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The Impacts of the Dollar-Renminbi Exchange Rate Misalignment on the China-United States Commodity Trade: An Asymmetric Analysis

Abstract

Contrary to most existing studies of the literature that assumed that the effects of real exchange rate (RE) misalignment on trade flows are symmetric, this paper considers a more general and realistic framework allowing for possible asymmetric effects. We use monthly time-series data over the January 2002-October 2020 period from 66 two-digit industries that trade between China and the U.S. in order to avoid the well-known aggregation bias. Estimates of symmetric error-correction models (ECM) revealed that real dollar-renminbi rate misalignment has short-run effects on 35 U.S. exporting and 53 U.S. importing industries. These short-run effects translated into the long run in 18 and 17 industries, respectively. The numbers increased considerably when estimating asymmetric ECM. Indeed, short-run asymmetric effects were then found in 47 U.S. exporting and 62 U.S. importing industries, which translated into long-run asymmetric effects in 20 U.S. exporting and 21 U.S. importing industries. Our analysis highlights the importance of separating currency overvaluation from currency undervaluation in assessing the effects of the RE misalignment on trade flows between the U.S. and China and confirms that the impacts are industry specific. Our findings (robust to possible structural breaks) are useful for trading industries, and policymakers, and advocate accounting for asymmetries when examining the RE misalignment-trade flows nexus.

JEL-Codes: F140, F310, C100.

Keywords: asymmetry, nonlinear ARDL, exchange rate misalignment, commodity trade, China, the United States.

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I- Introduction

Since the early 2000s, China has become the major cause of the huge United States trade deficit (Ito, 2009; Tu and Zhang, 2019). Between 2000 and 2019, its share in the United States global trade deficit jumped from 19.05 percent to 40.40 percent. Over the same period, while the total United States exports to China increased in value from $16.1 billion in 2000 to $106.4 billion in 2019, China's exports to the United States swelled from $100 billion in 2000 to $ 451.6 billion in 2019. As a result, the United States trade deficit with China climbed from $38.8 billion in 2000 to $345.2 billion in 2019 (U.S. Census Bureau, 2020)[2]. As noted by Moosa *et al.* (2020) and Wan (2020), this trade deficit is among the major factors that have triggered the ongoing trade war between the two countries. In April 2018, the American government imposed additional tariffs of 25 percent on $50 billion worth of commodities imported from China. The Chinese government responded immediately by imposing 25 percent additional duty on the same amount of imports from the United States (for an extensive discussion see Yu and Zhang, 2019; Kwan, 2020; Liu and Lee, 2020).

Among American policymakers and academics[3],it is widely believed that the United States-China trade imbalance is a result of an undervaluation of the Chinese currency, renminbi (Groenewold and He, 2007; You and Sarantis**,** 2012). Such argument is sharply rejected by Chinese authorities (Xu, 2008; Nouira *et al.*, 2011). This controversial debate has motivated a number of studies to address this subject. However, existing empirical studies have so far provided mixed results and have failed to reach a consensus on the relationship between Chinese exchange rate and United States-China trade imbalance (Chiu *et al.*, 2010; Weber and Shaikh, 2020). While some support the United States view that a revaluation of the renminbi against the dollar would be helpful in reducing the bilateral United States-China trade deficit (Baak, 2008; Chiu *et al.*, 2010; Wang *et al.*, 2012; Cheung *et al.*, 2016; Hurley and Papanikolaou, 2020), others argue that such a revaluation would have only limited effects (Groenewold and He, 2007; Zhang, 2012; Kim and Kim, 2016; Shi and Li, 2017; Nasir and Jackson, 2019)[4]. A few other empirical researchers also

[2] Available at https://usatrade.census.gov/

[3]For instance, Paul Krugman (2009) considers the devaluation of the Chinese currency as one of the major causes of the huge United States trade deficit. This is also the view of the Trump administration, which has launched an aggressive trade policy aimed at reducing the trade deficit.

[4]Some recent studies argue that the United States trade deficit is mainly due to a decline in the investment and saving rather than competitive currency devaluations (see, e.g., Reinhart, 2017; Eichengreen, 2017; Fratzscher, 2017).

report evidence of a negative impact of a renminbi undervaluation on U.S. trade balance (Yang et *al.*, 2013; Allegret and Sallenave, 2014).

A review of the literature[5] reveals that most studies dealing with the impacts of real exchange rate (RE) misalignment on trade flows of the United States with China (or other country studies)[6]have implicitly supposed that the impacts of RE misalignment on imports and exports are symmetric. A great number of recent empirical studies, however, suggests that the effects of RE misalignment on economic activity in general, and on trade flows in particular, are likely to be asymmetric (Béreau*et al.*, 2012; Couharde, and Sallenave, 2013; Allegret and Sallenave, 2014; Tipoy and Zerihun, 2017; Wong, 2019; Cuestas *et al.*, 2020). For example, Allegret and Sallenave (2014) estimated a GVAR model to assess the impacts of exchange rate misalignment on global imbalances for 15 developed and emerging economies using data for the 1980–2010 period. They concluded that exports and imports respond to exchange rate misalignment in an asymmetric fashion. This asymmetrical response is mostly due to the shift in traders' anticipations; they might react to an undervaluation differently from an overvaluation. Since relative import prices underlie the impact of RE misalignment on trade (Mussa, 1984; Dornbusch, 1996), such asymmetry may be also attributed to the asymmetric response of export and import prices to RE changes (Bussiere 2013). Furthermore, it has been demonstrated that the response of the trade balance to exchange rate and/or its volatility is asymmetric (see *e.g.* Bahmani-Oskooee and Fariditavana, 2015; Nusair, 2017; Bahmani-Oskooee and Aftab, 2017; Arize*et al.*, 2017; Bahmani-Oskooee*et al.*, 2019; Nacir and Leung, 2020).Therefore, it is expected that the same holds for RE misalignments. This study aims at filling this gap of the literature by testing for asymmetric effects of RE misalignments.

Another common feature of prior studies is that they have mainly relied on aggregate trade data, which means that may suffer from the well-known aggregation bias problem. Indeed, as pointed out by Wong (2019), different industries may react differently to RE misalignment, depending on industry-specific factors such as the industry structure, the demand and supply elasticity, the firm heterogeneity, and the product quality (Melitz and Redding, 2014).Therefore, we consider in this paper commodity-level trade flows between the United Statesand China and

[5]For an extensive review, see Auboin and Ruta (2013).
[6]See, for instance, Sekkat and Varoudakis (2000), Nabli and Véganzonès-Varoudakis (2002), Diallo (2011), and Nicita(2013).

assess the possible symmetric as well as asymmetric effects of RE misalignment on the exports and imports of 66 commodities that trade between the two investigated countries. For this purpose, we make use of two recent econometric techniques, namely the symmetric (linear) ARDL approach of Pesaran *et al.* (2001) and the asymmetric nonlinear ARDL approach of Shin *et al.* (2014). Hence, unlike most existing studies that relied exclusively on the conventional symmetric framework, this paper aims at examining the RE misalignment-trade flows nexus using symmetric and asymmetric frameworks.

Specifically, this study makes four key contributions. First, while most existing studies rely on annual data on RE misalignment, we employ monthly data in our analysis. Second, we use highly disaggregated industry level data at the two-digit level in order to alleviate the aggregation bias from which most existing studies on this topic suffer. Third, we contribute to the related literature by allowing the impacts of RE misalignment on imports and exports to be asymmetric, and by investigating short and long-run effects employing the ARDL bounds testing approach based on the estimation of an Error Correction Model (ECM). To the best of author's knowledge this is the first empirical study that considers both a linear and a nonlinear framework to examine the impact of RE misalignment on imports and exports. Fourth, the choice of the specific case of the United States bilateral trade experience with China is due to two reasons: on the one hand, China represents the United States largest trading partner, and on the other, the United States is the major partner for Chinese compagnies.

From a policy point of view, exploring possible asymmetry in the response of exports and imports to RE misalignment at a disaggregate level may be of paramount importance. Indeed, it would allow to determine industries that could gain and those that could be hampered by an over and undervaluation, which would provide very useful information for policy makers. As noted by Diop *et al.* (2018), different sectors could have various levels of sensitivity to RE misalignments.

The paper is organised as follows. Section II presents the econometric methodology, while Section III discusses the estimation results. Section IV summarises the main findings and concludes.

II- Econometric methodology

As it is common in the related literature (see *eg.* Bahmani-Oskooee and Ardalani, 2006 ; Hurley and Papanikolaou, 2018), we assume that the level of economic activity or income and the real dollar-renminbi are the two most important determinants of the import and export demand functions. In an attempt to open a new path to this body of literature, we also incorporate a measure of RE misalignment as another determinant of imports and exports at commodity level. The theoretical and empirical literature reviewed by Auboin and Ruta (2013) shows that the RE misalignment should have a significant effect on international trade. Additionally, at the industry level, several studies such as those of Achy and Sekkat (2003) and Li et *al.* (2006) have provided evidence that industry exports are more responsive to the misalignment of the RE than its volatility. Thus, we consider the following extended regression models:

$$Ln X_{i,t}^{U.S.} = \alpha_1 + \alpha_2 \, Ln \, Y_t^{CH} + \alpha_3 \, Ln \, R \, E_t + \alpha_4 MIS_t + \varepsilon_t \qquad (1)$$

$$Ln \, M_{i,t}^{U.S.} = \beta_1 + \beta_2 \, Ln \, Y_t^{US} + \beta_3 \, Ln \, R \, E_t + \beta_4 MIS_t + \xi_t \qquad (2)$$

In equation (1) $X_i^{U.S.}$ denotes the United States export volume to China by industry$i$, which is assumed to depend on the Chinese income (Y^{CH}), the real dollar-renminbi exchange rate (RE), and the misalignment of REdenoted by MIS.Similarly, in Eq. (2), $M_i^{U.S.}$ refers tothe United States import volume from China by industry$i$ and is assumed to depend on the United States own income ($Y^{U.S.}$), RE, and MIS. $\varepsilon_t$and $\xi_t$are white noise disturbance terms. Since an increase in the income of the United States or China is expected to foster their bilateral trade, we expect estimates ofα_2 in (1) and β_2 in (2) to be positive. As for the signs of the estimates of α_3 and β_3, they will depend on the definition of RE. As indicated in the Appendix, the RE variable is specified in a way that an increase represents a depreciation of the dollar, or an appreciation of the renminbi. If a dollar depreciation is to foster industry i's exports and hamper the same industry imports, we expect the estimate of α_3 in (1) to be positive and that of β_3 in (2) to be negative. Lastly, as discussed in the introduction, RE misalignment, MIS, could have positive or negative effects on exports and imports. This involves that estimates of α_4 an $\beta_4$might be either positive or negative.

