the empirical literature for Turkey is quite limited. As a matter of fact, this study will contribute to this literature gap by providing information in terms of current account deficit sustainability beyond the determination of hysteresis in foreign trade flows.

Data and methodology

In the real effective exchange rate calculations for the Turkish economy, 2003 is used as the base year (2003=100). In order to increase the efficiency of the model by minimising nominal effects in the relationship between foreign trade flows and real effective exchange rate, 2003 is set as the base year. In order to analyse the hysteresis effect in foreign trade flows, time series are constructed quarterly for 2003Q1:2021Q2 (t=74). Import quantity index (IMP) is obtained from OECD (Monthly International Merchandise Trade) database, CPI-based real effective exchange rate (REER) and GDP data are obtained from CBRT-EVDS system.

Real effective exchange rate volatility is calculated as the moving average of the standard deviation of the change in the real effective exchange rate, which is widely used in the literature. C_t is the measure of exchange rate volatility, m is the order of the moving average. This order is the measure commonly used in the literature[1] to capture exchange rate volatility.

$$C_t = \left[\left(\frac{1}{m}\right)\sum_{i=1}^{m}(\ln Q_{+i-1}\text{-}\ln Q_{1+i-2})^2\right]^{1/2} \quad (1)$$

The natural logarithm of the series is calculated by taking the moving average of the series and 0.028 is the volatility. The Zivot-Andrews unit root test with structural breaks and the asymmetry hypothesis developed by Parsley and Wei (1994) will be used to detect the hysteresis effect.

Asymmetry hypothesis

In empirical studies analysing the hysteresis effect in the literature, hysteresis is analysed through overvaluation in exchange rates and structural breaks in import volume. In this context, hysteresis in foreign trade flows is a function of overvaluation and structural break:

$$\textit{Foreign Trade Hysteresis} = f(overvalued, structuralbreak) \quad (2)$$

The model is constructed as follows by defining to be equal to the cumulative change in real exchange rates over the period.

$$V_t = \sum_{i=0}^{m}\Delta S_{t-i} = S_t - S_{t-m-1} \quad (3)$$

Then, the dummy variable is defined as follows to determine whether the last change in the real exchange rate is in the same or different direction as the change in the real exchange rate during the period m:

$$D_t = \begin{cases} 1 \text{ if } \Delta S_t \textit{ and } V_t > 0 \\ -1 \text{ if } \Delta S_t \textit{ ve } V_t < 0 \\ 0 \text{ otherwise} \end{cases} \quad (4)$$

Finally, the equation expressing the cumulative change in real exchange rates is constructed;

$$E_t = D_t \, \Delta \, S_t V_t \quad (5)$$

To test the asymmetry hypothesis, the appreciation or depreciation of the domestic currency should be continuous. If the depreciation of the domestic currency triggers each other throughout the periods, V_t takes positive value and therefore E_t takes also be positive value. In this case, V_t imports are negatively affected. The continuous depreciation of the domestic currency causes domestic goods to become expensive relative to foreign goods in foreign trade. In this process, the decrease in the demand for domestic goods and the decrease in the revenue of firms will cause exits from the market. On the other hand, $\Delta S_t V_t$ takes a positive value in the case of currency appreciation (upward movement in the CPI-based real effective exchange rate) and the continuation of appreciation. In case of appreciation of the domestic currency, the domestic market becomes more profitable due to the increase in the purchasing power of the domestic currency and market entry occurs. In this case, sunk costs incurred by firms in market entry are the dynamics of hysteresis. These developments are possible when V_t takes a negative value. Otherwise, when the signs of the last exchange rate change and the cumulative change are opposite, $E_t = 0$. In this study, the period m is determined by taking into account the data for the period $2016Q2{:}2018Q2$ $(t=9)$ when the TL was undervalued. In order to analyse the hysteresis effect in foreign trade, regression analyses were conducted using GDP, import volume, real effective exchange rate and cumulative exchange rate change E_t series by using the OLS method. The model is defined by equation (6):

$$\mathrm{LNIMP} = \beta_0 + \beta_1 \mathrm{E}_t + \beta_2 \mathrm{LNGDP} + \beta_3 \mathrm{LNRER} + \mu \quad (6)$$

Variables; LNIMP = Natural logarithm import volume index, Et = Cumulative exchange rate change, LNGDP = Natural logarithm real national income, LNRER = Natural logarithm CPI-based real effective exchange rate.

