

Research Article

Exchange Rate Pass-Through in Turkish E-Commerce Marketplace

Türk E-Ticaret Pazar Yerinde Döviz Kuru Geçişkenliği

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Abstract

This paper examines exchange rate pass-through (ERPT) in a large Turkish e-commerce marketplace using high-frequency weekly micro price data. The empirical analysis relies on a balanced panel of 13,433 products continuously observed over a 26-week period following a substantial currency depreciation episode. We estimate a dynamic single-equation panel model in first differences of logarithmic variables using a recursive expanding-window framework, allowing ERPT coefficients to evolve over time. The results indicate that short-run pass-through is consistently negative and statistically significant across recursive windows, suggesting the presence of price smoothing behavior and nominal rigidities even in a digital retail environment characterized by minimal menu costs. In contrast, long-run pass-through exhibits marked state dependence, rising to approximately 30-35 percent during periods of sustained exchange rate pressure and declining during intensive discount weeks. After implementing product-level corrections to account for temporary promotional distortions, cumulative pass-through becomes more stable but remains incomplete. Furthermore, percentile-based heterogeneity analysis reveals a monotonic increase in long-run pass-through from low to high-priced product segments, indicating substantial variation across pricing tiers. Overall, the findings demonstrate that exchange rate transmission in Türkiye's e-commerce market is gradual, incomplete, heterogeneous, strongly state-dependent, and declines over time following exchange rate shocks, while also varying across different price groups, despite the high degree of digital price flexibility.

JEL Classification: E31, L81, E32, D40

Keywords: Exchange rate pass-through, pricing behavior, nominal rigidities, micro-level price dynamics.

Öz

Bu çalışma, Türkiye'de faaliyet gösteren büyük ölçekli bir e-ticaret pazar yerinde döviz kuru geçişkenliğini yüksek frekanslı haftalık mikro fiyat verileri kullanarak analiz etmektedir. Çalışma, önemli bir kur şokunu takip eden 26 haftalık dönemde kesintisiz gözlemlenen 13.433 üründen oluşan dengeli panel veri setine dayanmaktadır. Ampirik analizde, birinci farkları alınmış logaritmik değişkenlerle tanımlanan dinamik tek-denklemlili panel modeli özyinelemeli pencere yaklaşımıyla tahmin edilmiştir. Bu yöntem, geçişkenlik katsayılarının zaman içinde evrilmesini izlemeye olanak tanımaktadır. Bulgular, kısa dönem geçişkenliğinin tüm tahmin pencerelerinde negatif

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ve istatistiksel olarak anlamlı olduğunu, bunun da çevrimiçi piyasalarda dahi fiyat yumuşatma davranışı ve nominal katılıkların varlığına işaret ettiğini göstermektedir. Uzun dönem geçişkenlik ise belirgin biçimde durum-bağımlı olup, kur baskısının sürdüğü dönemlerde %30-35 düzeyine kadar yükselmekte, yoğun indirim haftalarında ise zayıflamaktadır. İndirim haftalarına yönelik ürün-düzeyleli düzeltmeler sonrasında geçişkenlik daha istikrarlı ancak hâlâ eksik kalmaktadır. Ayrıca başlangıç fiyat yüzdeliklerine göre yapılan ayrıştırma, uzun dönem geçişkenliğinin fiyat segmentleri boyunca fiyat seviyesi arttıkça monoton biçimde arttığını göstermektedir. Genel olarak bulgular, Türkiye'deki e-ticaret pazarında döviz kuru geçişkenliğinin kademeli, eksik, heterojen ve büyük ölçüde duruma bağlı olduğunu; ayrıca kur şoklarının ardından zaman içinde azalma eğilimi gösterdiğini ve farklı fiyat gruplarına göre farklılaştığını, buna karşın dijital ortamlardaki yüksek fiyat esnekliğine rağmen bu özelliklerin devam ettiğini göstermektedir.

JEL Sınıflandırması: E31, L81, E32, D40

Anahtar Kelimeler: Döviz kuru geçişkenliği, fiyatlama davranışı, nominal katılıklar, mikro düzey fiyat dinamikleri.

1. Introduction

Understanding price adjustments to nominal shocks is crucial to macroeconomic research, particularly when exchange rate fluctuations interact with nominal rigidities. Exchange rate pass-through, the extent to which changes in exchange rates movements affect trade prices, serves as a key mechanism for analyzing how exchange rate fluctuations affect core economic outcomes such as inflation, and trade balance. The pass-through assumption is central to macroeconomic theory, as it explains how monetary shocks generate business cycle fluctuations (Lünnemann and Wintr, 2006).

Empirical research over recent years, especially those using large-scale micro price datasets, initially compiled for inflation measurement, has significantly advanced our understanding of price setting behavior and the frequency of price changes across products and markets. These studies have provided deeper insights into the complexity of pass-through in various economic environments. However, the transmission dynamics of exchange rate pass-through in e-commerce marketplace, particularly in emerging markets, remain unexplored. A notable study by Akgündüz et al. (2019) uses disaggregated bilateral trade data at the six-digit product level to estimate exchange rate pass through into prices in Türkiye. Their findings reveal that pass-through rates are particularly high in processed goods, leather, and textiles, with rates exceeding 90 percent in the short run and remaining above 80 percent in the long run. While this study offers critical insights into the pass-through in traditional markets, there is a lack of similar studies focused on e-commerce platforms.

Despite the rapid growth of e-commerce in recent years, few studies have examined the relationship between exchange rates and prices in e-commerce marketplaces. A prominent study by Gorodnichenko and Talavera (2017) shows that online market prices in Canada and the US exhibit more flexible, and stronger pass-through, estimated at 60-75 percent, while converging more rapidly in response to nominal exchange rate movements. However, similar research focusing on emerging markets like Türkiye remains absent, underscoring the need for further investigation into pass-through dynamics in digital platforms. To our knowledge, this study is the first to examine time-varying exchange rate pass-through dynamics using high-frequency product-level data from a large e-commerce marketplace in an emerging economy.

The present study examines the dynamics of exchange rate pass-through within an e-commerce marketplace operating in Türkiye. E-commerce platforms offer SMEs significant advantages, such as broad customer reach, low transaction costs, and access to integrated services like shipping, brand recognition, and customer support. Over time, these platforms have evolved into multi-service ecosystems, expanding beyond core commerce to include digital wallets, express delivery, and insurance services, all of which reinforce economies of scale in global trade. These unique characteristics of e-commerce platforms contribute to distinct dynamics in price-setting and exchange rate pass-through, which differ substantially from traditional markets.

Given these features, exchange rate pass-through in e-commerce platforms is expected to differ significantly from traditional markets. Lower transaction costs in e-commerce enable faster and more flexible price adjustments to exchange rate fluctuations. In addition, increased competition in digital marketplaces, facilitates dynamic pricing, which lead to a more rapid and effective pass-through than in

traditional markets, where price adjustments are often constrained by logistical delays and price stickiness. Moreover, the granularity of product pricing and heightened consumer price sensitivity in online environments enhance the responsiveness of prices to nominal shocks. Several limitations of this study should be acknowledged. The dataset covers a short time span and is restricted to textile-home textile products within a single marketplace, having a highest market share in Türkiye, while ensuring internal consistency, limits the generalizability of findings.

This paper contributes to the exchange rate pass-through literature in several ways. First, it provides micro-level evidence from a large-scale e-commerce marketplace in a high-inflation emerging economy, offering insights into price adjustment dynamics in a digital market environment. Second, unlike most prior studies that treat pass-through as a stable structural parameter, we document pronounced time variation in pass-through using a recursive estimation framework. Third, we demonstrate that discount campaigns and seasonal pricing behaviors significantly distort pass-through estimates, suggesting that pricing strategies, such as temporary promotions, weaken the link between exchange rates and domestic prices. Fourth, the study offers new evidence on exchange rate transmission under high inflation and persistent currency depreciation, revealing that even in a digital marketplace with low adjustment costs, pass-through remains incomplete and delayed. Finally, we observe substantial heterogeneity in exchange rate pass-through across product segments. Specifically, long-run pass-through increases monotonically from low-to high-priced products.

