Turkish Trade in Eight Service Categories and the Role of Exchange Rate

Bahmani-Oskooee, Mohsen and Halicioglu, Ferda

University of Wisconsin-Milwaukee, USA, University of Bradford, UK

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Mohsen Bahmani-Oskooee
The Center for Research on International Economics and
Department of Economics
University of Wisconsin-Milwaukee
https://orcid.org/0000-0002-8242-7715
bahmani@uwm.edu

Ferda Halicioglu
Department of Peace Studies and International Development
University of Bradford
Bradford, BD7 1DP, United Kingdom.
https://orcid.org/0000-0001-7528-0973
f.halicioglu@bradford.ac.uk

Abstract

A new strand of literature in international economics is now in the early stages of development, i.e., the impact of exchange rate changes on service trade. We add to this literature by considering the link between the Turkish lira's real effective exchange rate and its trade in services. Since nonlinear adjustment of the exchange rate has proven to yield more significant outcomes relative to linear adjustment, we estimate a nonlinear model (assuming the effects are asymmetric) in addition to a linear model (which assumes the effects are symmetric). When we first estimated the models using Turkish aggregate trade in services, we could only find some short-run effects. However, we disaggregated the data into eight service categories to reduce aggregation bias. We then found short-run significant effects in all eight service industries. Short-run effects lasted into long-run effects in six industries. The unaffected industries were construction and transport.

JEL Classifications: C22, F14, G20

Keywords: Trade in Services, Real Effective Exchange Rate, Asymmetric Analysis, Turkey.

I. Introduction

The link between a country's exchange rate and trade flows continues to receive attention from policymakers and academicians. The primary purpose is determining whether a devaluation or a depreciation can improve the trade balance. Traditionally, the answer lies behind the sensitivity of trade flows to exchange rate changes, summarized by the well-known Marshall-Lerner condition. The condition claims that if the sum of import and export demand price elasticities exceed one, a devaluation or a depreciation can improve the trade balance in the long run. Bahmani-Oskooee et al. (2013) is a review article on the subject matter.

Economic theory dictates that the dependent variable must be quantity in estimating price elasticities, which is a prerequisite for testing the Marshall-Lerner condition. In case prices are not available to deflate nominal values of trade flows, researchers have replaced quantities of trade with nominal imports or exports and prices with the exchange rate. These new trade models are known as outpayments and inpayments schedules. Researchers in this area try to establish a direct link between inpayments and outpayments of a country with movements in its exchange rate. Examples are Haynes et al (1986), Bergstrand (1987), Cushman (1987), Bahmani-Oskooee and Goswami (2004), Bahmani-Oskooee et al. (2005a, 2005b), Bahmani-Oskooee and Harvey (2006), Bahmani-Oskooee Ratha (2008), Bahmani-Oskooee and Fariditavana (2019).

As far as the country of our concern, Turkey, is regarded, no study has estimated Turkish inpayments and outpayments schedules to determine how sensitive they are to changes in the value of Turkish lira. However, to avoid using import and export prices, especially at the bilateral or commodity level, several researchers have defined the ratio of nominal exports over nominal imports as the trade balance in real or nominal terms. They have then tried to assess the short-run and long-run effects of exchange rate changes on the Turkish trade balance, i.e., the J-curve effect.[1] Some studies such as Bahmani-Oskooee and Malixi (1992), Bahmani-Oskooee and Alse (1994), Brada *et al.* (1997), Akbostanci (2004), Halicioglu (2008a), and Bahmani-Oskooee and Kutan (2009) have considered Turkish trade with the rest of the world. Others, such as Halicioglu (2007, 2008b) and Celik and Kaya (2010), have considered Turkish trade with major partners at the bilateral level. To reduce aggregation bias further, Yazici and Klasra (2010), Durmaz (2015), Bahmani-Oskooee and Durmaz (2020), and Bahmani-Oskooee and Karamelikli (2021) have considered the Turkish bilateral trade balance at the commodity level. They have all found mixed results.[2]

A common feature of all the above studies is that they have considered Turkish trade in goods. There is now a new direction in which researchers are concerned with the impact of exchange rate changes on trade in services. Due to a lack of service prices, a limited number of studies in this new area have followed the first group and have tried to determine how sensitive a country's inpayments and outpayments of the service industry are to exchange rate changes.

Cheng (2020) is perhaps the first study that considered the U.S. trade in services with the rest of the world in several categories and found that the outcome depends on the type and the nature of each service, but no significant long-run effect was discovered. In another study, in the hope of finding more significant results, Cheng (2021) used disaggregated financial and insurance service trade between the U.S. and its six major trading partners and found only some short-run effects. Both studies were criticized by Bahmani-Oskooee and Karamelikli (2021) on the grounds that the lack of a significant link between exchange rate and inpayments and outpayments of a service industry could be due to assuming symmetric effects. Asymmetric analysis, which requires using nonlinear models, yielded relatively more significant outcomes.

[1] Note that Bahmani-Oskooee (1991) who introduced the ration, argued that not only the ratio could be considered trade balance in real or nominal term, it is also a unit free measure.
[2] The above studies have been reviewed in detail by Bahmani-Oskooee and Durmaz (2020).

Such findings were further supported by Xu et al. (2022) who considered trade in eleven service categories from China with the rest of the world, and by Bahmani-Oskooee and Saha (2024) who were concerned with the experience of Indian trade in services.

Our goal in this paper is to assess the short-run and long-run effects of changes in the real value of the Turkish lira on inapyments and outpayments of nine service categories that Turkey trades with the rest of the world. These categories are Total Service; Constructions; Insurance and Pension Services; Intellectual Property; Other Business Services; Personal, Cultural, and Recreational Services; Telecommunications; Transportation, and Travel. To that end, we introduce the models and explain the methods in Section II. In Section III, we report and discuss our findings. A summary and conclusion are then provided in Section IV, followed by an Appendix in which we define and provide data sources.

II. The Models and Methods

Following previous studies, e.g., Cheng (2020, 2021), Xu et al. (2022), and Bahmani-Oskooee and Saha (2024), we outline the inpayments and outpayments schedule for the service industry *i* as follows:

$$LnX_t^i = \alpha_0 + \alpha_1 \mathrm{LnE}_t + \alpha_2 \mathrm{LnY}_t^* + \xi_t \qquad (1)$$

$$LnM_t^i = \beta_0 + \beta_1 \mathrm{LnE}_t + \beta_2 \mathrm{LnY}_t + \epsilon_t \qquad (2)$$

where X^i in (1) is the export value (export earnings or inpayments) of service *i* that Turkey exports to the rest of the world. It is assumed that export earnings depend on the effective exchange value of the Turkish lira, E, and the level of economic activity in the rest of the world, Y^*. By way of construction, a decline in E signifies a depreciation of Turkish lira, and if lira depreciation is to increase inpayments, we expect an estimate of $\alpha_1 < 0$.[3] Since an increase in the world economic activity is expected to boost the world's purchase of service *i*, we expect

[3] Note that it is assumed that the rest of the world's demand for Turkish export of service *i* is elastic. In the event that the world import demand is inelastic, an estimate of α_1 could be positive.

an estimate of $\alpha_2 > 0$. Similarly, equation (2) identifies determinants of import costs or outpayments of the Turkish service industry *i*. It is assumed that the real effective exchange rate (E) and Turkish domestic economic activity (Y) are the two major determinants. Since depreciation is expected to increase import prices, assuming an elastic Turkish import demand, imports will decline, yielding a positive estimate for β_1.[4] Finally, since an increase in economic activity in Turkey boosts its imports of service *i*, and an estimate of $\beta_2 > 0$ is expected.

