

Research Notes in Economics

The Role of Real Exchange Rates in Export Price Determination

Mustafa Faruk Aydın, Selçuk Gül

Abstract

This study investigates the determinants of Turkey's export prices measured in foreign currency for the 1994Q1:2019Q3 period. Estimates from separate models using nominal and real exchange rates indicate that movements of the exchange rate have a long-run impact on export prices measured in foreign currency. However, the exchange rate pass-through to export prices in foreign currency is relatively low. This finding indicates that the exchange rate pass-through into export prices measured in local currency is almost complete. Results suggest that low exchange rate pass-through to export prices measured in foreign currency limits the expansionary impact of local currency depreciation, but increases the firms' profitability when the local currency depreciates. Besides, the most significant determinant of export prices measured in foreign currency in the short and long term is the world export prices.

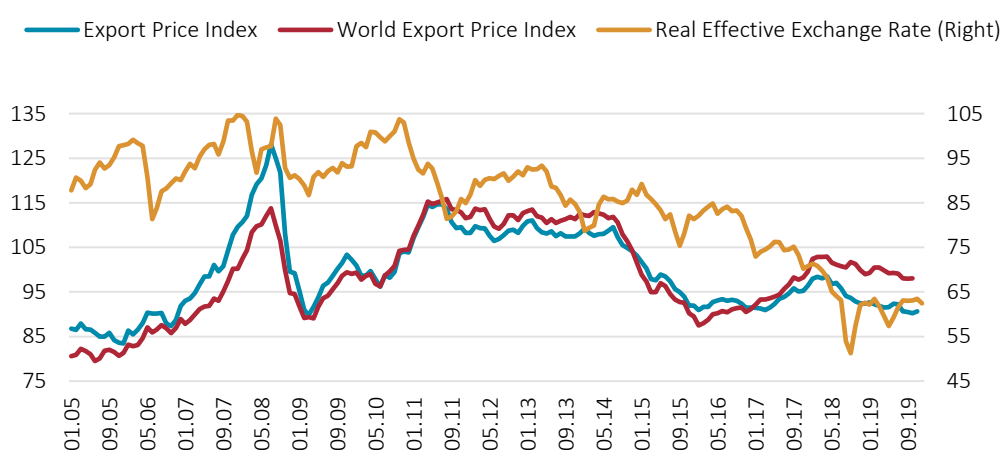
Özet

Bu çalışmada, 1994Ç1:2019Ç3 dönemi için Türkiye'nin yabancı para cinsinden ihracat fiyatlarının belirleyicileri incelenmektedir. Nominal ve reel döviz kurlarının kullanıldığı ayrı modellerden elde edilen tahminler, uzun dönemde döviz kurundaki hareketlerin yabancı para cinsinden ihracat fiyatlarını etkilediğini göstermektedir. Bununla birlikte, döviz kurunun yabancı para birimi cinsinden ihracat fiyatlarına geçişkenliği görece düşüktür. Söz konusu bulgu, döviz kuru değişimlerinin Türk lirası cinsinden ihracat fiyatlarına güçlü bir şekilde taşındığına işaret etmektedir. Sonuçlar yabancı para cinsinden ihracat fiyatlarına zayıf döviz kuru geçişkenliğinin, yerel para birimindeki değer kaybının yarattığı genişleyici etkiyi sınırladığını, ancak yerel paranın değer kaybı durumunda firma karlılığını arttırdığını ima etmektedir. Ayrıca, yabancı para cinsinden ihracat fiyatlarının kısa ve uzun dönemde en önemli belirleyicisinin dünya ihracat fiyatları olduğu gözlenmektedir.

