Asymmetric cointegration and the J-Curve: Evidence from commodity trade between Turkey and EU

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Asymmetric Cointegration and the J-Curve: Evidence from Commodity Trade between Turkey and EU

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ABSTRACT

In testing the effects of exchange rate changes on the trade balance, the emphasis has now shifted towards application of asymmetric cointegration and error-correction modeling. Such approach that introduces nonlinear adjustment of the exchange rate yields results that are different than linear models. When we apply these new advanced techniques to the trade balance of 57 industries that trade between Turkey and EU, indeed we find short-run asymmetry effects in all industries, short run adjustment asymmetry in 24 industries, short-run impact asymmetry in 17 industries, and long-run asymmetry effects in 23 industries. Small and large industries seem to be subject to the same asymmetry effects.

Key Words: Asymmetric Cointegration, Nonlinear ARDL, Turkish-EU Trade, Industry data, J-Curve.

JEL Classification: F14**,** F31

I. Introduction

Due to adjustment lags such as recognition lags, production lags, delivery lags, etc. trade balance is said to respond to exchange rate changes with lags too, implying that if a country devalues its currency or allows it to depreciate, improvement in the trade balance is not instantaneous. In the short-run, the trade balance will continue to deteriorate until not only the lags are realized, but also new contracts at new prices kick in. Then, the trade balance may improve after passage of some times or perhaps in the long run, hence the J-curve phenomenon.[1]

Since introduction of the error-correction modeling and cointegration, the J-curve concept has received a renewed attention. So much attention that each country now has its own literature, and Turkey, our country of concern is no exception. Studies that have assessed the short-run and long-run effects of Turkish lira depreciation on Turkey's trade balance could be divided into three categories. The first category includes those that have used aggregate trade flows of Turkey with the rest of the world and have found mixed results. The list includes Bahmani-Oskooee and Alse (1994) and Halicioglu (2008a) who found support for the J-curve and Rose (1991), Bahmani-Oskooee and Malixi (1992), Brada *et al*. (1997), Akbostanci (2004), and Bahmani-Oskooee and Kutan (2009) who did not.

The above studies suffer from aggregation bias, in that they have used Turkey's trade data with the rest of the world. To reduce the bias, the second group includes studies that use data between Turkey and her major trading partners. The findings are mixed again. Halicioglu (2007, 2008b) estimated bilateral trade balance models between Turkey and its trading partners by using different co-integration methods. While the short-run effects were mixed and did not follow any specific pattern, Turkish-US and Turkish-UK trade balances reacted favorably to lira depreciation

[1] For more on adjustment lags see Magee (1973) and Bahmani-Oskooee (1985).

in the long run. Celik and Kaya (2010) is another study that considered Turkey's trade balance with each of her seven partners and found no J-curve effect.

Studies in the second group are also said to suffer from aggregation bias in that one industry may react favorably to depreciation than another industry. To reduce the bias further, two studies test the J-curve hypothesis at industry level. Yazici and Klasra (2010) investigated response of two sectors of Turkish economy, i.e., manufacturing and mining with 24.9% and 8.2% imported inputs respectively. They found an inverse of the J-curve pattern in both sectors. Durmaz (2015) is the most comprehensive study who assessed response of the trade balance of 58 Turkish industries that trade with the rest of the world. Using Pesaran *et al.*'s (2001) bounds testing approach and monthly data over January 1990-December 2012, he found support for short-run deterioration combined with long run improvement of the trade balance in 11 industries, a rather disappointing outcome. Could failure to find favorable results be due to another aggregation bias? After all, even though Durmaz (2015) used disaggregated industry level data, the data were between Turkey and rest of the world.[2]

In this paper we take an additional step in order to reduce aggregation bias by disaggregating Turkey's industry level data further and considering the trade balance of 57 industries that trade between Turkey and European Union (EU). Due to its close proximity to EU region, Turkey enjoys a close economic tie with EU and the euro being a major and reserve currency can induce the lira-euro rate to play a major role. In order to get some insight about the lira-euro exchange rate, we plot in figure 1 the nominal and real rate, defined as number of euro per lira and the real rate in figure 2. As can be seen, the nominal value of lira has declined

[2] For studies related to other countries see the review article by Bahmani-Oskooee and Hegerty (2010).

continuously over time, but its real value has been subject to fluctuations, depreciating some times and appreciating some other times.

Figures 1 and 2 go about here

In addition to disaggregating Turkish trade data, we also address an important deficiency associated with all of the studies reviewed above. The studies reviewed above have assumed that changes in the value of lira has symmetric effect on the Turkey's trade balance which implies using a model in which the adjustment of the exchange rate is linear. However, recently Bahmani-Oskooee and Fariditavana (2015, 2016) argued and demonstrated that the effects of exchange rate changes on the trade balance could be asymmetric, implying that we must rely upon a nonlinear model. As they argue, reaction of importers and exporters could be different to currency appreciation versus depreciation, mostly due to changes in their expectations. Furthermore, evidence produced by Bussiere (2013) supports the fact that pass-through of exchange rate changes to import and export prices are asymmetric. This implies that if traded goods prices respond to exchange rate changes in an asymmetric manner, so should trade itself and eventually the trade balance.[3]

Rest of the paper is organized as follows. In Section II we introduce our models and discuss the methodologies. Section III reports our empirical results for each of the 57 industries and Section IV concludes. Data definition and sources are cited in the Appendix.

II. The Models and Methods

[3] For historical developments in the value of Turkish lira see : https://en.wikipedia.org/wiki/Revaluation_of_the_Turkish_Lira

Following the literature, e.g., Rose and Yellen (1989), and Bahmani-Oskooee and Fariditavana (2016) we assume our long-run trade balance model includes a measure of economic activity at home and in European Union as well as the real exchange rate between lira and euro. Since Rose and Yellen (1989) and Bahmani-Oskooee and Fariditavana (2016) formulated the bilateral trade balance between two countries, we modify their specifications so that our specification conforms to bilateral trade data at industry level, still between two regions as in equation (1):

$$LnTB_{i,t} = \alpha_o + \alpha_1 LnIP_t^{TR} + \alpha_2 LnIP_t^{EU} + \alpha_3 LnREX_t + \varepsilon_t \qquad (1)$$

Although each variable is defined in the Appendix, in order to judge expected sign of each coefficient, it pays to define them here too. For the reasons to be cleared later, we define TB_i to be the ratio of Turkish imports of commodity i from EU over her exports of commodity i to EU.[4] Turkish economic activity is measured by index of its industrial production denoted by IP^{TR}. This is the only measure of economic activity that come out monthly basis. Comparable measure for EU is the EU's index of industrial production, IP^{EU}. Finally, REX is the real exchange rate between Turkish lira and euro defined in a way that a decline signifies a depreciation of Turkish lira. It is expected that an estimate of α_1 to be positive and that of α_2 to be negative. If lira depreciation is to improve Turkey's trade balance of industry i, an estimate of α_3 should be positive.

As mentioned above, specifications such as (1) are long-run specifications and coefficient estimates reveal only long-run effects of exogenous variables. How about their short-run effects? To get the short-run estimates we need to rewrite (1) in an error-correction modeling format as outlined by equation (2):

[4] For advantages of defining the trade balance as a ratio, see Bahmani-Oskooee (1991).

$$\Delta LnTB_{i,t} = \beta_o + \sum_{j=1}^{n1} \beta_{1,j} \Delta LnTB_{i,t-j} + \sum_{j=0}^{n2} \beta_{2,j} \Delta LnIP_{t-j}^{TR} + \sum_{j=0}^{n3} \beta_{3,j} \Delta LnIP_{t-j}^{EU} + \sum_{j=0}^{n4} \beta_{4,j} \Delta LnREX_{t-j}$$
$$+ \gamma_0 LnTB_{i,t-1} + \gamma_1 LnIP_{t-1}^{TR} + \gamma_2 LnIP_{t-1}^{EU} + \gamma_3 LnREX_{t-1} + \xi_t \qquad (2)$$

The error-correction model (2) is due to Pesaran *et al.* (2001) where short-run effects of each variables is reflected in coefficient estimates attached to each first-differenced variable. The long-run effects of each variable is reflected in the estimates of γ_1, γ_2 and γ_3 normalized on γ_0.[5] However, for these long-run effects to be valid and not spurious, Pessaran *et al*. (2001) recommend applying the F test to establish joint significance of lagged level variables as a sign of cointegration. However, the F test in this context has a new distribution for which they tabulate new critical values. Since their critical values account for degree of integration of variables in a given model, there is no need to test for unit root in variables and they could be combination of I(0) and I(1) which is properties of almost all macro variables and this is one of the main advantages of this approach.

In estimating equation (2) which is an extension of equation (1), the main assumption is that each exogenous variable has symmetric effects on the trade balance of industry i. The symmetry assumption implies that a 1% depreciation of lira improves the trade balance of industry i by $\hat{\alpha}_3$ % and a 1% appreciation of lira hurts the trade balance by the same $\hat{\alpha}_3$ %. As discussed in the introductory section, this need not be the case and indeed, as demonstrated by Bahmani-Oskooee and Fariditavana (2016) exchange rate changes could have asymmetric effects on the trade balance. To test for asymmetry effects of exchange rate changes we follow Shin *et al.* (2014)

[5] For exact normalization procedure see Bahmani-Oskooee and Fariditavana (2015) and for some other application of this procedure see Narayan et al. (2007), Wong and Tang (2008), De Vita and Kyaw (2008), Chen and Chen (2012), Tayebi and Yazdani (2014), and Hajilee and Al-Nasser (2014).

and rather than including *LnREX* as one variable in the model, we decompose it into two variables, one representing just appreciation and the other one, just depreciation. To that end, we first generate rate of change of *LnREX* as *ΔLn REX* which includes positive values (lira appreciations) and negative values (lira depreciations). Denoting the positive values by $\Delta Ln\ REX^{+}$ and negative values by $\Delta LnREX^{-}$, the two variables are generated as:

$$POS_t = \sum_{j=1}^{t} \Delta LnREX_j^{+} = \sum_{j=1}^{t} \max(\Delta LnREX_j, 0),$$

$$NEG_t = \sum_{j=1}^{t} \Delta LnREX_j^{-} = \sum_{j=1}^{t} \min(\Delta LnREX_j, 0) \qquad (3)$$

where POS_t which represents lira appreciation only is the partial sum of positive changes and NEG_t which represents lira depreciations only is the partial sum of negative changes.