Coefficient estimates from (1) and (2) are long-run estimates. To assess the short-run effects, it is a common practice to turn both models to error-correction specifications as follows:

$$\Delta LnX_t^i = a_0 + \sum_{j=1}^{n1} a_{1j}\Delta LnX_{t-j}^i + \sum_{j=0}^{n2} a_{2j}\Delta \mathrm{LnE}_{t-j} + \sum_{j=0}^{n3} a_{3j}\Delta Ln\mathrm{Y}_{t-j}^* + \lambda_0 LnX_{t-1}^i + \lambda_1 Ln\mathrm{E}_{t-1} + \lambda_2 \mathrm{LnY}_{t-1}^* + \vartheta_t \quad (3)$$

$$\Delta LnM_t^i = b_0 + \sum_{j=1}^{n1} b_{1j}\Delta LnM_{t-j}^i + \sum_{j=0}^{n2} b_{2j}\Delta \mathrm{LnE}_{t-j} + \sum_{j=0}^{n3} b_{3j}\Delta Ln\mathrm{Y}_{t-j} + \rho_0 LnM_{t-1}^i + \rho_1 Ln\mathrm{E}_{t-1} + \rho_2 \mathrm{LnY}_{t-1} + \omega_t \quad (4)$$

In (3) and (4) short-run effects are reflected by the estimates of coefficients attached to first-differenced variables. Long-run effects are inferred by the estimates of λ_1 and λ_2 normalized on $-\lambda_0$ in (3) and ρ_1 and ρ_2 normalized on $-\rho_0$ in (4). Such ARDL models are due to Pesaran et al. (2001), who propose two cointegration tests to validate the long-run estimates. One is the standard F test to establish the joint significance of the lagged-level variables in both models. The other one is a t-test to judge the significance of λ_0 in (3) and ρ_0 in (4). Since the distribution of both tests is non-standard, Pesaran et al. (2001) tabulate new critical values using the Monte Carlo experiment.

As mentioned in the introductory section, Bahmani-Oskooee and Karamelikli (2021) argued and demonstrated that the effects of exchange rate changes on services could be asymmetric,

[4] Again, if Turkish import demand is inelastic, an estimate of β_1 could be negative.

requiring nonlinear models. Following their approach and Shin et al. (2014), we convert the two linear ARDL models (3) and (4) to nonlinear ARDL models (5) and (6) as follows:

$$\Delta LnX_t^i = d_0 + \sum_{j=1}^{n1} d_{1j}\Delta \mathrm{LnX}_{t-j}^i + \sum_{j=0}^{n2} d_{2j}\Delta POS_{t-j} + \sum_{j=0}^{n3} d_{3j}\Delta NEG_{t-j} + \sum_{j=0}^{n4} d_{4j}\Delta LnY_{t-j}^*$$

$$+\chi_0 LnX_{t-1}^i + \chi_1 LnY_{t-1}^* + \chi_2 POS_{t-1} + \chi_3 NEG_{t-1} + \xi_t \qquad (5)$$

$$\Delta\ \mathrm{LnM}_t^i = c_0 + \sum_{j=1}^{n1} c_{1j}\Delta LnM_{t-j}^i + \sum_{j=0}^{n2} c_{2j}\Delta POS_{t-j} + \sum_{j=0}^{n3} c_{3j}\Delta NEG_{t-j} + \sum_{j=0}^{n4} c_{4j}\Delta \mathrm{LnY}_{t-j}$$

$$+\pi_0 LnM_{t-1}^i + \pi_1 LnY_{t-1} + \pi_2 POS_{t-1} + \pi_3 NEG_{t-1} + \tau_t \qquad (6)$$

Note that all models (3)-(6) are linear when all variables are concerned. However, since (5) and (6) have two additional variables that adjust nonlinearly, they are usually referred to as nonlinear ARDL models. Both models' nonlinear variables are partial sum variables denoted by POS and NEG. POS is the partial sum of positive changes in the real effective exchange rate, and NEG is the partial sum of negative changes.[5]

We estimate all four models by the Ordinary Least Squares (OLS) method, and following Shin et al. (2014, p. 291), we rely upon the same high critical values of the F test to establish cointegration in all models. We then test a few asymmetric assumptions. First, short-run effects of changes in the exchange rate on any service category will be asymmetric if, at any given lag order j, the estimate of $d_{2j} \neq d_{3j}$ in (5) and $c_{2j} \neq c_{3j}$ in (6). However, if we reject the null hypothesis of $\sum d_{2j} = \sum d_{3j}$ in (5) and $\sum c_{2j} = \sum c_{3j}$ in (6), we will be able to support cumulative short-run asymmetric effects. Additionally, if we reject the null of $\frac{\chi_2}{-\chi_0} = \frac{\chi_3}{-\chi_0}$ in (5) and $\frac{\pi_2}{-\pi_0} = \frac{\pi_3}{-\pi_0}$ in (6),

[5] For constructing the partial sum variables see Bahmani-Oskooee and Karamalekli (2021) and Shin et al. (2014).

we will be able to support long-run asymmetric effects of exchange rate changes on inpayments and out payments of service industry i in (5) and (6) respectively.[6]

III. Empirical Results

In this section, we estimate and report the results for all models, i.e., two linear models (3) and (4) and two nonlinear models (5) and (6). All models are estimated using aggregate data first and then for each of the eight Turkish service industries next to determine if there is aggregation bias. Quarterly data over 2005Q1-2022Q4 are the only data frequency available for Turkey. In estimating each model, we impose a maximum of eight lags on each first-differenced variable and use Akaike's Information Criterion (AIC) to select the lag order.[7] We start by estimating the linear Turkish export earnings model (3) and reporting the results in Table 1.

Table 1 goes about here

From the short-run estimates reported in Panel A, we learn that when all export services are combined (All Services), the exchange rate carries no significant coefficient in the short run. However, the story is somewhat different when we consider each service category separately. The exchange rate carries at least one lagged significant coefficient in all service categories except Telecommunications. This highlights the importance of using disaggregated data versus aggregate data. Since the exchange rate has short-run significant effects on the export earnings of most service industries, we expect it to last into the long run in some cases. Indeed, this is the case in the model that uses aggregate data and the models that belong to intellectual property and Personal-Cultural-Recreational Services. Although in these two service industries, the exchange rate carries coefficients that are different in sign, in the

[6] It should be noted that the Wald test is used to test these hypotheses. For some other application of these methods see Arize et al. (2017), Bahmani-Oskooee et al. (2024a, 2024b), Hajilee and Niroomand (2019, 2020, 2021), and Baek (2020).
[7] Note that all required critical values are provided in the notes to each table and used to identify significant estimates.

aggregate model, the estimate is significantly negative, implying that lira depreciation will boost Turkish export earnings in services. These long-run findings are meaningful since cointegration is supported either by the F-test or the t-test (Reported in Panel C).[8]

Next, we turn to Table 2, which reports the results of Turkey's linear import demand model (4). We gather from the estimates using aggregate data that the exchange rate changes have neither short-run nor long-run significant effects on Turkish outpayments. However, when disaggregated data are considered from each service category, we find short-run significant effects in Insurance and Pension Services, Other Business Services, Personal-Cultural-Recreational Services, and Travel Services. Short-run effects last into the long run in all four service industries except in Personal-Cultural-Recreational Services. Since the estimated coefficient is positive, Lira depreciation is expected to lower outpayments in the three industries, i.e., Insurance and Pension Services, Other Business Services, and travel services.[9]

Table 2 goes about here

How would the results change if we shifted to the estimates of nonlinear models? We start with the estimates of the nonlinear export earnings model (6) and report the results in Table 3. From the short-run estimates in Panel A, we gather that either ΔPOS or ΔNEG (or both) carry at least one lagged significant coefficient in all service categories, including the model using aggregate data. Such an outcome clearly favours relying on nonlinear models and supports the asymmetric effects of exchange rate changes on Turkish export earnings. However, short-run asymmetric effects last into the long run only in five categories, i.e., in Insurance and Pension Services, Intellectual Property Services, Other Business Services, Personal-Cultural-

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[8] Note that in Panel C we have reported four additional test statistics. To test for autocorrelation, we have reported the LM test which is insignificant in most models, supporting autocorrelation-free residuals. To test for misspecification, we report RESET test which indicates correct specification in most cases. Additionally, to learn about stability of the estimates, we have reported the outcome of CUSUM (CS) and CUSUMSQ (CS^2) tests. Estimates appear to be stable at least by one of the tests in most cases. Finally, we have reported the size of adjusted R^2 to judge the goodness of the fit.

[9] Again, long-run estimates are valid since cointegration is supported by either the F test or by the t-test.

Recreational, and Telecommunication Services. In these five service categories, as reported in Panel B, either the POS or the NEG variable carries a significant coefficient that is meaningful.[10] Furthermore, these long-run results are asymmetric in all five categories (except in Other Business Services) supported by the significant Wald test reported as Wald-L in Panel C.[11]

Table 3 goes about here

Finally, we report the estimates of the nonlinear Turkish import demand models for all service categories in Table 4. From the short-run estimates reported in Panel A, we gather that either ΔPOS or ΔNEG carries at least one significant coefficient in all models, including the one that uses aggregate data. These short-run effects seem to be asymmetric since the estimates differ in size and sign. However, cumulative short-run asymmetric effects are supported by significant Wald-S test (Panel C) in the models that belong to Construction Services, Insurance and Pension Services, Intellectual Property Services, Telecommunication Services, and transport services. In which service category do short-run effects translate into the long run? The answer is provided in Panel B of the table. While neither the POS nor the NEG variables carry a significant coefficient in the model that belongs to All Services, at least one of them does in the models that belong to Intellectual Property Services, Personal-Cultural Recreational Services, Telecommunications Services, and Travel Services. Again, this highlights the importance of using disaggregate versus aggregate data.[12]

Table 4 goes about here

IV. Summary and Conclusion

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[10] Supported by at least one of the tests for cointegration in Panel C.