Stationarity Analysis

Before estimating the regression analysis, the stationarity of the series should be tested. At this stage, the degree of integration of the series should be determined. Since the series are not stationary I(0), the series are integrated at the same degree I(1) by taking the first difference. Structural break (unit root) means that the shocks occurring in the time series cause permanent effects (Christopoulos and Ledesma, 2010). The variables are at I(1) level.

Zivot-Andrews structural-break test

Zivot and Andrews (1992), who criticized the Perron (1989) test technique, which considers structural breaks as exogenous in unit root tests, made structural breaks endogenous by modeling them in an autoregressive structure. The following equations are used for the Zivot-Andrews test:

[1] For the methodology, see Chowdhury (1993) and Doğanlar (2002).

Model A $\Delta yt = c + \alpha yt - 1 + \beta t + \gamma DUt + \sum_{i=1}^{k} dt\Delta yt - i + \varepsilon$ (7)

Model B $\Delta yt = c + \alpha yt - 1 + \beta t + \theta DUt + \sum_{i=1}^{k} dt\Delta yt - i + \varepsilon$ (8)

Model C $\Delta yt = c + \alpha yt - 1 + \beta t + \theta DUt + \gamma DTt + \sum_{i=1}^{k} dt\Delta yt - i + \varepsilon$ (9)

The dummy variable DU, which is defined for each possible break date (TB), is defined as DT taking into account the slope changes. In this context, T denotes the period to be estimated, TB denotes the break period and ve l = TB **/ T** denotes the break point obtained from the edit field (l Î (0.15,0.85)). The values of the dummy variables are; DU will be 1 if t > TB and 0 otherwise. DT will be t - TB when t > TB in the identical case and 0 otherwise. The regression process with (T - 2) number of dummy variables created for possible break dates at the point of estimation is followed (Zivot and Andrews 1992). After the application of the empirical technique, the decision process is finalised by comparing the t statistic value (in absolute value) calculated for α with the critical values.

For Turkey, the structural break in the import volume in 2009Q2 period with the overvaluation of the exchange rate in 2007-2011 proves the validity of the hysteresis effect in foreign trade flows.

Tablo 2: Zivot-Andrews Findings

Model	Breaking Points	t stats	%1	Critical Values %5	%10
Model A	2008Q4	-7.20	-5.34	-4.93	-4.58
Model B	2009Q1	-7.12	-4.80	-4.42	-4.11
Model C	2009Q2	-7.57	-5.57	-5.08	-4.82

Note: Critical values were obtained by Zivot and Andrews (1992)

Table 3: Model 1 Regression Analysis Estimation Results

Dependent Variable: IMP
Method: Least Squares
Sample (adjusted): 2003Q2 2021Q2
Included observations: 73 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	1.995474	0.241523	8.262027	0.0000
REER	0.305344	0.118907	2.567913	0.0124
C	-0.004677	0.008477	-0.551767	0.5829
R-squared	0.501675	Mean dependent var		0.019761
Adjusted R-squared	0.487437	S.D. dependent var		0.093873
S.E. of regression	0.067207	Akaike info criterion		-2.521861
Sum squared resid	0.316171	Schwarz criterion		-2.427733
Log likelihood	95.04793	Hannan-Quinn criter.		-2.484349
F-statistic	35.23528	Durbin-Watson stat		1.540853
Prob(F-statistic)	0.000000			

Note: * denotes significance at 1% level, ** denotes significance at 5% level.