It is commonly argued in the economic literature that the impact of RE misalignment on trade flows is likely to be a short run phenomenon rather than a long run one (see Auboin and Ruta,

2013, and references therein). Therefore, to distinguish the short-run impacts of RE misalignment from its long-run impacts, we need to rewrite Eqs. (1) and (2) in an ECM format. Thus, we follow the Pesaran *et al.*'s (2001) ARDL bounds testing method. An appealing feature of this method is that both short-run and long-run effects are estimated simultaneously by applying the ordinary least square (OLS) method to the following models:

$$\Delta LnX_{i,t}^{US} = \lambda_1 + \sum_{j=1}^{n1} \lambda_{2j} \Delta LnX_{i,t-j}^{US} + \sum_{j=0}^{n2} \lambda_{3j} \Delta LnY_{t-j}^{CH} + \sum_{j=0}^{n3} \lambda_{4j} \Delta LnRE_{t-j} + \sum_{j=0}^{n4} \lambda_{5j} \Delta MIS_{t-j} + \Psi_1 LnX_{i,t-j}^{US} + \Psi_2 LnY_{t-1}^{CH} + \Psi_3 LnRE_{t-1} + \Psi_4 MIS_{t-1} + \vartheta_t \quad (3)$$

$$\Delta LnM_{i,t}^{US} = \delta_1 + \sum_{j=1}^{n5} \delta_{2j} \Delta LnM_{i,t-j}^{US} + \sum_{j=0}^{n6} \delta_{3j} \Delta LnY_{t-j}^{US} + \sum_{j=0}^{n7} \delta_{4j} \Delta LnRE_{t-j} + \sum_{j=0}^{n8} \delta_{5j} \Delta MIS_{t-j} + \eta_1 LnM_{i,t-j}^{US} + \eta_2 LnY_{t-1}^{US} + \eta_3 LnRE_{t-1} + \eta_4 MIS_{t-1} + \tau_t \quad (4)$$

In Eqs. (3) and (4), the coefficients of first-differenced variables represent short-run impacts. As for the long-run impacts, they are provided by the estimates of $\Psi_2 - \Psi_4$ normalized on $-\Psi_1$ in (3) and by the estimates of $\eta_2 - \eta_4$normalized on $-\eta_1$ in (4). Of course, the validity of the long-run estimates is conditioned by the existence of a cointegrating relationship among the relevant variables. Pesaran *et al.* (2001) suggest applying two tests. The F test is recommended to investigate joint significance of lagged level variables[7]. The t-test is suggested to test for the significance of $\Psi_1$in (3) and η_1 in (4)[8]. Since the distributions of the related test statistics are non-standard, new critical values have been tabulated for both tests that also account for the integration degree of the investigated variables. In fact, under this approach variables might be a combination of I(0) and I(1) processes which is a plausible assumption in applied works. This turns out to be another interesting feature of this method.

In the above models (1)–(4), we have supposed that the impacts of the RE misalignment on exports and imports are symmetric. In order to test whether the effects are asymmetric, we follow

[7]The null and alternative hypotheses in Eqs. (3) and (4) are, respectively,
$H_0: \Psi_1 = \Psi_2 = \Psi_3 = \Psi_4 = 0$ and $H_1: \Psi_1 \neq \Psi_2 = \Psi_3 \neq \Psi_4 \neq 0$
$H_0: \eta_1 = \eta_2 = \eta_3 = \eta_4 = 0$ and $H_1: \eta_1 \neq \eta_2 = \eta_3 \neq \eta_4 \neq 0$,
[8]Bahmani-Oskooee (2020) has demonstrated that estimates of Ψ_1 and $\eta_1$are exactly the same as the estimates of the coefficients attached to lagged error-correction terms due to Engle and Granger (1987).

Wong (2019) and Shin *et al.* (2014) in decomposing the MISvariable into positive changes denoted by $\Delta MIS^{+}$and negative changes, denoted by ΔMIS^{-}.In our case, given the adopted definition of RE, negative values reflect an undervaluation of the dollar against the renminbi (renminbi overvalued) and positive values indicate an overvaluation of the dollar against the renminbi (renminbi undervalued).

The two new time-series denoted by $MIS_t^{+}$and $MIS_t^{-}$are then generated using the partial sum concept as follows:

$$MIS_t^{+} = \sum_{j=1}^{t} \max(\Delta MIS, 0)\text{ , and } MIS_t^{-} = \sum_{j=1}^{t} \min(\Delta MIS, 0) \quad (5)$$

We then replace MIS variable in (3) and (4) with the two newly constructed variables, $MIS^{+}$and MIS^{-}. Thus, the asymmetric error-correction forms of eqs (3) and (4) will be specified as:

$$\begin{aligned}\Delta LnX_{i,t}^{US} = \theta_1 &+ \sum_{j=1}^{n1} \theta_{2j} \Delta LnX_{i,t-j}^{US} + \sum_{j=0}^{n2} \theta_{3j} \Delta LnY_{t-j}^{CH} + \sum_{j=0}^{n3} \theta_{4j}\, \Delta LnRE_{t-j} + \sum_{j=0}^{n4} \theta_{5j}\, \Delta MIS_{t-j}^{+} \\ &+ \sum_{j=0}^{n5} \theta_{6j}\, \Delta MIS_{t-j}^{-} + \mu_1 LnX_{i,t-j}^{US} + \mu_2 LnY_{t-1}^{CH} + \mu_3 LnRE_{t-1} + \mu_4 MIS_{t-1}^{+} \\ &+ \mu_4 MIS_{t-1}^{-} + \varkappa_t \end{aligned} \quad (6)$$

$$\begin{aligned}\Delta LnM_{i,t}^{US} = \gamma_1 &+ \sum_{j=1}^{n6} \gamma_{2j} \Delta LnM_{i,t-j}^{US} + \sum_{j=0}^{n7} \gamma_{3j} \Delta LnY_{t-j}^{US} + \sum_{j=0}^{n8} \gamma_{4j}\, \Delta LnRE_{t-j} + \sum_{j=0}^{n9} \gamma_{5j}\, \Delta MIS_{t-j}^{+} \\ &+ \sum_{j=0}^{n10} \gamma_{6j}\, \Delta MIS_{t-j}^{-} + \varphi_1 LnM_{i,t-j}^{US} + \varphi_2 LnY_{t-1}^{US} + \varphi_3 LnRE_{t-1} + \varphi_4 MIS_{t-1}^{+} \\ &+ \varphi_4 MIS_{t-1}^{-} + \omega_t \end{aligned} \quad (7)$$

Once the nonlinear ARDL specifications (6) and (7) are estimated, a number of asymmetric hypotheses may be formally tested. First, RE misalignment will have short-run asymmetric effects on industry i's exports and on industry i's imports if at a given lag order j,$\hat{\theta}_{5j} \neq \hat{\theta}_{6j}$ in (6) and $\hat{\gamma}_{5j} \neq \hat{\gamma}_{6j}$in (7). Second, short-run cumulative asymmetric effects will be supported if the Wald test rejects the null of $\sum \hat{\theta}_{5j} = \sum \hat{\theta}_{6j}$ in (6) and $\sum \hat{\gamma}_{5j} = \sum \hat{\gamma}_{6j}$in (7). Finally, RE misalignment will have long-run asymmetric effects on industry i's exports and on industry i's imports if the Wald test rejects the null of$\hat{\mu}_4/_{-\hat{\mu}_1} = \hat{\mu}_5/_{-\hat{\mu}_1}$ in (6) and $\hat{\varphi}_4/_{-\hat{\varphi}_1} = \hat{\varphi}_5/_{-\hat{\varphi}_1}$ in (7).

III- Empirical Results

Since the main goal of the current paper is to determine whether the impacts of the real dollar-renminbi rate misalignment on the United States-China commodity trade are symmetric or asymmetric, we estimate in this section four models: two symmetric ECM models (3) and (4), and two asymmetric ones (6) and (7). Both export and import demand models are estimated for each of the 66 commodities that traded among the two countries. We employ monthly time series data during the January 2002-October 2020 period[9]. All data sources and definitions are relegated in the appendix. A maximum of eight lags are considered in each estimated model and the optimum number of lags is chosen using the Akaike's Information Criterion (AIC). Furthermore, since our sample period includes the 2008 global financial crisis, we add a dummy variable in all estimated equations in order to account for it. Additionally, due to volume of the results, while short-run results are mentioned, they are not reported here to save space. [10] However, long-run results and related diagnostic tests are reported in the tables below and discussed.

We begin with the estimates of the symmetric ECM export demand equation (3) for each of the 66 industries. The short-run estimates reveal that RE misalignment (*i.e.*ΔMIS) exhibits at least one significant coefficient in 35 industries coded 02, 03, 04, 09, 11, 12, 21, 23, 27, 28, 33, 52, 53, 58, 59, 64, 65, 66, 67, 68, 69, 71, 72, 74, 75, 77, 78, 79, 82, 83, 87, 88, 89, 93, and 97. Based on their trade shares in Table 2, these industries represent almost 57.08% of the United States exports to China. However, as can be seen from Table 1, there is evidence of significant long-run effects in only 25 industries. Furthermore, since a(cointegrating) long-run relationship is not supported by neither the F test nor the ECM_{t-1}test in industries coded 01, 52, 63, 68, 74, 85, and 99 (see Table 2), only 18 American exporting industries coded 00, 05, 07, 22, 23, 26, 27, 32, 34, 51, 53, 54, 57, 71, 72, 84, 88, and 89 are affected by RE misalignment in the long run. Interestingly, except industry 34, in the remaining 17 industries all estimates are negative, implying that dollar-renminbi rate misalignment has an adverse effect on United States exports of these industries to China. The largest industry with an export share of 23.87%, coded 22 (Oil Seeds and Oleaginous), is included on the

[9]As a preliminary step we have checked that all series under investigation were either I(0), and I(1) by carrying out conventional unit-root tests. The results (not reported here to save space but available upon request) confirm that all series are at most integrated of order one-I(1)- but not I(2), and that the dependent variable of all equations is I(1). This legitimates the implementation of an ARDL approach.

[10] The initial version of the paper also included six additional tables which displayed short-run coefficient. These tables are now available upon request from authors.

list and 17 industries that are hurt by RE misalignment constitute almost 40.64% of the trade. Therefore, these findings seem to support the view that currency misalignment should have a negative effect on exports (see, Sekkat and Varoudakis, 2000; Olimilov and Sirajiddinov, 2008; Diallo, 2011).

As for the impacts of the real dollar-renminbi rate, the results show that it exhibits its expected positive and statistically significant coefficient estimate in 50 industries coded 00, 02, 03, 04, 05, 07, 08, 11, 21, 22, 23, 24, 25, 26, 27, 32, 33, 42, 51, 52, 53, 54, 57, 58, 61, 64, 65, 67, 71, 72, 73, 74, 76, 78, 79, 81, 82, 88, 89,97 and 89. This suggests that a dollar depreciation against the renminbi will increase the United States exports of these industries to China. The results also indicate that a dollar depreciation will reduce exports of only three industries coded 06, 73, and 56. Finally, the Chinese industrial production index has its expected significant and positive coefficient in 12 industries coded 00, 08, 21, 23, 26, 42, 51, 53, 61, 63, 73, and 82, suggesting that as the Chinese economy grows, the United States exports more of these goods to China[11].