[11] Note that short-run results are also asymmetric in almost all models, as the Wald test reported as Wald-S in Panel C is significant.

[12] Long-run effects are meaningful since either the F or the t-test is significant in Panel C. They are also asymmetric since the Wald-L test is significant.

There is now a new strand of literature on the nexus between trade flows and the exchange rate that concentrates on trade in services only. Literature is in its infancy, and any contribution must be welcomed. We add to this new literature by investigating the short-run and long-run effects of the real effective exchange rate of the Turkish lira on the Turkish export earnings and import payments of eight different service industries that trade between Turkey and the rest of the world. In line with the literature, we use the linear ARDL approach to assess the symmetric effects of exchange rate changes and then the nonlinear ARDL approach to assess the asymmetric effects.

Our findings could be best summarized by saying that when aggregate service data were used, although there was evidence of some short-run effects of real effective exchange rate on total trade in services, no long-run effects were discovered in either the linear or nonlinear models. However, this proved wrong when we disaggregated the service data into eight different categories. Again, while short-run significant effects were found in almost all service categories, short-run effects lasted into the long-run significant effects in some industries. For ease of exposure, we summarize the long-run effects in Table 5.

Table 5 goes about here

Following Bahmani-Oskooee and Harvey (2022, p. 852), if we consider the results from estimating the two models as complement and not substitute from Table 5, we gather that changes in the real effective exchange rate of the Turkish lira have significant long-run effects on either inpayments or outpayments of six out of eight service categories and this signifies the use of disaggregated service data. As can be seen from Table 5, our findings are industry-specific. The construction service industry does not seem affected by exchange rate changes. However, the insurance and pension service outpayments or import costs are expected to decline due to lira depreciation (due to + sign), in line with the theory. Introducing nonlinear adjustment of the exchange rate does not help this industry since neither in the inpayments nor in the outpayments models, any of the partial sum variables carry significant coefficient. The opposite is true in telecommunication services. Lira depreciation seems to increase export earnings or inpayments of this industry, but lira appreciation has no long-run effects. As for outpayments in this industry, contrary to our expectations, lira depreciation will increase its outpayments, and this could be due to an inelastic Turkish import demand for this service category. Other cells in Table 5 could be reviewed in a similar fashion by market participants in each service category.

APPENDIX

Quarterly data over the period 2005Q1-2022Q4 are employed to estimate the models for all service categories, except for the intellectual property exports for which the period is 2013Q1 - 2022Q4. The data are collected from the following sources:

a) Trade Statistics for International Business Development, International Trade Centre (ITC)

b) Central Bank of the Republic of Turkey (CBRT)

c) Organization for Economic Co-operation and Development (OECD).

Variables:

X^i = the Export value of the Turkish service *i*th industry to the rest of the world in US dollars. The data come from source (a).

M^i = the Import value of the Turkish service *i*th industry from the rest of the world in US dollars. The data come from source (a).

E = The Real Effective Exchange Rate of Turkish Lira (Index 2009=100). By way of construction, a decline reflects a depreciation of the Turkish Lira. Data is sourced from (b).

Y = level of economic activity in Turkey measured by the Index of Industrial Production, Index, 2015=100. Data is sourced from c.

Y*= level of economic activity in the world proxied by the Index of Industrial Production in OECD countries, Index, 2015=100. Data is sourced from c.

Dummy = Dummy variable accounts for the 2008 financial crisis and the COVID-19 pandemic. It takes the value of 1 for 2008Q3-2009Q4 and 2019Q4-2021Q2 and zero for the other quarters.

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Table 1: Full-Information Estimates of the Linear Service Export Demand Models for Turkey

	All Services	Constructions	Insurance and Pension Services	Intellectual Property	Other Business Services
Panel A: Short–Run Estimates [a]					
$\boldsymbol{\Delta lnX_{t-1}}$	0.45 (3.88)**	-0.21 (1.77)*	-0.20 (1.88)*	0.77 (3.27)**	-0.07 (0.30)
ΔlnX_{t-2}		-0.27 (2.27)**	-0.67 (6.21)**	0.47 (2.88)**	
ΔlnX_{t-3}		-0.12 (1.01)**	-0.48 (4.43)**	0.05 (0.33)	
ΔlnX_{t-4}		0.32 (2.95)**	-0.66 (6.79)**		
ΔlnX_{t-5}		-0.34 (2.80)**			
ΔlnX_{t-6}		-0.23 (1.91)*			
ΔlnX_{t-7}		-0.52 (4.47)**			
$\boldsymbol{\Delta lnE_{t}}$	-0.51 (0.69)	0.18 (0.31)	0.18 (0.38)	-1.33 (2.75)**	-1.88 (1.79)*
ΔlnE_{t-1}	1.03 (1.58)	-3.64 (4.94)**	0.16 (0.36)	8.88 (4.94)**	1.26 (1.21)
ΔlnE_{t-2}		-1.14 (1.39)	0.77 (1.67)*	7.65 (6.02)**	
ΔlnE_{t-3}		-2.66 (3.25)**	-0.59 (0.44)	5.94 (5.62)**	
ΔlnE_{t-4}		-2.91 (3.79)**	-2.31 (4.47)**	2.70 (2.62)**	
ΔlnE_{t-5}		-1.58 (2.07)**			
ΔlnE_{t-6}		-0.70 (0.93)			
ΔlnE_{t-7}		-1.97 (2.47)**			
$\boldsymbol{\Delta lnY^{*}_{t}}$	1.47 (1.03)	3.43 (2.19)**	1.02 (2.11)**	0.88 (0.64)	1.44 (0.67)
ΔlnY^{*}_{t-1}	-3.92 (2.69)**	-6.21 (3.89)**	-2.08 (1.85)*	18.09 (5.85)**	-0.05 (0.02)
ΔlnY^{*}_{t-2}	-2.24 (1.72)*	-2.03 (1.39)	-3.10 (2.89)**	14.83 (5.39)**	
ΔlnY^{*}_{t-3}	-0.32 (0.24)	-3.76 (2.59)**	-1.98 (1.91)*	10.26 (6.49)**	
ΔlnY^{*}_{t-4}	-0.82 (0.59)	-3.25 (2.25)**		9.23 (5.27)	
ΔlnY^{*}_{t-5}	-4.44 (2.93)**	-2.49 (1.97)**		6.09 (4.04)**	
ΔlnY^{*}_{t-6}					
ΔlnY^{*}_{t-7}					
lnE	-1.72 (3.05)**	21.09 (0.40)	-0.71 (0.22)	-5.74 (10.79)**	-9.16 (1.43)
lnY^{*}	0.43 (0.24)	45.96 (0.32)	4.73 (1.94)*	-8.15 (4.66)**	-0.84 (0.04)
Dummy	-0.61 (0.87)	5.86 (0.33)	0.05 (0.24)	0.22 (1.63)	-1.34 (0.65)
Constant	22.23 (2.14)**	-297. (0.32)	-0.85 (0.57)	72.60 (7.08)**	58.53 (0.51)
Panel C: Diagnostic Statistics					
F[b]	8.93**	2.77	7.60**	5.63**	0.94
(t-test)[c]	-0.86 (6.94)**	--0.10 (3.95)**	-0.68 (6.45)**	-2.94 (6.19)**	-0.13 (2.24)
LM[d]	17.81**	2.46E-08	0.10	2.88*	3.01*
RESET[d]	0.25	0.53	3.97**	6.91**	1.29
Adjusted R^2	0.52	0.86	0.71	0.90	0.04
CS (CS^2)[e]	NS (S)	S(S)	S(S)	S(S)	NS(NS)

Notes:

a. Numbers inside parentheses are absolute values of the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * (**) indicate significance at the 10% (5%) level.

b. The critical value of the F test at the 10% (5%) significance level when there are two exogenous variables (k=2) is 4.23 (5.02). These come from Narayan (2005, p. 1988) for our small sample size.

c. The number outside the parenthesis is the estimate of λ0, and the one inside the parenthesis is the absolute value of the t-ratio. Its upper bound critical value at the 10% (5%) significance level is −3.20 (−3.57) when k = 2, and these come from Banerjee et al. (1998, p. 276).

d. LM is the Lagrange Multiplier test of residual serial correlation (first order), and RESET is Ramsey's test for misspecification. Both are distributed as χ^2 with one degree of freedom. Its critical value at 10% (5%) significance level is 2.70 (3.84). These critical values are also used for Wald tests since they also follow a χ^2 distribution with one degree of freedom.

e. CS and (CS^2) stand for the stability tests of CUSUM and CUSUMSQ. S indicates stability, and NS indicates non-stability.