The remainder of the paper is organized as follows: Section 2 presents the related literature. Section 3 provides descriptive statistics and pricing patterns of the products used in the analysis. Section 4 outlines the methodological framework, followed by Section 5, which discusses the baseline model estimation results. Section 6 provides robustness checks, and the final section concludes the paper with policy implications and suggestions for future research.

2. Literature Review

A large body of empirical research has examined exchange rate pass-through across countries and sectors. Early studies typically relied on aggregate or sectoral data and documented incomplete transmission of exchange rate movements into domestic prices. Campa and Goldberg (2005) show that pass-through into import prices varies substantially across OECD economies and is generally far from complete, with long-run pass-through averaging around two-thirds of exchange rate changes. Similarly, Marazzi et al. (2005) provide evidence that exchange rate pass-through into U.S. import prices has decreased over time, highlighting the importance of structural changes in global production and pricing strategies. More recent studies emphasize that pass-through depends on macroeconomic conditions, including inflation regimes, exchange rate volatility, and the persistence of exchange rate shocks (Bussiere et al., 2014). These findings suggest that exchange rate transmission is often gradual, incomplete, and sensitive to the broader economic environment.

More recent contributions have increasingly relied on micro-level price data to better understand the mechanisms underlying exchange rate pass-through. Using detailed import price data, Gopinath, Itskhoki, and Rigobon (2010) show that the currency in which goods are invoiced plays a central role in determining the degree of pass-through, with prices set in dominant currencies exhibiting slower adjustment to exchange rate fluctuations. Relatedly, Gopinath and Itskhoki (2010) demonstrate that goods with more frequent price adjustments tend to display higher long-run pass-through, highlighting the importance of nominal rigidities in shaping exchange rate transmission. Other studies also highlight substantial heterogeneity across products and firms, indicating that pass-through may depend on factors such as market structure, markup adjustment, and competitive pressure.

A parallel strand of literature focuses on price stickiness and retail price dynamics. Influential empirical studies, including Pesendorfer (2002), Bils and Klenow (2004), and Boivin, Clark, and Vincent (2012), document that prices often adjust infrequently even in competitive retail markets. Cross-country evidence further suggests that price rigidity varies substantially across economies. For example, offline retail prices in Europe tend to be more rigid than in the United States across both food (Dhyne et al., 2009) and non-food sectors (Alvarez et al., 2006). Within Europe, Dhyne et al. (2009) report considerable heterogeneity across countries: roughly half of unprocessed food prices in Portugal, Luxembourg, Finland, and Spain change within a single month, whereas prices in Italy, France, and

Germany exhibit substantially longer durations of rigidity. Herrmann et al. (2005) show that in Germany some products maintain unchanged prices for more than 100 weeks despite active promotional efforts.

More recently, a growing literature has investigated pricing behavior in online markets. Earlier research has focused primarily on highly competitive e-commerce environments in developed countries, such as the computer-components marketplace studied by Ellison and Ellison (2009a, 2009b). These studies document that even in fast-moving online environments prices may remain relatively sticky, complementing broader evidence that retail prices adjust slowly to economic conditions (Nakamura and Steinsson, 2008; Loy and Schaper, 2014). Gorodnichenko and Talavera (2017) show that exchange rate pass-through in online markets is considerably higher than in traditional retail environments, with estimated rates between 60 and 75 percent, reflecting greater price flexibility and stronger competitive pressures in digital markets. At the same time, studies of online prices suggest that digital markets may display more frequent price adjustments and less pronounced cross-country differences compared to traditional retail settings (Lünnemann and Wint, 2011; Gorodnichenko, Sheremirov, and Talavera, 2018).

Evidence for Türkiye using highly disaggregated product-level data also points to substantial pass-through heterogeneity across sectors. Akgündüz et al. (2019) estimate exchange rate pass-through using product-level trade data and find that transmission rates can be relatively high in certain sectors, particularly in processed goods and textile-related industries.

Against this backdrop, the present study contributes to the literature by examining price dynamics in a large e-commerce marketplace operating in a developing country. Unlike much of the existing literature that focuses on advanced economies or offline retail settings, this study exploits product-level price data from an online marketplace in Türkiye to analyze how exchange rate movements are transmitted into prices in a digital retail environment.

3. Data Description

The dataset used in this study was collected from a leading e-commerce marketplace in Türkiye, which represents the largest player in the Turkish e-commerce marketplace sector. Access to the data was granted through a special authorization obtained exclusively for academic research purposes. The dataset contains no information that could identify individual firms, sellers, or commercial entities, either directly or indirectly.

The analysis focused exclusively on a subset of products consisting of textiles and home textiles (such as towels, bathrobes, etc.). To ensure consistency across observations, product prices were collected at 23:59 every Monday over a 26-week period, from June 12, 2023, to December 4, 2023. During this period, a total of 99,402 products were simultaneously listed for sale in the marketplace, which represents the total number of distinct products in the dataset. However, not all products had complete price data for the entire observation period. Missing data can be attributed to factors, such as sellers discontinuing certain products due to low sales or profitability, items becoming outdated or out of season, or temporary product unavailability.

Among the total products listings, 21,516 products had price records available both at the beginning and at the end of the study period, while 13,433 products had uninterrupted weekly price data throughout the entire period from June 12 to December 4, 2023. Table 1 presents the descriptive statistics for the dataset, which exceeds the scope of many previous studies in terms of product count and coverage.

Table 1. Data Description

	Variable	Observations	Mean	Standard Deviation	Min Value	Max Value
Products with prices available for 26 consecutive weeks	TR price (TL)	349,258	223.74	138.30	20.98	3373.34

As shown in Table 1, the dataset exhibits substantial variation in product price levels. For the purpose of analysis, attention was focused on the 13,433 products that had recorded prices at both the beginning (June 12, 2023) and end on (December 4, 2023) of the observation period. To facilitate the extended analysis by ordering the lower and higher price segments, products were grouped according to their prices as of June 12, 2023.

It is often argued that prices in online markets tend to change more frequently than in traditional retail settings. This is often attributed to the relatively low impact of menu costs, as online sellers can update their prices with just a few clicks and without incurring significant additional costs. However, upon analyzing the dataset, it becomes evident that lower-priced products tend to change the value more rapidly than higher-priced ones. Consequently, the focus was narrowed to the 13,433 products with uninterrupted price data over the full 26-week period. Although the dataset provides unusually granular weekly product-level information, the analysis is limited to a single marketplace, a relatively short post-depreciation period, and textile-related product categories. Therefore, the findings should be interpreted primarily as evidence on pricing dynamics within a specific online retail environment rather than as fully generalizable estimates for the broader Turkish economy.

At this stage, both the mean and median price changes of these products were examined to better understand pricing behavior. The year 2023 was particularly notable for fluctuations in the Turkish lira. As Figure 1 illustrates, the USD/TRY exchange rate remained relatively stable from the beginning of the year until the end of May. However, it began to rise during the summer months, and from September onward, the exchange rate continues to climb, closing the year with 55.5 percent increase. Over the same period, the Turkish lira depreciated by 23.8 percent against the USD. Simultaneously, Türkiye experienced an inflation rate of 37.5 percent from June to December 2023.