Shin *et al.* (2014) then recommend going back to specification (2) and replacing *LnREX* variable by POS and NEG variables. We then have a new error-correction model outlines by equation (4) below:

$$\Delta LnTB_{i,t} = \beta_o + \sum_{j=1}^{n1} \beta_{1,j} \Delta LnTB_{i,t-j} + \sum_{j=0}^{n2} \beta_{2,j} \Delta LnIP_{t-j}^{TR} + \sum_{j=0}^{n3} \beta_{3,j} \Delta LnIP_{t-j}^{EU}$$
$$+ \sum_{j=0}^{n4} \beta_{4,j} \Delta POS_{t-j} + \sum_{j=0}^{n5} \beta_{5,j} \Delta NEG_{t-j} + \gamma_0 LnTB_{i,t-1} + \gamma_1 LnIP_{t-1}^{TR}$$
$$+ \gamma_2 LnIP_{t-1}^{EU} + \gamma_3 POS_{t-1} + \gamma_4 NEG_{t-1} + \xi_t \qquad (4)$$

Since constructing the two POS and NEG variables introduce nonlinearity into (4), Shin *et al*. (2014) call this specification a nonlinear ARDL model as compared to the linear ARDL specification of Pesaran *et al*. (2001) outlined by equation (2). They then demonstrate that Pesaran *et al*.'s (2001) bounds testing approach and critical values are equally applicable to (4). Indeed, in establishing asymmetric cointegration they argue that critical values of the F test should stay the same when we move from (2) to (4) even though (4) has one more variable. This is due to dependency between POS and NEG variables and due to the fact the critical values for the case of three exogenous variables (k=3) are higher than the same values when there are four exogenous variables (k=4).[6]

Once (4) is estimated, a few hypothesis with regards to asymmetry effects of exchange rate changes are observed or tested. First, by observing short-run multiplies we can infer short run adjustment asymmetry if number of lags are different for ΔPOS variable as compared to number of lags of ΔNEG variable. Second, short-run effects of exchange rate changes will be asymmetric if for each lag j estimate of β_4 is different than the estimate of β_5. Although this could be tested by applying the Wald test, due to volume of the results we will avoid this significance test and instead apply the Wald test to determine if $\sum \hat{\beta}_{4,j} \neq \sum \hat{\beta}_{5,j}$. A significant Wald statistic will support short-run impact asymmetry. Finally, long run asymmetry effects of exchange rate changes will be established if $normalized \quad \hat{\gamma}_3 \neq normalized \quad \hat{\gamma}_4$. Again, the Wald test will be used for this purpose.[7] We estimate both models (2) and (4) in the next section.

III. The Results

In this section we estimate both the linear ARDL model (2) and the nonlinear model (4) for each of the 57 industries that trade between Turkey and EU. Since data are monthly over the period 1995:1 – 2014:12 we impose a maximum of 10 lags on each first-differenced variables and use Akaike's Information Criterion (AIC) to select an optimum model for each industry. We then report coefficient estimates and diagnostic statistics in several tables to be explained. For ease of

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[6] For more on this point see Shin *et al*. (2014, p. 291).
[7] For some other applications of the nonlinear model and the partial sum concept see Apergis and Miller (2006), Delatte and Lopez-Villavicencio (2012), Verheyen (2013), Greenwood-Nimmo and Shin (2013), Atil *et al.* (2014), Bahmani-Oskooee and Fariditavana (2014), Bahmani-Oskooee and Bahmani (2015), Bahmani-Oskooee and Ghodsi (2016).

exposure a significant coefficient or statistic at the 10% (5%) level is identified by * (**). The critical values used to arrive at * or ** are cited in the notes to each table.

Let us first begin with the estimates of the linear model (2). For brevity, while we report short-run coefficient estimates only for the exchange rate in Table 1, long-run estimates are reported for all variables in Table 2. Diagnostic statistics associated with each optimum model are then reported in Table 3. From Table 1 we gather that there are 43 industries in which there is at least one significant short-run coefficient estimate, implying that exchange rate changes have short-run significant effects on the trade balance of these 43 industries. However, the short-run effects last into the long run significant effects only in 27 industries and while in 26 industries the normalized long-run coefficient estimate is positive, in one industry (coded 12) it is negative.[8] The 26 industries that benefit from lira depreciation are coded as 4, 6, 7, 23, 24, 43, 51, 52, 56, 58, 62, 65, 66, 68, 69, 72, 74, 76, 78, 79, 81, 82, 83, 84, 85, and 89. This supports the J-curve effect if we rely upon its definition by Rose and Yellen (1989. P. 67) and define it as short-run deterioration combined with long-run improvement.[9] Although a majority of the industries that benefit from lira depreciation are small, the two largest industries, i.e., 78 (road vehicles) with 19% of the trade share and 84 (articles of apparel and clothing accessories) with 7.29% of the trade share are among the list.[10]

Tables 1-3 go about here

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[8] The negative coefficient implies that as lira depreciates, either Turkish import value of this industry rises or its export value declines. This indeed could be the case if Turkish import demand is inelastic or EU import demand is elastic.

[9] Note that in the traditional estimates of the J-curve prior to introduction of cointegration analysis, the emphasis was on the short-run estimates only (Bahmani-Oskooee 1985). We only see initial deterioration followed by an improvement only in industries coded 4, 24, 34, 51, 57, and 63.

[10] Trade share that is reported inside the parenthesis next to each industry's name in Table 2 is defined as sum of imports and exports of each industry as a percent of sum of total imports and total exports by Turkey to EU.

As for the long run effects of measures of economic activities, it is clear that index of industrial production in Turkey carries a significant coefficient in 32 industries and while in 20 cases its expectedly positive, in 15 cases the estimate is negative. The positive income elasticity implies that as Turkish economy grows, she imports more from EU. The negative coefficient implies that as Turkish economy grows she imports less of these goods. This is a possibility if economic growth in Turkey is due to an increase in production of import-substitute goods (Bahmani-Oskooee 1986). Finally, the index of industrial production in EU carries significant coefficient in 16 industries and while in eight cases the estimate is negative, in the other eight cases it is positive.

For the above long-run estimates to be valid, we now need to establish cointegration. Table 3 not only reports the results of the F test but also several other diagnostic statistics. Note that from Table 2 we saw that in every industry there was at least one significant long-run coefficient estimate except in industries coded 3, 5, 25, 26, 28, 34, 41, 42, 55, and 64. Therefore, except these 10 industries, we expect a significant F statistic in the remaining industries. While this is the case for most industries in Table 3, there are some industries in which there was at least one significant long-run coefficient estimate but F statistic is insignificant, e.g., industry coded 0 (live animals) or 7 (coffee). In such occasions we rely upon an alternative test. At the recommendation of Pesaran *et al*. (2001) we use long-run normalized estimates and equation (1) to generate an error term. Denoting this error term by ECM, we replace the linear combination of lagged level variables by ECM_{t-1} and estimate this new specification one more time after imposing the same optimum lags as before. A significantly negative coefficient estimate for ECM_{t-1} will support cointegration. This test was originally introduced by Banerjee *et al* (1998) who showed that the distribution of this t statistic to judge significance of ECM_{t-1} is nonstandard. Hence they tabulated new critical values.

Within the ARDL approach where variables could be combination of I(0) and I(1), Pesaran *et al.* (2001, p. 303) tabulate an upper and a lower bound critical value for this t-test. Clearly ECM_{t-1} carries significantly negative coefficient in most models supporting cointegration.

A few additional diagnostic statistics are also reported in Table 3. In an effort to make sure the residuals in each optimum model are autocorrelation free, we rely upon the Lagrange Multiplier (LM) statistic which is distributed as χ^2 with 12 degrees of freedom. As can be seen this statistic is insignificant in most models, implying lack of serial correlation. The next statistic is Ramsey's RESET statistic which is used to judge misspecification. This is also distributed as χ^2 but with one degree of freedom. Clearly, in most models this statistic is also insignificant, supporting correctly specified optimum models. To establish stability of short-run and long-run coefficient estimates we have applied the well-known CUSUM and CUSUMSQ tests to the residuals of each model and indicated stable estimates by "S" and unstable ones by "US". Here while the first test supports stability of coefficient estimates in most models, the second test does not.[11] Finally, to judge goodness of fit, we report the adjusted R^2.

We now shift to the estimates of optimum nonlinear models. Due to volume of the results, short-run effects of the two partial sum variables, ΔPOS and ΔNEG are reported in tables 4 and 5 respectively. Comparing the results in these tables, first we gather that at least one of the variables (ΔPOS or ΔNEG) carry one significant coefficient in all industries except the ones coded 8, 33, 41, and 87, implying that exchange rate changes have short-run significant effects on the trade balance of 53 industries. This number was 43 in the linear model. Therefore, allowing nonlinear adjustment of the real exchange rate yields more short-run significant effects which support

[11] For details of all these tests and a graphical presentation of CUSUM and CUSUMSQ tests see Bahmani-Oskooee and Fariditavana (2015).

application of nonlinear ARDL model. Second, short run adjustment asymmetry is observed in 24 industries in which both variables take on different lag orders. These 24 industries are coded as 0, 4, 6, 11, 24, 28, 29, 34, 42, 51, 55, 63, 64, 68, 69, 72, 73, 75, 76, 77, 79, 84, 88, and 89. Third, we also observe short-run asymmetric effects since in almost all models either the sign or the size of short-run estimates attached to ΔPOS are different than those attached to ΔNEG. Finally, we test for short-run impact asymmetry in each model by applying the Wald test to determine if sum of the short-run coefficient estimates attached to ΔPOS is different than sum of the estimates attached to ΔNEG. As mentioned before, in terms of notations used in nonlinear model (4) we are trying to determine if $\sum \hat{\beta}_{4,j} \neq \sum \hat{\beta}_{5,j}$. The results of the Wald test denoted by Wald-S are reported in Table 7 along with all other diagnostics and clearly show that this statistic is significant in 17 industries. These industries are coded as 0, 2, 3, 11, 24, 29, 54, 57, 62, 63, 64, 66, 74, 76, 79, 81, and 83. Once again we ask if the short-run asymmetry effects of exchange rate changes last into the long run. To this end, we consider the long-run estimates in Table 6 and associated diagnostics in Table 7.