Table 1 continued

	Personal-Cultural-Recreational Services	Telecommunications Services	Transport Services	Travel Services
Panel A: Short–Run Estimates [a]				
$\Delta \boldsymbol{lnX_{t-1}}$	-0.18 (1.50)	-0.06 (0.57)	0.47 (4.13)**	0.11 (2.39)**
ΔlnX_{t-2}			-0.81 (11.50)**	-0.69 (1.43)
ΔlnX_{t-3}			0.42 (3.82)**	
ΔlnX_{t-4}				
ΔlnX_{t-5}				
ΔlnX_{t-6}				
ΔlnX_{t-7}				
$\Delta \boldsymbol{lnE_t}$	-0.36 (0.41)	-0.05 (0.09)	0.56 (1.88)**	1.52 (2.30)**
ΔlnE_{t-1}	-2.24 (2.17)**		-0.55 (1.77)*	
ΔlnE_{t-2}	-0.91 (0.94)		-0.05 (0.20)	
ΔlnE_{t-3}	-1.67 (1.78)*		-0.55 (1.93)**	
ΔlnE_{t-4}	-3.33 (3.18)**		-0.24 (0.75)	
ΔlnE_{t-5}	-2.85 (2.52)**		0.20 (0.58)	
ΔlnE_{t-6}			-0.90 (2.62)**	
ΔlnE_{t-7}				
$\Delta \boldsymbol{lnY_t^*}$	7.49 (3.33)**	1.00 (1.46)	5.36 (6.86)**	8.75 (6.61)**
ΔlnY_{t-1}^*	-0.51 (0.22)		-4.11 (5.03)**	-5.98 (3.95)**
ΔlnY_{t-2}^*	-4.67 (2.18)**		2.57 (3.92)**	5.12 (3.22)**
ΔlnY_{t-3}^*			-1.14 (1.75)*	
ΔlnY_{t-4}^*				
ΔlnY_{t-5}^*				
ΔlnY_{t-6}^*				
ΔlnY_{t-7}^*				
Panel B: Long-Run Estimates [a]				
lnE	16.05 (2.02)**	1.75 (0.50)	7.21 (0.44)	1.20 (0.66)
lnY^*	37.84.09 (1.42)	4.54 (2.62)**	26.12 (0.61)	7.91 (1.19)
Dummy	7.71 (1.90)*	0.009 (0.01)	2.93 (0.56)	0.19 (0.33)
Constant	-237.47 (1.50)	-15.93 (0.68)	-137.86 (0.51)	-26.33 (0.08)
Panel C: Diagnostic Statistics				
F[b]	2.70	1.48	1.66	1.07
(t-test)[c]	-0.14 (3.84)**	-0.18 (2.81)	-0.04 (3.01)	-0.62 (2.39)
LM[d]	1.81	0.007	0.65	0.90
RESET[d]	0.88	5.21**	0.11	0.52
Adjusted R^2	0.34	0.07	0.77	0.79
CS (CS^2)[e]	S(NS)	S (S)	S (S)	S (NS)

Notes:

a. Numbers inside parentheses are absolute values of the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * (**) indicate significance at the 10% (5%) level.

b. The critical value of the F test at the 10% (5%) significance level when there are two exogenous variables (k=2) is 4.23 (5.02). These come from Narayan (2005, p. 1988) for our small sample size.

c. The number outside the parenthesis is the estimate of $\lambda 0$, and the one inside the parenthesis is the absolute value of the t-ratio. Its upper bound critical value at the 10% (5%) significance level is −3.20 (−3.57) when k = 2, and these come from Banerjee et al. (1998, p. 276).

d. LM is the Lagrange Multiplier test of residual serial correlation (first order), and RESET is Ramsey's test for misspecification. Both are distributed as χ^2 with one degree of freedom. Its critical value at 10% (5%) significance level is 2.70 (3.84). These critical values are also used for Wald tests since they also follow a χ^2 distribution with one degree of freedom.

e. CS and (CS^2) stand for the stability tests of CUSUM and CUSUMSQ. S indicates stability, and NS indicates non-stability.

Table 2: Full-Information Estimates of the Linear Service Import Demand Models for Turkey

	All Services	Constructions Services	Insurance and Pension Services	Intellectual Property Services	Other Business Services
Panel A: Short–Run Estimates [a]					
$\Delta \boldsymbol{lnM_{t-1}}$	-0.31 (2.66)**	-0.21 (4.57)**	0.02 (0.16)	-0.34 (3.53)**	-0.30 (2.44)**
ΔlnM_{t-2}			-0.10 (-0.86)		-0.52 (3.66)**
ΔlnM_{t-3}			0.09 (0.88)		-0.46 (3.00)**
ΔlnM_{t-4}			0.33 (3.27)**		-0.004 (0.02)
ΔlnM_{t-5}					-0.01 (0.09)
ΔlnM_{t-6}					0.13 (0.74)
ΔlnM_{t-7}					-0.24 (0.74)
$\Delta \boldsymbol{lnE_t}$	0.33 (1.23)	-0.49 (0.29)	1.11 (4.10)**	0.47 (1.14)	-1.56 (2.76)
ΔlnE_{t-1}	-0.23 (0.83)			-0.38 (0.90)	-1.26 (2.58)**
ΔlnE_{t-2}	0.16 (0.64)				-1.26 (2.58)**
ΔlnE_{t-3}	0.10 (0.41)				-1.69 (3.63)**
ΔlnE_{t-4}					-1.73 (3.24)**
ΔlnE_{t-5}					-1.07 (1.77)**
ΔlnE_{t-6}					0.009 (0.18)
ΔlnE_{t-7}					1.19 (2.17)**
$\Delta \boldsymbol{lnY_t}$	0.74 (2.14)**	2.01 (1.07)	0.84 (2.93)**	1.16 (2.50)**	-2.44 (3.38)**
ΔlnY_{t-1}	-0.15 (0.36)		0.59 (1.70)*	0.06 (0.13)	-4.30 (4.99)**
ΔlnY_{t-2}	-0.59 (1.84)		-0.96 (2.67)**		-3.19 (4.44)**
ΔlnY_{t-3}	-0.25 (0.87)		-0.43 (1.20)		-2.94 (4.27)**
ΔlnY_{t-4}			-0.99 (2.95)**		-.2.55 (3.67)**
ΔlnY_{t-5}					-3.06 (4.18)**
ΔlnY_{t-6}					-2.39 (3.27)**
ΔlnY_{t-7}					
Panel B: Long-Run Estimates [a]					
lnE	1.32 (1.57)	1.96 (0.65)	1.22 (21.15)**	1.28 (1.10)	2.42 (2.14)**
lnY	1.64 (3.94)**	-0.89 (0.58)	1.47 (5.46)**	2.72 (4.74)**	2.78 (5.64)**
Dummy	0.17 (1.22)	-0.95 (1.77)*	-0.01 (0.15)	0.31 (1.57)	0.58 (1.90)*
Constant	2.16 (0.38)	5.44 (0.26)	1.29 (0.36)**	-5.46 (0.70)	-9.68 (1.40)
Panel C: Diagnostic Statistics					
F[b]	2.14	26.23**	3.11	2.33	6.56**
(t-test)[c]	-0.41 (3.40)*	-0.57 (11.82)**	-0.50 (4.09)**	-0.42 (3.53)*	-0.64 (6.19)**
LM[d]	0.0001	5.78**	1.53	1.22	1.88
RESET[d]	0.26	10.55**	0.37	2.37	0.16
Adjusted R^2	0.44	0.80	0.58	0.41	0.76
CS (CS^2)[e]	NS (S)	S (S)	S (NS)	S (S)	S (S)

Notes:

a. Numbers inside parentheses are absolute values of the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * (**) indicate significance at the 10% (5%) level.

b. The critical value of the F test at the 10% (5%) significance level when there are two exogenous variables (k=2) is 4.23 (5.02). These come from Narayan (2005, p. 1988) for our small sample size.

c. The number outside the parenthesis is the estimate of ρ0, and the one inside the parenthesis is the absolute value of the t-ratio. Its upper bound critical value at the 10% (5%) significance level is −3.20 (−3.57) when k = 2, and these come from Banerjee et al. (1998, p. 276).

d. LM is the Lagrange Multiplier test of residual serial correlation (first order), and RESET is Ramsey's test for misspecification. Both are distributed as χ^2 with one degree of freedom. Its critical value at 10% (5%) significance level is 2.70 (3.84). These critical values are also used for Wald tests since they also follow a χ^2 distribution with one degree of freedom.

e. CS and (CS^2) stand for the stability tests of CUSUM and CUSUMSQ. S indicates stability, and NS indicates non-stability.