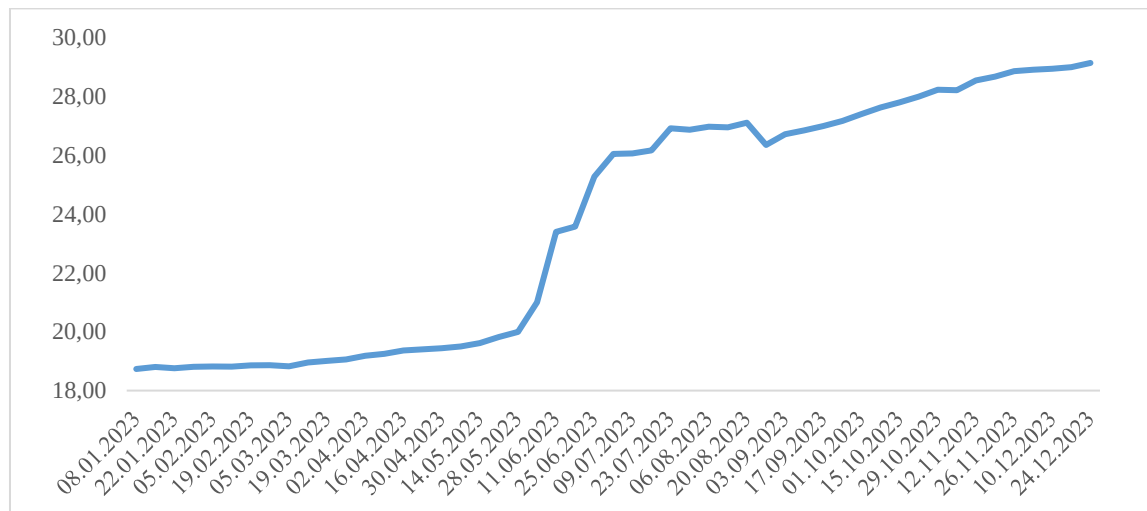


Figure 1. Weekly USD/TRY Exchange Rate in 2023

Source: Central Bank of Republic of Türkiye (CBRT)

Throughout the analysis period, as shown in Table 2, the mean prices in Türkiye increased by 11.1 percent in Turkish lira terms. Although earlier studies frequently relied on mean prices, median prices are generally less affected by outliers and offer a more stable measure of central tendency. As noted by Chevalier and Kashyap (2011) and Baye et al. (2009), minimum prices are more often closely aligned with actual transaction prices, and therefore may better reflect prices that are most relevant to consumers. Accordingly, it is important to examine changes in median prices as well. The variation in median prices in Türkiye was more limited, with median prices increasing by 12.3 percent over the 26-week period. Menu-cost models of price adjustment (Caplin and Spulber, 1987) suggest that price changes and exchange rate pass-through are more pronounced in markets experiencing high inflation (Bils and Klenow, 2004).

Table 2. Mean and median price of 13,433 products between 12 June-4 December 2023

Date	Mean Price TL	Median Price TL
12/06/2023	216.61	186.99
19/06/2023	220.17	189.99
26/06/2023	221.66	189.99
03/07/2023	221.67	189.99
10/07/2023	221.91	190.27
17/07/2023	223.65	191.99
24/07/2023	221.19	190.99
31/07/2023	221.78	191.39
07/08/2023	220.53	190.99
14/08/2023	226.98	198.99
21/08/2023	223.25	193.99
28/08/2023	221.52	192.99
04/09/2023	220.62	191.39
11/09/2023	202.87	179.99
18/09/2023	219.35	189.99
25/09/2023	222.18	195.99
02/10/2023	224.11	198.78
09/10/2023	223.38	199.59
16/10/2023	235.07	204.99
23/10/2023	233.20	200.99
30/10/2023	233.67	203.01
06/11/2023	209.57	181.37
13/11/2023	236.61	205.99
20/11/2023	213.32	184.99
27/11/2023	241.73	211.59
04/12/2023	240.71	209.99

Over the estimation sample, mean prices increased in 14 weeks and declined in 10 weeks compared to the previous week. In particular, during the weeks of September 11, November 6, and November 20, we observe noticeable deviations in both mean and median prices from their underlying price trajectory. These weeks display clear breaks from the prevailing price flow pattern, suggesting the presence of temporary distortions most likely associated with promotional or discount-driven pricing behavior.

E-commerce markets are particularly well-positioned to implement dynamic pricing strategies. Online sellers can automatically adjust prices in response to demand fluctuations, competitor prices, customer traffic, or inventory levels, allowing for greater flexibility in price adjustments. However, whether it alters the transmission of nominal shocks depends on the factors to which firms respond. If price changes are driven solely by temporary sectoral disturbances, increased price flexibility does not necessarily weaken the effectiveness of monetary policy. Under dynamic pricing, both the frequency and timing of price adjustments are crucial (Gorodnichenko and Talavera, 2017). To minimize the potential impact of dynamic pricing on the dataset and ensure easy interpretation, four-week moving mean and four-week moving median price series were analyzed.

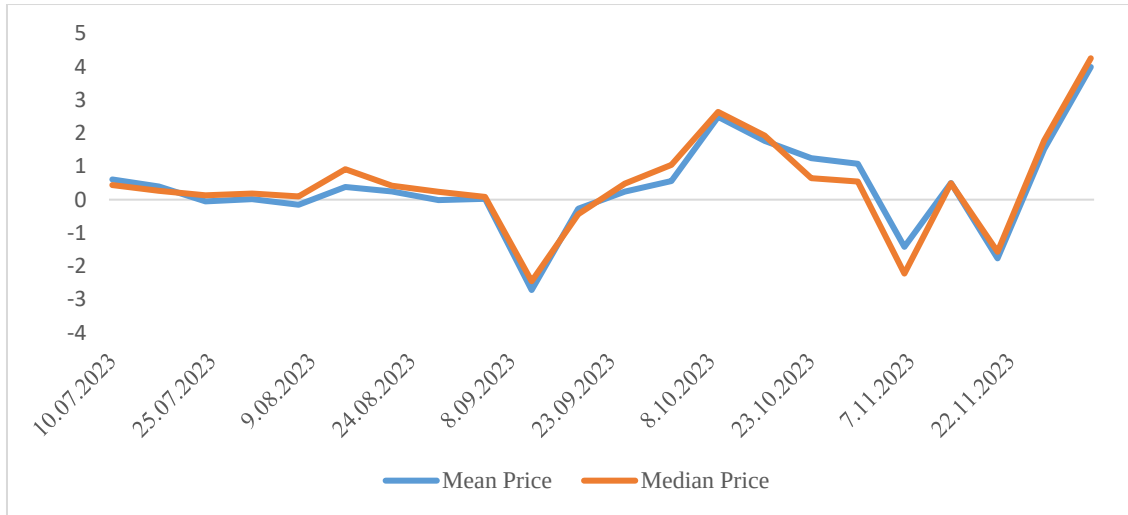


Figure 2. Four-week moving mean and median of price changes (%)

When evaluating Figure 2, which present the four-week moving means, it is clear that, although prices in Türkiye occasionally exhibited a mild negative trend, the overall tendency remained slightly positive. Between August 28 and November 2, prices in Türkiye showed a downward movement, with a particularly notable decline during the week of September 11. Afterward, prices generally trended upward, except for two weeks in November.

In Figure 2, several noticeable deviations disrupted the overall trend. To better understand the price dynamics within the dataset, we examined the movements in both mean and median prices more closely. Weekly analyses were performed to identify the weeks in which significant price changes occurred in both mean and median price levels. Since the dataset spans from the 24th week of 2023 to the 49th week, the subsequent figures refer to the corresponding week numbers of the year rather than specific calendar dates. The unusual pricing observed during the weeks of September 11, November 6, and November 20 becomes evident not only in Table 2 but also in Figure 2. In particular, these weeks stand out as clear deviations from the prevailing price adjustment pattern, reinforcing the interpretation that they reflect temporary distortions rather than systematic exchange-rate-driven movements. Accordingly, examining the weekly changes in mean prices provides a clearer view of the price declines observed during specific weeks.