Regression analysis estimation results

In order to effectively test hysteresis in foreign trade, firstly, whether the basic macroeconomic variables are consistent with the theory in the 2003Q1:2021Q2 period will be tested in Model 1. In the next stage, the existence of hysteresis effects in foreign trade flows will be tested with Model 2, in which the asymmetry hypothesis is modelled. Model 1 consists of real national income, import volume and real effective exchange rate variables for the period 2003Q1:2021Q2. The variables were tested with the seasonality test and seasonality was detected in the real national income series. The real national income series was seasonally adjusted and estimated. Autocorrelation, changing variance and multicollinearity problems were not found in the model. Model 1 results are presented in Table 3.

Table 4: Model 2 (Asymmetry Hypothesis) Regression Analysis Estimation Results

Dependent Variable: IMP Method: Least Squares Sample (adjusted): 2003Q2 2021Q2 Included observations: 73 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	1.995151	0.243293	8.200603	0.0000
REER	0.305382	0.119762	2.549912	0.0130
DUMMY	0.001747	0.022723	0.076876	0.9389
C	-0.004744	0.008582	-0.552820	0.5822
R-squared	0.501718	Mean dependent var		0.019761
Adjusted R-squared	0.480053	S.D. dependent var		0.093873
S.E. of regression	0.067689	Akaike info criterion		-2.494549
Sum squared resid	0.316144	Schwarz criterion		-2.369045
Log likelihood	95.05106	Hannan-Quinn criter.		-2.444534
F-statistic	23.15856	Durbin-Watson stat		1.544021
Prob(F-statistic)	0.000000			

Note: * denotes significance at 1% level, ** denotes significance at 5% level.

The model structure and variable coefficients are statistically significant. If the coefficients of the variables are interpreted, the effect of real exchange rate and real national income on imports is consistent with empirical studies and theoretical foundations. A 1% increase in real national income leads to a 1.99% increase in import volume. A 1% appreciation in the real effective exchange rate causes a 0.30% increase in the volume of imports. As a result, appreciation of domestic currency increases imports. On the other hand, a decrease in import volume is expected in the period when the domestic currency depreciates. At this point, in order to detect the hysteresis effect, the course of import volume should not change in consecutive periods of depreciation of the domestic currency. This structure is analysed with the asymmetry hypothesis. Considering the cumulative exchange rate, the estimation results of the period (2016Q2-2018Q2) (t=9) when the real exchange rate depreciation is continuous (t=9) with a dummy variable are contrary to what is theoretically expected. The positive coefficient of the dummy variable (0.001) reveals that the import volume and the real effective exchange rate move in different directions in the periods when real exchange rate depreciations follow each other, in other words, there is no decrease in the import volume during the period when the domestic currency depreciates. This indicates the existence of hysteresis effect in foreign trade. The regression estimation results showing the relationship between the coefficients are presented in Table 4.

As can be seen in Figure 5, the real effective exchange rate and import volume generally follow a parallel course. In order to analyse the hysteresis effect, the period in which exchange rate depreciations follow each other should be taken into account. In this sense, exchange rate depreciations in the (2016Q2-2018Q2) period are continuous. During this period, import volume did not decline and followed a horizontal course. Moreover, while exchange rate depreciations became continuous between 2012-2021, import volume followed a horizontal course, which proves the hysteresis.

The period of overvalued exchange rates in Turkey is between 2007 and 2011. Based on these developments, the fact that the structural break in the import volume in the 2009Q2 period after the 2007-2011 period when the domestic currency was overvalued strengthens the proposition that importing firms apply a wait-and-see policy in entering the market. As a matter of fact, the high growth performance and the increase in imports in the period when the Turkish Lira was overvalued after the 2008 World Crisis are in parallel. When these developments are evaluated in the long run, it is theoretically expected that imports will decrease in the period when the national currency depreciates (2016Q2-2018Q2). However, imports that increase when the national currency appreciates do not decrease when the national currency depreciates, in other words, this asymmetric structure is hysteresis behaviour.