Table 2 continued

	Personal-Cultural-Recreational Services	Telecommunications Services	Transport Services	Travel Services
Panel A: Short–Run Estimates [a]				
$\boldsymbol{\Delta lnM_{t-1}}$	-1.11 (5.27)**	-0.06 (0.57)	-0.10 (0.88)	0.67 (5.24)**
ΔlnM_{t-2}	-1.04 (7.28)**			0.54 (4.45)**
ΔlnM_{t-3}	-1.20 (5.92)**			0.07 (0.61)
ΔlnM_{t-4}	-0.91 (4.20)**			0.49 (3.95)**
ΔlnM_{t-5}	0.68 (3.42)**			
ΔlnM_{t-6}	-0.65 (3.83)**			
ΔlnM_{t-7}	-0.32 (2.44)**			
$\boldsymbol{\Delta lnE_t}$	-1.88 (1.89)*	-0.05 (0.09)	0.37 (1.21)	0.16 (0.22)
ΔlnE_{t-1}	5.54 (4.38)**		0.43 (1.34)	-5.90 (5.37)**
ΔlnE_{t-2}	4.06 (3.68)**			6.63 (6.01)**
ΔlnE_{t-3}	4.15 (4.12)**			-4.95 (5.67)**
ΔlnE_{t-4}	2.70 (2.78)**			-5.31 (5.78)**
ΔlnE_{t-5}	0.49 (0.50)			-3.16 (3.67)**
ΔlnE_{t-6}	2.48 (2.60)**			-4.27 (5.31)**
ΔlnE_{t-7}				
$\boldsymbol{\Delta lnY_t}$	0.51 (0.55)	1.05 (1.46)	0.78 (2.23)**	2.20 (2.41)**
ΔlnY_{t-1}	2.49 (2.77)**		0.47 (1.28)	-3.48 (3.47)**
ΔlnY_{t-2}	1.27 (1.42)			-5.60 (5.43)**
ΔlnY_{t-3}	2.91 (3.19)**			-2.83 (2.35)**
ΔlnY_{t-4}	3.30 (3.49)**			-5.62 (4.92)**
ΔlnY_{t-5}	0.68 (0.71)			-4.35 (5.20)**
ΔlnY_{t-6}	1.86 (1.70)*			-3.61 (4.10)**
ΔlnY_{t-7}				0.03 (0.25)
Panel B: Long-Run Estimates [a]				
lnE	28.55 (1.62)	1.75 (0.50)	-1.59 (0.57)	5.03 (5.54)**
lnY	15.61 (1.65)	4.54 (2.62)**	0.31 (0.24)	1.63 (3.66)**
Dummy	-0.93 (0.69)	0.009 (0.01)	-0.01 (0.03)	-0.41 (2.40)**
Constant	-189.67 (1.55)	-15.93 (0.68)	20.32 (1.11)	-16.34 (2.66)**
Panel C: Diagnostic Statistics				
F[b]	5.00**	1.48	0.84	9.84**
(t-test)[c]	0.22 (5.27)**	-0.18 (2.81)	-0.13 (2.12)	-1.06 (7.42)**
LM[d]	1.08	0.007	2.50	1.01
RESET[d]	0.04	5.21**	1.07	22.69**
Adjusted R^2	0.49	0.07	0.23	0.73
CS (CS^2)[e]	S (S)	S (S)	S (NS)	S (NS)

Notes:

a. Numbers inside parentheses are absolute values of the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * (**) indicate significance at the 10% (5%) level.

b. The critical value of the F test at the 10% (5%) significance level when there are two exogenous variables (k=2) is 4.23 (5.02). These come from Narayan (2005, p. 1988) for our small sample size.

c. The number outside the parenthesis is the estimate of ρ0, and the one inside the parenthesis is the absolute value of the t-ratio. Its upper bound critical value at the 10% (5%) significance level is −3.20 (−3.57) when k = 2, and these come from Banerjee et al. (1998, p. 276).

d. LM is the Lagrange Multiplier test of residual serial correlation (first order), and RESET is Ramsey's test for misspecification. Both are distributed as χ^2 with one degree of freedom. Its critical value at 10% (5%) significance level is 2.70 (3.84). These critical values are also used for Wald tests since they also follow a χ^2 distribution with one degree of freedom.

e. CS and (CS^2) stand for the stability tests of CUSUM and CUSUMSQ. S indicates stability, and NS indicates non-stability.

Table 3: Full-Information Estimates of the Non-Linear Service Export Demand Models for Turkey

	All Services	Constructions Services	Insurance and Pension Services	Intellectual Property Services	Other Business Services
Panel A: Short–Run Estimates [a]					
$\Delta \boldsymbol{lnX_{t-1}}$	0.18 (1.56)	0.33 (2.37)**	0.12 (5.74)**		0.11 (0.92)
ΔlnX_{t-2}	0.18 (1.33)	0.27 (1.75)*			0.03 (0.28)
ΔlnX_{t-3}	0.40 (2.63)	0.26 (2.14)**			0.11 (0.92)
ΔlnX_{t-4}	0.61 (5.68)**	0.52 (4.48)**			0.14 (1.16)
ΔlnX_{t-5}	0.25 (1.77)*	-0.11 (0.86)			0.16 (1.31)
ΔlnX_{t-6}	-0.15 (1.38)	-0.16 (1.35)			0.20 (1.74)*
ΔlnX_{t-7}	-0.30 (2.59)**	-0.40 (3.36)**			0.31 (2.46)**
$\Delta \boldsymbol{POS_t}$	1.80 (2.59)**	4.82 (3.66)**	1.05 (0.89)	1.39 (1.63)	0.55 (0.20)
ΔPOS_{t-1}	1.02 (1.55)	-1.57 (1.19)	0.63 (0.72)	2.29 (2.27)**	3.94 (1.28)
ΔPOS_{t-2}	0.98 (0.32)	5.84 (4.23)**		5.28 (6.49)**	2.52 (0.93)
ΔPOS_{t-3}	0.66 (1.07)	2.86 (2.24)**		-1.71 (3.21)**	-1.72 (0.66)
ΔPOS_{t-4}	0.37 (0.43)				8.34 (2.39)**
ΔPOS_{t-5}	-1.47 (1.69)*				-3.78 (1.25)
ΔPOS_{t-6}	-6.46 (6.58)**				2.26 (0.71)
ΔPOS_{t-7}	-3.40 (3.19)**				-10.12 (2.95)**
$\Delta \boldsymbol{NEG_t}$	0.53 (1.05)	-4.77 (4.47)**	-0.40 (0.58)	-2.76 (4.58)**	-1.27 (0.59)
ΔNEG_{t-1}	-0.03 (0.05)	-2.23 (1.71)*	-1.51 (1.70)*	7.64 (6.77)**	9.31 (3.31)**
ΔNEG_{t-2}	-0.03 (0.05)	-0.88 (0.78)		4.50 (4.24)**	9.12 (3.07)**
ΔNEG_{t-3}	-0.73 (1.13)	0.05 (0.05)		8.23 (772)**	13.88 (4.62)**
ΔNEG_{t-4}	1.54 (2.66)**				4.54 (1.76)**
ΔNEG_{t-5}	2.48 (3.89)**				14.00 (4.74)**
ΔNEG_{t-6}	2.31 (3.19)**				5.82 (2.48)**
ΔNEG_{t-7}	-1.00 (1.83)*				12.11 (4.67)**
$\Delta \boldsymbol{lnY_t^*}$	5.01 (5.80)**	-1.72 (1.15)	0.88 (0.83)	1.73 (1.32)	-3.79 (1.14)
ΔlnY_{t-1}^*	1.24 (1.25)	4.35 (1.94)*	0.78 (0.73)	10.47 (6.73)**	-12.34 (3.68)**
ΔlnY_{t-2}^*	1.80 (1.99)**	5.25 (2.99)**		6.46 (6.16)**	-10.85 (3.47)**
ΔlnY_{t-3}^*	0.47 (0.60)	4.10 (2.47)**		4.89 (5.83)**	-8.87 (3.02)**
ΔlnY_{t-4}^*	-0.92 (1.30)	1.21 (1.01)			-13.27 (4.65)**
lnY_{t-5}^*	-1.55 (2.13)**	-2.51 (2.19)**			-6.15 (2.00)**
lnY_{t-6}^*		0.61 (0.48)			-11.00 (3.36)**
lnY_{t-7}^*		3.61 (2.54)**			
Panel B: Long-Run Estimates [a]					
POS	1.99 (1.02)	1.03 (0.52)	1.56 (1.95)**	-6.75 (5.35)**	-7.13 (1.20)
NEG	0.76 (0.51)	1.09 (0.75)	0.52 (0.83)	-7.70 (5.89)**	-8.72 (1.89)*
lnY^*	-1.00 (0.56)	-13.062 (4.34)	0.51 (0.39)	-13.60 (3.83)**	4.29 (0.64)
$Dummy$	-0.14 (0.61)	-1.24 (3.97)**	-0.13 (0.94)	-0.87 (2.46)**	-2.60 (3.31)**
$Constant$	20.59 (2.49)**	74.42 (5.26)	9.33 (1.55)	72.56 (4.45)**	-6.67 (0.21)
Panel C: Diagnostic Statistics					
F[b]	5.03**	3.17	5.03**	7.63**	5.93**
(t-test)[c]	-0.59 (6.04)**	-0.64 (4.72)**	-0.95 (5.74)**	-0.89 (7.69)**	-0.69 (6.60)**
LM[d]	2.65	0.99	0.006	0.11	1.70
RESET[d]	12.06**	6.86**	9.00**	0.92	28.01**
Adjusted R^2	0.95	0.88	0.43	0.86	0.41
CS (CS^2)[e]	S (S)	S (S)	NS (NS)	S (S)	NS (S)
Wald-S	5.66**	11.60**	2.66	3.33*	11.10**
Wald-L	7.83**	0.01	14.93**	6.14**	1.13