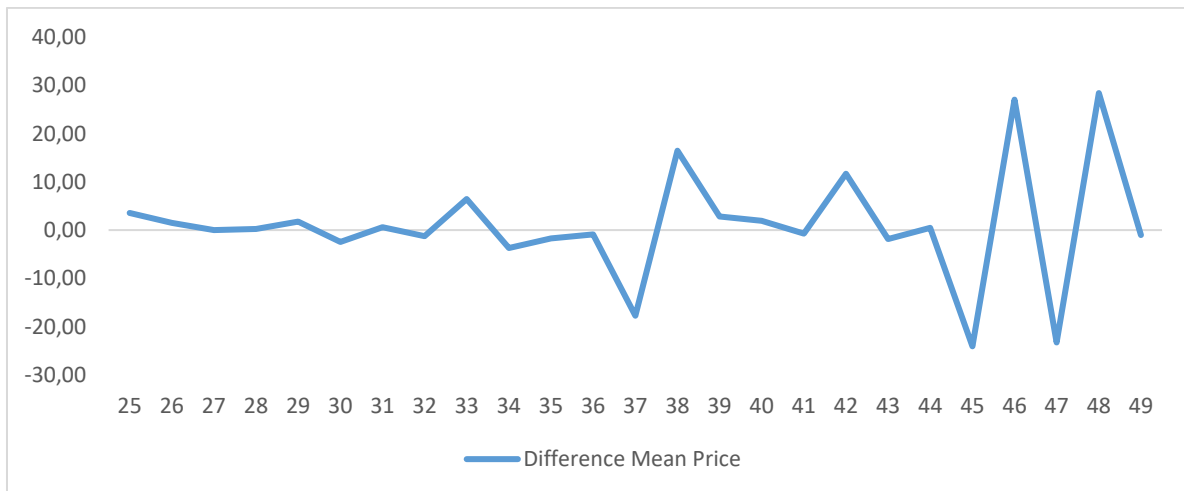


Figure 3. Weekly difference of changes in mean prices (%)

Note:Horizontal axis represents the week's number of the year

As illustrated in Figure 3, frequency of price changes initially increases over time. Figure 3 indicates that Türkiye experienced notable price declines during certain weeks, with significant deviations from the general trend in weeks September 11 (week 37), November 6 (week 45), and November 20 (week

47). Various factors may explain these price declines. First, the data for week 37 correspond to September 11, 2023, which marked the beginning of the 2023–2024 academic year in Türkiye. This timing likely led to substantial price reductions in textile products, a trend that can be observed across many product categories. Weeks 45 and 47, on the other hand, coincide with the widely observed “11.11” discount week in Türkiye and the globally recognized “Black Friday” sale campaigns, both of which lead to significant temporary price reductions.

4. Methodology

In this study, we adopt a fixed-effects distributed lag panel model single-equation framework with recursive estimation, consistent with a large body of exchange rate pass-through literature (e.g. Campa and Goldberg, 2005; Marazzi et al., 2005; Bussiere et al., 2014). This approach combines the dynamic structure of a distributed lag panel model with a recursive expanding-window estimation procedure, whereby the model is re-estimated each time a new observation is added to the sample. As a result, the estimated coefficients are allowed to evolve over time, enabling the analysis to capture changes in exchange rate pass-through dynamics and price adjustment behavior throughout the sample period. While recursive least-square methods, as proposed by Bai (2009) are often used in large panel data models featuring unobserved interactive fixed effects, previous studies have not fully addressed the implications of recursive on the asymptotic behavior of least-square estimators. By contrast, our approach offers an appropriate means of capturing time-varying pass-through dynamics while maintaining model parsimony in the context of a high-frequency, short-sample dataset.

Although VAR models are widely used in the exchange rate pass-through literature, they are not well suited to the empirical setting of this study. Our analysis includes high-frequency weekly product-level price data observed over a short time span, where the application of VAR models would lead to severe overparameterization and unstable impulse responses. Alternative frameworks such as ARDL models and local projection methods were considered but were not adopted for the baseline analysis. First, the dataset consists of a short weekly panel with a large cross-sectional dimension and a relatively limited time dimension, which constrains the efficiency of highly parameterized dynamic specifications. In particular, the recursive estimation strategy employed in the study would substantially reduce estimation stability and degrees of freedom under higher-dimensional frameworks such as ARDL or local projections. Second, the primary objective of the study is not impulse-response forecasting, but rather the identification of dynamic exchange rate pass-through behavior at the product level within a high-frequency e-commerce environment. In this context, the selected specification provides a more transparent and economically interpretable representation of weekly pass-through dynamics. The adopted framework is consistent with a broad strand of the exchange rate pass-through literature that models pass-through using distributed lag structures within single-equation settings. Moreover, our objective is not to model systemic feedback among macroeconomic variables, but rather to trace how exchange rate movements directly transmit into individual product prices within an e-commerce marketplace. By allowing the pass-through coefficients to vary across the sample period, this method enables the capture of both the magnitude and persistence of exchange-rate pass-through, particularly in response to large fluctuations in the exchange rate and shifting macroeconomic conditions. Accordingly, rather than simply measuring the average duration of price changes, the recursive expanding-window approach is employed to examine how price stickiness evolves over time.

Finally, the large-N, short-T panel structure of our data makes VAR approaches impractical, as substantial aggregation would obscure firm-level pricing behavior, which is central to our analysis. Therefore, recursive single-equation regressions provide a more transparent and feasible approach for capturing the time-varying nature of exchange rate pass-through in this setting. In line with standard exchange rate pass-through studies, exchange rate changes are treated as weakly exogenous at the product level, a specification more naturally accommodated in single-equation frameworks (Campa and Goldberg 2005, Marazzi et al. 2005). The weak exogeneity assumption is justified by the micro-level structure of the dataset and the nature of the exchange rate variable. The empirical analysis is conducted at the individual product level within an e-commerce marketplace, whereas the exchange rate is an aggregate macro-financial variable determined by broader factors such as monetary policy conditions, inflation expectations, capital flows, and external financial developments. Individual sellers' weekly pricing decisions for textile and home-textile products are therefore highly unlikely to exert any

measurable feedback effect on the USD/TRY exchange rate. In this sense, while exchange rate movements may affect product prices, reversing causality from individual product-level prices to the nominal exchange rate is not a plausible concern in this setting. This treatment is also consistent with single-equation ERPT studies that regard exchange rate changes as predetermined or weakly exogenous when the unit of observation is disaggregated product-level prices. The estimation proceeds as follows: the model is initially estimated using a sub-sample of the data consisting of $T - K$ observations. Subsequently, the sample is expanded sequentially by adding one observation at a time, and the model is re-estimated at each step until the full estimation period is covered. This recursive procedure generates a time series of coefficient estimates, which are subsequently plotted against time to examine how the exchange rate pass-through relationship evolves throughout the sample period. By allowing the estimated coefficients to vary over time, we are able to identify how exchange rate pass-through adapts to changing economic environment, offering valuable insights into the dynamic nature of pricing in e-commerce markets.

Before beginning the regression analysis, all prices and exchange rates are transformed into logarithmic form, and the empirical model is estimated using first differences of log variables. Specifically, for each product i sold in week t , weekly log price changes are defined as:

$$\Delta p_{i,t} = \ln(P_{i,t}) - \ln(P_{i,t-1}) \quad (1)$$

Where P_{it} represents the price of product i at week t , and Δp_{it} is the change in the log price between consecutive weeks. This transformation captures the percentage change in price, which allows for a clearer interpretation of the relationship between exchange rate changes and price adjustments.

Within each estimation window, we estimate the following dynamic panel model:

$$\Delta p_{i,t} = \alpha_i + \sum_{k=1}^2 \varphi_k \Delta p_{i,t-k} + \sum_{k=0}^2 \beta_k \Delta e_{t-k} + \varepsilon_{i,t} \quad (2)$$

where e_t denotes the exchange rate (in the empirical implementation, $e \equiv \text{USD/TRY}_t$), k is lag index, α_i represents product fixed effects (included to control for time-invariant heterogeneity across products), and $\varepsilon_{i,t}$ is an idiosyncratic error term.

In all panel regressions, standard errors are clustered at the product level. Product-level clustering is particularly important in this setting because the same products are repeatedly observed over time, and unobserved product-specific pricing factors may generate correlated residuals across weeks.

To determine the appropriate lag structure, alternative specifications ranging from one to seven lags were estimated and compared using the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). Both criteria continued to improve as additional lags were introduced. The corresponding information criteria across lag specifications are reported in Appendix Table A1. The baseline specification adopts a two-lag structure, conserving a higher number of observations and avoiding an overfitted model¹.