[Table 1]

[Table 2]

In Table 2, in addition to the F and ECM_{t-1} tests we have also reported some additional diagnostics. The Lagrange Multiplier (LM) and Ramsey's RESET tests are performed to check for residual autocorrelation and model misspecification, respectively. In more than two-third of the cases, both statistics are insignificant, thus supporting autocorrelation free residuals and correct specification for most models. Besides, we have also examined the stability of all coefficient estimates by applying the well-known CUSUM and CUSUMSQ tests to residuals of each estimated model. Stable coefficient estimates are denoted by "S" and unstable coefficient estimates by "US". As Table 2 reveals, most estimates are stable. Lastly, from the size of adjusted R^2, we can conclude that most of the estimated models enjoy a good fit.

Next, we consider the estimates of the linear United States import demand function or Chinese export function to the United States outlined by Eq. (4). The long-run estimates and the related

[11]There are 14 industries coded 01, 05, 27, 33, 54, 55, 72, 83, 84, 85, 88, and 89 in which Chinese industrial production index exhibits a negative and significant coefficient. These are the industries that export less as Chinese economy grows. These must be industries for which China has close substitute and as its economy grows, it produces more of these products (Bahmani-Oskooee, 1986).

diagnostic tests are displayed in Tables 3-4, respectively. The short-run estimates (available upon request) reveal that the ΔMIS variable exhibits at least one significant coefficient in 53 out of 66 industries, supporting short-run effects of the real dollar- renminbi rate misalignment on United States imports (or Chinese exports). Based on the trade shares from Table 3, the 53 industries together account for almost 98.24% of China exports to the United States. However, as Tables 3 and 4 show, there is evidence of significant and meaningful long-run effects in only 17 industries. Furthermore, Chinese exports to the United States are hampered by dollar-renminbi rate misalignment in 12 industries (coded as 03, 05, 06, 23, 25, 27, 42, 52, 55, 76, 84, and 96) and are fostered in the remaining five industries (coded as 12, 21, 33, 81, and 88). The 12 industries that are hurt, together account for almost 54.31% of China's exports to the United States and the five industries that gain from dollar-renminbi rate misalignment represent 3.41% of Chinese exports to the United States. Two relatively large importing industries, that is 76 (Telecommunications Equipment with 17.57% share of trade) and 84 (Articles of Apparel and Clothing with 5.80% share of trade) are in the first group and 81 (Prefab Buildings; Sanitary, Plumbing, etc. with 1.49% share of trade) is in the second group. Other diagnostic test results are quite analogous to those of the United States export demand function and therefore don't require any further comments.

[Table 3]

[Table 4]

All in all, the empirical findings from symmetric ECM models reveal that while real dollar-renminbi rate misalignment has significant short-run impacts on the United States exports and imports of most industries, short-run impacts translated into the long run impacts only in 18 American exporting industries and 19 American importing industries. How do these outcomes change if we consider a more general framework allowing for possible asymmetries in the impact of the RE misalignment on the trade balance?

We first consider the estimates of the asymmetric ECM export demand function outlined by Eq. (6) for each American exporting industry to China. Again, as the results are voluminous, short-run estimates are not reported here. Long-run estimates are included in Table 5 and the related diagnostic tests in Table 6.

From the short-run estimates (available upon request), it can be seen that either the ΔMIS^{+} (dollar overvaluation or renminbi undervaluation) or ΔMIS^{-} (dollar undervaluation or renminbi overvaluation) variable exhibits at least one significant lagged coefficient estimate (at least at the 10% significance level) in 47 industries, suggesting that real dollar-renminbi rate misalignment affects most of the American exporting industries in the short run. While many of the 47 industries are small, the ten largest industries are among the list. They are : 22 (Oil Seeds and Oleaginous with 23.87% export share), 33 (Petroleum, Petroleum Products with 6.27% export share), 34 (Gas, Natural and Manufactured with 2.27% export share), 54 (Medicinal and Pharmaceutical Products with 2.80% export share), 72 (Machinery Specialized with 3.64% export share), 74 (General Industrial Machry with 2.42% export share), 77 (Electrical Machry, Apparatus &Appliances with 9.63% export share), 78 (Motor Vehicles with 7.99% export share), 79 (Transport Equipment with 4.77% export share), and 87 (Professional Scientific Instruments with 4.22% export share). Furthermore, the 47 industries together account for 88.14 % of the United States exports to China. This rise in the number of affected industries from 35 with a 57.08% export share in the symmetric ECM model to 47 with a 88.14% export share in asymmetric ECM model can be due to the asymmetric adjustment of the real dollar- renminbi rate.

It can be also seen that, at any given lag j, the coefficient estimate associated to the ΔMIS^{+}_{t-j} variable is distinctfrom the one attached to the ΔMIS^{-}_{t-j}variable, advocating the short-run asymmetric impacts of RE misalignment. However, the sum of the coefficient estimates attached to ΔMIS^{+}_{t-j} are significantly distinct from the sum attached to ΔMIS^{-}_{t-j} only in 13 industries coded 03, 07, 12, 24, 28, 58, 63, 64, 65, 72, 74, 79, and 89. Indeed, as Table 6 shows, the Wald-S test is significant in these 13 industries, rejecting the hypothesis of the equality of the two sums and therefore advocating short-run asymmetric impacts.

[Table 5]

[Table 6]

In how many and in which industries do short-run asymmetric impacts carry over into long-run asymmetric impacts? From Table 5, it can be seen that the estimated coefficients of either the MIS^{+}or MIS^{-} variable are significant in a total of 27 industries. However, the F test or the ECM_{t-1} test reported in Table 6 suggests that the estimates are statistically meaningful only in 20 industries. Specifically, dollar overvaluation (or renminbi undervaluation) seems to foster the United States

exports (or Chinese imports) of industries coded 04, 09, 29, 43, 63, 72, 81, and 93. These industries are all small except 04 (Cereals and Cereal Preparation with 2.23% export share) and 72 (Machinery Specialized with 3.64 export share). However, dollar overvaluation will hamper the exports of industries coded 00, 22, and 54. The largest industry that is, 22 with 23.87% export share, is in the list. Based on the export shares, it appears that while only 6.71% of the United States exports to china will benefit from dollar overvaluation, 26.67 % of its exports will be hurt. As for the long-run impacts of the MIS^{-} variable, it exhibits a significantly positive and meaningful coefficient in five industries coded 04, 09, 43, 63, and 93, implying that a dollar undervaluation (or a renminbi overvaluation) will hamper the United States exports of these industries. The sum of the export shares of these industries amounts to almost 2.52%. However, dollar undervaluation will foster the exports of industries coded 00, 03, 05, 07, 22, 23, 26, 54, 55, 71, 85,87, and 89 which all together have an export share of 38.08%. This finding, which is consistent with those of Nabil and Véganzonès-Varoudakis (2002), Rodrik (2008), and Wong (2019), seems to confirm the argument that currency undervaluation (overvaluation) has a favorable (adverse) effect on exports.

Next, we turn to estimates of the asymmetric ECM import demand function. Again, due to the volume of the obtained results, while we discuss short-run estimates, they are not reported here. From short-run estimates (available upon request) we learn that either the ΔMIS^{+} or ΔMIS^{-} variable exhibits at least one significant lagged coefficient (at least at the 10% significance level) in all industries except 08, 11, 68, and 79, leaving us with 62 industries. These 62 industries together account for 99.70% of the trade. Thus, it appears that almost all-American importing industries (or Chinese exporting industries) are affected by dollar overvaluation or undervaluation in the short run. By comparing the size of the coefficient estimates we also learn that at any given lag j, the coefficient of the ΔMIS^{+} variable is distinct from the one of the ΔMIS^{-} variable, supporting the short-run asymmetric effects of RE misalignment. However, the sum of the coefficient estimates attached to both variables are significantly different from each other only in 24 industries coded 00, 01, 33, 53, 55, 57, 63, 64, 65, 66, 69, 73, 75, 76, 77, 82, 83, 84, 85, 87, 88, 89, 93, and 97. These are industries in which the Wald-S test reported in Table 14 is statistically significant, thus rejecting the hypothesis of the equality of the two sums attached to ΔMIS^{+} and ΔMIS^{-} variables.

[Table 7]

[Table 8]

As regards long-run estimates, the results outlined in Table 7 indicate that either the MIS^{+} orMIS^{-}variable exhibits a statistically significant coefficient in 27 small and large industries. However, since neither the F test nor the ECM_{t-1} test support cointegration in industries coded 11, 33, 56, 62, 77, and 81 (see Table 8), short-run impacts carry over into long-run significant and meaningful impacts only in the 21 American importing industries (or Chinese exporting industries). Specifically, dollar overvaluation seems to increase the United States imports (or Chinese exports) of industries coded 09, 12, 88, and 93. However, dollar overvaluation will hamper the imports of industries coded 03, 06, 08, 23, 25, 27, 32, 42, 52, 55, 75, 76, 84, 95, 96, and 98. This means (based on the import shares) that a total of 1.79% of United States imports from China will gain advantage from dollar overvaluation, a total of 39.56 % will be hurt. While one sizeable industry, *ie.*39 (Special Transactions with 1.11% import share) is in the first list, three sizeable industries are in the second list. They are: 75 (Official Machines and Adp Equipment with 14.34% import share) 76 (Telecommunications Equipment with 17.57% import share), and 84 (Articles of Apparel and Clothing with 5.80% import share). As regards the long-run impacts of dollar undervaluation, the MIS^{-} variable exhibits a negative and meaningful coefficient estimate in industries coded 08, 09, 23, 25, 27, 42, 52, 59, 75, 76, 93, and 96 (with an import share of 33.89%). Thus, dollar undervaluation will help 33.86% of United States imports from China. On the other hand, dollar undervaluation will lower the imports of only two industries coded 12 and 88 which together have an import share of 0.55%.

As a robustness check, we investigate whether the findings of asymmetry obtained in Tables 5 and 7 are robust to the possible presence of structural breaks in the mean of the series under investigation. To do so, we first use the Hansen (1997) test to detect (possible) endogenous break dates in each industry. The identified structural breaks (if any) are then incorporated in the nonlinear ARDL specifications (6) and (7) by adding a dummy variable for each break date. As can be seen in Tables 9 and 10 in the Appendix B, there is still strong evidence of asymmetry even after accounting for the presence of structural breaks. Furthermore, when allowing for structural breaks, the number of affected industries in the long run increases. In the nonlinear export model, dollar overvaluation exhibits a significant and meaningful coefficient in 23 industries coded as 03,05, 09,21, 22, 25, 26, 28, 29, 34, 52, 53,55, 56, 61, 63, 64, 65, 74, 76, 84 and 88, and dollar undervaluation in 16 industries coded as 03, 04, 05, 07, 08, 21, 23, 66, 69, 73, 74, 75, 79, 83, 88, and 97. In the

nonlinear import model, dollar overvaluation has a significant and meaningful coefficient in 29 industries coded 05, 07, 08, 11, 12, 23, 26, 27, 29, 32, 33, 42, 51, 52, 53, 54, 59, 62, 65, 67, 69, 71, 74, 77, 79, 81, 88, 93, and 96, and dollar undervaluation in 31 industries coded as 00, 03, 06, 09, 11, 24, 25, 27, 29, 33, 43, 51, 52, 55, 56, 57, 64, 66, 69, 71, 72, 74, 76, 77, 78, 79, 81, 84, 85, 87, and 89.