Tables 4-7go about here

From long-run coefficient estimates in Table 5 we gather that in 41 models either POS or NEG or both carry a significant coefficient. This number from the linear model was only 27. Again, it appears that introducing nonlinearity yields more support for the significant effects of exchange rate changes in the long run.[12] It is interesting to note that the largest industry coded as 78 (road vehicles) with 19% trade share benefits from lira depreciation but is not hurt from lira appreciation. Such information is masked when we rely upon the linear model. On the other hand, the second largest industry coded 84 (Articles of apparel and clothing accessories) with 7.29% trade share does not

[12] The industries in which neither POS nor NEG was significant are coded as 0, 2, 8, 26, 29, 33, 41, 42, 53, 55, 63, 68, 73, 75, 87, 88, and 89.

benefit from lira depreciation but benefits from lira appreciation. This is clearly an example of an industry for which the European demand is inelastic such that even though Turkey may export less, but export earning rises. Additionally, in the linear model lira depreciation had favorable effects on the trade balance of 26 industries and adverse effects in only one industry. Now we learn that lira depreciation has significantly positive effects on the trade balance of 27 industries and adverse effects in five industries. The results help us

identify industries in which lira appreciation improves their trade balances, like the second largest industry 84. These are industries in which the POS variable carries significantly negative coefficient and they are: 3, 9, 34, 54, 57, 61, 64, 77, and 84.[13] Such information and discovery was hidden in the linear model. However, there are also 15 industries in which the POS carries significantly positive coefficient, implying that lira appreciation hurts the trade balance of these industries. These industries are coded as 1, 4, 5, 6, 7, 11, 23, 25, 28, 56, 65, 67, 71, 79, and 83. Again, such information was masked in the linear model.

By just glancing through the long run coefficient estimates of POS and NEG variables, we learn, that almost in all cases either the size or the sign of coefficients attached to POS are different than those attached to NEG variable, supporting asymmetric effects. But are they significantly different than each other? The results of the Wald test denoted by Wald-L are reported in Table 7 along with other diagnostics show that this statistic is significant in 23 models, supporting significant asymmetry effects of exchange rate changes in the long run. Again, the asymmetric long-run coefficient estimates and estimates of income elasticities will be valid only if cointegration is established. This is clearly established either by the F test or ECM_{t-1} test. One of the two is significant

[13] In this industries as lira appreciates and Turkish export prices rise, so does Turkey's export earnings which leads to a decline in our measure of the trade balance. These must be commodities for which the EU demand is inelastic.

in 47 models. Furthermore, the LM test and RESET test support autocorrelation free residuals and correctly specified models in a majority of cases. Finally, all models enjoy a good fit.

IV. Summary and Conclusion

Given the abundant evidence from the literature, it is now clear that the short-run effects of exchange rate changes on the trade balance are different than its long-run effects. Due to adjustment lags and contracts at old prices, currency depreciation could worsen the trade balance or have no effect in the short run. However, in the long run once contracts are over and adjustment lags are realized, trade balance may improve. The short-run deterioration combined with long-run improvement is known as the J-curve effect.

Today, error-correction modelling technique is sued to test the short-run effects of exchange rate changes on the trade balance and cointegration method is sued to settle its long-run effects. Due to excessive interest by researchers and policy makers there is now a vast literature testing the J-curve effect. The literature is so large that each country has its own literature and our country of concern, the Turkey is no exception. Studies related to Turkey have used Turkish trade data at different aggregation levels. While some have used trade data between Turkey and rest of the world, some have used trade data between Turkey and several of his trading partners. They have provided mixed but poor results. A common feature of all Turkey-related studies is that they have assumed exchange rate changes to have symmetric effects on the trade balance. However, this need not be the case if traders react to currency depreciation differently than to appreciation. Indeed, they do since their expectations regarding the effects of depreciation differs from their expectations related to appreciation.

In this paper we consider the Turkish trade balance one more time and contribute to the literature in two directions. First, we employ commodity level trade data between Turkey and European Union. Second, we test if exchange rate changes have asymmetric effects on the trade balance of each of the 57 industries that trade between the two regions. Following the literature, when a linear model was used, we were able to show that lira depreciation has significant favorable effects on the trade balance of 26 industries and unfavorable effects in one industry in the long run. However, when depreciations were separated from appreciations via partial sum concept and a nonlinear model was used, we found strong results in support of long-run effects of lira depreciation or appreciation in 41 industries, including the largest industry with almost 20% of the trade share. This finding by itself supports nonlinear adjustment of the real lira-euro exchange rate. Comparing the long-run effects of lira depreciation to those of lira appreciation, these effects were different in sign or size in all cases but significantly different, supporting asymmetry effects of exchange rate changes only in 23 industries.

Appendix
Data Definition and Sources

Monthly data over the period 1995:1 – 2014:12 are used to carry out the present empirical analysis. The data come from the following sources:

(a) Turkish Statistical Institute (TurkStat).
(b) Central Bank of the Republic of Turkey (CBRT).
(c) The IMF, International Financial Statistics (IFS).

Variables:

$\boldsymbol{TB_i}$ = the trade balance of commodity i defined as imports over exports (Source a).

$\boldsymbol{IP^{TR}}$ = Measure of the Turkish income. It is proxied by index of industrial production in Turkey (Source c).

$\boldsymbol{IP^{EU}}$ = Measure of the Turkish income. It is proxied by index of industrial production in Turkey (Source c).

REX = the real bilateral rate between lira and euro. A decline reflects a real depreciation of lira (Source b).

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Figure 1. Nominal Lira-Euro Rate