1. Introduction

Turkey's export prices in US dollars (USD)¹ have recorded a gradual yet continuous decline since 2011. Chart 1 shows that export prices co-moved with the world export prices during the period when the real effective exchange rate also followed a downward trend. Another important observation for the characteristics of Turkish exports is that exporters mainly price to market. Recent data show that exports of Turkey are mostly priced in foreign currencies. In 2019, the shares of invoicing currencies of Turkish exports were 47%, 45%, and 4% for Euro, USD, and Turkish liras, respectively. By considering these stylized facts, this study aims to investigate the determinants of the variations in Turkey's export prices². Quantifying the relative contributions of the real exchange rate developments as well as of the world export prices is our primary interest. In this context, the measurement of exchange rate pass-through to export prices while controlling for the movements in world export prices is of great importance in terms of investigating how much the depreciation of the exchange rate is reflected in export prices over the recent period. Besides, uncovering the dynamics regarding export prices will contribute to a better interpretation of the gains in demand-side competitiveness.

Chart 1: Export Price Index and CPI-based Real Effective Exchange Rate (2010 = 100)



Source: CBRT, TurkStat, CPB Netherlands Bureau for Economic Policy Analysis. Price indices are in USD. A decrease in the real effective exchange rate means real depreciation of the local currency.

When the local currency depreciates in real terms, keeping other factors unchanged, exporter firms are expected to decrease their USD export prices up to a certain percent of the depreciation to increase their export volumes. If firms do not change their export prices, their revenues in foreign currency will remain constant while their revenues in Turkish liras (TRY) will increase as much as the depreciation of the local currency. In other words, while the depreciation allows exporters to increase their profit margins in the local currency, firms can also gain competitiveness by lowering the export prices measured in foreign currency to a certain extent. Accordingly, limited pass-through from exchange rate movements to export prices may not provide a strong effect on export volumes in the short term. Still, it can provide firms some indirect competitive power by increasing their profit margins in the medium and long term in a sense that higher revenues in local currency may enable firms to spend more on capacity-building

¹ Throughout the study, the term "export prices" is used for the export prices measured in USD unless otherwise specified.

² Export prices also depend on supply-side factors such as productivity, the marketing power of exporting firms, input costs, etc. Although these factors are also important for pricing behavior for firms, these are beyond the scope of our study. In this paper, we mainly focus on exchange rate and world prices as the determinants of export prices.

investments for exports.³ In this study, the extent to which the movements in the exchange rate affect export prices through the price channel, also known as exchange rate pass-through to export prices, is examined. The pass-through figures to be estimated using macro-data may provide some evidence on the flexibility of Turkish exporters to set prices at the global export markets.

From a conceptual perspective, Ghosh and Rajan (2007) define the two related concepts, exchange rate pass-through (ERPT) and pricing-to-market (PTM), in terms of the export price. According to their definition, the first is the percentage change in export prices in the destination country's currency due to a one percent change in nominal exchange rates. In contrast, the second is the percentage change in export prices in the exporter country's currency due to a one percent change in the nominal exchange rates.

Empirical literature regarding the ERPT mostly focuses on the pass-through of nominal exchange rate changes into import prices. What makes it so popular is that import prices are directly related to domestic prices, so to the inflation. On the contrary, there is relatively limited research regarding the ERPT into export prices. In this context, several studies examine the Turkish case and provide a variety of results. Some of these studies are interested in cross-country evidence. For instance, Choudhri and Hakura (2015) estimate the ERPT into trade prices for 34 advanced and developing countries, including Turkey, by using both OLS and VAR methods. They document the ERPT into Turkish export prices in local currency as 0.91 in both the short and long run. Similarly, Bussière et al. (2014) examine the ERPT into trade prices for a broader country set, including 40 advanced and developing countries. Their OLS and GMM estimations indicate that long term pass-through of exchange rate into export prices in TRY is around 0.28, whereas it is not statistically significant.

Some other studies explore the Turkish case from an individual country perspective. Toraganlı (2010) uses firm-level data and provides evidence of ERPT into export prices on the sectoral level for the period 1995-2007. She reports that average pass-through into export prices in TRY is around 0.60. Different from those studies, Tekin and Yazgan (2009) examine the ERPT into Turkish export prices in USD. Their aggregate data set of manufacturing sector spans the period 1988Q1-2004Q3. Their findings based on cointegration and error correction methods indicate an almost complete pass-through for export prices while an incomplete pass-through for import prices. Although they report almost complete ERPT into export prices in USD, they do not control for world export prices that we show to be an important determinant of Turkey's export prices.