Notes:

a. Numbers inside parentheses are absolute values of the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * (**) indicate significance at the 10% (5%) level.

b. The critical value of the F test at the 10% (5%) significance level when there are three exogenous variables (k=3) is 3.92 (4.58). These come from Narayan (2005, p. 1988) for our small sample size.

c. The number outside the parenthesis is an estimate of $\chi 0$, and the one inside the parenthesis is the absolute value of the t-ratio. Its upper bound critical value at the 10% (5%) significance level is −3.46 (−3.91) when k = 2, and these come from Banerjee et al. (1998, p. 276).

d. LM is the Lagrange Multiplier test of residual serial correlation (first order), and RESET is Ramsey's test for misspecification. Both are distributed as χ^2 with one degree of freedom. Its critical value at 10% (5%) significance level is 2.70 (3.84). These critical values are also used for Wald tests since they also follow a χ^2 distribution with one degree of freedom.

e. CS and (CS^2) stand for the stability tests of CUSUM and CUSUMSQ. S indicates stability, and NS indicates non-stability.

Table 3 continued

	Personal-Cultural-Recreational Services	Telecommunications Services	Transport Services	Travel Services
Panel A: Short–Run Estimates [a]				
$\boldsymbol{\Delta lnX_{t-1}}$		0.09 (0.68)	-0.43 (3.45)**	0.36 (2.12)**
ΔlnX_{t-2}		0.11 (0.78)	0.20 (1.56)	0.20 (1.10)
ΔlnX_{t-3}		-0.08 (0.71)	0.55 (4.39)**	0.36 (2.29)**
ΔlnX_{t-4}		0.33 (2.89)	0.24 (2.21)**	0.68 (4.66)**
ΔlnX_{t-5}			0.33 (2.82)**	0.13 (0.88)
ΔlnX_{t-6}				-0.17 (1.30)
ΔlnX_{t-7}				-0.23 (1.83)*
$\boldsymbol{\Delta POS_t}$	7.08 (2.90)**	1.00 (0.69)	1.30 (2.00)**	1.97 (1.51)
ΔPOS_{t-1}	-3.11 (1.24)	3.28 (1.89)*	-0.76 (1.06)	2.24 (1.99)**
ΔPOS_{t-2}	5.37 (2.45)**	0.03 (0.02)	-1.31 (2.13)**	1.63 (1.44)
ΔPOS_{t-3}	1.12 (0.51)	-0.47 (0.37)	-1.78 (2.89)**	3.98 (3.74)**
ΔPOS_{t-4}	-0.18 (0.06)	3.52 (2.05)**	0.20 (0.26)	0.96 (0.53)
ΔPOS_{t-5}	1.50 (0.55)	6.08 (3.38)**	-0.43 (0.58)	-3.22 (2.09)**
ΔPOS_{t-6}	1.43 (0.48)	-1.54 (0.80)	-3.77 (4.24)**	-8.27 (4.86)**
ΔPOS_{t-7}	8.72 (3.10)**	-2.43 (1.30)	-3.50 (3.88)**	-1.44 (0.98)
$\boldsymbol{\Delta NEG_t}$	-5.89 (3.23)**	1.97 (1.85)*	0.24 (0.50)	0.74 (084)
ΔNEG_{t-1}	-7.17 (2.51)**	5.94 (3.66)	1.54 (2.50)**	5.06 (4.03)**
ΔNEG_{t-2}	-7.10 (2.64)**	6.53 (3.90)**	1.69 (2.72)**	3.04 (1.99)**
ΔNEG_{t-3}	-5.19 (2.11)	3.43 (2.42)**	0.36 (0.63)	-2.70 (2.54)**
ΔNEG_{t-4}	-5.85 (2.87)**	2.30 (1.79)*	0.43 (0.85)	1.83 (1.70)*
ΔNEG_{t-5}	-8.22 (3.23)**	4.73 (3.60)**	2.34 (4.22)**	2.27 (1.79)*
ΔNEG_{t-6}	-3.30 (1.45)	4.87 (3.53)**	1.72 (2.67)**	1.69 (1.61)
ΔNEG_{t-7}	-4.35 (2.01)**	3.32 (2.70)**	0.88 (1.55)	-2.29 (2.06)**
$\boldsymbol{\Delta lnY_t^*}$	5.64 (1.92)*	-1.67 (0.98)	2.92 (3.37)**	10.75 (7.11)**
ΔlnY_{t-1}^*	13.72 (3.87)**	-4.63 (2.96)**	-4.18 (4.60)**	4.02 (1.50)
ΔlnY_{t-2}^*	7.45 (2.26)**	-3.32 (2.90)**	0.31 (0.43)	7.41 (3.24)**
ΔlnY_{t-3}^*	9.82 (4.08)**	-1.51 (1.29)	-1.99 (2.73)**	4.27 (1.62)
ΔlnY_{t-4}^*	8.99 (3.82)**		-1.42 (2.34)**	
lnY_{t-5}^*	5.10 (1.99)**		-1.88 (2.66)**	
lnY_{t-6}^*	3.57 (1.33)			
lnY_{t-7}^*	4.57 (1.80)*			
Panel B: Long-Run Estimates [a]				
POS	12.92 (1.95)*	-5.62 (1.35)	1.77 (0.96)	4.37 (1.16)
NEG	11.33 (2.22)**	-5.27 (1.67)*	-0.005 (0.003)	2.81 (0.96)
lnY^*	-8.16 (1.19)	4.19 (1.37)	1.61 (0.88)	-5.98 (1.64)*
$Dummy$	1.52 (1.87)*	0.01 (0.03)	-0.35 (1.55)	-0.43 (0.86)
Constant			7.38 (0.87)	42.19 (2.55)
Panel C: Diagnostic Statistics				
F[b]		4.81**	5.73**	3.87*
(t-test)[c]	-0.49 (5.05)**	-0.62 (5.79)**	-0.54 (6.40)**	-0.61 (5.34)**
LM[d]	4.68**	5.81**	6.52**	1.59
RESET[d]	53.54**	4.27**	8.13**	7.19**
Adjusted R^2	0.46	0.60	0.87	0.95
CS (CS^2)[e]	S (NS)	S (S)	S (S)	S (S)
Wald-S	17.89**	10.95**	17.51**	0.22
Wald-L	0.97	0.12	12.06**	4.35**

Notes:
a. Numbers inside parentheses are absolute values of the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * (**) indicate significance at the 10% (5%) level.
b. The critical value of the F test at the 10% (5%) significance level when there are three exogenous variables (k=3) is 3.92 (4.58). These come from Narayan (2005, p. 1988) for our small sample size.
c. The number outside the parenthesis is an estimate of $\chi 0$, and the one inside the parenthesis is the absolute value of the t-ratio. Its upper bound critical value at the 10% (5%) significance level is −3.46 (−3.91) when k = 2, and these come from Banerjee et al. (1998, p. 276).
d. LM is the Lagrange Multiplier test of residual serial correlation (first order), and RESET is Ramsey's test for misspecification. Both are distributed as χ^2 with one degree of freedom. Its critical value at 10% (5%) significance level is 2.70 (3.84). These critical values are also used for Wald tests since they also follow a χ^2 distribution with one degree of freedom.
e. CS and (CS^2) stand for the stability tests of CUSUM and CUSUMSQ. S indicates stability, and NS indicates non-stability.