Overall, our empirical evidence confirms the existence of an asymmetric effect of the RE misalignment on imports and exports at a disaggregated level. The results suggest that while a dollar overvaluation against the renminbi will lower the bilateral commodity trade between the United States and China, a dollar undervaluation will promote it. Therefore, our findings complement those obtained by Allegret and Sallenave (2014), who showed using aggregated data that an overvaluation, and an undervaluation do not have the same impacts on exports and imports.

IV- Conclusion

In this paper, we have investigated whether RE misalignment has symmetric or asymmetric impacts on imports and exports. To that end, we have implemented two recent econometric techniques which are the symmetric (linear) ARDL approach of Pesaran *et al.* (2001), and the asymmetric nonlinear ARDL approach suggested by Shin *et al.* (2014). The analysis was carried out using disaggregated data for 66 industries that traded between China and the United States. This permits to avoid the aggregation bias from which most existing studies on this topic suffer. Overall, our findings from the symmetric ECM models yielded the evidence of significant short-run impacts of the real dollar-renminbi rate misalignment on 35 American exporting industries to China, and 53 American importing industries from China. However, in the long run, only the trade of 18 exporting industries and 17 importing industries was found to be influenced by real dollar-renminbi rate misalignment. These numbers increased when we shifted to the estimates of asymmetric ECM models.

Specifically, asymmetric ECM results revealed the evidence of short-run effects in 47 American exporting industries which carried over into long-run asymmetric impacts in 19 industries. Moreover, the long-run asymmetry results indicated that an overvaluation of the dollar against renminbi worsens the exports of three industries that export 26.67% and fosters the exports of eight industries that have 6.71% export share. On the other hand, our results indicated that an undervaluation of the dollar against renminbi worsens the exports of only three industries that have

2.52% export share. It, however, boosts the exports of 13 industries with 38.08% shares of U.S. exports to China. These findings seem to support the arguments of Gala (2008) and Mbaye (2013), who noted that a currency undervaluation can foster exports by increasing investment and savings and by improving total factor productivity.

As for United States imports from China, the asymmetric ECM models revealed that there was evidence of significant short-run impacts of real dollar-renminbi rate misalignment in 62 industries which translated into the long run, only in 21 industries. Asymmetric long run estimates suggested that an overvaluation of the dollar against renminbi will increase the United States imports of four industries which account for 1.79% of United States imports from China. However, it will lower the imports of 12 industries with 39.56% shares of United States imports. On the other hand, an undervaluation of the dollar was found to increase the imports of 12 industries with 33.89% import shares and hurt the imports of only two industries which have 0.55% import share.

Clearly, our analysis underscores the importance of separating currency overvaluation from currency undervaluation in assessing the effects of the RE misalignment on trade flows. For instance, the symmetric ECM model indicated no long-run effect in the American exporting industry 87 (Professional Scientific Instruments with 4.22% share of the United States exports to China). However, the asymmetric ECM model revealed that while an overvaluation of the dollar against renminbi had no effect, an undervaluation of the dollar had a favorable effect. Similarly, within the symmetric model, no long-run effect was discovered for another relatively large American exporting industry (04, Cereals and Cereal Preparation with 2.23% export share). In contrast, the asymmetric model suggested that an overvaluation of the dollar will increase this industry exports and an undervaluation reduce its exports to China. Therefore, our results provide evidence advocating the existence of the asymmetric impacts of the RE misalignment on trade flows. In this respect, our findings may be very useful in future research, as they suggest that academics should account for asymmetry when exploring the RE misalignment-trade flows nexus.

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Appendix A

Data Definitions

Sources

Monthly data over the January 2002-October 2020 period are employed in the empirical analysis. The data come from the following three sources:

a. International Financial statistics (IFS)
b. U.S. Census Bureau, https://usatrade.census.gov/
c. Federal Reserve Economic Data (FRED), https://fred.stlouisfed.org/

Variables

X_i^{US}= United States' export volume to China by industry$i$. Due to the unavailability of export prices at industry level, nominal exports in terms of dollar are deflated by the United States aggregate export price index as in Bahmani-Oskooee and Hegerty (2009). While nominal exports for each commodityare derived from source b, the aggregate export price index is derived from source c.
M_i^{US}= United States'import volume to China by industry$i$. Again, nominal imports in terms of dollar are deflated by the United States aggregate import price index. While nominal imports for each commodityare derived from source b, the aggregate import price index is derived from source c.
IP^{US} = United States' economic activity. As data are monthly, we use industrial production index as a proxy of economic activity in line with, among others, Bahmani-Oskooee and Ardalani (2006), and Bahmani-Oskooee *et al.* (2020). Data are derived from source c.
IP^{CH} = China's economic activity, also measured by the industrial production index. Data are derived from source c.
RE_t= Real bilateral exchange rate between dollar and renminbi. It is calculated as follows:

$$\frac{CPI_t^{CH}}{(NEX_t \times CPI_t^{US})}$$

, where $NEX_t$is the nominal exchange rate defined as number of renminbi per American dollar. CPI^{US} and CPI^{CH} are consumer price indices for the United States and China, respectively. Thus, an increase in REindicates a real depreciation of the dollar. All data are derived from Source a.

MIS = Misalignment degree defined as the deviation between the RE and its equilibrium level, the ERE. Given the adopted definition of RE, positive values reflect an overvaluation of the dollar against the renminbi.

To estimate ERE, we rely on the well-known Behavioral Equilibrium Exchange Rate (BEER) method initially proposed by Clark and MacDonald (1998) (for more details, see Couharde*et al.* 2018). Specifically, we consider the following model:

$$\ln(RE_t) = \alpha_0 + \alpha_1 \ln(NFA_t) + \alpha_2 \ln(BS_t) + \alpha_3 \ln(Trade_t) + \varepsilon_t$$

, where NFA denotes the ration of a Net foreign asset over trade volume (see Baak, 2017), BS is the difference between the China ratio of the CPI over the PPI and the same ratio of the United States (Sallenave, 2009), and Trade is the Term of Trade defined as the ratio of export to import prices (Nouira and Sekkat, 2012). All the variables come from source c.

The estimated equation with the t-ratios in brackets are as follows:

$$\underset{}{\ln(RE)} = \underset{(10.54)}{4.66} + \underset{(5.32)}{0.066} * \ln(NFA_t) - \underset{(-11.27)}{0.11} * \ln(BS_t) + \underset{(3.64)}{0.015} * \ln(Trade_t)$$

Table 1: Long-Run Coefficient Estimates of Linear ECM Export Demand Function					
Industries		Long-Run Coefficient Estimates			
	Trade Share(%)	*Constant*	*Ln* Y^{CH}	*Ln* RE_t	MIS_t
00 LIVE ANIMALS#	0,00	-30.546(2.11)**	13.23(2.36)**	7.29(3.85)**	-0.173(2.14)**
01 MEAT AND MEAT PREPARATIONS	1,87	4.235(1.55)	-11.364(1.72)*	3.041(1.36)	-0.22(2.34)**
02 DAIRY PRODUCTS AND BIRDS' EGGS#	0,26	-2.097(0.77)	-0.460(0.15)	6.201(6.59)**	-0.043(1.13)
03 FISH (EXCEPT MARINE MAMMAL)#	0,49	-1.626(0.28)	-0.209(0.12)	3.909(6.50)**	-0.035(1.54)
04 CEREALS AND CEREAL PREPARATION	2,23	-13.524(1.00)	3.620(0.44)	9.077(3.31)**	0.154(1.39)
05 VEGETABLES AND FRUIT	1,29	12.59(2.50)**	-7.384(3.61)**	3.418(5.84)**	-0.072(2.92)**
06 SUGARS, SUGAR PREPARATIONS#	0,06	2.397(0.52)	-1.753(0.74)	-2.757(3.75)**	-0.020(0.67)
07COFFEE, TEA, COCOA	0,02	-4.109(0.65)	0.194(0.07)	4.800(5.40)**	-0.083(2.36)**
08 FEEDING STUFF FOR ANIMALS#	0,59	-15.928(3.54)**	4.492(1.94)*	9.129(11.88)**	0.036(1.22)
09 MISCELLANEOUS EDIBLE	0,27	6.266(1.47)	-4.582(1.37)	0.614(0.56)	0.001(0.04)
11 BEVERAGES	0,05	-8.806(1.95)*	1.699(0.53)	7.540(7.91)**	-0.055(1.41)
12 TOBACCO AND TOBACCO	0,00	3.735(0.06)	1.848(0.13)	-1.931(0.31)	0.342(1.54)
21 HIDES, SKINS AND FURSKINS	0,27	-11.044(3.80)**	19.051(3.14)**	4.007(3.07)**	0.054(1.10)
22 OIL SEEDS AND OLEAGINOUS	23,87	10.15(0.38)	-6.717(1.14)	8.177(4.31)**	-0.27(3.81)**
23 CRUDE RUBBER	0,13	-18.733(4.92)**	11.161(6.77)**	4.789(9.33)**	-0.074(3.49)**
24 CORK AND WOOD#	0,90	1.136(0.44)	-2.965(0.73)	3.888(3.00)**	0.025(0.50)
25 PULP AND WASTE PAPER	1,39	-2.094(1.55)	7.466(1.30)	3.258(2.00)**	-0.060(1.14)
26 TEXTILE FIBERS	1,19	-14.349(1.98)**	7.842(2.82)**	2.847(3.50)**	-0.057(1.87)*
27 CRUDE FERTILIZERS#	0,16	6.854(2.39)**	-3.742(2.65)**	2.063(4.24)**	-0.046(2.24)**
28 METALLIFEROUS ORES	0,99	-0.001(0.00)	5.69(0.54)	-3.003(0.51)	0.110(0.65)
29 CRUDE ANIMAL AND VEGETABLE MATERIALS	0,23	3.694(1.17)	-4.107(1.40)	1.600(1.63)	0.046(0.94)
32 COAL, COKE AND BRIQUETTES#	0,00	-87.970(2.47)**	18.334(1.32)	29.465(5.22)**	-0.645(3.06)**
33 PETROLEUM, PETROLEUM PRODUCTS	6,27	37.352(3.61)**	-24.659(4.17)**	2.407(1.96)**	-0.073(1.14)
34 GAS, NATURAL AND MANUFACTURED	2,27	44.147(1.38)	-19.437(1.13)	-9.77(1.13)	0.692(2.44)**
41 ANIMAL OILS AND FATS	0,00	-0.902(0.09)	2.911(0.84)	-0.815(0.62)	0.009(0.18)
42 FIXED VEG. FATS & OILS	0,01	-49.793(2.43)**	11.037(2.17)**	7.718(4.43)**	-0.018(0.25)
43 ANML/VEG FATS/OILS PROCESS/WASTE	0,00	26.462(2.17)**	-5.774(1.56)	-3.278(2.92)**	-0.007(0.17)
51 ORGANIC CHEMICALS#	1,36	-2.661(1.02)	2.118(2.01)**	2.429(6.58)**	-0.034(2.28)**
52 INORGANIC CHEMICALS	0,46	-5.13(1.92)*	2.653(1.48)	4.941(8.20)**	-0.126(5.05)**
53 DYEING, TANNING AND COLORING MATERIALS#	0,27	-7.530(3.01)**	4.343(2.56)**	5.225(9.81)**	-0.094(4.36)**
54 MEDICINAL AND PHARMACEUTICAL PRODUCTS#	2,80	29.373(4.12)**	-21.346(8.78)**	3.821(5.66)**	-0.137(4.41)**
55 ESSENTIAL OILS	0,74	7.631(2.51)**	-14.071(3.50)**	1.060(0.85)	-0.069(1.57)
56 FERTILIZERS#	0,15	38.266(2.38)**	-5.471(1.34)	-4.604(3.33)**	0.046(0.78)
57 PLASTICS IN PRIMARY FORM	2,02	2.009(1.11)	1.575(0.83)	2.446(4.10)**	-0.062(2.62)**
58 PLASTICS IN NONPRIMARY FORM#	0,76	0.772(0.55)	-1.320(0.48)	2.50(2.52)**	-0.051(1.35)