Recently, Akgündüz et al. (2019) examine the pass-through of the exchange rate to trade prices in TRY using a detailed 6-digit product-level dataset. They estimate the pass-through to export prices in TRY as around 0.82, which corresponds to a 0.18 pass-through to export prices measured in USD. Using 3-digit product-level data and 2-digit sector-level data Saygılı (2019) estimates the exchange rate pass-through to export prices by considering the invoicing currency choice and integration to the global value chains. She provides evidence that the coefficient estimate for pass-through varies with respect to the invoicing currency, and it is higher for products invoiced in the local currency. Besides, her results suggest that greater integration to global value chains is associated with lower pass-through to export prices. Using an extensive firm-level dataset, Akgündüz and Fendoğlu (2019) provide estimates for the exchange rate pass-through to Turkish firms' export prices while accounting for the domestic supply networks of the firms. Their results suggest that firms with lower imported-input dependency can set more competitive prices than firms with higher imported-input reliance do.

³ See Demiroğlu (2019) that examines the impact of currency depreciation on the profits of Turkish exporters. His evidence indicates that depreciation leads exporters to increase their profits in local currency. From a broader perspective, Gopinath (2015) provides evidence that depreciation helps countries to increase their mark-ups and profits in their local currencies by taking into account the existence of invoicing currencies and the dollar as the dominant pricing currency. As an indirect impact of currency depreciation, she claims that exporters can increase their exports in the extensive margin thanks to the increase in profits after the depreciation.

Overall, previous empirical evidence provides varying estimates (from 0.09 to 0.80) for pass-through from nominal exchange rate to export price in foreign currency. Our macro-level study contributes to the literature by considering a longer and recent period. While the three recent studies mentioned above examine the periods 2000-2016, 2007-2017, and 2006-2016, respectively, our research is interested in 1994Q1-2019Q3. Since there has been sharp depreciation in the previous years, estimating the exchange rate pass-through over the recent period provides us with more updated results. Second, our study investigates the long-run exchange rate pass-through to export prices by using a cointegration method. Either the recent studies do not estimate the short and long-term pass-through separately, or they compute a cumulative pass-through over a specific horizon (such as six months or a year) and call it the long-run pass-through. Third, our work differs from these three studies by generating estimations for both nominal and real exchange rate pass-through to nominal export prices. Our approach as estimating the real exchange rate pass-through may be compared to the frameworks of the product-level studies by Berman et al. (2012) for France and Han and Shen (2016) for China. Both of the studies estimate a nominal export price model that includes the real exchange rate as the exchange rate indicator. Our motivation to add the real exchange rate to the analysis lies in the distinct characteristics of the movements of the real exchange rates in the Turkish context. During the period under consideration, there are mainly two sub-periods with stable and persistent real appreciation and depreciation of Turkish liras, until 2011 and after 2011, respectively. By considering the stability and persistence of the real exchange rate movements, we expect the exporters to take the real exchange rate movements into account while setting their prices.

This study aims to estimate the ERPT into Turkey's export prices in USD. We follow the standard ERPT estimation practice by using the nominal exchange rate as the main regressor. Alternatively, we test whether the real exchange rate significantly affects export prices or not. The rest of the paper is organized as follows. Section 2 introduces the data and methodology. Section 3 presents the empirical results, and Section 4 concludes.