CONCLUSION and POLICY IMPLICATIONS

With the abandonment of the Bretton Woods system and the financial liberalization process, exchange rates have widened their fluctuation margin globally, and sudden shocks in exchange rates have become frequent with capital flows. At this point, Dornbusch (1976) observed that the speed of adjustment of financial and real markets is different with the model of overshooting in exchange rates and observed that real markets adapt with a lag. However, another structure that should be emphasized at this point is the hysteresis phenomenon. Because hysteresis effects are not included in macrodynamism, macroeconomic variables exhibit a structure inconsistent with the theoretical foundations in the stabilization process of economic activity after structural break.

In the study, hysteresis effects are analyzed by testing whether the increase in imports after exchange rate shocks (overvaluation) returns to its previous level in exchange rate depreciations. As a result of the unit root test with structural break, the structural break in imports in 2009Q2 points to hysteresis effects. At the same time, hysteresis effects are tested with the asymmetry hypothesis in terms of the behaviour of staying in the market in case of depreciation of the domestic currency. The strength of the asymmetry hypothesis approach is that it identifies the resilient structure between foreign trade and exchange rate, which is the most basic hysteresis behaviour pattern. The combination of these two approaches provided a more robust basis for the findings. Recurring exchange rate depreciations, which are necessary to test hysteresis at the estimation stage, were experienced in the 2016Q2-2018Q2 period. In this period, the decline in import volume is theoretically expected in recurring exchange rate depreciations. However, no decline in import volume was observed in this period, and it was observed that firms maintained their importing structure by exhibiting a stay-in-the-market behaviour. These findings provide strong evidence for the existence of hysteresis effects in foreign trade flows.

Due to the hysteresis effect, importer firms exhibited a stay in the market behaviour during the period of depreciation of the domestic currency in the Turkish economy. The structural break in the 2009 Q2 period triggered the importer structure in the Turkish economy due to the high growth performance after the 2008 World Crisis. After the 2008 World Crisis, the Turkish economy exhibited strong growth performance, and imports increased. The period of overvalued exchange rates in Turkey is the 2007-2011 period. Based on these developments, the fact that the structural break in the import volume in the 2009Q2 period after the 2007-2011 period when the domestic currency was overvalued reinforces that importing firms applied a wait-and-see policy in entering the market. As a matter of fact, during the period when the Turkish lira was overvalued, an importer structure was acquired by causing market entries. Looking at the import volume developments in the 2016Q2-2018Q2 period, when the domestic currency depreciated strongly, it is observed that firms exhibited a stay-in-the-market behaviour. Akdoğan and Werner (2021), who analyzed hysteresis effects in the manufacturing industry of the Turkish economy, reached similar findings and found that firms exhibit wait-and-see behaviour by considering certain exchange rate threshold levels in their market entry and exit decisions. It is concluded that the main dynamic of hysteresis effects is sunk costs.

As a result, structural breaks in exchange rates in foreign trade flows of the Turkish economy and the long-run effects of these breaks on the importing structure, in other words, the existence of hysteresis effects have been determined. It is observed that the hysteresis effects in the Turkish economy started with the behaviour of firms with delayed entry into the market due to the overvaluation of the domestic currency. In the following period, the theoretically expected decline in imports did not materialize during the period of strong depreciation of the domestic currency. This process points to a structure suitable for the hysteresis process in foreign trade flows. However, although the macro-based process implies that firms prefer to stay in the market due to sunk costs, a micro-based sectoral and firm-based analysis is important for clear inferences. This approach will ensure that the hysteresis in trade flows has a more robust microbasis in future studies. Finally, firms' stay-in-market behaviour has widened the immobility band for market entry and exit. The ongoing importing structure due to hysteresis effects causes the current account deficit problem in the Turkish economy to deepen, making the sustainability of the current account deficit difficult. Based on the macroeconomic variables and empirical findings in the Turkish economy, there are some issues that policymakers should pay attention to for the solution of hysteresis effects. In this context, stabilizing exchange rates in a way that does not cause structural breaks in import volume, reducing sunk costs by increasing efficiency in market entry, and reducing the effect of sunk costs on market entry and exit decisions in the long run by increasing total factor productivity come to the fore as important policy recommendations.