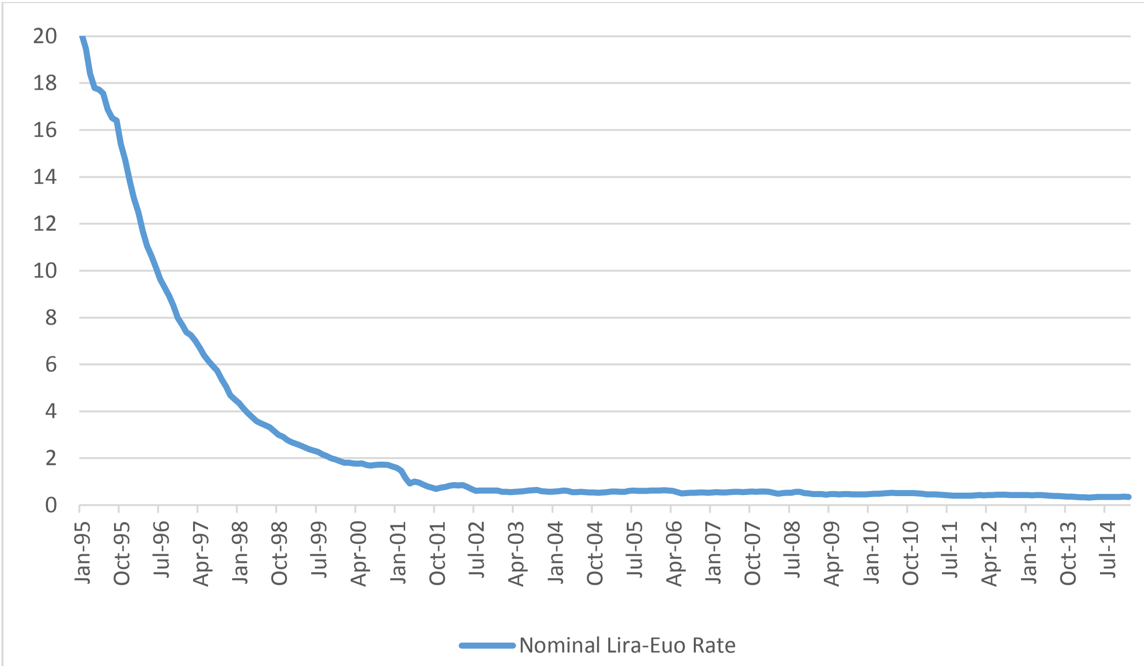

Figure 2. Real Lira-Euro Rate

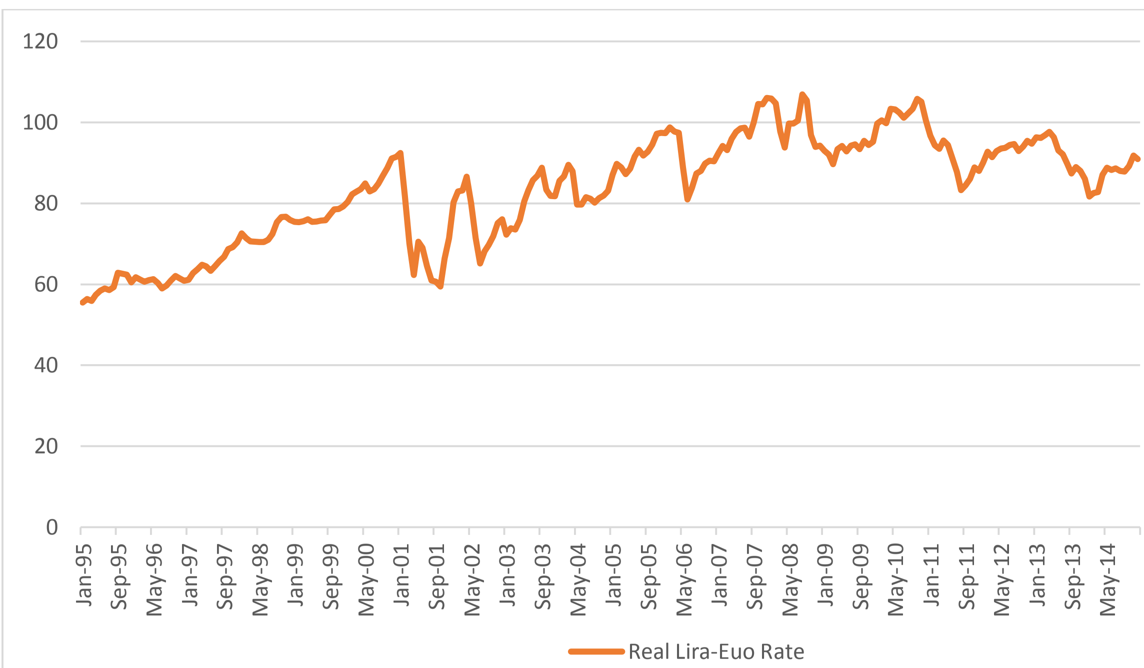

Table 1: Short-Run Coefficient Estimates of Linear ARDL Model

Code	Short-Run Coefficient Estimates									
	$\Delta\ Ln\ REX_t$	$\Delta\ Ln\ REX_{t-1}$	$\Delta\ LnREX_{t-2}$	$\Delta\ Ln\ REX_{t-3}$	$\Delta\ LnREX_{t-4}$	$\Delta\ LnREX_{t-5}$	$\Delta\ LnREX_{t-6}$	$\Delta\ LnREX_{t-7}$	$\Delta\ LnREX_{t-8}$	$\Delta\ LnREX_{t-9}$
0	-0.32 (-0.16)	5.39 (2.48)**	-3.72 (-1.66)*	-4.84 (-2.14)**	7.66 (3.36)**	-3.50 (-1.52)	4.72 (2.26)**			
1	7.29 (2.30)**									
2	0.03 (0.12)									
3	0.17 (1.12)									
4	1.00 (0.72)	-0.72 (-0.48)	0.62 (0.41)	0.94 (0.63)	3.40 (2.46)**					
5	0.96 (1.49)									
6	0.10 (1.22)									
7	0.10 (2.48)**									
8	-0.02 (-0.14)									
9	0.70 (1.38)									
11	-0.81 (-0.94)	-0.70 (-0.76)	-1.78 (-1.88)*	0.76 (0.82)	-1.72 (-1.98)**					
12	-0.61 (-3.23)**									
23	0.39 (2.79)**									
24	2.35 (1.51)	-0.18 (-0.11)	3.21 (1.88)*	1.21 (0.72)	2.45 (1.57)					
25	-0.03 (-0.08)									
26	1.28 (2.57)**									
28	-1.92 (-1.56)	3.15 (2.39)**	0.03 (0.02)	1.61 (1.18)	-5.88 (-4.29)**	4.05 (2.91)**	-2.23 (-1.61)	3.55 (2.60)**	-2.9 (-2.32)**	
29	0.36 (0.71)	0.69 (1.29)	0.11 (0.20)	0.60 (1.10)	-0.37 (-0.68)	1.57 (2.86)**	-1.46 (-2.68)**	0.98 (1.94)		
33	-0.10 (-0.82)									
34	-7.79 (-1.48)	9.83 (1.88)*								
41	0.15 (0.63)									
42	0.22 (1.43)									
43	0.49 (2.66)**									
51	-0.86 (-1.19)	1.65 (2.34)**								
52	1.33 (3.16)**									
53	1.01 (2.42)**	-0.58 (-1.41)								
54	-0.03 (-0.62)									
55	0.48 (1.18)	0.15 (0.35)	-1.08 (-2.49)**	1.03 (2.60)**						
56	0.52 (1.90)*									
57	0.14 (0.30)	0.81 (1.70)*								
58	0.09 (2.71)**									
61	1.07 (1.87)*									

62	0.50 (1.99)**									
63	0.63 (1.04)	0.93 (1.46)	0.22 (0.35)	1.15 (1.95)*						
64	0.67 (1.90)*	-0.81 (-2.13)**	1.25 (3.23)**	-0.69 (-1.77)*	1.00 (2.60)**	-0.63 (-1.79)*				
65	0.56 (2.79)**									
66	0.19 (6.58)**									
67	0.82 (1.84)*									
68	0.84 (2.04)**	0.12 (0.27)	0.55 (1.23)	0.25 (0.56)	-1.00 (-2.42)**					
69	0.44 (1.67)*	-0.13 (-0.45)	-0.04 (-0.14)	0.43 (1.53)	-0.92 (-3.54)**					
71	0.02 (0.51)									
72	0.18 (0.44)	1.09 (2.49)**	-0.65 (-1.54)							
73	1.22 (1.77)*	-0.04 (-0.05)	0.78 (1.03)	0.50 (0.65)	-0.23 (-0.31)	-0.89 (-1.18)	1.77 (2.34)**	0.76 (1.00)	-1.40 (-1.83)*	1.45 (2.06)**
74	0.15 (4.25)**									
75	1.18 (1.76)*									
76	0.12 (2.66)**									
77	0.47 (2.48)**									
78	1.20 (2.85)**									
79	0.53 (2.30)**									
81	0.78 (2.40)**									
82	0.25 (5.77)**									
83	0.10 (1.92)*									
84	0.04 (0.11)	-0.49 (-1.40)	-0.12 (-0.32)	0.30 (0.84)	-0.85 (-2.61)**					
85	0.15 (2.88)**									
87	0.04 (1.10)									
88	0.07 (0.92)									
89	-0.25 (-0.68)	-0.30 (-0.76)	0.02 (0.06)	0.60 (1.54)	-1.26 (-3.22)**	0.91 (2.37)**	-0.72 (-2.07)**			

Notes: Numbers inside parentheses are the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * indicates significance at the 10% level And ** at the 5% level.

Table 2: Long-Run Coefficient Estimates of Linear ARDL Model.				
Industries (Trade share, %)	**Long-Run Coefficient Estimates**			
	Constant	***Ln IP^{TR}***	***Ln IP^{EU}***	***Ln REX***
0 - Live animals (0.05)	0.75 (0.02)	7.99 (2.00)**	-7.39 (-0.84)	0.78 (0.78)
1 - Meat and meat preparations (0.01)	-43.14 (-0.90)	6.68 (1.64)*	2.62 (0.22)	1.62 (1.39)
2 - Dairy products and birds' eggs (0.23)	-17.20 (-0.91)	4.34 (2.39)**	0.59 (0.13)	0.06 (0.12)
3 - Fish (not marine mammals) and preparations thereof (0.30)	-1.99 (-0.18)	-0.87 (-0.85)	0.66 (0.23)	0.34 (1.26)
4 - Cereals and cereal preparations (0.54)	3.16 (0.50)	0.99 (1.43)	-1.54 (-1.02)	0.53 (3.05)**
5 - Vegetables and fruit (3.47)	-12.45 (-1.56)	1.08 (1.62)	0.89 (0.44)	0.04 (0.22)
6 - Sugars, sugar preparations and honey (0.17)	-13.47 (-0.95)	0.47 (0.34)	2.16 (0.59)	0.61 (1.69)*
7 - Coffee, tea, cocoa, spices, and manufactures (0.17)	-10.38 (-3.34)**	1.10 (3.60)**	1.34 (1.78)*	0.20 (2.48)**
8 - Feeding stuff for animals (0.11)	-1.18 (-0.08)	2.04 (1.73)*	-0.97 (-0.27)	-0.04 (-0.14)
9 - Miscellaneous edible products and preparations (0.55)	50.42 (2.20)**	1.31 (0.63)	-12.10 (-1.82)*	-0.39 (-1.01)
11 - Beverages (0.20)	-12.13 (-2.59)**	3.85 (7.52)**	-1.17 (-1.07)	0.17 (1.39)
12 - Tobacco and tobacco manufactures (0.20)	3.24 (0.35)	4.12 (6.14)**	-4.84 (-2.10)**	-0.77 (-3.61)**
23 - Crude rubber (inc. synthetic and reclaimed) (0.14)	-14.13 (-2.03)**	-3.23 (-4.95)**	6.96 (3.92)**	0.51 (3.02)**
24 - Cork and wood (0.03)	-14.92 (-1.07)	5.63 (4.80)**	-1.78 (-0.52)	1.11 (3.38)**
25 - Pulp and waste paper (0.07)	-19.69 (-0.86)	3.09 (1.22)	2.36 (0.42)	-0.05 (-0.08)
26 - Textile fibers (other than wool) and their wastes (0.71)	3.01 (0.92)	-0.41 (-1.56)	-0.01 (-0.01)	-0.05 (-0.63)
28 - Metalliferous ores and metal scrap (2.14)	3.53 (0.22)	2.39 (1.44)	-2.78 (-0.74)	-0.01 (-0.01)
29 - Crude animal and vegetable materials, n.e.s. (0.21)	-11.46 (-3.11)**	0.07 (0.22)	2.52 (2.76)**	0.08 (0.71)
33 - Petroleum, petroleum products and related materials (3.31)	26.44 (2.54)**	3.77 (4.50)**	-9.33 (-3.59)**	-0.20 (-0.83)
34 - Gas, natural and manufactured (0.12)	186.37 (1.40)	-5.59 (-0.72)	-35.07 (-1.07)	-3.15 (-1.16)
41 - Animal oils and fats (0.00)	5.46 (0.45)	0.62 (0.45)	-1.76 (-0.59)	0.22 (0.64)
42 - Fixed vegetable fats and oils, crude, refined or fractionated (0.02)	-5.95 (-0.34)	0.64 (0.38)	0.51 (0.12)	0.62 (1.39)
43 - Animal or vegetable fats and oils, processed (0.02)	-20.44 (-1.97)**	-3.81 (-3.96)**	8.82 (3.34)**	0.70 (2.83)**
51 - Organic chemicals (1.52)	7.44 (3.47)**	-0.62 (-2.66)**	-0.54 (-1.06)	0.14 (2.35)**
52 - Inorganic chemicals (0.56)	-9.31 (-3.07)**	-1.17 (-4.61)**	3.24 (4.20)**	0.48 (6.65)**
53 - Dyeing, tanning and coloring materials (0.78)	8.37 (1.40)	-1.51 (-3.17)**	0.35 (0.23)	0.15 (1.06)
54 - Medicinal and pharmaceutical products (2.63)	3.75 (0.88)	0.57 (1.73)*	-0.75 (-0.72)	-0.06 (-0.63)
55 - Essential oils and resinoids and perfume materials (1.02)	6.17 (1.08)	-0.34 (-0.77)	-0.61 (-0.42)	0.16 (1.30)
56 - Fertilizers (other than those of group 272) (0.10)	-11.08 (-0.83)	2.51 (1.70)*	0.34 (0.10)	0.72 (1.91)
57 - Plastics in primary forms (3.10)	10.95 (3.17)**	-1.49 (-4.02)**	-0.26 (-0.32)	-0.15 (-1.60)
58 - Plastics in non-primary forms (1.18)	8.49 (1.59)	-1.29 (-2.97)**	-0.44 (-0.33)	0.44 (3.46)**
61 - Leather, leather manufactures (0.16)	5.26 (0.54)	-3.19 (-3.96)**	2.28 (0.92)	0.07 (0.30)