Moreover, given the short weekly time dimension of the panel and the recursive expanding-window estimation framework employed in the study, higher-order lag structures substantially increased model complexity and reduced estimation stability in early recursive windows. Accordingly, the baseline specification adopts a two-lag structure for both price changes and exchange rate changes. This specification provides a simpler and economically more meaningful representation of exchange rate transmission dynamics while avoiding the overparameterization problems associated with higher-order lag structures. To capture the evolving nature of exchange rate pass-through, we implement a recursive estimation strategy inspired by McCarthy (1999). Initially, the model is estimated using an early subsample, and the sample is then expanded sequentially by adding one week at a time until the end of the observation period. This recursive procedure generates a series of time-varying coefficient estimates,

¹ Following standard practice in ERPT estimations for emerging markets like Türkiye, we incorporate two lags of the exchange rate change (Δe_{t-1} and Δe_{t-2}) to capture short-term dynamics and pricing-to-market effects, as longer lags often yield insignificant coefficients due to rapid adjustment in e-commerce settings.

providing insights into how the pass-through dynamics change over time, particularly in response to large exchange rate movements.

Rather than estimating the model over the full sample in a single step, we implement an expanding-window procedure. For each terminal week $t \in \{37, \dots, 49\}$, we produce a sequence of time-indexed parameter vectors:

$$\hat{\theta}_t = (\hat{\phi}_{1,t}, \hat{\phi}_{2,t}, \hat{\beta}_{0,t}, \hat{\beta}_{1,t}, \hat{\beta}_{2,t}) \quad (3)$$

Short-run pass-through is measured by the contemporaneous coefficient $ERPT_t^{SR}$ as:

$$ERPT_t^{SR} = \beta_{0,t} \quad (4)$$

The coefficient captures the immediate response of prices to exchange rate movements.

Then, long-run pass-through is computed as:

$$ERPT_t^{LR} = \frac{(\beta_0 + \beta_1 + \beta_2)}{(1 - (\phi_1 + \phi_2))} \quad (5)$$

This formulation reflects the total price adjustment implied by a permanent exchange rate shock under the ceteris paribus assumption. Long-run pass-through is computed as the ratio of the cumulative exchange rate coefficients to one minus the sum of autoregressive price coefficients, capturing the total price adjustment implied by a permanent exchange rate shock under dynamic persistence.

5. Regression Results

The results presented in Table 3 indicate a statistically significant and dynamically structured exchange rate pass-through process. The model is estimated on 308,959 observations across 13,433 products, with an average of 23 weekly observations per product. The lagged dependent variables are highly significant: the first lag of price changes is negative (-0.241), indicating short-term reversal or correction effects, whereas the second lag is positive (0.085), suggesting partial adjustment dynamics.

Exchange rate changes exhibit a significant and distributed impact on prices. The contemporaneous exchange rate coefficient is negative (-0.217), the first lag remains negative (-0.090), while the second lag turns strongly positive (0.380), indicating delayed and non-monotonic transmission of exchange rate shocks into prices. All coefficients are statistically significant at the 1% level. The Wald test strongly rejects the joint null of no explanatory power ($p < 0.001$), confirming the model's overall significance. Finally, the estimated variance component $\rho = 0$ suggests that virtually none of the residual variance is attributed to product-specific random effects, suggesting that unobserved heterogeneity beyond the included regressors is minimal.

Table 3. Regression results

Variables	Coefficients and Standard Errors
$\Delta p_{i,t-1}$	-0.2413***
	-0.0018
$\Delta p_{i,t-2}$	0.0848***
	-0.0019
Δe_t	-0.2168***
	-0.0236
Δe_{t-1}	-0.0896***
	-0.0142
Δe_{t-2}	0.3800***
	-0.0136
Constant	0.0030***
	-0.0003
Observations	308,959
Number of products	13,433
R^2 (overall)	0.079

By plotting both short-run and long-run exchange rate pass-through coefficients over time, we trace how exchange rate transmission into domestic prices evolves across periods characterized by different inflation dynamics and exchange rate volatility in Türkiye. To accomplish this, we employ a recursive estimation strategy, which allows the pass-through coefficients to adjust endogenously to as new information is incorporated. The initial estimation period shown in Figure 4 covers the first 13 weeks of the dataset with subsequent windows expanding the sample one week at a time until the final window includes the full 26-week period (weeks 24–49). This structure enables the identification of both early-period pricing behaviors and later adjustments, particularly as exchange rate pressures persist and macroeconomic conditions evolve.

Across all recursive windows, short-run exchange rate pass-through is consistently negative and statistically significant. The negative short-run pass-through estimates should not be interpreted as evidence that exchange rate depreciation permanently reduces prices. Rather, they indicate that prices do not adjust mechanically and immediately to exchange rate movements at the weekly frequency. In online marketplaces, sellers may initially absorb exchange rate shocks through temporary markup compression in order to preserve search ranking, customer traffic, and relative price competitiveness. The negative short-run pass-through estimates may also reflect platform-level strategic responses following periods of exchange rate depreciation. In particular, the marketplace may have implemented policies aimed at sustaining transaction volumes and seller competitiveness, such as temporarily lowering commission rates, increasing promotional visibility for sellers, or intensifying platform-supported discount campaigns. Such interventions could partially offset sellers' cost pressures and contribute to short-run price reductions despite exchange rate increases. Consequently, the observed negative short-run coefficients may capture not only seller-level pricing behavior but also broader platform-driven pricing dynamics within the digital marketplace environment. In addition, algorithmic or rule-based pricing may respond more strongly to competitors' prices and demand conditions than to contemporaneous exchange rate movements. Therefore, the negative impact coefficients are consistent with short-run price smoothing, strategic pricing, and delayed adjustment rather than with a negative long-run relationship between exchange rates and prices. The magnitude of the impact coefficients ranges from approximately -0.02 to -0.21 , reflecting substantial short-run price rigidities in the e-commerce marketplace.

In contrast, long run exchange rate pass-through exhibits pronounced time variation, as shown in Figure 4. As the sample window expands to include periods of sustained currency depreciation and heightened inflationary pressure, long run pass-through increases markedly, reaching values between 0.29 and 0.35 at peak. These estimates imply gradual but economically meaningful transmission of exchange rate shocks into prices once short run stickiness dissipates. The pronounced decline in exchange rate pass-through is observed in the eleventh and thirteenth recursive windows, coincides with the period of widespread November discount campaigns in Türkiye. In line with the findings of Warner and Barsky (1995) this decline suggests that promotional pricing during these weeks may have temporarily weakened the transmission of exchange rate fluctuations into prices.

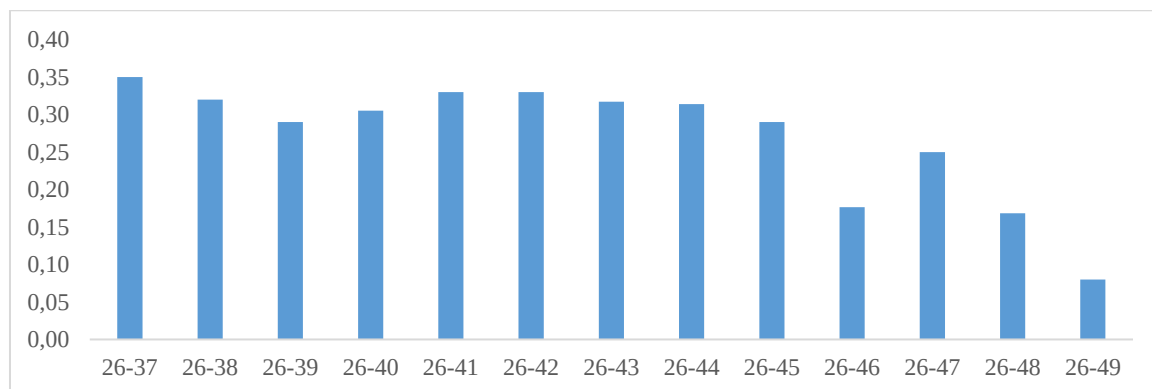


Figure 4. Recursive window long-run exchange rate pass-through values

In the final recursive windows, long run pass-through declines steadily, falling to approximately 0.07 in the full-sample estimate. This attenuation suggests that as exchange rate dynamics stabilize, the

cumulative response of prices weakens, consistent with reduced adjustment incentives or increased uncertainty faced by sellers. These findings align with Tunc and Kilinc (2018), who observed relatively stable pass-through patterns over time in VAR and SVAR models. This stability is disrupted during discount periods.