REFERENCES

Akdoğan, K., & Werner, L. (2021). Sunk cost hysteresis in Turkish manufacturing exports.

Alfaro, L., Cuñat, A., Fadinger, H., & Liu, Y. (2018). The real exchange rate, innovation and productivity: regional heterogeneity, asymmetries and hysteresis. *NBER Working Paper*, (w24633).

Amable, B., Henry, J., Lordon, F., & Topol, R. (1994). Strong hysteresis versus zero-root dynamics. *Economics Letters*, *44*(1-2), 43-47.

Ansic, D., & Pugh, G. (1999). An experimental test of trade hysteresis: Market exit and entry decisions in the presence of sunk costs and exchange rate uncertainty. *Applied Economics*, *31*(4), 427-436.

Arnon, A. (2022). How did micro come to reign over macro again? On microeconomics, macroeconomics and microfoundations for macro. In *Debates in Macroeconomics from the Great Depression to the Long Recession: Cycles, Crises and Policy Responses* (pp. 211-231). Cham: Springer International Publishing.

Aslan, A., & Kula, F. (2010). On asymmetry effects of exchange rate volatility in Turkey. *International Journal of Economic Policy in Emerging Economies*, *3*(2), 183-193.

Axarloglou, K. (2007). Multinational corporations and inertia in foreign direct investment flows. *The International Trade Journal*, *21*(4), 359-383.

Backus, D. K. (1994). Comments on 'Hysteresis and the duration of the J-curve', by Avinash Dixit. *Japan and the World Economy*, *6*(2), 121-128.

Bagnai, A., & Ospina, C. A. M. (2015). Long-and short-run price asymmetries and hysteresis in the Italian gasoline market. *Energy Policy*, *78*, 41-50.

Baily, M. N. (2003). Persistent dollar swings and the US economy. *Dollar Overvaluation and the World Economy*.

Baldwin, R. (1988a). Some empirical evidence on hysteresis in aggregate US import prices. DOI 10.3386/w2483

Baldwin, R. (1988b). *Hysteresis in import prices: the beachhead effect* (No. w2545). DOI 10.3386/w2545

Baldwin, R. E., & Lyons, R. K. (1994). Exchange rate hysteresis? Large versus small policy misalignments. European Economic Review, 38(1), 1-22.

Baldwin, R., & Krugman, P. (1989). Persistent trade effects of large exchange rate shocks. *The Quarterly Journal of Economics*, *104*(4), 635-654.

Baydur, C. M., Atasever, G. (2016). Türkiye'de Histeri Etkisi ve Dış Ticaret Dengesi:2000-2012. Cari Açık, Enerji Sektörü ve Ortadoğu ve Asya ile Ekonomik İlişkiler, *Türkiye Ekonomi Kurumu*, 1-15.

Belke, A., & Göcke, M. (1999). A simple model of hysteresis in employment under exchange rate uncertainty. Scottish Journal of Political Economy, 46(3), 260-286.

Belke, A., & Kronen, D. (2016). Exchange rate bands of inaction and play-hysteresis in Greek exports to the Euro Area, the US and Turkey: sectoral evidence. *Empirica*, *43*(2), 349-390.

Bhat, S. A., & Bhat, J. A. (2021). Impact of exchange rate changes on the trade balance of India: An asymmetric nonlinear cointegration approach. *Foreign Trade Review*, *56*(1), 71-88.

Bilgin, C. (2020). Asymmetric effects of exchange rate changes on exports: A sectoral nonlinear cointegration analysis for turkey.