Table 4: Full-Information Estimates of the Non-Linear Service Import Demand Models for Turkey

	All Services	Constructions Services	Insurance and Pension Services	Intellectual Property Services	Other Business Services
Panel A: Short–Run Estimates [a]					
$\Delta \boldsymbol{lnM_{t-1}}$	-0.03 (0.25)	-0.20 (4.47)**	0.34 (2.48)**	0.05 (0.41)	-1.20 (6.88)**
ΔlnM_{t-2}	0.24 (1.61)		0.14 (1.20)	0.25 (1.86)*	-1.42 (6.57)**
ΔlnM_{t-3}	0.19 (1.24)		0.55 (4.44)**	0.06 (0.48)	-0.80 (3.64)**
ΔlnM_{t-4}	0.65 (4.56)		0.62 (6.02)**	0.40 (3.14)**	-0.54 (2.80)**
ΔlnM_{t-5}	0.60 (3.48)**		0.38 (3.93)**		0.12 (0.80)
ΔlnM_{t-6}	0.05 (0.34)				1.28 (5.47)**
ΔlnM_{t-7}	-0.28 (2.24)**				0.56 (2.65)**
$\Delta \boldsymbol{POS_t}$	0.25 (0.48)	5.79 (2.36)**	0.37 (0.53)	1.74 (2.54)**	6.11 (3.71)**
ΔPOS_{t-1}	-0.32 (0.60)		1.34 (2.10)**		-18.86 (6.39)**
ΔPOS_{t-2}	-0.16 (0.34)		0.23 (0.36)		-17.37 (5.74)**
ΔPOS_{t-3}	-1.28 (2.66)**		-2.03 (3.11)**		-14.57 (6.27)**
ΔPOS_{t-4}	0.91 (1.34)		0.87 (1.31)		-15.44 (5.79)**
ΔPOS_{t-5}	0.51 (0.76)		0.76 (1.17)		-14.36 (4.94)**
ΔPOS_{t-6}	-1.81 (2.58)**		1.64 (2.11)**		-8.90 (3.80)**
ΔPOS_{t-7}	-1.29 (2.20)**		-2.08 (2.61)**		
$\Delta \boldsymbol{NEG_t}$	0.15 (0.40)	-4.64 (2.19)**	2.13 (4.35)**	-1.06 (1.73)*	-9.95 (6.55)**
ΔNEG_{t-1}	0.75 (1.64)		1.49 (2.58)**		-11.69 (4.32)**
ΔNEG_{t-2}	-0.16 (0.34)		0.86 (1.70)*		-8.76 (4.56)**
ΔNEG_{t-3}	-0.03 (0.08)		2.38 (4.57)**		-4.41 (3.50)**
ΔNEG_{t-4}	-0.64 (1.51)		0.31 (0.65)		-4.79 (3.76)**
ΔNEG_{t-5}	0.91 (1.92)*		2.62 (4.85)**		-8.29 (5.23)**
ΔNEG_{t-6}	0.96 (1.92)*		0.46 (0.86)		-5.02 (3.11)**
ΔNEG_{t-7}	0.07 (0.16)		1.33 (2.45)**		
$\Delta \boldsymbol{lnY_t}$	0.39 (1.04)	1.42 (0.78)	1.57 (3.74)**	1.50 (3.82)**	-10.43 (5.73)**
ΔlnY_{t-1}	-0.14 (0.41)		-1.87 (3.06)**	-1.20 (2.53)**	-2.88 (4.20)*
ΔlnY_{t-2}	-0.09 (0.30)		-3.28 (6.41)**	-1.99 (3.84)**	-4.42 (5.23)**
ΔlnY_{t-3}	0.02 (0.10)		-2.81 (5.24)**	-1.25 (2.44)**	-.3.52 (4.08)**
ΔlnY_{t-4}	-0.94 (3.31)**		-3.41 (6.98)**	-1.70 (3.51)**	-4.78 (4.70)**
ΔlnY_{t-5}	-0.72 (2.21)**			2.15 (4.17)**	12.08 (6.98)**
ΔlnY_{t-6}				-1.52 (3.05)**	-11.51 (5.64)**
ΔlnY_{t-7}				-0.96 (2.21)**	-0.99 (1.65)*
Panel B: Long-Run Estimates [a]					
POS	0.71 (0.79)	7.42 (2.21)	-0.73 (0.92)	0.88 (1.47)	44.67 (0.45)
NEG	0.15 (0.20)	4.69 (1.50)	0.53 (0.96)	1.10 (1.95)*	18.38 (0.50)
lnY	0.39 (0.92)	-2.96 (1.12)	2.74 (5.68)**	3.02 (6.24)**	-17.18 (0.35)
$Dummy$	-0.14 (1.77)*	0.88 (1.64)*	0.30 (2.14)	0.03 (0.38)	-1.19 (0.23)
$Constant$	13.62 (7.44)**	22.34	1.73 (0.89)	-0.72 (0.35)	88.56 (0.42)
Panel C: Diagnostic Statistics					
F[b]	2.77	23.05**	7.33**	4.80**	3.87
(t-test)[c]	-0.76 (4.46)**	-0.59 (12.24)**	-1.09 (7.29)**	-0.84 (5.67)**	-0.47 (6.52)**
LM[d]	0.29	5.66**	0.29	2.07	28.07**
RESET[d]	13.35**	23.09**	0.68	0.04	5.47**
Adjusted R^2	0.80	0.81	0.79	0.61	0.87
CS (CS^2) [e]	S (S)	NS (S)	NS (S)	S (S)	S (S)
Wald-S	1.09	3.20*	6.71**	3.40*	0.75
Wald-L	1.46	2.25	6.38**	0.63	3.47*

Notes:

a. Numbers inside parentheses are absolute values of the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * (**) indicate significance at the 10% (5%) level.

b. The critical value of the F test at the 10% (5%) significance level when there are three exogenous variables (k=3) is 3.92 (4.58). These come from Narayan (2005, p. 1988) for our small sample size.

c. The number outside the parenthesis is an estimate of $\pi0$, and the one inside the parenthesis is the absolute value of the t-ratio. Its upper bound critical value at the 10% (5%) significance level is −3.46 (−3.91) when k = 2, and these come from Banerjee et al. (1998, p. 276).

d. LM is the Lagrange Multiplier test of residual serial correlation (first order), and RESET is Ramsey's test for misspecification. Both are distributed as χ^2 with one degree of freedom. Its critical value at 10% (5%) significance level is 2.70 (3.84). These critical values are also used for Wald tests since they also follow a χ^2 distribution with one degree of freedom.

e. CS and (CS^2) stand for the stability tests of CUSUM and CUSUMSQ. S indicates stability, and NS indicates non-stability.