62 - Rubber manufactures, n.e.s. (1.30)	-1.76 (-0.61)	0.23 (0.95)	0.08 (0.11)	0.20 (2.96)**
63 - Cork and wood manufactures (excluding furniture) (0.19)	-6.22 (-0.76)	1.56 (1.92)*	0.21 (0.11)	0.32 (1.35)
64 - Paper, paperboard and articles of paper pulp, (1.37)	19.85 (2.10)**	-0.36 (-0.45)	-3.54 (-1.51)	0.17 (0.82)
65 - Textile yarn, fabrics, made-up articles (3.95)	-3.51 (-1.83)*	-0.84 (-5.27)**	1.38 (2.81)**	0.17 (3.81)**
66 - Non-metallic mineral manufactures, n.e.s. (1.14)	-4.00 (-2.66)**	1.85 (15.24)**	-1.05 (-2.80)**	0.35 (9.66)**
67 - Iron and steel (3.76)	7.77 (1.10)	2.66 (4.97)**	-4.18 (-2.40)**	0.17 (1.02)
68 - Non-ferrous metals (2.01)	1.91 (0.35)	-0.48 (-1.07)	0.08 (0.06)	0.26 (2.10)**
69 - Manufactures of metals, n.e.s. (2.55)	-2.33 (-1.25)	-0.31 (-2.01)**	0.82 (1.74)*	0.36 (8.44)**
71 - Power-generating machinery and equipment (4.58)	8.12 (3.07)**	0.58 (2.80)**	-2.08 (-3.20)**	0.03 (0.51)
72 - Machinery specialized for particular industries (4.21)	6.07 (0.84)	-0.35 (-0.60)	-0.52 (-0.28)	0.37 (2.24)**
73 - Metalworking machinery (0.97)	14.06 (1.85)*	0.42 (0.76)	-3.10 (-1.71)*	0.18 (1.10)
74 - General industrial machinery and equipment (5.31)	1.24 (0.39)	-0.12 (-0.44)	0.17 (0.22)	0.43 (5.87)**
75 - Office machines and automatic data-processing machines (0.78)	9.35 (1.31)	-2.12 (-3.57)**	0.60 (0.34)	0.03 (0.19)
76 - Telecommunications and sound-recording (2.09)	-12.84 (-1.20)	0.34 (0.34)	2.39 (0.94)	0.82 (2.90)**
77 - Electrical machinery, apparatus and appliances (5.90)	8.36 (0.97)	-1.38 (-1.91)*	-0.45 (-0.20)	0.28 (1.19)
78 - Road vehicles (including air-cushion vehicles) (19.07)	14.09 (1.70)*	1.71 (2.51)**	-4.75 (-2.24)**	0.60 (3.05)**
79 - Other transport equipment (2.07)	-6.78 (-0.52)	3.90 (2.77)**	-2.32 (-0.74)	1.22 (3.44)**
81 - Prefabricated buildings; sanitary, plumbing, heating (0.63)	-24.20 (-1.16)	1.25 (0.90)	3.85 (0.91)	1.27 (1.91)*
82 - Furniture, and parts thereof; bedding, mattresses (0.61)	-1.69 (-0.49)	1.48 (5.20)**	-1.17 (-1.38)	0.71 (8.75)**
83 - Travel goods, handbags and similar containers (0.16)	-8.59 (-1.39)	0.76 (1.67)*	0.96 (0.63)	0.29 (1.93)*
84 - Articles of apparel and clothing accessories (7.29)	-8.76 (-2.90)**	0.66 (2.78)**	0.49 (0.67)	0.13 (1.66)*
85 - Footwear (0.15)	-9.81 (-0.85)	1.31 (1.41)	0.78 (0.28)	0.76 (2.38)**
87 - Professional, scientific and controlling instruments (1.54)	8.34 (2.58)**	-0.57 (-2.19)**	-0.70 (-0.87)	0.09 (1.15)
88 - Photographic apparatus, equipment and supplies (0.17)	-5.61 (-0.60)	-3.33 (-3.82)**	5.17 (2.21)**	0.24 (1.02)
89 - Miscellaneous manufactured articles, n.e.s. (2.10)	1.39 (0.39)	-0.54 (-1.91)*	0.33 (0.37)	0.27 (3.28)**

Notes: Numbers inside parentheses are the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * indicates significance at the 10% level and ** at the 5% level.

Table 3: Diagnostic Statistics Associated with Linear ARDL Model.							
Industries	**Diagnostics**						
	F Stat	***ECM_{t-1}***	***LM***	***RESET***	***CUSUM***	***CUSUMSQ***	***Adj. R^2***
0 - Live animals	1.78	-0.14 (-2.42)	8.53	2.79	S	US	0.44
1 - Meat and meat preparations	1.4	-0.22 (-3.64)*	9.81	10.93**	US	US	0.41
2 - Dairy products and birds' eggs	2.84	-0.57 (-5.89)**	5.72	0.01	S	US	0.45
3 - Fish (not marine mammals) and preparations thereof	2.16	-0.49 (-3.88)**	10.98	0.23	US	US	0.52
4 - Cereals and cereal preparations	4.45**	-0.55 (-6.19)**	17.79	3.13*	US	US	0.31
5 - Vegetables and fruit	2.41	-0.32 (-3.13)	15.7	0.42	S	US	0.52
6 - Sugars, sugar preparations and honey	0.85	-0.16 (-2.47)	31.84**	25.89**	US	US	0.24
7 - Coffee, tea, cocoa, spices, and manufactures	1.71	-0.49 (-8.49)**	26.71**	0.7	US	S	0.33
8 - Feeding stuff for animals	5.1**	-0.52 (-6.72)**	11.77	0	S	US	0.47
9 - Miscellaneous edible products and preparations	4.87**	-0.13 (-1.95)	30.26**	7.23**	US	US	0.36
11 - Beverages	4.14*	-0.47 (-4.49)**	11.82	5.95**	S	US	0.36
12 - Tobacco and tobacco manufactures	3.84*	-0.79 (-5.15)**	34.26**	1.95	S	US	0.42
23 - Crude rubber (inc. synthetic and reclaimed)	5.12**	-0.76 (-8.10)**	48.92**	12.18**	US	US	0.51
24 - Cork and wood	4.02*	-0.36 (-4.60)**	12.8	1.55	S	US	0.49
25 - Pulp and waste paper	2.74	-0.65 (-3.76)*	9.43	0.28	S	US	0.52
26 - Textile fibers (other than wool) and their wastes	2.8	-0.58 (-8.55)**	18.84	2	S	US	0.31
28 - Metalliferous ores and metal scrap	2.59	-0.21 (-2.38)	16.36	12.7**	S	US	0.44
29 - Crude animal and vegetable materials, n.e.s.	5.31**	-0.45 (-3.50)*	22.29**	0.68	S	S	0.50
33 - Petroleum, petroleum products and related materials	4.3**	-0.50 (-7.26)**	8.58	0.37	S	US	0.29
34 - Gas, natural and manufactured	3.03	-0.20 (-2.12)	11.09	2.49	S	US	0.46
41 - Animal oils and fats	3.99*	-0.70 (-6.77)**	16.73	3.53*	S	US	0.45
42 - Fixed vegetable fats and oils, crude, refined or fractionated	2.5	-0.36 (-3.64)*	14.07	0.05	S	S	0.27
43 - Animal or vegetable fats and oils, processed	2.42	-0.70 (-6.25)**	5.69	0.09	S	US	0.47
51 - Organic chemicals	5.08**	-0.83 (-12.7)**	8.97	0.43	S	S	0.43
52 - Inorganic chemicals	3.94*	-0.53 (-5.92)**	4.86	0.88	S	US	0.54
53 - Dyeing, tanning and coloring materials	4.52**	-0.26 (-3.70)*	26.24**	0.14	S	US	0.47
54 - Medicinal and pharmaceutical products	2.98	-0.49 (-5.45)**	4.79	0.19	S	US	0.45
55 - Essential oils and resinoids and perfume materials	0.72	-0.28 (-2.89)	12.48	0.45	S	US	0.42
56 - Fertilizers (other than those of group 272)	5.22**	-0.72 (-8.38)**	5.38	0.7	US	US	0.45
57 - Plastics in primary forms	3.48	-0.35 (-6.47)**	8.72	0.44	US	US	0.24
58 - Plastics in non-primary forms	2.61	-0.19 (-3.82)**	45.78**	0.27	S	US	0.44
61 - Leather, leather manufactures	2.91	-0.23 (-3.04)	15.96	1.53	US	US	0.48

62 - Rubber manufactures, n.e.s.	7.56**	-0.34 (-5.48)**	12.75	1.19	S	US	0.41
63 - Cork and wood manufactures (excluding furniture)	5.39**	-0.21 (-3.07)	13.78	0.14	US	US	0.36
64 - Paper, paperboard and articles of paper pulp,	2.78	-0.13 (-2.61)	11.04	0.05	US	US	0.44
65 - Textile yarn, fabrics, made-up articles	5.96**	-0.42 (-5.82)**	26.98**	12.21**	S	S	0.70
66 - Non-metallic mineral manufactures, n.e.s.	5.41**	-0.55 (-9.11)**	13.6	1.31	US	US	0.45
67 - Iron and steel	2.38	-0.24 (-5.14)**	5.99	0.7	S	S	0.25
68 - Non-ferrous metals	2.05	-0.28 (-3.62)*	17.96	1.84	US	US	0.44
69 - Manufactures of metals, n.e.s.	3.52	-0.51 (-6.55)**	6.99	0.78	US	US	0.53
71 - Power-generating machinery and equipment	3.99*	-0.57 (-5.84)**	9.83	1.89	S	US	0.44
72 - Machinery specialized for particular industries	3.39	-0.21 (-3.55)*	17.18	1.64	S	US	0.61
73 - Metalworking machinery	2.17	-0.35 (-3.63)*	8.77	6.86**	S	US	0.50
74 - General industrial machinery and equipment	3.26	-0.36 (-5.26)**	13.61	2.04	US	US	0.48
75 - Office machines and automatic data-processing machines	4.17*	-0.37 (-5.00)**	12.02	0.06	S	US	0.47
76 - Telecommunications and sound-recording	2.9	-0.15 (-3.31)	14.7	0.13	S	US	0.33
77 - Electrical machinery, apparatus and appliances	2.06	-0.09 (-1.96)	23.88**	8	S	S	0.47
78 - Road vehicles (including air-cushion vehicles)	6.97**	-0.20 (-4.94)**	22.58**	1.93	S	US	0.56
79 - Other transport equipment	1.42	-0.44 (-2.99)	19.06	10.48**	US	US	0.48
81 - Prefabricated buildings; sanitary, plumbing, heating	5.8**	-0.10 (-1.76)	15.86	4.44**	S	US	0.58
82 - Furniture, and parts thereof; bedding, mattresses	8.01**	-0.35 (-6.21)**	13.14	0.31	S	US	0.51
83 - Travel goods, handbags and similar containers	5.91**	-0.34 (-4.77)**	24.47**	4.77**	S	S	0.52
84 - Articles of apparel and clothing accessories	11.72**	-0.42 (-6.48)**	34.5**	4.79**	US	US	0.76
85 - Footwear	5.39**	-0.20 (-2.96)	29.61**	4.13**	S	S	0.60
87 - Professional, scientific and controlling instruments	2.95	-0.48 (-5.36)**	16.65	0.94	S	US	0.55
88 - Photographic apparatus, equipment and supplies	3.3	-0.28 (-3.82)**	7.15	0.26	S	US	0.37
89 - Miscellaneous manufactured articles, n.e.s.	5.44**	-0.37 (-4.57)**	17.51	5.35**	US	US	0.54

Notes:

a. The critical value of the F test at the 10% (5%) significance level when there are three exogenous variables (k=3) is 3.77 (4.35). These come from Pesaran *et al*. (2001, Table CI-Case III, page 300). * (**) indicates a significant statistic at the 10% (5%) level.

b. Number inside the parenthesis next to ECM_{t-1} is the t-ratio, Its upper bound critical value is -3.46 (-3.78) at the 10% (5%) significance level and this comes from Pesaran et al. (2001, Table CII-Case III, page 303).

c. LM is the Lagrange Multiplier test of residual serial correlation. It is distributed as χ^2 with 12 degrees of freedom. Its critical value at the 10% (5%) level is 18.54 (21.02).

d. RESET is Ramsey's test for misspecification. It is distributed as χ^2 with one degree of freedom and its critical value at 10% (5%) level is 2.71 (3.84).

e. Abbreviation n.e.s. stands for not elsewhere specified.

g. Trade share is in percentage calculated for the year 2013.