2. Data and Methodology

In this section, we provide an empirical specification to examine the determinants of export prices. Following Ceglowski (2010) and Campa and Goldberg (2005), export prices in USD can be described by a function of world export prices, nominal exchange rates, input costs, and the external demand as the following:

$$p_{x,t}^{USD} = \alpha_0 + \alpha_1 p_{f,t}^{USD} + \alpha_2 e_t + \beta_0 c_t + \beta_1 y_t^f \quad (1)$$

where $p_{x,t}^{USD}$ is the export price of Turkey in USD and $p_{f,t}^{USD}$ is the world export price or competitors' export price in USD. The exchange rate, e_t , is defined as USD per domestic currency. Input costs, c_t , are represented by producer prices. Foreign demand, y_t^f , is the global growth index, which is weighted according to Turkey's export partners' shares.⁴

This model incorporates principal elements of exporters' pricing behavior. For instance, the world export price helps quantify the extent of how exporters respond to fluctuations in the competitors' prices. Since most of Turkey's exports belong to sectors with low and medium technology, Turkish exporters' price-setting power in the international markets is likely to be weak. Hence, the expected sign of α_1 is positive. Similarly, the estimate for the coefficient of the nominal exchange rate, α_2 , which is the exchange rate pass-through estimate, is expected to be positive in line with the literature. As a response to currency depreciation, exporters are likely to decrease their export prices in USD to increase their market shares.

⁴ In addition to these regressors, depending on their statistical significance, we control for a trend variable, quarter-fixed effects, and dummy variables for the crises during the sample period.

Besides, increases in input prices and a positive outlook of external demand exert upward pressure to export prices. Thus, estimates for the coefficients of these variables are also expected to be positive.

According to the model, there are three cases regarding the parameter of exchange rates such as

- If $\alpha_2 = 0$, then-No ERPT (Full PTM)
- If $\alpha_2 = 1$, then-Full ERPT (No PTM)
- If $0 < \alpha_2 < 1$, then-incomplete (partial) pass-through

Based on the equation (1), the empirical specification for estimation is presented below:

$$\Delta p_{x,t}^{USD} = \alpha_0 + \sum_{i=0}^3 \alpha_{1i} \Delta p_{f,t-i}^{USD} + \sum_{i=0}^3 \alpha_{2i} \Delta e_{t-i} + \sum_{i=0}^3 \beta_{0i} \Delta c_{t-i} + \beta_1 \Delta y_t^f + v_t \quad (2)$$

where v_t is the error term. This specification contains up to three lags of differenced exchange rates and production costs.⁵ The contemporaneous effect of the exchange rate is defined as short-term pass-through, while the sum of contemporaneous and lagged effects is defined as the cumulative pass-through of exchange rates into export prices. We estimate the specification (2) using the OLS method.

In addition to OLS-based estimations, we employ cointegration analysis and estimate the short and long-run pass-through by ARDL methodology following Pesaran et al. (2001). This methodology has some advantages against other cointegration methods. First, it does not require all the variables to be in the same order of integration by allowing the variables to be I(0) or I(1). Second, we can estimate the short and long-term relations simultaneously within a model using the OLS method.

The dataset consists of export prices of Turkish exporters, export prices of Turkey's competitors (weighted world export prices), the producer price index of Turkey, real and nominal exchange rates, and foreign demand as an export weighted global growth index. Turkey's export prices and producer prices are from TurkStat. The nominal exchange rate is defined as the USD per TRY; thus, a decrease in the nominal exchange rate implies a depreciation of TRY. The real effective exchange rate is the weighted average of the value of TRY according to a basket of currencies with high shares in Turkey's foreign trade that are adjusted by some price indices. Both exchange rates are from the Bank for International Settlements (BIS). Export prices of Turkey's competitors (weighted world export prices) measured in USD are published by CPB Netherlands Bureau for Economic Policy Analysis. The export weighted global growth index produced by Eren and Yavuz (2020) is used as the global demand variable. The sample includes 103 quarterly observations for the period 1994Q1:2019Q3. All the series are indexed to a base year (2010), and then they are transformed into logarithms.