59 CHEMICAL MATERIALS	2,01	0.327(0.12)	-0.166(0.01)	2.168(0.66)	-0.122(0.87)
61 LEATHER, LEATHER MFR	0,07	-17.677(3.59)**	22.851(2.54)**	5.747(3.48)**	0.071(1.23)
62 RUBBER MANUFACTURES	0,18	1.077(0.41)	-2.162(0.35)	1.910(0.79)	-0.028(0.37)
63 CORK AND WOOD MANUFACTURES	0,02	-7.515(1.94)*	12.554(2.85)**	0.090(0.06)	0.149(2.40)**
64 PAPER, PAPERBOARD#	0,39	8.562(4.85)**	-1.570(2.65)**	0.523(2.51)**	0.006(0.82)
65 TEXTILE YARN, FABRICS	0,29	-0.655(0.48)	2.344(1.20)	1.579(2.57)**	-0.029(1.26)
66 NONMETALLIC MINERAL	0,48	-2.079(0.75)	7.97(0.49)	2.906(1.29)	0.039(0.30)
67 IRON AND STEEL#	0,50	-0.375(0.11)	1.712(0.91)	1.386(2.07)**	-0.027(0.97)
68 NONFERROUS METALS	2,14	7.800(1.78)*	-8.493(1.54)	0.833(0.46)	-0.191(2.81)**
69 MANUFACTURES OF METALS	0,71	-2.385(1.51)	13.793(0.52)	4.213(1.32)	-0.055(0.53)
71 POWER GENERATING MACHINERY	1,26	4.555(1.29)	-0.462(0.62)	2.450(10.01)**	-0.035(3.57)**
72 MACHINERY SPECIALIZED	3,64	10.758(2.39)**	-6.755(2.66)**	1.438(1.87)*	-0.058(1.96)**
73 METALWORKING MACHINERY	0,20	-15.531(4.12)**	9.415(5.30)**	2.785(5.35)**	-0.015(0.78)
74 GENERAL INDUSTRIAL MACHRY	2,42	0.711(0.42)	0.301(0.22)	2.337(5.88)**	-0.035(2.12)**
75 OFFICE MACHINES AND ADP EQUIPMENT	1,12	3.330(1.39)	0.183(0.13)	0.448(1.02)	-0.021(1.21)
76 TELECOMMUNICATIONS EQUIPMENT	0,87	-1.245(0.73)	3.755(1.30)	1.745(1.78)*	0.006(0.16)
77 ELECTRICAL MACHRY, APPARATUS & APPLIANCES	9,63	0.350(0.23)	0.650(0.08)	0.639(0.24)	-0.087(0.78)
78 MOTOR VEHICLES	7,99	-1.241(0.34)	-1.331(0.20)	7.775(4.20)**	-0.088(1.13)
79 TRANSPORT EQUIPMENT#	4,77	-1.757(0.33)	0.833(0.23)	4.120(3.15)**	-0.011(0.22)
81 PREFAB BUILDINGS; SANITARY, PLUMBING, ETC.	0,03	8.708(1.85)*	-2.097(1.69)*	1.632(4.20)**	-0.014(0.91)
82 FURNITURE & BEDDING	0,05	-10.736(4.49)**	11.019(2.99)**	4.565(4.55)**	0.020(0.60)
83 TRAVEL GOODS, HANDBAGS	0,04	18.792(2.43)**	-16.894(3.31)**	2.096(1.32)	-0.048(0.77)
84 ARTICLES OF APPAREL AND CLOTHING#	0,07	14.453(3.01)**	-10.268(4.35)**	1.13(1.42)	-0.056(1.66)*
85 FOOTWEAR	0,10	5.902(1.19)	-12.887(2.03)**	1.881(0.85)	-0.138(1.82)*
87 PROFESSIONAL SCIENTIFIC INSTRUMENTS	4,22	-3.808(1.69)*	18.77(0.56)	5.920(1.14)	-0.070(0.52)
88 PHOTO APPT, EQUIPMENT & OPTICAL GOODS#	0,64	4.981(2.48)**	-4.325(2.56)**	2.060(3.43)**	-0.047(2.01)**
89 MISCELLANEOUS MANUFACTURED ARTICLES#	1,92	6.480(2.09)**	-5.159(2.93)**	2.645(4.99)**	-0.059(2.73)**
93 SPECIAL TRANSACTIONS	0,25	1.009(0.17)	-0.671(0.06)	0.222(0.07)	0.171(0.70)
97 GOLD, NONMONETARY	0,00	-2.091(0.10)	-2.859(0.38)	5.782(1.90)*	0.050(0.42)
99 LOW VALUE SHIPMENTS	0,63	-1.131(0.72)	0.887(0.47)	3.814(5.91)**	-0.063(2.48)**

Notes:

a. # indicates that the 2008Global Financial Crisis dummy was statistically significant (at least at the 10% significance level).

b. * and ** indicate significance at 10% and 5% levels, respectively.

Table2: Diagnostic Statistics Related to Linear ECM Export Demand Function.							
Industries	**Diagnostics**						
	F Stat	***ECM_{t-1}***	***LM***	***RESET***	***CUSUM***	***CUSUMSQ***	***Adj. R^2***
00 LIVE ANIMALS	4.216*	-0.366(4.10)**	0.178	0.41	S	S	0.331
01 MEAT AND MEAT PREPARATIONS	2.367	-0.076(3.05)	0.058	2.55	S	S	0.055
02 DAIRY PRODUCTS AND BIRDS' EGGS	5.240**	-0.220(4.76)**	0.155	1.50	S	S	0.183
03 FISH (EXCEPT MARINE MAMMAL)	4.986**	-0.551(4.74)**	0.000	4.90**	S	S	0.407
04 CEREALS AND CEREAL PREPARATION	4.543**	-0.287(4.66)**	0..776	1.24	S	S	0.263
05 VEGETABLES AND FRUIT	3.502	-0.381(3.96)**	5.310**	6.83**	S	S	0.307
06 SUGARS, SUGAR PREPARATIONS	6.414**	-0.347(5.54)**	0.015	0.09	S	S	0.303
07COFFEE, TEA, COCOA	3.287	-0.372(3.73)*	0.828	3.61*	S	S	0.358
08 FEEDING STUFF FOR ANIMALS	8.262**	-0.321(6.14)**	1.715	1.98	S	S	0.312
09 MISCELLANEOUS EDIBLE	3.519	-0.204(4.10)**	0.758	2.05	S	S	0.213
11 BEVERAGES	3.228	-0,289(3.03)	3.666*	1.28	S	S	0.390
12 TOBACCO AND TOBACCO	10.826**	-0.825(7.23)**	0.472	4.67**	S	S	0.435
21 HIDES, SKINS AND FURSKINS	4.258*	-0.116(2.47)	1.107	1.40	S	S	0.316
22 OIL SEEDS AND OLEAGINOUS	12.737**	-0.799(7.83)**	0.651	13.32**	S	S	0.331
23 CRUDE RUBBER	8.516**	-0.309(5.92)**	0.019	2.40	S	US	0.272
24 CORK AND WOOD	3.480	-0.113(3.45)	0.098	2.98*	S	S	0.238
25 PULP AND WASTE PAPER	4.045*	-0.060(1.55)	0.735	2.83*	S	S	0.166
26 TEXTILE FIBERS	10.692**	-0.407(6.83)**	0.982	3.12*	S	S	0.257
27 CRUDE FERTILIZERS	4.342	-0.32*(4.24)**	2.094	0.64	S	S	0.460
28 METALLIFEROUS ORES	2.209	-0.045(1.72)	1.020	1.71	S	S	0.129
29 CRUDE ANIMAL AND VEGETABLE MATERIALS	1.903	-0.154(2.26)	1.484	0.50	S	S	0.336
32 COAL, COKE AND BRIQUETTES	6.313**	-0.439(5.51)**	0.103	1.83	S	US	0.326
33 PETROLEUM, PETROLEUM PRODUCTS	6.496**	-0.325(5.13)**	1.865	1.34	S	S	0.300
34 GAS, NATURAL AND MANUFACTURED	3.845*	-0.320(3.66)*	2.222	2.16	S	S	0.321
41 ANIMAL OILS AND FATS	4.805**	-0.531(4.81)**	1.708	1.44	S	US	0.468
42 FIXED VEG. FATS & OILS	8.463**	-0.649(6.33)**	0.020	1.52	S	S	0.337
43 ANML/VEG FATS/OILS PROCESS/WASTE	5.712**	-0.525(5.22)**	0.824	1.51	S	S	0.486
51 ORGANIC CHEMICALS	10.796**	-0.436(7.02)**	0.013	0.26	S	US	0.278
52 INORGANIC CHEMICALS	3.229	-0.258(3.43)	0.000	1.09	S	S	0.352
53 DYEING, TANNING AND COLORING MATERIALS	5.410**	-0.250(4.70)**	0.149	0.83	S	S	0.246
54 MEDICINAL AND PHARMACEUTICAL PRODUCTS	4.319*	-0.297(4.26)**	0.148	0.08	S	S	0.424