Table 4: Short-Run Coefficient Estimates of Lira Appreciation in the Nonlinear ARDL Model.

Code	Short-Run Coefficient Estimates									
	Δ ***POS***$_t$	Δ ***POS***$_{t-1}$	Δ ***POS***$_{t-2}$	Δ ***POS***$_{t-3}$	Δ ***POS***$_{t-4}$	Δ ***POS***$_{t-5}$	Δ ***POS***$_{t-6}$	Δ ***POS***$_{t-7}$	Δ ***POS***$_{t-8}$	Δ ***POS***$_{t-9}$
0	0.36 (0.28)									
1	-7.56 (-0.35)	50.32 (2.41)**								
2	-52.8 (-2.39)**									
3	-25.9 (-2.57)**									
4	3.24 (4.41)**									
5	1.07 (2.11)**									
6	-2.54 (-0.63)	3.76 (0.93)	-9.3 (-2.31)**							
7	1.46 (4.11)**									
8	-1.82 (-1.36)									
9	-0.79 (-1.80)*									
11	-2.72 (-0.55)	-4.85 (-0.97)	-8.71 (-1.73)*	2.29 (0.46)	-9.08 (-1.82)*	-1.62 (-0.32)	-5.66 (-1.14)	-4.17 (-0.83)	-15.1 (-3.02)**	
12	-0.97 (-0.91)									
23	2.06 (1.79)*									
24	0.99 (1.02)									
25	6.12 (1.78)*									
26	0.20 (0.63)									
28	-17.3 (-2.25)**	-2.13 (-0.28)	-14.63 (-1.93)*	5.08 (0.67)	-15.2 (-2.0)**	22.1 (2.84)**	-7.81 (-0.99)	14.9 (1.87)*	12.93 (1.61)	13.3 (1.7)*
29	0.51 (1.46)									
33	-0.50 (-0.57)									
34	-68.9 (-2.26)**	44.45 (1.45)	42.94 (1.43)							
41	-1.83 (-0.96)									
42	5.97 (0.48)	30.34 (2.49)**								
43	-0.20 (-0.12)									
51	0.27 (0.65)									
52	7.23 (2.77)**									
53	-0.38 (-1.33)									
54	-10.8 (-3.05)**									
55	0.98 (0.42)	0.01 (0.00)	-7.24 (-3.07)**	4.6 (1.96)**						
56	8.62 (3.49)									
57	-5.00 (-1.71)	-4.09 (-1.41)								
58	0.04 (0.22)									
61	7.63 (2.17)									

62	-2.36 (-1.39)									
63	0.04 (0.10)									
64	-4.48 (-2.00)**									
65	0.34 (2.23)**									
66	0.08 (0.51)									
67	6.69 (2.45)**									
68	0.35 (0.14)	1.95 (0.79)	6.24 (2.61)**							
69	0.29 (1.59)									
71	0.55 (2.22)**									
72	0.28 (0.94)									
73	0.99 (0.23)	-3.95 (-0.97)	8.41 (2.11)**	9.97 (2.4)**	-2.77 (-0.68)	-2.28 (-0.56)	6.07 (1.49)	10.0 (2.45)**		
74	-0.12 (-0.51)									
75	-2.34 (-0.51)	2.33 (0.50)	-4.02 (-0.86)	-6.08 (-1.32)	11.0 (2.45)**	13.1 (2.99)**				
76	-5.09 (-1.51)	0.31 (0.09)	-3.43 (-0.99)	-8.12 (-2.3)**						
77	-2.47 (-1.91)*	0.41 (0.32)	1.27 (0.98)	-2.10 (-1.62)	0.46 (0.35)	1.59 (1.21)	-1.20 (-0.93)	2.21 (1.67)*	4.44 (3.26)**	
78	0.15 (0.35)									
79	6.95 (4.06)**									
81	-2.80 (-1.32)									
82	0.03 (0.11)									
83	-9.14 (-2.63)**									
84	-0.28 (-0.15)	-4.76 (-2.52)**	2.66 (1.40)							
85	-0.48 (-1.04)									
87	-0.04 (-0.14)									
88	-7.49 (-1.66)*	8.83 (2.00)**								
89	-4.49 (-2.03)**									

Notes: Numbers inside parentheses are the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * indicates significance at the 10% level and ** at the 5% level.

Table 5: Short-Run Coefficient Estimates of Lira Depreciation in the Nonlinear ARDL Model.

Ind.	ΔNEG_{t}	ΔNEG_{t-1}	ΔNEG_{t-2}	ΔNEG_{t-3}	ΔNEG_{t-4}	ΔNEG_{t-5}	ΔNEG_{t-6}	ΔNEG_{t-7}	ΔNEG_{t-8}	ΔNEG_{t-9}
0	-0.40 (-0.07)	15.85 (2.45)**	-15.7 (-2.39)**	-15.3 (-2.32)**	23.64 (3.55)**	-11.39 (-1.68)*	14.78 (2.4)**			
1	25.35 (2.42)**	-18.35 (-1.77)**								
2	20.41 (2.00)**									
3	17.06 (3.55)**									
4	3.18 (0.81)	-3.65 (-0.84)	0.94 (0.21)	5.02 (1.17)	10.38 (2.64)**					
5	4.51 (2.44)**									
6	1.18 (6.03)**									
7	0.38 (3.72)**									
8	-0.04 (-0.12)									
9	2.28 (1.58)									
11	0.18 (1.10)									
12	-1.39 (-3.07)**									
23	0.76 (1.97)**									
24	7.28 (1.59)	-1.37 (-0.27)	9.90 (1.94)*	3.54 (0.71)	7.44 (1.63)					
25	0.67 (0.63)									
26	3.70 (2.61)**									
28	1.24 (0.33)	7.51 (1.80)*	6.08 (1.45)	-0.55 (-0.13)	-9.16 (-2.18)**	-0.51 (-0.12)	-0.91 (-0.22)	4.82 (1.15)	-11.6 (-3.02)**	
29	0.68 (0.47)	2.82 (1.92)*								
33	-0.22 (-0.71)									
34	-2.24 (-2.03)**									
41	0.02 (0.04)									
42	0.33 (0.81)									
43	1.00 (2.06)**									
51	-2.63 (-1.25)	5.31 (2.53)**								
52	0.59 (4.33)**									
53	2.70 (2.45)**									
54	4.29 (2.62)**									
55	0.10 (1.06)									
56	2.85 (3.41)**									
57	2.53 (1.69)*	3.93 (2.60)**								
58	0.13 (1.82)*									
61	-0.10 (-0.74)									
62	2.21 (2.89)**									

63	2.44 (1.39)	3.05 (1.58)	-0.71 (-0.37)	4.35 (2.52)**						
64	4.27 (3.74)**	-2.85 (-2.49)**	3.19 (2.76)**	-0.94 (-0.81)	2.50 (2.15)**	-1.52 (-1.32)	1.11 (0.97)	-0.69 (-0.61)	2.81 (2.70)**	
65	1.47 (2.58)**									
66	1.58 (2.61)**									
67	0.24 (2.13)**									
68	2.34 (2.03)**									
69	1.50 (1.97)**	-0.64 (-0.75)	0.12 (0.15)	1.15 (1.39)	-2.62 (-3.46)**					
71	0.11 (1.17)									
72	1.04 (0.86)	2.65 (1.99)**	-1.92 (-1.56)							
73	4.30 (2.21)**									
74	0.32 (3.77)**									
75	5.68 (2.47)**	-2.21 (-0.88)	0.85 (0.33)	0.60 (0.24)	-5.97 (-2.59)**					
76	3.85 (2.27)**	1.41 (0.76)	1.56 (0.83)	0.84 (0.46)	-1.56 (-0.90)	1.72 (1.01)	2.99 (1.96)*			
77	1.97 (3.13)**	0.79 (1.13)	-0.83 (-1.18)	1.97 (2.82)**	-1.73 (-2.44)**	-0.61 (-0.85)	1.02 (1.44)	-1.26 (-1.83)*	-0.62 (-0.87)	1.40 (2.33)**
78	3.25 (2.70)**									
79	-7.11 (-1.13)	1.70 (0.24)	-8.13 (-1.16)	-10.02 (-1.43)	0.22 (0.03)	-14.6 (-2.31)**				
81	3.20 (3.31)**									
82	0.71 (6.37)**									
83	3.37 (2.14)**									
84	0.01 (0.13)									
85	0.27 (2.05)**									
87	0.09 (0.94)									
88	0.10 (0.62)									
89	0.99 (0.88)	-0.97 (-0.83)	-0.72 (-0.61)	2.24 (1.93)*	-3.71 (-3.18)**	1.39 (1.31)				

Notes: Numbers inside parentheses are the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * indicates significance at the 10% level and ** at the 5% level.

Table 6: Long-Run Coefficient Estimates of Nonlinear ARDL Model.