3. Empirical Results

Table 1 presents the estimation results of equation (2). In the baseline estimations, we use the nominal USDTRY exchange rates. Robustness tests using the nominal effective exchange rate instead of the nominal USDTRY exchange rate provide similar results. We follow a general-to-specific approach to choose the appropriate lag structure in the models. In addition to information criteria such as Akaike and Schwarz, we consider the results of the diagnostic tests such as the Breusch-Godfrey LM test of serial correlation and Ramsey RESET test of functional form. Estimations indicate that the nominal exchange rate affects the export prices contemporaneously. We estimate the simultaneous ERPT into export prices in USD as around 0.16. That is to say, a 10 percent nominal depreciation leads to about a 1.6 percent decline in export prices. This finding is consistent with the results of a recent study by Akgündüz et al. (2019) that investigate the exchange rate pass-through to Turkey's trade prices in TRY. They estimate the simultaneous pass-through from nominal exchange rates to export prices in local currency as 0.82 that corresponds to a pass-through to export prices in USD as around 0.18.

⁵ Campa and Goldberg (2005) employ up to four-quarter lags, while Ceglowski (2010) estimates the model with two-quarter lags. Here, we considered up to 4 quarter lags and decided on three lags based on model selection criteria and the adjusted R-square values.

Table 1: Exchange Rate Pass-Through From Nominal Exchange Rates to Export Prices

Dep. Variable: DPX _t	Coefficient Estimates
DER _t	0.163 (0.037)***
DER _{t-1}	0.068 (0.030)**
DER _{t-2}	0.036 (0.018)*
DPXF _t	0.862 (0.109)***
DPPI _t	0.265 (0.065)***
Constant	-0.002 (0.003)
Number of Obs.	100
Adj-R ²	0.798
Jarque-Bera Test p-value	0.156
Breusch–Godfrey LM Test p-value	0.478
Ramsey RESET Test p-value	0.131

Notes: Variables are log-differenced. Standard errors are in parenthesis. PX: Export prices in USD, ER: Nominal exchange rates, PXF: Competitors' export prices in USD, PPI: Producer price index, and YF: Export weighted foreign demand. Heteroscedasticity-robust standard errors are in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The short-term results may also be compared with the findings of Akgündüz and Fendoğlu (2019) and Saygılı (2019). Both of the two studies estimate panel regressions that have log-difference of export prices in TRY as dependent variable and log-difference of nominal exchange rates as the main independent variable. Besides, they use an exchange rate definition that is the opposite of the exchange rate definition of our analysis. According to the definition in these studies, an increase in the exchange rate implies a depreciation of the domestic currency. The estimations of pass-through in these two studies are larger than the results of our study. The average pass-through to export prices in TRY is estimated by Akgündüz and Fendoğlu (2019) as around 0.22 that corresponds to a pass-through to export prices measured in USD as about 0.78. Their pass-through estimates increase for the firms with greater imported input dependency. They interpret the results as that firms that are less dependent on imports, on average, can make more competitive pricing. Similarly, Saygılı (2019) reports the pass-through to export prices in TRY as around 0.20, which is almost 0.80 for export prices in USD. According to their study, a one percent depreciation of the local currency is associated with an approximately 0.8 percent decline in export prices measured in USD. An explanation of why the estimates of these two studies differ from our results and the results of Akgündüz et al. (2019) is that none of the two studies control for the world export prices in their analysis contrary to our study and Akgündüz et al. (2019). In export pricing mechanism, world export prices act as a common factor since the periods when local currency depreciates generally coincide with the periods when global risk appetite and growth, thereby export prices measured in foreign currency, decline. Thus, controlling for the world export price in the export price model provides more reliable estimates for exchange rate pass-through into export prices measured in foreign currency.