55 ESSENTIAL OILS	1.813	-0.101(2.51)	0.924	5.15**	S	US	0.375
56 FERTILIZERS	21.352**	-0.672(10.25)**	2.813*	0.49	S	S	0.367
57 PLASTICS IN PRIMARY FORM	4.813**	-0.169(4.54)**	0.224	1.82	S	S	0.097
58 PLASTICS IN NONPRIMARY FORM	1.865	-0.086(2.23)	0.511	2.65	S	S	0.293
59 CHEMICAL MATERIALS	1.512	-0.043(0.80)	0.013	2.53	US	S	0.381
61 LEATHER, LEATHER MFR	2.877	-0.144(2.22)	1.878	16.39**	S	US	0.373
62 RUBBER MANUFACTURES	2.561	-0.075(1.94)	0.000	3.17*	S	S	0.279
63 CORK AND WOOD MANUFACTURES	2.586	-0.147(3.31)	0.175	2.48	S	S	0.294
64 PAPER, PAPERBOARD	15.331**	-0.477(8.10)**	0.746	3.17*	S	S	0.288
65 TEXTILE YARN, FABRICS	3.710	-0.135(2.54)	0.099	2.21	S	S	0.277
66 NONMETALLIC MINERAL	1.069	-0.055(0.91)	0.001	0.14	S	S	0.345
67 IRON AND STEEL	8.653**	-0.310(6.42)**	1.381	0.52	S	US	0.149
68 NONFERROUS METALS	2.998	-0.149(2.76)	0.506	1.13	S	S	0.205
69 MANUFACTURES OF METALS	1.771	-0.034(0.66)	2.430	1.99	US	S	0.382
71 POWER GENERATING MACHINERY	30.734**	-0.833(12.34)**	0.060	3.85**	S	S	0.431
72 MACHINERY SPECIALIZED	2.775	-0.264(3.67)*	0.219	0.37	S	S	0.315
73 METALWORKING MACHINERY	6.613**	-0.356(5.32)**	0.507	0.88	S	S	0.313
74 GENERAL INDUSTRIAL MACHRY	3.111	-0.212(3.05)	0.460	0.82	S	S	0.463
75 OFFICE MACHINES AND ADP EQUIPMENT	3.265	-0.289(4.03)**	1.223	0.33	S	S	0.473
76 TELECOMMUNICATIONS EQUIPMENT	1.518	-0.108(2.12)	0.009	0.09	S	S	0.297
77 ELECTRICAL MACHRY, APPARATUS & APPLIANCES	0.894	-0.031(1.00)	0.103	0.41	S	US	0.369
78 MOTOR VEHICLES	1.617	-0.103(2.42)	1.575	1.30	S	S	0.368
79 TRANSPORT EQUIPMENT	3.760	-0.263(3.89)**	0.426	1.98	S	S	0.350
81 PREFAB BUILDINGS; SANITARY, PLUMBING, ETC.	21.326**	-0.661(10.31)**	0.605	0.82	S	S	0.329
82 FURNITURE & BEDDING	6.752**	-0.176(3.60)*	0.166	0.54	S	US	0.396
83 TRAVEL GOODS, HANDBAGS	3.142	-0.233(3.93)**	0.326	0.76	S	S	0.431
84 ARTICLES OF APPAREL AND CLOTHING	3.983*	-0.264(4.23)**	0.045	2.62	S	S	0.359
85 FOOTWEAR	2.544	-0.090(2.09)	0.602	0.77	US	S	0.414
87 PROFESSIONAL SCIENTIFIC INSTRUMENTS	2.387	-0.038(0.72)	1.109	2.11	S	S	0.543
88 PHOTO APPT, EQUIPMENT & OPTICAL GOODS	3.650	-0.199(4.00)**	0.020	2.99*	S	S	0.288
89 MISCELLANEOUS MANUFACTURED ARTICLES	3.388	-0.238(3.94)**	0.183	0.39	S	S	0.389
93 SPECIAL TRANSACTIONS	0.859	-0.082(1.04)	1.671	1.47	S	S	0.525
97 GOLD, NONMONETARY	7.627**	-0.472(6.11)**	2.466	0.97	S	S	0.355
99 LOW VALUE SHIPMENTS	2.170	-0.150(3.04)	2.629	3.23*	S	S	0.120
Notes:							

a.The upper bound critical value of the F test at the 5% (10%) significance level is 4.35(3.77) when k=3 (the number of the exogenous variables). These are derived from Pesaran*et al.* (2001. Table CI-Case III. page 300).
b. The upper bound critical value of the test for significance of $ECM_{t-1}$is -3.78(-3.46) at the 5% (10%) significancelevel when k=3. These are derived from Pesaran*et al*. (2001. Table CII-Case III. page 303).
c. LM refers tothe Lagrange Multiplier test of residual serial correlation. It hasthe χ^2distribution with one degree of freedom. Its critical value at 5% (10%) significance level is 3.84(2.71).
d. RESET refers to the Ramsey's test for misspecification. It has the χ^2 distribution with one degree of freedom.
e. *. and ** indicate significance level at 10% and 5%, respectively.

Table 3: Long-Run Coefficient Estimates of Linear ECM Import Demand Function

Industries		**Long-Run Coefficient Estimates**			
	Trade Share (%)	***Constant***	***Ln Y_t^{US}***	***Ln RE_t***	***MIS_t***
00 LIVE ANIMALS#	0,00	-0.793(0.18)	1.572(0.40)	1.217(0.63)	-0.014(0.17)
01 MEAT AND MEAT PREPARATIONS	0,00	2.943(1.04)	-0.843(0.55)	1.313(1.77)*	-0.004(0.14)
02 DAIRY PRODUCTS AND BIRDS' EGGS#	0,00	-1.792(0.58)	0.510(0.55)	1.764(4.15)**	0.019(0.99)
03 FISH (EXCEPT MARINE MAMMAL)	0,30	2.563(2.17)**	0.318(0.55)	1.640(5.56)**	-0.031(2.25)**
04 CEREALS AND CEREAL PREPARATION#	0,02	-4.931(2.16)**	2.824(3.46)**	1.766(4.49)**	-0.029(1.57)
05 VEGETABLES AND FRUIT	0,25	0.298(0.33)	0.594(0.83)	2.309(6.36)**	-0.028(1.64)*
06 SUGARS, SUGAR PREPARATIONS	0,02	1.461(1.16)	0.598(0.75)	1.095(2.74)**	-0.032(1.79)*
07COFFEE, TEA, COCOA	0,06	-0.909(0.74)	1.709(1.63)	1.840(3.59)**	0.018(0.17)
08 FEEDING STUFF FOR ANIMALS	0,06	-1.388(0.85)	-0.130(0.06)	5.493(5.49)**	-0.182(3.25)**
09 MISCELLANEOUS EDIBLE	0,13	-0.081(0.08)	5.588(0.22)	-5.590(0.15)	-0.288(0.24)
11 BEVERAGES	0,00	-7.109(2.71)**	4.064(4.16)**	1.530(3.18)**	-0.007(0.33)
12 TOBACCO AND TOBACCO	0,00	-0.732(0.12)	3.647(2.23)**	-1.749(2.08)**	0.071(1.94)*
21 HIDES, SKINS AND FURSKINS#	0,00	51.386(4.82)**	-9.897(4.17)**	-0.672(0.74)	0.098(2.19)**
22 OIL SEEDS AND OLEAGINOUS	0,00	1.267(0.54)	-0.427(0.14)	0.755(0.45)	0.081(1.06)
23 CRUDE RUBBER	0,00	-3.402(1.53)	-0.391(0.22)	6.434(7.46)**	-0.099(2.58)**
24 CORK AND WOOD#	0,02	0.860(0.67)	2.768(0.84)	-2.350(1.99)**	0.070(1.01)
25 PULP AND WASTE PAPER#	0,00	17.065(2.17)**	2.782(1.73)*	4.345(3.42)**	-0.250(5.74)**
26 TEXTILE FIBERS	0,02	-1.244(0.84)	1.100(0.48)	4.041(3.61)**	-0.109(2.16)**
27 CRUDE FERTILIZERS	0,03	0.419(0.20)	2.108(3.53)**	0.537(1.97)**	-0.026(2.15)**
28 METALLIFEROUS ORES#	0,01	-9.754(2.96)**	2.598(3.31)**	2.144(5.52)**	-0.016(0.98)
29 CRUDE ANIMAL AND VEGETABLE MATERIALS	0,12	1.655(2.00)**	-0.288(0.27)	1.661(3.86)**	0.007(0.44)