Overall, the recursive results reveal a clear asymmetry between impact and cumulative pass-through. As illustrated in Figure 4, long-run pass-through initially increases following the depreciation but gradually weakens over time as the immediate effects of the exchange rate shock dissipate. In line with our expectations, pass-through declines as time progresses after depreciation. This suggests that the impact of the exchange rate shock diminishes over time. These results indicate that long-run exchange rate pass-through is state-dependent and sensitive to the persistence of exchange rate shocks. Taken together, the findings underscore that exchange rate transmission in Türkiye’s e-commerce markets operates through delayed and incomplete price adjustments, shaped by nominal rigidities rather than immediate price indexation.

6. Robustness Analysis

A key challenge when working with high-frequency online price data is that short-lived promotions can mechanically generate large, week-to-week price changes that do not reflect underlying pricing decisions of firms. To address this issue, we implemented a simple and transparent correction procedure for the identified “discount weeks”. As discussed in Section 3, and illustrated in Figure 2, we observed noticeable distortions in price dynamics during specific weeks. These irregularities appear to result from temporary price adjustments that deviate from the prevailing pricing pattern, potentially biasing the estimation of exchange rate pass-through. To mitigate the influence of these anomalous periods, we implemented several corrective strategies.

Firstly, we introduced week-specific dummy variables for the identified distortion periods. However, incorporating these dummies into the baseline specification did not materially alter the estimated short-run or long-run exchange rate pass-through coefficients. This suggests that the “abnormal” weeks did not systematically drive the main pass-through results.

Secondly, we implemented a correction procedure tailored specifically to the weeks identified in Section 2 (weeks 37, 45, and 47). For each product, we examined the price trajectory surrounding these weeks. When a product’s price exhibited a temporary decline in the focal week followed by a rebound in the subsequent week—i.e., when $p_{i,t-1} = p_{i,t+1}$ and $p_{i,t} < p_{i,t-1}$ —we interpreted this pattern as a short-lived promotional deviation rather than a structural pricing response. In such cases, we replaced the distorted weekly price with the price observed in the preceding week, effectively smoothing one-period price dips.

After applying this correction, we re-estimated product-level fixed-effects panel regressions in a recursive manner. Specifically, for each window ending from week 36 to week 49, we re-estimate the model using only observations with $week \leq t$. This approach provided a time-evolving view of pass-through estimates and allowed us to examine whether pass-through dynamics changes as new weeks entered the sample. By replacing the week t price with the price in week $t-1$ when a discount pattern was identified, we minimized the influence of temporary promotional effects while preserving the underlying pricing dynamics relevant for exchange rate pass-through.

Table 4. Discount weeks adjusted regression result

Variables	Coefficients and Standard Errors
$\Delta p_{i,t-1}$	-0.1963***
	-0.0018
$\Delta p_{i,t-2}$	0.0699***
	-0.0019
Δe_t	-0.1491***
	-0.0229
Δe_{t-1}	-0.0882***
	-0.0137

Δe_{t-2}	0.3514***
	-0.0131
Constant	0.0025***
	-0.0003
Observations	308,959
Number of products	13,433
R^2 (overall)	0.052

The estimation results confirm the presence of statistically significant dynamic pricing behavior and distributed exchange rate pass-through effects. The model is estimated to use 308,959 observations across 13,433 products, each observed for 23 weeks. The lagged dependent variables are highly significant, revealing short-term price adjustment dynamics. The first lag of price changes is negative (-0.196), suggesting partial reversal or short-run correction effects, while the second lag is positive (0.070), indicating gradual adjustment and persistence in pricing behavior.

Exchange rate changes exhibit a distributed and statistically significant impact. The contemporaneous exchange rate coefficient is negative (-0.149), and the first lag remains negative (-0.088), whereas the second lag becomes strongly positive (0.351). This pattern suggests that exchange rate shocks are not fully transmitted immediately but rather unfold over subsequent weeks, consistent with delayed pass-through and pricing frictions.

The recursive fixed-effects estimation follows the same expanding-window structure, beginning with a window ending in week 37 and sequentially incorporating one additional week until the full 26-week sample (week 49) is included. This approach allows us to trace how exchange rate pass-through evolves as additional observations, particularly those associated with exchange rate persistence and discount weeks enter the estimation sample.

Short-run pass-through remains negative across all windows and is estimated with high precision. The contemporaneous coefficients vary between -0.21 and -0.03 , with standard errors consistently around 0.02 . The magnitude of the impact effect is strongest in the early windows (e.g., -0.21 in week 37 and -0.19 in week 38) and gradually moderates in later windows. This persistent negative short-run response is consistent with immediate price smoothing behavior and short-term nominal rigidities in online retail pricing.

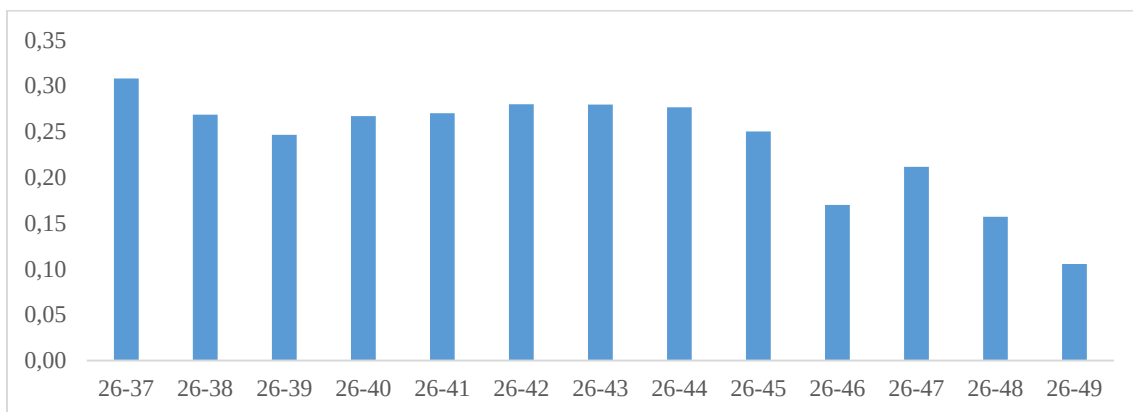


Figure 5. Discount weeks adjusted recursive window long-run exchange rate pass-through values

The more informative pattern is observed in the long-run pass-through estimates. As the sample expands to include weeks after 44 in Figure 5, long-run pass-through smoothly declines and stabilizes within a relatively narrow range between 0.25 and 0.28 . In particular, the estimates peak at 0.31 in week 37, then remain close to 0.27 for several consecutive weeks. This suggests that once additional data capturing sustained exchange rate pressures are incorporated, cumulative transmission becomes economically

significant, implying that roughly one-quarter to one-third of exchange rate changes are eventually reflected in prices.

However, following week 45, long-run pass-through begins to decline. The estimate drops to 0.17 in week 46, partially recovers to 0.21 in week 47, and then falls further to 0.16 and 0.11 in the final two windows. The weakening observed in the full-sample estimate (0.11) indicates that the cumulative price response weakens as later weeks are included. This decline is consistent with the tendency of exchange rate pass-through to gradually weaken over time following an exchange rate shock, suggesting that the transmission of the shock into prices diminishes as the adjustment process unfolds.