Estimations show that the most important determinant of the variations in export prices is the variations in world export prices. A one percent increase in world export prices leads to an almost 0.82 percent contemporaneous rise in Turkey's export prices. Results, overall, suggest that exporters do not have high flexibility to change their export prices in USD, as a response to exchange rate movements in the short-term. To put it differently, they seem to make the price adjustments in the domestic currency. For instance, following currency depreciation, exporters may be making only small reductions in export prices measured in foreign currency and allowing local prices to adjust gradually upwards over time, which would help them to increase their profits in local currency. Recently, Demiroğlu (2019) provides evidence

that supports this mechanism. By using an accounting approach for the financing structure and profitability of an average exporter firm, he suggests that currency depreciation helps firm increase their profits in TRY. Another result from the estimation indicates that external demand does not significantly affect Turkey's export prices. This finding is also in line with the price-taker characteristics of Turkish exporters. Turkey's export prices are not responsive to variations in external demand conditions while they are highly correlated with the variations in world export prices.

Table 2: Exchange Rate Pass-Through From Real Exchange Rates to Export Prices

Dep. Variable: DPX_t	Coefficient Estimates
DREER _t	0.060 (0.031)*
DREER _{t-1}	0.088 (0.035)**
DPXF _t	1.069 (0.105)***
Constant	-0.018 (0.011)
Number of Obs.	101
Adj-R ²	0.779
Jarque-Bera Test p-value	0.319
Breusch–Godfrey LM Test p-value	0.109
Ramsey RESET Test p-value	0.102

Notes: Variables are log-differenced. Standard errors are in parenthesis. PX: Export prices in USD, REER: Real effective exchange rates, PXF: Competitors' export prices in USD, PPI: Producer price index, and YF: Export weighted foreign demand. Heteroscedasticity-robust standard errors are in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We proceed to our analysis with the model that uses the real effective exchange rates instead of the nominal exchange rates. By considering that real exchange rate movements in Turkey generally follow stable and persistent periods, we expect that real exchange rate plays a role in Turkish exporters' price-setting decisions. Since the real exchange rate includes domestic price dynamics in it, we do not control for the producer prices in this specification. The findings presented in Table 2 are in line with the results in Table 1 that are generated by the model with nominal exchange rates and producer prices. We observe that the contemporaneous effect of exchange rate developments on export prices is lower for the real exchange rate compared to the nominal exchange rate. We estimate the simultaneous real exchange rate pass-through to export prices as 0.06. That is to say, a 10 percent real depreciation of the local currency leads to a 0.6 percent decline in export prices in USD. Our results are in line with the results of the empirical studies that estimate the real exchange rate pass-through into nominal export prices. For instance, Berman et al. (2012) report that the baseline real exchange rate elasticity of export prices are between 0.05-0.14 in France. Similarly, Han and Shen (2016) provide evidence that the corresponding figure for China is around 0.12. Results also indicate that the impact of world export prices on Turkey's export prices becomes stronger when the model is estimated using the real exchange rate. Besides, similar to previous estimations, variations in global demand do not significantly contribute to explaining the variations in Turkey's export prices.

In addition to estimating the ERPT into export prices using the OLS methodology, we apply the ARDL approach for the long-term real exchange rate pass-through using the levels of variables under consideration. First, we confirm that none of the variables is I(2). Table 4 in the Appendix provides the unit root test results. The appropriate lag structure of the ARDL model is chosen following a general-to-specific approach that considers Schwarz information criteria and the results of diagnostic tests. Residuals from the ARDL model pass the tests for serial correlation (Breusch-Godfrey), normality (Jarque-Bera), and

validity of the functional form (RESET). Parameter stability tests, such as CUSUM and CUSUM-squared, are also satisfied. The findings from the ARDL model are provided in Table 3.⁶

Table 5 in the Appendix provides the bounds test statistics based on Pesaran et al. (2001). They confirm that a long-run relationship between the export prices of Turkish exporters, real exchange rate, and the world export prices exists.⁷ The usual expectation is that competitiveness gains from real exchange rate depreciation should allow exporters to decrease their export prices so that they can increase their export volumes. However, we observe that the pass-through from real exchange rates to export prices is relatively low, and the most significant determinant of the export prices is the competitors' (or world) export prices. OLS and cointegration estimations indicate that exporters do not have much power to set their prices in the destination country's currency. While they project the competitiveness gains from real exchange rate developments into prices to a minimal degree, what they mainly do is merely following the world export prices.