32 COAL, COKE AND BRIQUETTES#	0,00	29.868(2.36)**	0.464(0.09)	-12.575(5.30)**	-0.064(0.59)
33 PETROLEUM, PETROLEUM PRODUCTS#	0,03	8.945(1.93)*	-0.158(0.06)	-2.270(1.90)*	0.102(1.76)*
41 ANIMAL OILS AND FATS	0,00	0.651(0.21)	-0.749(0.09)	1.151(0.18)	-0.092(0.50)
42 FIXED VEG. FATS & OILS	0,00	-7.331(3.12)**	2.693(3.46)**	2.223(5.84)**	-0.036(2.15)**
43 ANML/VEG FATS/OILS PROCESS/WASTE#	0,00	-14,844(2.44)**	5.004(2.40)**	4.214(4.46)**	0.037(0.93)
51 ORGANIC CHEMICALS	1,02	-1.760(1.41)	3.162(2.30)**	3.442(3.56)**	-0.027(0.67)
52 INORGANIC CHEMICALS	0,13	0.459(0.31)	0.391(0.61)	2.610(8.90)**	-0.062(4.81)**
53 DYEING, TANNING AND COLORING MATERIALS	0,07	-1.257(1.21)	1.921(2.72)**	1.913(5.79)**	-0.018(1.22)
54 MEDICINAL AND PHARMACEUTICAL PRODUCTS	0,66	-0.219(0.25)	5.136(0.80)	-0.830(0.14)	0.138(0.61)
55 ESSENTIAL OILS	0,51	-3.620(2.10)**	2.726(2.27)**	3.542(6.19)**	-0.052(1.94)*
56 FERTILIZERS	0,00	2.001(0.23)	-2.304(0.34)	2.598(0.81)	0.219(1.51)
57 PLASTICS IN PRIMARY FORM	0,09	-2.473(1.59)	2.516(1.88)*	3.136(5.12)**	-0.020(0.77)
58 PLASTICS IN NONPRIMARY FORM	0,26	0.287(0.25)	-0.973(0.20)	2.921(1.90)*	-0.014(0.22)
59 CHEMICAL MATERIALS#	0,52	-2.784(2.27)**	3.286(2.77)**	2.736(4.77)**	-0.017(0.70)
61 LEATHER, LEATHER MFR#	0,14	-1.375(1.15)	2.179(4.55)**	1.142(4.77)**	-0.013(1.29)
62 RUBBER MANUFACTURES	0,43	0.999(1.26)	-3.559(0.59)	1.728(0.76)	-0.067(0.71)
63 CORK AND WOOD MANUFACTURES	0,50	0.977(1.32)	0.287(0.13)	0.407(0.38)	0.011(0.23)
64 PAPER, PAPERBOARD	0,57	-0.098(0.12)	1.567(2.23)**	1.718(5.10)**	-0.019(1.29)
65 TEXTILE YARN, FABRICS	3,72	1.416(1.60)	-4.964(0.55)	3.306(1.60)	-0.104(0.99)
66 NONMETALLIC MINERAL	1,02	0.141(0.22)	2.133(3.72)**	1.048(3.58)**	-0.003(0.30)
67 IRON AND STEEL#	0,17	0.910(0.65)	0.176(0.04)	0.325(0.17)	-0.034(0.38)
68 NONFERROUS METALS	0,16	1.505(1.25)	-4.630(0.24)	-9.862(0.38)	0.195(0.33)
69 MANUFACTURES OF METALS	4,59	0.181(0.31)	2.270(2.25)**	0.950(1.73)*	0.006(0.25)
71 POWER GENERATING MACHINERY	1,06	-2.009(2.02)**	3.322(3.06)**	3.462(6.09)**	-0.029(1.14)
72 MACHINERY SPECIALIZED	1,00	-1.320(1.24)	3.320(2.12)**	2.839(3.80)**	-0.0006(0.02)
73 METALWORKING MACHINERY	0,14	-1.501(1.04)	1.182(0.70)	3.941(5.55)**	-0.041(1.33)
74 GENERAL INDUSTRIAL MACHRY	3,91	-0.076(0.09)	1.557(0.88)	2.195(2.48)**	0.006(0.14)
75 OFFICE MACHINES AND ADP EQUIPMENT#	14,34	2.072(2.60)**	-0.807(0.58)	2.196(4.53)**	-0.044(2.00)**
76 TELECOMMUNICATIONS EQUIPMENT	17,57	-1.918(2.04)**	2.493(3.36)**	3.268(8.46)**	-0.066(3.53)**
77 ELECTRICAL MACHRY, APPARATUS & APPLIANCES#	9,41	-0.177(0.29)	1.351(1.98)**	2.653(8.72)**	-0.021(1.59)
78 MOTOR VEHICLES#	2,86	-1.026(1.20)	3.026(2.42)**	2.430(4.08)**	0.010(0.34)
79 TRANSPORT EQUIPMENT	0,08	-1.928(1.07)	3.841(2.24)**	1.998(2.01)**	0.011(0.28)
81 PREFAB BUILDINGS; SANITARY, PLUMBING, ETC.	1,49	0.835(1.09)	1.933(2.98)**	0.674(2.18)**	0.026(1.88)*
82 FURNITURE & BEDDING	3,82	1.555(2.23)**	0.440(0.27)	0.308(0.49)	0.056(1.41)
83 TRAVEL GOODS, HANDBAGS	0,45	1.120(1.17)	10.269(0.69)	-0.212(0.07)	0.033(0.26)

84 ARTICLES OF APPAREL AND CLOTHING	5,80	2.089(2.09)**	0.358(0.57)	2.174(6.93)**	-0.051(3.55)**
85 FOOTWEAR	1,90	3.069(2.08)**	-1.495(1.02)	0.657(0.95)	-0.002(0.08)
87 PROFESSIONAL SCIENTIFIC INSTRUMENTS#	1,77	-0.293(0.38)	0.868(0.55)	3.250(4.55)**	-0.053(1.54)
88 PHOTO APPT, EQUIPMENT & OPTICAL GOODS	0,55	3.107(3.74)**	0.803(2.03)**	0.312(1.53)	0.032(3.65)**
89 MISCELLANEOUS MANUFACTURED ARTICLES	16,26	2.587(3.04)**	1.268(2.50)**	0.753(3.03)**	-0.0001(0.01)
93 SPECIAL TRANSACTIONS	1,11	-1.458(1.12)	14.829(0.74)	1.896(0.36)	-0.033(0.14)
95 COIN INCLUDING GOLD	0,00	-0.446(0.06)	-3.521(1.74)*	5.893(5.98)**	-0.020(0.46)
96 COIN (OTHER THAN GOLD)#	0,00	-22.303(4.07)**	4.273(3.61)**	3.915(6.35)**	-0.103(3.78)**
97 GOLD, NONMONETARY	0,00	14.103(1.47)	-7.439(1.10)	-2.468(0.49)	0.220(1.23)
98 ESTIMATE OF LOW VALUED IMPORT TRANSACTIONS	0,80	0.001(0.00)	2.488(2.50)**	0.766(1.41)	-0.031(1.30)

Notes:

a. # indicates that the 2008 Global Financial Crisis dummy was statistically significant (at least at the 10% significance level).
b. * and ** indicate significance at 10% and 5% levels, respectively.

Table 4: Diagnostic Statistics Related to Linear ECM Import Demand Function.

Industries	Diagnostics						
	F Stat	***ECM_{t-1}***	***LM***	***RESET***	***CUSUM***	***CUSUMSQ***	***Adj. R^2***
00 LIVE ANIMALS	3.395	-0.251(2.57)	0.089	1.06	S	S	0.372
01 MEAT AND MEAT PREPARATIONS	10.912**	-0.407(7.31)**	0.214	3.26*	S	S	0.296
02 DAIRY PRODUCTS AND BIRDS' EGGS	20.756**	-0.775(9.64)**	1.813	1.66	S	S	0.440
03 FISH (EXCEPT MARINE MAMMAL)	10.590**	-0.445(7.04)**	0.915	6.92**	S	S	0.454
04 CEREALS AND CEREAL PREPARATION	4.576**	-0.529(4.29)**	0.003	5.17**	S	S	0.562
05 VEGETABLES AND FRUIT	6.871**	-0.284(5.79)**	0.008	10.07**	S	S	0.245
06 SUGARS, SUGAR PREPARATIONS	9.808**	-0.350(6.80)**	0.132	3.77*	S	S	0.428
07COFFEE, TEA, COCOA	2.677	-0.210(2.96)	0.268	2.92*	S	S	0.313
08 FEEDING STUFF FOR ANIMALS	2.904	-0.143(2.36)	0.326	4.68**	S	S	0.312
09 MISCELLANEOUS EDIBLE	0.462	0.007(0.25)	0.244	0.93	S	S	0.341
11 BEVERAGES	4.627**	-0.464(4.62)**	0.657	0.71	S	S	0.378
12 TOBACCO AND TOBACCO	9.525**	-0.872(6.86)**	0.356	0.97	S	S	0.498
21 HIDES, SKINS AND FURSKINS	25.459**	-0.986(11.23)**	0.338	0.71	S	S	0.480
22 OIL SEEDS AND OLEAGINOUS	2.943	-0.166(3.50)*	0.222	3.92**	S	S	0.202
23 CRUDE RUBBER	3.725	-0.216(3.68)*	0.083	1.39	S	S	0.202
24 CORK AND WOOD	4.384**	-0.097(2.06)	0.000	7.44**	S	S	0.533

25 PULP AND WASTE PAPER	23.165**	-0.797(10.72)**	0.000	1.09	S	S	0.390
26 TEXTILE FIBERS	2.583	-0.125(3.14)	0.121	0.61	S	S	0.189
27 CRUDE FERTILIZERS	11.021**	-0.824(7.28)**	0.967	2.14	S	S	0.559
28 METALLIFEROUS ORES	35.101**	-0.925(13.21)**	0.089	0.24	S	S	0.472
29 CRUDE ANIMAL AND VEGETABLE MATERIALS	2.960	-0.240(2.65)	1.825	0.82	S	S	0.323
32 COAL, COKE AND BRIQUETTES	4.909**	-0.472(4.92)**	1.396	1.54	S	S	0.399
33 PETROLEUM, PETROLEUM PRODUCTS	4.978**	-0.411(4.19)**	2.468	1.52	S	S	0.475
41 ANIMAL OILS AND FATS	1.593	-0.078(1.31)	0.135	2.36	S	US	0.429
42 FIXED VEG. FATS & OILS	10.950**	-0.580(7.30)**	0.253	2.24	S	S	0.345
43 ANML/VEG FATS/OILS PROCESS/WASTE	3.889*	-0.440(3.60)*	0.017	1.97	S	S	0.483
51 ORGANIC CHEMICALS	2.786	-0.119(2.48)	10.655**	1.00	S	S	0.289
52 INORGANIC CHEMICALS	8.319**	-0.528(5.96)**	0.448	2.72*	S	S	0.422
53 DYEING, TANNING AND COLORING MATERIALS	2.801	-0.268(3.44)	0.167	3.53*	S	S	0.313
54 MEDICINAL AND PHARMACEUTICAL PRODUCTS	1.000	-0.031(0.93)	0.944	1.26	S	S	0.388
55 ESSENTIAL OILS	3.139	-0.253(3.76)*	2.322	12.68**	S	S	0.311
56 FERTILIZERS	2.340	-0.293(2.76)	0.047	2.12	S	S	0.363
57 PLASTICS IN PRIMARY FORM	2.705	-0.199(3.35)	1.299	2.67	S	S	0.308
58 PLASTICS IN NONPRIMARY FORM	1.575	-0.053(1.38)	0.288	4.16**	S	S	0.327
59 CHEMICAL MATERIALS	5.844**	-0.206(5.36)**	0.249	2.29	S	S	0.317
61 LEATHER, LEATHER MFR	6.720**	-0.516(5.41)**	0.750	1.25	S	S	0.366
62 RUBBER MANUFACTURES	1.285	-0.041(1.18)	0.314	5.72**	S	S	0.293
63 CORK AND WOOD MANUFACTURES	1.235	-0.087(1.80)	0.345	2.91*	S	S	0.441
64 PAPER, PAPERBOARD	4.081*	-0.269(4.34)**	5.423**	4.00**	S	S	0.398
65 TEXTILE YARN, FABRICS	8.589**	-0.055(0.98)	5.312**	14.75**	S	S	0.579
66 NONMETALLIC MINERAL	5.512**	-0.257(4.88)**	0.029	5.51**	S	S	0.375
67 IRON AND STEEL	3.600	-0.074(2.63)	0.971	1.82	S	S	0.188
68 NONFERROUS METALS	1.598	-0.019(0.53)	0.156	3.34*	S	S	0.236
69 MANUFACTURES OF METALS	1.911	-0.126(2.59)	1.581	4.58**	S	S	0.482
71 POWER GENERATING MACHINERY	2.512	-0.129(3.32)	6.322**	1.33	S	S	0.342
72 MACHINERY SPECIALIZED	1.986	-0.100(2.76)	0.015	1.98	S	S	0.254
73 METALWORKING MACHINERY	2.828	-0.156(2.88)	3.210*	3.79*	S	S	0.309
74 GENERAL INDUSTRIAL MACHRY	1.701	-0.090(2.01)	10.453**	1.04	S	S	0.403
75 OFFICE MACHINES AND ADP EQUIPMENT	3.667	-0.172(2.91)	2.156	6.29**	S	S	0.339