Overall, the recursive fixed-effects results reinforce the asymmetry between short-run and long-run pass-through. While impact effects remain negative and relatively stable, cumulative transmission exhibits clear time variation. Long-run ERPT initially intensifies as exchange rate pressures persist, reaching values around 25–30 percent, but subsequently moderates when discount-related weeks enter the sample. These findings support the interpretation that exchange rate transmission in Türkiye's e-commerce market is gradual, incomplete, and state-dependent, shaped by nominal rigidities and periodic pricing campaigns rather than instantaneous price adjustments. This behavior is consistent with the partial pass-through evidence documented for OECD import prices by Campa and Goldberg (2005).

To further explore heterogeneity in ERPT, we re-estimated the model by partitioning products into percentile groups based on their initial-week prices. Products were ranked according to their price levels in the first week of the sample and divided into equally sized percentile group. The dynamic pass-through specification was then estimated separately for each percentile group, allowing us to assess whether exchange rate transmission differs across low, middle, high, very high priced product segments.

Table 5. Exchange rate pass-through estimates by initial price percentiles

Discount weeks unadjusted ERPT			
Group	SR_ERPT	LR_ERPT	Number of Observations
Low	-0.314	-0.141	77740
Mid	-0.222	0.043	77004
High	-0.151	0.165	78844
Very High	-0.160	0.209	75371

Discount weeks adjusted ERPT			
Group	SR_ERPT	LR_ERPT	Number of Observations
Low	-0.248	-0.097	77740
Mid	-0.154	0.087	77004
High	-0.087	0.201	78844
Very High	-0.093	0.225	75371

Table 5 reveals substantial heterogeneity in exchange rate pass-through across initial price percentiles, particularly in long-run transmission. In the baseline (without discount-week adjustment) specification, short-run pass-through is negative for all price groups, with magnitude decreasing as product prices rise. The impact coefficient is strongest for the low-price segment (−0.314) and gradually declines for the high and very high groups (−0.151 and −0.160, respectively), indicating stronger short-term price smoothing for lower-priced goods.

In terms of long-run pass-through, a clear, monotonic pattern emerges along with the price distribution. The low-price group exhibits negative long-run pass-through (−0.141), indicating incomplete or even offsetting price adjustment, while higher-price segments exhibit progressively positive coefficients, reaching 0.209 in the very high-price group. This implies that exchange rate shocks are more fully transmitted into prices of higher-value products, consistent with greater pricing power or higher import content in these segments.

After adjusting for discount-week distortions, the overall pattern remains but becomes more economically coherent. Short-run pass-through remains negative across all groups, though declined in magnitude, reflecting that promotional periods had amplified short-term reversals in the baseline specification. Long-run pass-through increases systematically for all segments, except the lowest percentile, with a more pronounced positive gradient across price groups. In the adjusted specification, long-run pass-through rises from -0.097 in the low group to 0.225 in the very high-price group. Notably, mid-priced products now display a clearly positive cumulative pass-through (0.087), reinforcing the view that temporary promotional distortions had suppressed measured transmission in the baseline results.

Overall, the percentile-based evidence indicates that exchange rate pass-through is strongly price-level dependent. Higher-priced products exhibit larger and more stable long-run pass-through, whereas lower-priced goods show weaker or even negative cumulative responses. One possible explanation is that sellers of lower-priced products operate under thinner margins and more intense price competition, making them more likely to temporarily absorb exchange rate shocks in order to preserve sales volumes and platform visibility. This heterogeneity suggests that exchange rate transmission in Türkiye's e-commerce marketplace is influenced from differentiated pricing strategies, potentially reflecting variation in markups, competitive intensity, or cost structures across product segments.

7. Policy Implications and Conclusion

Our findings reveal that short-run pass-through is consistently negative and precisely estimated across all recursive windows. This result indicates that sellers do not mechanically adjust prices to contemporaneous exchange rate fluctuations. Instead, short-term price smoothing and nominal rigidities prevail, even in an online marketplace where menu costs are minimal and technological price updating is flexible.

In contrast, long-run pass-through exhibits pronounced time variation. In the analysis without adjusting for the discount weeks, long-run ERPT peaks at approximately 30–35 percent before declining to 7 percent in the full-sample estimation. However, when the discount weeks are adjusted for, the results show significant changes. As additional weeks capturing sustained exchange rate depreciation enter the estimation window, cumulative pass-through rises to meaningful levels, reaching approximately 25–30 percent. However, once discount-intensive weeks are incorporated, long-run pass-through declines considerably. In the full-sample recursive estimate, cumulative transmission falls to nearly 11 percent. This pattern reveals that exchange rate transmission is state-dependent and sensitive to promotional pricing campaigns.

To address potential distortions caused by discount weeks, we implement a product-level adjustment that removes temporary one-week price dips. After applying this adjustment, long-run pass-through stabilizes and follows a smoother trajectory. The adjustment confirms that although promotional pricing weakens the statistical relationship between exchange rate motions and domestic prices, it does not eliminate cumulative transmission entirely.

An important finding of this study is the documentation of substantial heterogeneity in pass-through across product price segments. When products are stratified according to their initial price percentiles, long-run pass-through increases monotonically from low- to high-priced segments. In the discount-unadjusted specification, long-run pass-through is negative for the lowest-priced segment (-0.141) but rises to 0.209 for the very high-priced segment. After adjusting discount distortions, this gradient becomes even more pronounced, with long-run exchange rate pass-through ranging from -0.097 in the low-price group to 0.225 in the very high-price group. These findings indicate that exchange rate transmission is significantly stronger for higher-value products, while lower-priced goods exhibit weaker and sometimes offsetting cumulative responses. This percentile-based heterogeneity suggests that exchange rate pass-through operates through differentiated pricing strategies across product segments. Higher-priced goods may embed larger import content, greater markup flexibility, or lower competitive pressure, allowing sellers to transmit cost shocks more fully. In contrast, lower-priced products appear to be more constrained by competitive dynamics or demand sensitivity, limiting their ability to fully adjust.

The results challenge the common presumption that digital price flexibility necessarily implies faster or more complete exchange rate transmission. Even in an online marketplace with minimal menu costs, pass-through remains incomplete, delayed, and strongly state dependent. Promotional campaigns, macroeconomic persistence, and product-level heterogeneity jointly shape the magnitude and timing of exchange rate transmission.

Several limitations of this study should be noted. The dataset covers a relatively short time horizon and focuses exclusively on textile and home-textile products within a single marketplace. Although this enhances internal consistency, it limits generalizability of the findings across sectors and macroeconomic contexts. Future research could extend this framework to multi-sector digital platforms, incorporate seller-level heterogeneity, and structurally model the interaction between demand shocks, promotional pricing, and cost-based exchange rate transmission.

Overall, the findings demonstrate that exchange rate transmission in Türkiye's e-commerce market is gradual, incomplete, heterogeneous, and strongly state-dependent despite the high degree of digital price flexibility. Pass-through dynamics weaken over time following an exchange rate shock and vary substantially across different product and price groups, suggesting that exchange rate depreciation does not translate uniformly into consumer prices in digital retail markets. Instead, the transmission process appears to depend on the persistence of exchange rate shocks, competitive pricing behavior, and the timing of promotional campaigns. These results carry important implications for inflation forecasting and monetary policy transmission in high-inflation environments such as Türkiye, where assuming a constant and homogeneous pass-through parameter may lead to biased inflation projections. Although digital marketplaces reduce nominal adjustment costs and enable rapid repricing, they do not eliminate the structural frictions governing the transmission of macroeconomic shocks into consumer prices.

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Appendix**Table A1. Lag-Length Comparison Using Information Criteria**

Lag Length	AIC	BIC
1 Lag	-346653.1	-346611.5
2 Lags	-350108.4	-350046.1
3 Lags	-353825.2	-353742.0
4 Lags	-356601.5	-356497.6
5 Lags	-361152.6	-361027.8
6 Lags	-362143.6	-361998.0
7 Lags	-363988.7	-363822.4

Notes: Both AIC and BIC continue to improve as additional lags are introduced. This pattern likely reflects the large cross-sectional dimension and high-frequency structure of the dataset, where incremental improvements in fit mechanically dominate the penalty term imposed by the information criteria, creating a tendency to favor increasingly higher lag lengths (resulting more negative values) rather than identifying a clear optimal lag structure.