Table 3: Short and Long Run Pass-Through of Real Exchange Rates into Export Prices in USD

	Short Run (ECM Regression)
DREER _t	0.078 (0.028)***
DPXF _t	0.987 (0.064)***
CointEq _{t-1}	-0.096 (0.024)***
	Long Run (Levels Equation)
PXF _t	0.866 (0.088)***
REER _t	0.165 (0.090)*
Number of Obs.	101
Jarque-Bera Test p-value	0.589
Breusch–Godfrey LM Test p-value	0.303
Ramsey RESET Test p-value	0.935

Notes: Heteroscedasticity-robust standard errors are in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Model includes quarter-fixed effects.

In terms of the long term ERPT, our results can be compared with the results of Tekin and Yazgan (2009). Although most of the previous studies regarding pass-through into Turkish export prices are interested in export prices in TRY, they conduct a similar analysis to ours. They use cointegration methods to exploit the dynamics of the relationship between exchange rates and export prices in USD. In the estimation, they use the nominal exchange rate while we employ the real effective exchange rate. Thus, we further estimate the long-run exchange rate pass-through to export prices using the specification that includes nominal exchange rate and producer prices instead of the real exchange rate. The results are provided in Table 6 in the Appendix. Our estimations show that the long-run pass-through from the nominal exchange rate to export price is around 0.30, which is smaller than the estimates of Tekin and Yazgan (2009). They estimate the long-run ERPT into export prices in USD as about 0.71. There are several reasons why the two estimations differ. First, the period they examine (1988Q1-2004Q3), and the period we are interested in (1994Q1-2019Q3) are different. Second, they focus on the manufacturing sector exports while we analyze aggregate exports. Third, they do not control for the competitors' (or world) export prices in their specification.

Finally, we provide a brief discussion regarding the explanations behind existing but relatively low pass-through from the exchange rate to export prices. The first explanation relies on the heterogeneous

⁶ Following the short-run dynamics provided in Table 1 and Table 2, we impose the existence of the short-run exchange rate pass-through in the model.

⁷ ARDL estimations suggest that in the long-run, there is not a statistically significant relationship between export prices and external demand.

composition of Turkish exports by regions and sectors. Turkey's exports to EU countries are mainly composed of capital-intensive products with high import content, which may cause movements of world export prices to be more effective in pricing behavior than the real exchange rate developments are. Besides, the sensitivity of Turkey's automotive, basic metals and chemical exporting sectors, as the leading exporter sectors, to use of imported inputs may be a factor that limits the flexibility on firms' price response to real exchange rate shocks through the input cost channel. Two recent studies provide evidence that may support the link between the imported-input dependency of Turkish exporters and their pricing behavior. First, Erduman et al. (2019) suggest that the import content of exports has increased during the 2002-2017 period. According to their results, Turkey's leading exporter sectors have a higher imported-input dependency, on average. The other recent study by Akgündüz and Fendoğlu (2019) suggests that following currency depreciation, firms with higher import dependency can increase their local-currency prices more while raising their export volumes less, compared to the firms with lower import dependency.

Another explanation for the low exchange rate pass-through to export prices or almost perfect pricing-to-market behavior is the insufficient market power of Turkish firms in the global export markets. According to the bilateral trade statistics of the OECD (2019), the average share of member countries' exports belonging to high and medium-high R&D intensive activities in their total exports is around 59 percent in 2018.⁸ Although Turkey outperforms six member countries (Canada, Greece, Latvia, Lithuania, Luxembourg, and Portugal), the share of high and medium-tech exports to total exports in Turkey is 37 percent that is still lower than the OECD-average. On the upside, the corresponding figure of Turkey increased 4 percentage points since 2010, while the OECD-average only rose by 1 percentage point. These figures may be interpreted as that there is an upward trend in the quality of Turkish exports, which may increase Turkey's competitive power in global markets in the coming years. Accordingly, Çevirmez (2019) recently provides evidence that there is room for Turkish exporters to increase their export sophistication by the destination country and exported products.