Industries (Trade share, %)	*Constant*	*Ln Y_{TR}*	*Ln Y_{EU}*	*POS*	*NEG*
0 - Live animals (0.05)	4.86 (0.13)	5.40 (0.62)	-5.42 (-0.63)	2.40 (0.29)	1.09 (0.45)
1 - Meat and meat preparations (0.01)	-17.91 (-0.42)	-3.00 (-0.37)	7.39 (0.62)	14.59 (1.84)*	5.23 (1.87)*
2 - Dairy products and birds' eggs (0.23)	-34.02 (-1.78)*	6.12 (1.32)	2.94 (0.54)	-3.00 (-0.72)	-0.03 (-0.03)
3 - Fish (not marine mammals) and preparations thereof (0.30)	-4.45 (-0.72)	3.63 (2.69)**	-2.75 (-1.59)	-3.92 (-2.97)**	0.03 (0.07)
4 - Cereals and cereal preparations (0.54)	14.10 (2.41)**	-3.59 (-2.52)**	0.85 (0.60)	5.34 (3.94)**	1.76 (4.44)**
5 - Vegetables and fruit (3.47)	-9.44 (-1.36)	-1.78 (-1.02)	3.05 (1.37)	3.00 (1.82)*	0.66 (1.32)
6 - Sugars, sugar preparations and honey (0.17)	1.37 (0.27)	-6.02 (-4.58)**	5.76 (3.57)**	8.36 (7.20)**	2.83 (8.25)**
7 - Coffee, tea, cocoa, spices, and manufactures (0.17)	-3.40 (-1.17)	-1.20 (-1.75)*	2.12 (2.96)**	2.68 (4.24)**	0.69 (3.80)**
8 - Feeding stuff for animals (0.11)	-18.32 (-1.72)*	5.34 (2.08)**	-0.17 (-0.07)	-3.37 (-1.41)	-0.08 (-0.12)
9 - Miscellaneous edible products and preparations (0.55)	28.03 (2.51)**	2.28 (1.57)	-8.24 (-2.63)**	-3.30 (-2.52)**	-0.93 (-1.83)*
11 - Beverages (0.20)	-3.41 (-1.01)	1.53 (1.70)*	-0.74 (-0.88)	1.45 (1.86)*	0.26 (1.10)
12 - Tobacco and tobacco manufactures (0.20)	1.95 (0.22)	3.58 (2.79)**	-4.68 (-2.04)**	-1.20 (-0.90)	-1.72 (-3.32)**
23 - Crude rubber (inc. synthetic and reclaimed) (0.14)	-6.15 (-0.85)	-5.64 (-3.49)**	7.79 (3.66)**	2.91 (1.91)*	1.07 (2.19)**
24 - Cork and wood (0.03)	-11.57 (-0.92)	4.94 (2.34)**	-0.89 (-0.26)	2.59 (1.14)	2.52 (3.14)**
25 - Pulp and waste paper (0.07)	2.13 (0.11)	-4.09 (-0.95)	4.28 (0.86)	8.07 (1.85)*	0.88 (0.63)
26 - Textile fibers (other than wool) and their wastes (0.71)	3.45 (1.05)	-0.92 (-1.59)	0.35 (0.40)	0.35 (0.62)	-0.04 (-0.18)
28 - Metalliferous ores and metal scrap (2.14)	-0.54 (-0.06)	0.09 (0.05)	0.62 (0.28)	4.13 (2.22)**	1.56 (2.31)**
29 - Crude animal and vegetable materials, n.e.s. (0.21)	-12.04 (-3.57)**	-0.86 (-1.11)	3.58 (3.46)**	0.99 (1.36)	0.28 (1.06)
33 - Petroleum, petroleum products and related materials (3.31)	23.55 (2.31)**	4.42 (2.49)**	-9.44 (-3.51)**	-0.99 (-0.56)	-0.44 (-0.71)
34 - Gas, natural and manufactured (0.12)	26.44 (0.53)	8.86 (1.31)	-14.86 (-1.10)	-22.0 (-3.15)**	-5.61 (-1.99)**
41 - Animal oils and fats (0.00)	0.11 (0.01)	3.28 (1.27)	-2.95 (-0.91)	-2.61 (-0.94)	0.03 (0.04)
42 - Fixed vegetable fats and oils, crude, refined or fractionated (0.02)	-9.83 (-0.66)	8.05 (2.40)**	-5.21 (-1.31)	-4.34 (-1.46)	0.83 (0.80)
43 - Animal or vegetable fats and oils, processed (0.02)	-20.79 (-2.18)**	-1.80 (-0.78)	7.55 (2.59)**	-0.27 (-0.12)	1.36 (2.09)**
51 - Organic chemicals (1.52)	8.00 (3.44)**	-0.64 (-1.27)	-0.52 (-0.96)	0.32 (0.65)	0.33 (2.13)**
52 - Inorganic chemicals (0.56)	-9.83 (-3.01)**	-0.73 (-1.17)	3.32 (3.64)**	0.85 (1.46)	1.13 (5.70)**
53 - Dyeing, tanning and coloring materials (0.78)	5.42 (1.23)	-0.08 (-0.10)	-0.19 (-0.16)	-1.12 (-1.41)	0.21 (0.79)
54 - Medicinal and pharmaceutical products (2.63)	4.10 (1.59)	0.93 (1.70)*	-1.25 (-1.83)*	-1.07 (-1.84)*	-0.44 (-2.19)**
55 - Essential oils and resinoids and perfume materials (1.02)	0.88 (0.29)	0.60 (0.79)	-0.20 (-0.22)	-0.71 (-1.06)	0.22 (1.12)
56 - Fertilizers (other than those of group 272) (0.10)	-8.05 (-0.50)	-7.30 (-2.28)**	9.85 (2.18)**	11.15 (3.49)**	3.69 (3.43)**
57 - Plastics in primary forms (3.10)	5.92 (2.19)**	-0.01 (-0.01)	-0.66 (-1.04)	-2.29 (-3.86)**	-0.67 (-3.72)**
58 - Plastics in non-primary forms (1.18)	9.78 (1.67)*	-0.70 (-0.65)	-0.97 (-0.64)	0.23 (0.21)	0.78 (2.20)**
61 - Leather, leather manufactures (0.16)	3.41 (0.31)	1.49 (0.70)	-1.83 (-0.62)	-3.57 (-1.80)*	-0.50 (-0.76)
62 - Rubber manufactures, n.e.s. (1.30)	-1.03 (-0.38)	-0.04 (-0.06)	0.35 (0.45)	0.58 (1.07)	0.48 (2.77)**

63 - Cork and wood manufactures (excluding furniture) (0.19)	-6.38 (-0.80)	1.63 (0.85)	0.47 (0.24)	0.17 (0.10)	0.60 (1.12)
64 - Paper, paperboard and articles of paper pulp, (1.37)	10.99 (2.31)**	1.10 (1.49)	-2.74 (-2.30)**	-1.93 (-2.78)**	0.11 (0.43)
65 - Textile yarn, fabrics, made-up articles (3.95)	-2.48 (-1.47)	-1.23 (-3.15)**	1.68 (3.20)**	0.76 (2.10)**	0.46 (4.05)**
66 - Non-metallic mineral manufactures, n.e.s. (1.14)	-3.79 (-2.62)**	2.54 (8.91)**	-1.47 (-3.67)**	0.14 (0.52)	0.72 (8.08)**
67 - Iron and steel (3.76)	14.98 (3.18)**	0.77 (1.07)	-3.88 (-3.27)**	2.72 (3.74)**	0.66 (2.39)**
68 - Non-ferrous metals (2.01)	4.37 (0.89)	1.77 (2.05)**	-2.45 (-1.83)*	-1.24 (-1.48)	0.26 (0.88)
69 - Manufactures of metals, n.e.s. (2.55)	-1.81 (-1.08)	0.05 (0.15)	0.67 (1.33)	0.54 (1.54)	0.83 (7.73)**
71 - Power-generating machinery and equipment (4.58)	10.22 (3.44)**	-0.48 (-0.88)	-1.51 (-2.00)**	1.09 (2.01)**	0.21 (1.16)
72 - Machinery specialized for particular industries (4.21)	8.19 (1.08)	-0.95 (-0.57)	-0.11 (-0.05)	1.33 (0.88)	0.90 (2.06)**
73 - Metalworking machinery (0.97)	11.99 (2.01)**	2.22 (2.29)**	-4.25 (-2.57)**	-0.55 (-0.60)	0.41 (1.15)
74 - General industrial machinery and equipment (5.31)	1.68 (0.68)	1.13 (1.98)**	-0.78 (-1.05)	-0.28 (-0.53)	0.75 (4.63)**
75 - Office machines and automatic data-processing machines (0.78)	6.60 (0.92)	-0.56 (-0.32)	-0.25 (-0.11)	-0.73 (-0.49)	0.15 (0.33)
76 - Telecommunications and sound-recording (2.09)	-0.02 (0.00)	-3.20 (-1.22)	3.80 (1.44)	3.30 (1.47)	1.89 (2.86)**
77 - Electrical machinery, apparatus and appliances (5.90)	4.47 (2.41)**	1.20 (2.34)**	-1.91 (-2.97)**	-2.32 (-5.70)**	-0.11 (-0.93)
78 - Road vehicles (including air-cushion vehicles) (19.07)	12.72 (1.81)*	2.35 (1.27)	-4.53 (-2.28)**	0.60 (0.33)	1.33 (2.80)**
79 - Other transport equipment (2.07)	10.82 (1.48)	-1.37 (-0.78)	-0.45 (-0.26)	8.57 (5.13)**	3.24 (6.91)**
81 - Prefabricated buildings; sanitary, plumbing, heating (0.63)	-15.35 (-1.29)	1.23 (0.61)	2.84 (0.79)	1.29 (0.53)	2.12 (1.90)*
82 - Furniture, and parts thereof; bedding, mattresses (0.61)	-0.36 (-0.17)	2.92 (5.75)**	-2.28 (-3.45)**	0.06 (0.11)	1.34 (8.77)**
83 - Travel goods, handbags and similar containers (0.16)	-2.71 (-0.44)	-1.06 (-0.94)	1.61 (1.04)	1.86 (1.71)*	0.64 (1.73)*
84 - Articles of apparel and clothing accessories (7.29)	-7.44 (-3.71)**	1.72 (3.61)**	-0.73 (-1.12)	-0.92 (-2.05)**	0.02 (0.13)
85 - Footwear (0.15)	-8.19 (-1.18)	4.10 (2.78)**	-1.73 (-0.86)	-1.59 (-1.14)	0.90 (1.80)*
87 - Professional, scientific and controlling instruments (1.54)	7.94 (2.55)**	-0.29 (-0.54)	-0.80 (-0.99)	-0.07 (-0.14)	0.18 (0.95)
88 - Photographic apparatus, equipment and supplies (0.17)	1.44 (0.14)	-3.94 (-1.67)*	4.32 (1.53)	1.05 (0.51)	0.43 (0.65)
89 - Miscellaneous manufactured articles, n.e.s. (2.10)	0.89 (0.24)	-0.33 (-0.32)	0.49 (0.36)	0.45 (0.43)	0.68 (2.12)**

Notes: Numbers inside parentheses are the t-ratios. The critical value of standard t-ratio is 1.64 (1.96) at the 10% (5%) significance level. * indicates significance at the 10% level and ** at the 5% level.