Table 4 continued

	Personal-Cultural-Recreational Services	Telecommunications Services	Transport Services	Travel Services
Panel A: Short–Run Estimates [a]				
$\Delta \boldsymbol{lnM_{t-1}}$	-0.23 (2.04)**	0.29 (2.37)**	-0.53 (3.71)**	0.58 (3.99)**
ΔlnM_{t-2}		0.03 (0.33)	-0.58 (3.76)**	0.43 (3.38)**
ΔlnM_{t-3}		0.07 (0.51)	-0.48 (3.33)**	0.14 (1.04)
ΔlnM_{t-4}		0.19 (1.48)	-0.10 (0.80)	0.67 (4.43)**
ΔlnM_{t-5}		0.29 (2.12)**	-0.66 (4.09)**	
ΔlnM_{t-6}		-0.12 (0.83)	-0.42 (2.65)**	
ΔlnM_{t-7}		0.25 (1.86)*	-0.28 (2.26)**	
$\Delta \boldsymbol{POS_t}$		-1.85 (0.73)	0.20 (0.24)	3.26 (1.86)*
ΔPOS_{t-1}	2.34 (1.34)	3.38 (1.60)	-0.10 (0.13)	-3.04 (1.50)
ΔPOS_{t-2}	-1.56 (1.13)	3.66 (1.69)*	1.39 (1.64)*	-4.39 (2.65)**
ΔPOS_{t-3}		-4.08 (1.92)*	0.74 (0.97)	-1.36 (0.91)
ΔPOS_{t-4}		9.82 (3.78)**	-1.71 (1.70)*	-3.20 (1.55)
ΔPOS_{t-5}		2.01 (0.84)	0.76 (0.76)	-5.59 (2.71)**
ΔPOS_{t-6}		3.54 (1.46)	2.06 (1.76)*	-9.34 (4.13)**
ΔPOS_{t-7}		6.03 (2.42)**	5.22 (5.60)**	-2.75 (1.41)
$\Delta \boldsymbol{NEG_t}$	-2.05 (1.82)**	1.52 (0.97)	-0.82 (1.30)	-0.58 (0.51)
ΔNEG_{t-1}	0.46 (0.31)	9.78 (4.86)**	-4.29 (4.26)**	-7.17 (4.44)**
ΔNEG_{t-2}		6.84 (3.31)**	-3.50 (3.51)**	-6.98 (4.37)**
ΔNEG_{t-3}		12.76 (5.70)**	-3.80 (4.60)**	-6.03 (4.06)**
ΔNEG_{t-4}		2.15 (1.05)	-2.84 (4.16)**	-3.45 (2.63)**
ΔNEG_{t-5}		12.21 (6.04)**	-5.28 (5.60)**	0.38 (0.27)
ΔNEG_{t-6}		3.81 (2.23)**	-2.83 (3.01)**	2.43 (1.84)*
ΔNEG_{t-7}		8.68 (4.97)**	-2.93 (-3.65)**	-0.42 (0.32)
$\Delta \boldsymbol{lnY_t}$	0.81 (0.89)	-0.71 (0.58)	2.47 (4.10)**	3.15 (2.71)**
ΔlnY_{t-1}	1.54 (1.65)*	-5.58 (4.43)**	0.08 (0.20)	-0.72 (0.60)
ΔlnY_{t-2}		-4.68 (4.24)**	-0.68 (1.65)*	-1.38 (1.33)
ΔlnY_{t-3}		-3.29 (2.93)**	-1.20 (2.37)**	0.18 (0.18)
ΔlnY_{t-4}		-4.75 (3.73)**	-1.38 (2.81)	-4.42 (4.45)**
ΔlnY_{t-5}		2.06 (1.30)	-0.43 (0.74)	-3.75 (3.97)**
ΔlnY_{t-6}		3.06 (2.50)**	0.83 (1.90)*	-4.45 (4.57)**
ΔlnY_{t-7}				-2.10 (2.14)**
Panel B: Long-Run Estimates [a]				
POS	4.82 (1.93)**	-7.73 (1.98)**	-3.28 (0.19)	6.62 (3.47)**
NEG	1.20 (0.47)	-6.39 (2.10)**	-34.09 (0.38)	5.36 (2.97)**
lnY	-3.18 (1.38)	3.88 (1.51)	-45.40 (0.38)	0.15 (0.13)
$Dummy$	-0.10 (0.22)	-0.40 (0.48)	-8.26 (0.37)	-0.87 (3.37)**
$Constant$	23.04 (2.42)**	-3.06 (0.29)	205.91 (0.41)	13.13 (2.65)**
Panel C: Diagnostic Statistics				
F[b]	2.48	6.30**	5.02**	5.33**
(t-test)[c]	-0.45 (4.03)**	-0.73 (6.91)**	0.07 (6.17)**	-0.95 (6.19)**
LM[d]	0.07	9.31**	18.74**	16.70**
RESET[d]	3.83*	9.73**	6.09**	0.83
Adjusted R^2	0.29	0.46	0.65	0.76
CS (CS^2)[e]	S (S)	S (S)	S (S)	S (S)
Wald-S	0.34	10.60**	11.34**	0.00006
Wald-L	8.10**	0.37	6.95**	1.49

Notes:

a. Numbers inside parentheses are absolute values of the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * (**) indicate significance at the 10% (5%) level.

b. The critical value of the F test at the 10% (5%) significance level when there are three exogenous variables (k=3) is 3.92 (4.58). These come from Narayan (2005, p. 1988) for our small sample size.

c. The number outside the parenthesis is an estimate of $\pi 0$, and the one inside the parenthesis is the absolute value of the t-ratio. Its upper bound critical value at the 10% (5%) significance level is −3.46 (−3.91) when k = 3, and these come from Banerjee et al. (1998, p. 276).

d. LM is the Lagrange Multiplier test of residual serial correlation (first order), and RESET is Ramsey's test for misspecification. Both are distributed as χ^2 with one degree of freedom. Its critical value at 10% (5%) significance level is 2.70 (3.84). These critical values are also used for Wald tests since they also follow a χ^2 distribution with one degree of freedom.

e. CS and (CS^2) stand for the stability tests of CUSUM and CUSUMSQ. S indicates stability, and NS indicates non-stability.

Table 5: Summary of the Long-run Effects of the Exchange Rates

	Linear ARDL Model		Nonlinear ARDL Model			
	Inpayments	**Outpayments**	**Inpayments**		**Outpayments**	
Service Category	Sign Attached to E[a]	Sign Attached to E[b]	Sign attached to NEG	POS	Sign attached to NEG	POS
All Services						
Construction Services						
Insurance and Pension Services		(+)				
Intellectual Property Services	(-)		(-)[c]	(-)	(+)	
Other Business Services	(-)	(+)	(-)			
Personal Recreational Services	(+)		(+)	(+)		(+)
Telecommunications Services			(-)		(-)	(-)
Transport Services						
Travel Services		(+)			(+)	(+)

Notes:
a)- When no sign is reported in a cell, that means there was no statistically significant effect.
b) The negative sign in the linear model implied that lira depreciation would boost outpayments in this industry, and Lira appreciation would reduce them, due to inelastic import demand.
c) A negative sign in this column implies that lira depreciation will boost inpayments in this industry.

Table 6: Descriptive Statistics of the Variables used in the Econometric Estimations

Dependent Variables	**Mean**	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**	**J-B**	**J-B Prob.**	**N**
Service Trade Balances										
All Services	-0.68	-0.64	-0.05	-1.31	0.27	-0.32	2.37	2.43	0.29	72
Constructions Services	-2.18	-1.80	0.006	-16.88	2.05	-5.32	1.87	39.6	0.00	72
Insurances and Pensions Services	0.68	0.69	1.48	-0.39	0.28	-0.38	2.16	15.7	0.00	72
Intellectual Property Services	2.60	2.65	3.20	1.91	0.34	-0.44	2.29	2.16	0.33	40
Other Business Services	1.00	0.62	2.55	-0.14	0.81	0.22	1.62	6.27	0.04	72
Personal-Cultural-Recreational Services	-0.69	-0.44	1.17	-2.93	1.12	-0.23	1.74	5.38	0.06	72
Telecommunications Services	-0.05	0.11	0.89	-1.36	0.63	-0.44	1.87	6.16	0.04	72
Transport Services	-0.59	-0.67	0.23	-1.49	0.48	0.002	1.65	5.39	0.06	72
Travel Services	-1.79	-1.64	-0.81	-3.80	0.59	-0.75	2.53	7.76	0.02	72
Independent Variables										
Domestic Income (Y)	4.49	4.52	4.96	4.04	0.27	0.02	1.80	4.25	0.11	72
Foreign Income (Y^*)	4.59	4.60	4.66	4.44	0.05	-0.89	2.62	10.7	0.004	72
Exchange rate (E)	4.55	4.59	4.74	4.20	0.13	-0.62	2.45	5.62	0.06	72

Notes: J-B stands for Jarque-Bera statistics for normality, and J-B probability is indicated by J-B prob. N is the sample size.