Bošnjak, M. (2021, June). Hysteresis in trade flows of ex-Yugoslav countries. In *Proceedings of FEB Zagreb International Odyssey Conference on Economics and Business* (Vol. 3, No. 1, pp. 172-181). University of Zagreb, Faculty of Economics and Business.

Bošnjak, M., Novak, I., & Wittine, Z. (2020). Hysteresis in the trade flows of some EU member countries. *Ekonomski vjesnik: Review of Contemporary Entrepreneurship, Business, and Economic Issues*, *33*(1), 117-132.

Bragger, J. D., Bragger, D., Hantula, D. A., & Kirnan, J. (1998). Hyteresis and uncertainty: The effect of uncertainty on delays to exit decisions. *Organizational Behavior and Human Decision Processes*, *74*(3), 229-253.

Buğra, A. (2016). *İktisatçılar ve insanlar*. İletişim Yayınları, 2016.

Campa, J. M. (2004). Exchange rates and trade: How important is hysteresis in trade?. *European Economic Review*, *48*(3), 527-548.

Campbell, D. L. (2020). Relative prices and hysteresis: evidence from US manufacturing. *European Economic Review*, *129*, 103474.

CBRT https://evds2.tcmb.gov.tr/index.php?/evds/serie Market Accessed: 16/02/2023

Chavas, J. P. (1994). Production and investment decisions under sunk cost and temporal uncertainty. *American Journal of Agricultural Economics*, *76*(1), 114-127.

Chowdhury, A. R. (1993). Does exchange rate volatility depress trade flows? Evidence from error-correction models. *The Review of Economics and Statistics*, 700-706.

Christophe, S. E. (1997). Hysteresis and the value of the US multinational corporation. *The Journal of Business*, *70*(3), 435-462.

Christopoulos, D. K., & León-Ledesma, M. A. (2010). Smooth breaks and non-linear mean reversion: Post-Bretton Woods real exchange rates. *Journal of International Money and Finance*, *29*(6), 1076-1093.

Cross, R. (1993). On the foundations of hysteresis in economic systems. *Economics & Philosophy*, *9*(1), 53-74.

De Grauwe, P. (1988). Exchange rate variability and the slowdown in growth of international trade. *Staff Papers*, *35*(1), 63-84.

Delgado, F. A. (1991). Hysteresis, menu costs, and pricing with random exchange rates. *Journal of Monetary Economics*, *28*(3), 461-484.

Demsetz, H. (1982). Barriers to entry. *The American economic review*, *72*(1), 47-57.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: journal of the Econometric Society*, 1057-1072.

Dinçer, N. N., Shingal, A., & Tekin-Koru, A. (2020, October). Trade and exchange rate effects: evidence from firm-level data. Economic Research Forum (ERF).

Dixit, A. (1989a). Hysteresis, import penetration, and exchange rate pass-through. *The Quarterly Journal of Economics*, *104*(2), 205-228.

Dixit, A. (1989b). Entry and exit decisions under uncertainty. *Journal of political Economy*, *97*(3), 620-638.

Dixit, A. (1991). Analytical approximations in models of hysteresis. *The Review of Economic Studies*, *58*(1), 141-151.

Dixit, A. (1992). Investment and hysteresis. *Journal of economic perspectives*, *6*(1), 107-132.

Dixit, A. K., Dixit, R. K., & Pindyck, R. S. (1994). *Investment under uncertainty*. Princeton university press.

Doğanlar, M. (2002). Estimating the impact of exchange rate volatility on exports: evidence from Asian countries. *Applied Economics Letters*, *9*(13), 859-863.

Dornbusch, R. (1976). Expectations and exchange rate dynamics. *Journal of political Economy*, *84*(6), 1161-1176.

Elsner, W. (2021). Collapse. Institutional decline and breakdown, its endogeneity and its asymmetry vis-á-vis emergence: A theoretical frame. *Journal of Economic Issues*, *55*(1), 79-102.