The mitigating effect of the invoicing currency may provide a third explanation for the weak pass-through from the exchange rate to export prices. Saygılı (2019) provides evidence that export products invoiced in several currencies have heterogeneous pass-through coefficient estimates. The composition of the invoicing currency may form some kind of buffer for the exporters against exchange rate shocks.

4. Conclusion

Depreciation of domestic currency might provide firms with competitiveness gains by allowing them to reduce the export prices measured in foreign currency. Exchange rate pass-through to export prices shows the extent to which this price adjustment occurs. Results suggest that despite the gradual depreciation of the TRY since 2011, the decline in export prices measured in foreign currency has been relatively low. This finding can be interpreted as that there has been a limited expansionary impact of local currency depreciation over the last decade. Besides, firms have mainly taken the movements in world export prices into consideration when determining the prices of their products. However, the weak adjustment of export prices measured in foreign currency can still have a positive impact on exporters' profit margins by increasing the firms' revenues in TRY. The improvement in firms' profit margins may lead to a positive effect on capacity-building investments for exports in the medium and long term. Besides, given the role of imported-input dependency in limiting price-setting flexibility, policy measures that may reduce the use of imported inputs in production may provide competitiveness gains. Finally, from an indirect perspective, policies that support firms in producing higher technology-based and sophisticated products can help them gain additional competitive power in global export markets.

⁸ OECD average excluding countries such as Australia, Chile, Iceland, New Zealand, and Norway with more than half of their exports are commodities.

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Appendix

Table 4: Results of the ADF Test

Variables	Level		First Difference	
	Constant	Constant and	Constant	Constant and Trend
PX	-1.300	-1.340	-7.388***	-7.378***
REER	-1.968	-1.710	-9.182***	-9.601***
PXF	-0.984	-2.019	-6.258***	-6.222***
YF	-1.162	-2.522	-4.469***	-4.499***

Notes: Figures are the corresponding t-statistics. Variables are in logarithms. PX: Export prices in USD. ER: Nominal exchange rate. PPI: Producer Price Index. PXF: Competitor's (World) export prices in USD. YF: Foreign demand. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Results of the Bounds Test

	Test Statistics	K
F-Statistics	5.07	2
Case 1: No Constant and No Trend		
	Critical Values	I(0)
		I(1)
10%	2.17	3.19
5%	2.72	3.83
2.5%	3.22	4.50
1%	3.88	5.30

Notes: The null hypothesis of the test states that no levels relationship exists in the long run.

Table 6: Short and Long Run Pass-Through of Nominal Exchange Rate into Export Prices in USD

	Short Run (ECM Regression)
DER_t	0.117 (0.031)***
$DPPI_t$	0.126 (0.038)***
$DPXF_t$	0.830 (0.071)***
$CointEq_{t-1}$	-0.175 (0.039)***
	Long Run (Levels Equation)
ER_t	0.301 (0.096)***
PPI_t	0.266 (0.094)***
PXF_t	0.673 (0.102)***
Number of Obs.	100
Jarque-Bera Test p-value	0.896
Breusch-Godfrey LM Test p-value	0.135
Ramsey RESET Test p-value	0.451

Notes: Heteroscedasticity-robust standard errors are in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The model includes restricted constant and quarter-fixed effects. The general-to-specific model selection approach is followed by considering the Schwarz information criteria and the results of relevant model diagnostic tests. The result of the bounds test confirms that a long-run relationship between export prices, nominal exchange rate, producer price index, and world export prices exists.

For questions and comments:

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TCMB İdare Merkezi. Hacı Bayram Mah. İstiklal Cad. No: 10. 06050. Ulus/Ankara/Türkiye

E-mail: Ekonomi.notlari@tcmb.gov.tr