Araştırma Makalesi**Exchange Rate Pass-Through in Turkish E-Commerce Marketplace***Türk E-Ticaret Pazar Yerinde Döviz Kuru Geçişkenliği*

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Genişletilmiş Özet

Bu çalışma, Türkiye’de faaliyet gösteren büyük ölçekli bir e-ticaret pazaryerinde döviz kuru geçişkenliğini yüksek frekanslı mikro fiyat verileri kullanarak incelemektedir. Döviz kuru geçişkenliği, nominal kur değişimlerinin yurtiçi fiyatlara ne ölçüde yansıdığını ifade etmekte olup, özellikle yüksek enflasyon ve kur oynaklığının belirgin olduğu ekonomilerde para politikası aktarım mekanizmasının anlaşılması açısından kritik bir parametredir. Literatürde geçişkenlik genellikle ithalat fiyatları ya da sektörel düzeyde toplulaştırılmış mikro veriler üzerinden analiz edilmiştir. Ancak dijital pazaryerlerinde fiyat belirleme davranışlarının ve kur şoklarının mikro düzeyde nasıl aktarıldığına ilişkin ampirik kanıtlar sınırlıdır. Bu çalışma, söz konusu boşluğu doldurmayı amaçlamaktadır.

Çalışmanın veri seti, Türkiye’de faaliyet gösteren lider bir e-ticaret platformundan akademik araştırma amacıyla sağlanmış olup, 12 Haziran 2023 – 4 Aralık 2023 tarihleri arasındaki 26 haftalık dönemi kapsamaktadır. Bu dönem, Türk lirasının belirgin biçimde değer kaybettiği ve enflasyonun yüksek seyrettiği bir makroekonomik konjoktüre karşılık gelmektedir. Veri seti 26 hafta boyunca kesintisiz gözlemlenen 13.433 ürüne odaklanmaktadır. İncelenen ürünlerin tamamı tekstil ve ev tekstili kategorisindedir. Toplam gözlem sayısı 349.258’dir. Fiyatlar haftalık olarak (her Pazartesi 23:59 itibarıyla) kaydedilmiştir.

Ampirik analizde dinamik tek-denklemli panel modeli tercih edilmiştir. Modelde ürün sabit etkileri yer almakta ve fiyat değişimleri kendi gecikmeleri ile döviz kuru değişimlerinin eşanlı ve gecikmeli değerleriyle açıklanmaktadır. Kısa dönem geçişkenlik eşanlı döviz kuru katsayısı ile ölçülürken, uzun dönem geçişkenlik, döviz kuru katsayılarının toplamının fiyatın otoregresif katsayılarının toplamı üzerinden normalize edilmesiyle hesaplanmaktadır. Zaman içinde geçişkenliğin evrimini gözlemleyebilmek amacıyla özyinelemeli tahmin yöntemi uygulanmıştır. Bu yaklaşım, katsayıların yeni gözlemler eklendikçe yeniden tahmin edilmesine ve böylece kur şoklarının sürekliliğine bağlı olarak geçişkenliğin nasıl değiştiğinin izlenmesine olanak tanımaktadır.

Temel bulgular, kısa dönem geçişkenliğin tüm tahmin pencerelerinde negatif ve istatistiksel olarak anlamlı olduğunu göstermektedir. Bu sonuç, döviz kuru artışlarının fiyatlara eşanlı ve mekanik biçimde yansıtılmadığını, aksine çevrimiçi piyasalarda dahi fiyat yumuşatma davranışının ve nominal katılıkların varlığını işaret etmektedir. Dijital ortamda menü maliyetlerinin düşük olması, teorik olarak daha hızlı fiyat ayarlamalarını mümkün kılarsa da, bulgular firmaların kısa vadede stratejik fiyatlama ve talep hassasiyeti gibi unsurları dikkate alarak kur şoklarını geciktirerek aktardığını göstermektedir.

Uzun dönem geçişkenlik ise belirgin bir zaman değişkenliği sergilemektedir. Kur baskısının sürdüğü ve değer kaybının kalıcı hale geldiği dönemlerde uzun dönem geçişkenlik %25–30 aralığına kadar

yükselmektedir. Bu durum, kur şoklarının kümülatif olarak fiyatlara anlamlı ölçüde yansıdığını göstermektedir. Ancak “11.11” ve “Black Friday” gibi yoğun indirim haftalarının tahmin penceresine dahil edilmesiyle birlikte uzun dönem geçişkenlikte belirgin bir düşüş gözlenmektedir. Bu bulgu, promosyon ve kampanya dönemlerinde fiyat hareketlerinin maliyet temelli olmaktan ziyade talep odaklı ve stratejik olduğunu, dolayısıyla kur-fiyat ilişkisinin geçici olarak zayıfladığını göstermektedir.

Bu potansiyel sapmayı gidermek amacıyla iki farklı sağlamlık analizi uygulanmıştır. İlk olarak ilgili haftalara kukla değişkenler eklenmiş, ancak temel sonuçların değişmediği görülmüştür. İkinci olarak ise ürün düzeyinde indirim haftalarında gözlenen tek dönemlik fiyat düşüşleri düzeltilmiş ve analiz tekrarlanmıştır. Bu düzeltme sonrasında uzun dönem geçişkenliğin daha istikrarlı bir patika izlediği, ancak yine de eksik kaldığı gözlenmiştir. Bu sonuç, dijital piyasalarda dahi kur aktarımının tam olmadığını teyit etmektedir.

Çalışmanın önemli katkılarından biri de geçişkenlikteki heterojenliği ortaya koymasıdır. Ürünler başlangıç haftasındaki fiyatlarına göre yüzdelik dilimlere ayrılmış ve model her bir grup için ayrı ayrı tahmin edilmiştir. Bulgular, uzun dönem geçişkenliğin düşük fiyatlı segmentlerden yüksek fiyatlı segmentlere doğru monoton biçimde arttığını göstermektedir. En düşük fiyat grubunda uzun dönem geçişkenlik sifıra yakın veya negatif iken, en yüksek fiyat grubunda %20’nin üzerine çıkmaktadır. Bu durum, yüksek fiyatlı ürünlerde daha yüksek ithal girdi oranı, daha güçlü fiyatlama gücü veya daha düşük rekabet baskısı gibi faktörlerin etkili olabileceğine işaret etmektedir. Buna karşılık düşük fiyatlı ürünlerde talep esnekliği ve rekabet yoğunluğu kur şoklarının tam yansıtılmasını sınırlamaktadır.

Genel olarak bulgular, dijital piyasalarda fiyat esnekliğinin yüksek olmasının kur geçişkenliğinin hızlı ve tam olacağı anlamına gelmediğini göstermektedir. Kur aktarımı gecikmeli, eksik ve durum-bağımlı bir yapıya sahiptir. Promosyon kampanyaları, talep koşulları ve fiyat segmentine özgü özellikler geçişkenliğin büyüklüğünü ve zamanlamasını belirlemektedir. Bu sonuçlar, yüksek enflasyon ortamında para politikası yapıcılarının açısından önemli çıkarımlar sunmaktadır. Döviz kuru şoklarının tüketici fiyatlarına aktarımı homojen ve eşanlı değildir; aktarım süreci zamana yayılan ve segmentlere göre farklılaşan bir yapı sergilemektedir.

Sonuç olarak bu çalışma, Türkiye’deki büyük bir e-ticaret platformunda döviz kuru geçişkenliğinin kademeli, eksik ve heterojen olduğunu ortaya koymaktadır. Dijital fiyatlama altyapısı ayarlama maliyetlerini azaltmakta ancak makroekonomik şokların fiyatlara aktarımını belirleyen yapısal katılıkları ortadan kaldırmamaktadır. Gelecek çalışmalar farklı sektörler, daha uzun zaman dilimleri ve firma düzeyinde heterojenlikleri içeren modellerle bu çerçeveyi genişletebilir.