Table 7: Diagnostic Statistics Associated with Nonlinear ARDL Model.								
Industries	***F***	***ECM_{t-1}***	***LM***	***RESET***	***CSM(SQ)***	***Adj. R^2***	**Wald-S**	**Wald-L**
0 - Live animals	1.78	-0.15 (-2.60)	5.54	2.90*	(S)(US)	0.46	7.13**	0.46
1 - Meat and meat preparations	1.39	-0.24 (-3.61)	11.25	9.29**	(S)(US)	0.43	1.36	4.15**
2 - Dairy products and birds' eggs	3.20	-0.60 (-6.16)**	8.80	0.36	(S)(US)	0.47	5.26**	0.42
3 - Fish (not marine mammals) and preparations thereof	2.20	-0.78 (-5.53)**	13.01	0.46	(S)(S)	0.55	11.35**	6.70**
4 - Cereals and cereal preparations	4.34*	-0.61 (-7.11)**	11.51	2.89	(S)(S)	0.35	1.90	7.86**
5 - Vegetables and fruit	2.93	-0.36 (-3.40)	18.97	2.22	(S)(US)	0.54	1.63	4.30**
6 - Sugars, sugar preparations and honey	2.75	-0.42 (-7.09)**	7.09	21.03**	(S)(US)	0.30	2.03	22.59**
7 - Coffee, tea, cocoa, spices, and manufactures	2.08	-0.54 (-9.31)**	22.70**	1.54	(S)(S)	0.36	0.01	11.77**
8 - Feeding stuff for animals	4.21*	-0.54 (-6.85)**	11.73	0.35	(S)(US)	0.45	1.02	0.86
9 - Miscellaneous edible products and preparations	3.59	-0.24 (-2.54)	33.06**	8.19	(S)(US)	0.37	1.30	1.77
11 - Beverages	4.17*	-0.68 (-10.79)**	10.88	1.61	(US)(US)	0.35	9.36**	2.74*
12 - Tobacco and tobacco manufactures	2.93	-0.81 (-5.13)**	38.90**	3.06	(S)(S)	0.41	1.86	0.08
23 - Crude rubber (inc. synthetic and reclaimed)	3.74	-0.71 (-7.77)**	15.19	0.41	(US)(US)	0.54	0.01	7.04**
24 - Cork and wood	3.06	-0.38 (-4.51)**	12.44	0.84	(S)(US)	0.50	3.74*	0.13
25 - Pulp and waste paper	2.85	-0.76 (-4.20)**	9.60	0.73	(S)(US)	0.52	0.02	6.12
26 - Textile fibers (other than wool) and their wastes	2.86	-0.57 (-8.41)**	13.68	2.33	(S)(US)	0.31	0.29	0.64
28 - Metalliferous ores and metal scrap	2.25	-0.33 (-3.82)*	15.21	19.62**	(US)(US)	0.46	0.46	0.82
29 - Crude animal and vegetable materials, n.e.s.	3.61	-0.52 (-3.82)*	18.60*	2.22	(S)(S)	0.49	3.58*	1.55
33 - Petroleum, petroleum products and related materials	3.53	-0.50 (-7.28)**	10.06	0.55	(S)(US)	0.29	1.10	0.26
34 - Gas, natural and manufactured	3.16	-0.40 (-3.28)	11.37	1.46	(S)(US)	0.47	0.00	5.02**
41 - Animal oils and fats	3.64	-0.70 (-6.77)**	16.16	5.91**	(S)(S)	0.45	0.10	1.29
42 - Fixed vegetable fats and oils, crude, refined or fractionated	1.87	-0.39 (-3.97)*	17.10	1.62	(S)(S)	0.27	0.54	2.80*
43 - Animal or vegetable fats and oils, processed	1.93	-0.74 (-6.30)**	6.34	0.74	(S)(US)	0.47	0.03	0.58
51 - Organic chemicals	3.91*	-0.83 (-12.67)**	9.49	0.36	(S)(S)	0.43	0.15	0.45
52 - Inorganic chemicals	3.18	-0.52 (-5.41)**	7.82	1.51	(S)(US)	0.54	1.17	0.33
53 - Dyeing, tanning and coloring materials	2.95	-0.34 (-4.15)**	28.30**	0.37	(S)(US)	0.47	1.08	0.54
54 - Medicinal and pharmaceutical products	3.21	-0.52 (-5.82)**	4.41	0.60	(S)(US)	0.47	2.98*	0.66
55 - Essential oils and resinoids and perfume materials	0.95	-0.43 (-5.92)**	22.05**	0.26	(S)(S)	0.40	0.00	3.66*
56 - Fertilizers (other than those of group 272)	5.30**	-0.77 (-9.00)**	4.86	7.12**	(S)(US)	0.48	0.09	3.47*
57 - Plastics in primary forms	4.56**	-0.47 (-7.83)**	5.76	0.50	(US)(US)	0.30	8.68**	5.78**

58 - Plastics in non-primary forms	1.77	-0.17 (-2.63)	26.23**	3.11*	(S)(US)	0.45	0.05	0.02
61 - Leather, leather manufactures	2.54	-0.19 (-2.65)	16.08	2.04	(US)(US)	0.49	0.94	2.42
62 - Rubber manufactures, n.e.s.	6.93**	-0.35 (-5.66)**	13.72	1.83	(S)(US)	0.42	4.33**	0.08
63 - Cork and wood manufactures (excluding furniture)	4.17*	-0.23 (-3.30)	14.83	0.05	(S)(S)	0.37	9.02**	0.00
64 - Paper, paperboard and articles of paper pulp,	2.15	-0.30 (-3.96)*	6.74	1.27	(US)(US)	0.47	11.44**	4.46**
65 - Textile yarn, fabrics, made-up articles	9.05**	-0.45 (-6.02)**	30.62**	9.12**	(S)(S)	0.70	0.02	0.53
66 - Non-metallic mineral manufactures, n.e.s.	4.28*	-0.55 (-7.82)**	17.79	0.00	(S)(US)	0.48	3.49*	5.33**
67 - Iron and steel	4.80**	-0.36 (-5.72)**	4.60	0.16	(US)(S)	0.27	0.88	7.63**
68 - Non-ferrous metals	1.55	-0.29 (-3.86)*	12.16	4.30**	(US)(US)	0.42	1.93	3.18*
69 - Manufactures of metals, n.e.s.	3.65	-0.55 (-6.53)**	8.30	4.11**	(US)(US)	0.54	0.35	0.45
71 - Power-generating machinery and equipment	3.71	-0.51 (-5.12)**	12.85	0.78	(S)(US)	0.43	0.00	3.35*
72 - Machinery specialized for particular industries	2.71	-0.21 (-3.25)	18.03	1.74	(S)(US)	0.61	2.24	1.09
73 - Metalworking machinery	1.87	-0.41 (-4.30)**	8.35	3.46*	(US)(US)	0.50	2.49	0.53
74 - General industrial machinery and equipment	3.26	-0.43 (-4.92)**	16.73	0.36	(US)(US)	0.47	3.29*	2.25
75 - Office machines and automatic data-processing machines	2.32	-0.35 (-4.30)**	10.95	0.29	(US)(US)	0.49	2.26	1.00
76 - Telecommunications and sound-recording	3.01	-0.16 (-3.64)	12.46	0.03	(US)(S)	0.38	10.77**	1.06
77 - Electrical machinery, apparatus and appliances	5.04**	-0.39 (-4.75)**	7.28	0.44	(S)(S)	0.52	0.58	10.49**
78 - Road vehicles (including air-cushion vehicles)	7.20**	-0.25 (-3.95)*	28.74**	1.67	(S)(US)	0.56	0.08	0.04
79 - Other transport equipment	3.76	-0.81 (-4.98)**	12.29	9.19**	(S)(US)	0.51	4.55**	13.06**
81 - Prefabricated buildings; sanitary, plumbing, heating	4.80**	-0.14 (-1.92)	18.53	5.63**	(S)(S)	0.59	4.70**	0.00
82 - Furniture, and parts thereof; bedding, mattresses	6.50**	-0.53 (-5.93)**	11.53	0.97	(S)(US)	0.52	0.00	4.99**
83 - Travel goods, handbags and similar containers	5.06**	-0.33 (-4.28)**	17.01	1.50	(S)(S)	0.55	8.86**	2.64
84 - Articles of apparel and clothing accessories	10.50**	-0.56 (-7.23)**	32.58**	2.56	(S)(S)	0.77	0.71	3.80*
85 - Footwear	5.89**	-0.30 (-3.66)*	30.89**	3.89	(S)(US)	0.60	0.43	3.72*
87 - Professional, scientific and controlling instruments	2.20	-0.49 (-5.17)**	18.99*	2.40	(S)(US)	0.55	1.14	0.00
88 - Photographic apparatus, equipment and supplies	2.14	-0.24 (-3.24)	8.27	0.45	(US)(S)	0.38	0.12	0.01
89 - Miscellaneous manufactured articles, n.e.s.	4.25*	-0.35 (-2.69)	20.97*	10.60**	(S)(US)	0.55	0.47	0.30

Notes: a. The critical value of the F test at the 10% (5%) significance level when there are three exogenous variables (k=3) is 3.77 (4.35). These come from Pesaran *et al*. (2001, Table CI-Case III, page 300). * (**) indicates a significant statistic at the 10% (5%) level.

b. Number inside the parenthesis next to ECM_{t-1} is the t-ratio, Its upper bound critical value is -3.66 (-3.99) at the 10% (5%) significance level and this comes from Pesaran et al. (2001, Table CII-Case III, page 303). Note that these values are for k=4.

c. LM is the Lagrange Multiplier test of residual serial correlation. It is distributed as χ^2 with 12 degrees of freedom. Its critical value at the 10% (5%) level is 18.54 (21.02).

d. RESET is Ramsey's test for misspecification. It is distributed as χ^2 with one degree of freedom and its critical value at 10% (5%) level is 2.71 (3.84). These critical values also apply to both Wald tests.