Farrell, J., & Klemperer, P. (2007). Coordination and lock-in: Competition with switching costs and network effects. *Handbook of industrial organization*, *3*, 1967-2072.

Gocke, M. (2001). A macroeconomic model with hysteresis in foreign trade. *Metroeconomica*, *52*(4), 449-473.

Göcke, M. (2002). Various concepts of hysteresis applied in economics. *Journal of economic surveys*, *16*(2), 167-188.

Kulatilaka, N., & Kogut, B. (1996). Direct investment, hysteresis, and real exchange rate volatility. *Journal of the Japanese and International Economies*, *10*(1), 12-36.

Ljungqvist, L. (1994). Hysteresis in international trade: a general equilibrium analysis. *Journal of International Money and Finance*, *13*(4), 387-399.

Máñez, J. A., Rochina-Barrachina, M. E., & Sanchis, J. A. (2008). Sunk costs hysteresis in Spanish manufacturing exports. *Review of World Economics*, *144*, 272-294.

McCausland, W. D. (2000). Exchange rate hysteresis from trade account interaction. *The Manchester School*, *68*(1), 113-131.

McCausland, W. D. (2002). Exchange Rate Hysteresis: The Effects of Overshooting and Short-Termism. *Economic Record*, *78*(240), 60-67.

Miller, K. D., & Reuer, J. J. (1998). Asymmetric corporate exposures to foreign exchange rate changes. *Strategic Management Journal*, *19*(12), 1183-1191.

OECD https://stats.oecd.org/Index.aspx?DataSetCode=MEI_TRD# Accessed:16/02/2023

Parsley, D. C., & Wei, S. J. (1994). *Insignificant and Inconsequential Hysteresis: The Case of the US Bilateral Trade* (No. w4738).

Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica: journal of the Econometric Society*, 1361-1401.

Rapach, D. (2001). Monetary Shocks and Real Exchange Rate Hysteresis: Evidence from the G-7 Countries. *Review of International Economics*, *9*(2), 356-371.

Rauscher, M., & Willert, B. (2020). Modern slavery, corruption, and hysteresis. *European Journal of Political Economy*, *64*, 101917.

Rogers, J. H., & Jenkins, M. (1995). Haircuts or hysteresis? Sources of movements in real exchange rates. *Journal of International Economics*, *38*(3-4), 339-360.

Saatçioğlu, C., & Karaca, O. (2011). Döviz kuru belirsizliğinin ihracata etkisi: Türkiye örneği. *Doğuş Üniversitesi Dergisi*, *5*(2), 183-195.

Schmitt-Grohé, S., Uribe, M., & Ramos, A. (2008). *International macroeconomics*. Durham: Duke University.

Setterfield, M. (1993). A model of institutional hysteresis. *Journal of Economic issues*, *27*(3), 755-774.

Stock, J. H. (1994). Unit roots, structural breaks and trends. *Handbook of econometrics*, *4*, 2739-2841.

The Economist https://www.economist.com/news/2019/01/10/the-big-mac-index Accessed: 22/12/2023

Thompson, F. (2020). On The Need For A Rule To Prevent Anti-Competitive Limit Pricing.

Timbeau, X., Blot, C., Cochard, M., Ducoudré, B., & Schweisguth, D. (2012). *iAGS Model for Euro Area Medium Term Projections*. OFCE Working Paper.

Werner, L. M. (2020). Hysteresis losses in the Preisach framework. *Empirical Economics*, *58*(3), 1249-1278.

Zengin, A., & Vergil, H. (2011). Ticaret Akımlarında Histerezis Etkileri: Türkiye Örneği. İstanbul Üniversitesi İktisat Fakültesi Mecmuası, 54(1), 195.

Zivot, E., & Andrews, D. W. K. (2002). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of business & economic statistics*, *20*(1), 25-44.