76 TELECOMMUNICATIONS EQUIPMENT	5.705**	-0.249(4.82)**	1.740	1.57	S	S	0.377
77 ELECTRICAL MACHRY, APPARATUS & APPLIANCES	4.843**	-0.204(4.13)**	3.235*	5.87**	S	S	0.339
78 MOTOR VEHICLES	3.248	-0.111(3.12)	1.598	5.19**	S	S	0.323
79 TRANSPORT EQUIPMENT	1.866	-0.139(2.25)	0.002	2.70	S	S	0.365
81 PREFAB BUILDINGS; SANITARY, PLUMBING, ETC.	3.873*	-0.288(3.92)**	1.048	3.85**	S	S	0.451
82 FURNITURE & BEDDING	3.028	-0.127(2.29)	0.005	3.11*	S	US	0.372
83 TRAVEL GOODS, HANDBAGS	1.251	0.035(0.69)	0.814	3.51*	S	S	0.413
84 ARTICLES OF APPAREL AND CLOTHING	7.360**	-0.348(5.62)**	0.683	4.26**	S	S	0.474
85 FOOTWEAR	1.749	-0.153(2.04)	0.666	1.51	S	S	0.453
87 PROFESSIONAL SCIENTIFIC INSTRUMENTS	3.335	-0.109(2.69)	0.419	3.45*	S	S	0.344
88 PHOTO APPT, EQUIPMENT & OPTICAL GOODS	6.031**	-0.347(4.75)**	0.012	3.81*	S	S	0.309
89 MISCELLANEOUS MANUFACTURED ARTICLES	4.511**	-0.323(4.60)**	6.897**	8.59**	S	S	0.527
93 SPECIAL TRANSACTIONS	0.287	-0.023(0.63)	2.084	2.35	S	S	0.411
95 COIN INCLUDING GOLD	15.989**	-0.788(8.92)**	0.763	3.36*	S	S	0.434
96 COIN (OTHER THAN GOLD)	10.911**	-0.782(7.33)**	0.498	0.82	S	S	0.409
97 GOLD, NONMONETARY	2.632	-0.283(2.07)	0.057	1.00	S	S	0.445
98 ESTIMATE OF LOW VALUED IMPORT TRANSACTIONS	2.463	-0.130(3.26)	0.374	0.13	S	S	0.289

Notes:

a. The upper bound critical value of the F test at the 5% (10%) significance level is 4.35(3.77) when k=3 (the number of the exogenous variables). These are derived from Pesaran *et al.* (2001. Table CI-Case III. page 300).

b. The upper bound critical value of the test for significance of ECM_{t-1} is -3.78(-3.46) at the 5% (10%) significance level when k=3. These are derived from Pesaran *et al.* (2001. Table CII-Case III. page 303).

c. LM refers to the Lagrange Multiplier test of residual serial correlation. It has the χ^2 distribution with one degree of freedom. Its critical value at 5% (10%) significance level is 3.84(2.71).

d. RESET refers to the Ramsey's test for misspecification. It has the χ^2 distribution with one degree of freedom.

e. *. and ** indicate significance level at 10% and 5%, respectively.

Table 5: Long-Run Coefficient Estimates of Non-Linear ECM Export Demand Function.					
Industries	***Constant***	***Ln Y_t^{CH}***	***Ln RE_t***	***MIS_t^+***	***MIS_t^-***
00 LIVE ANIMALS	4.361(2.46)**	-17.232(0.81)	9.253(11.42)**	-0.390(5.50)**	-0.287(5.01)**
01 MEAT AND MEAT PREPARATIONS	0.912(1.89)*	-39.406(1.34)	-2.911(0.33)	-0.415(2.43)**	-0.426(3.74)**
02 DAIRY PRODUCTS AND BIRDS' EGGS#	2.246(2.66)**	-1.116(0.00)	4.026(4.75)**	-0.034(0.14)	-0.062(0.83)
03 FISH (EXCEPT MARINE MAMMAL)#	8.464(4.39)**	5.095(1.45)	3.286(22.6)**	-0.012(0.15)	-0.035(2.29)**
04 CEREALS AND CEREAL PREPARATION	5.108(3.99)**	35.455(2.30)**	5.750(2.89)**	0.378(5.24)**	0.222(3.73)**
05 VEGETABLES AND FRUIT	10.529(5.84)**	3.389(1.67)*	2.232(29.05)**	-0.020(1.10)	-0.065(20.97)**
06 SUGARS, SUGAR PREPARATIONS	3.047(2.75)**	-5.855(0.25)	2.839(3.14)**	-0.037(0.20)	-0.023(0.16)
07COFFEE, TEA, COCOA	3.111(2.22)**	3.291(0.13)	4.210(7.08)**	-0.070(0.87)	-0.084(2.47)**
08 FEEDING STUFF FOR ANIMALS#	4.224(4.66)**	4.419(0.51)	9.199(85.38)**	0.024(0.27)	0.016(0.20)
09 MISCELLANEOUS EDIBLE	4.342(4.21)**	14.317(5.92)**	-0.835(0.79)	0.142(10.98)**	0.067(4.45)**
11 BEVERAGES#	3.091(2.45)**	14.222(2.21)**	6.260(17.92)**	0.027(0.16)	-0.018(0.14)
12 TOBACCO AND TOBACCO	1.809(0.33)	-7.217(0.00)	-87.245(0.32)	2.302(0.35)	1.782(0.33)
21 HIDES, SKINS AND FURSKINS	0.996(1.06)	24.853(0.78)	5.533(1.70)*	0.014(0.00)	0.013(0.01)
22 OIL SEEDS AND OLEAGINOUS#	8.943(5.26)**	-14.060(0.50)	6.115(3.51)**	-0.344(5.72)**	-0.355(10.82)**
23 CRUDE RUBBER#	2.087(1.93)*	6.708(0.45)	4.222(6.04)**	-0.092(1.61)	-0.076(2.07)**
24 CORK AND WOOD	1.252(1.50)	6.374(0.19)	2.674(1.03)	0.097(0.71)	0.060(0.43)
25 PULP AND WASTE PAPER	0.453(0.72)	-31.361(0.23)	5.370(1.24)	-0.262(0.43)	-0.090(0.32)
26 TEXTILE FIBERS	4.154(3.29)**	4.769(0.15)	3.063(2.89)**	-0.105(1.57)	-0.100(2.63)**
27 CRUDE FERTILIZERS	3.744(2.65)**	2.545(0.22)	2.375(7.22)**	-0.006(0.02)	-0.022(0.58)
28 METALLIFEROUS ORES	0.067(0.11)	-494.803(0.01)	-41.582(0.00)	-1.697(0.01)	-0.446(0.01)
29 CRUDE ANIMAL AND VEGETABLE MATERIALS	9.297(4.56)**	1.577(0.74)	1.331(20.63)**	0.036(6.96)**	0.006(0.34)
32 COAL, COKE AND BRIQUETTES	1.092(0.81)	-0.250(0.13)	30.406(5.76)**	-0.920(1.97)**	-0.947(3.79)**
33 PETROLEUM, PETROLEUM PRODUCTS	5.971(3.73)**	-6.688(0.36)	2.382(1.80)*	0.014(0.03)	-0.063(1.15)
34 GAS, NATURAL AND MANUFACTURED	0.816(0.50)	597.041(0.02)	74.111(0.02)	10.071(0.02)	11.337(0.02)
41 ANIMAL OILS AND FATS	5.378(3.86)**	20.513(1.87)*	0.425(0.04)	0.093(1.03)	0.061(0.94)
42 FIXED VEG. FATS & OILS#	4.503(3.29)**	-9.148(0.12)	-3.509(2.74)**	-0.173(0.83)	-0.099(0.48)
43 ANML/VEG FATS/OILS PROCESS/WASTE	5.201(3.42)**	15.998(1.95)*	-4.23(5.83)**	0.145(3.20)**	0.081(1.93)*
51 ORGANIC CHEMICALS#	5.656(3.91)**	-0.611(0.01)	2.445(10.92)**	-0.027(0.64)	-0.016(0.40)
52 INORGANIC CHEMICALS	1.876(1.57)	30.916(1.76)*	2.843(1.26)	0.008(0.00)	-0.098(2.16)**
53 DYEING, TANNING AND COLORING MATERIALS#	1.763(1.73)*	16.973(1.49)	4.521(7.38)**	-0.015(0.02)	-0.057(0.90)
54 MEDICINAL AND PHARMACEUTICAL PRODUCTS#	6.583(3.12)**	-11.659(5.53)**	3.393(15.3)**	-0.067(2.80)**	-0.090(13.11)**
55 ESSENTIAL OILS	3.626(2.51)**	2.242(0.34)	0.549(0.77)	0.011(0.14)	-0.047(5.41)**

56 FERTILIZERS	5.153(2.77)**	6.211(0.06)	-4.184(1.08)	0.154(0.75)	0.126(0.93)
57 PLASTICS IN PRIMARY FORM	0.930(1.18)	-2.706(0.02)	0.184(0.00)	0.027(0.04)	0.031(0.07)
58 PLASTICS IN NONPRIMARY FORM	0.968(0.96)	21.885(0.95)	1.950(1.29)	0.141(0.58)	0.085(0.30)
59 CHEMICAL MATERIALS#	3.974(2.30)**	6.656(2.38)**	2.153(10.3)**	0.021(0.44)	-0.028(1.52)
61 LEATHER, LEATHER MFR	1.931(1.99)**	30.893(2.88)**	4.054(3.45)**	0.118(1.22)	0.077(1.03)
62 RUBBER MANUFACTURES	0.804(1.43)	21.377(0.94)	3.354(1.10)	0.079(0.23)	0.032(0.05)
63 CORK AND WOOD MANUFACTURES	2.541(2.73)**	-0.562(0.00)	-0.031(0.00)	0.109(1.71)*	0.145(5.48)**
64 PAPER, PAPERBOARD#	8.146(4.55)**	0.031(0.00)	0.676(7.03)**	0.021(1.11)	0.009(1.24)
65 TEXTILE YARN, FABRICS	0.873(1.11)	-7.301(0.20)	1.071(0.28)	-0.138(0.78)	-0.108(0.98)
66 NONMETALLIC MINERAL	4.175(2.46)**	13.389(6.65)**	1.523(6.51)**	0.067(3.44)**	0.012(0.19)
67 IRON AND STEEL#	4.257(4.28)**	5.960(0.61)	0.287(0.04)	0.014(0.07)	-0.014(0.12)
68 NONFERROUS METALS	2.386(2.57)**	10.009(0.55)	0.691(0.09)	-0.099(0.99)	-0.173(5.15)**
69 MANUFACTURES OF METALS	0.944(1.07)	37.920(0.99)	1.820(0.85)	0.161(0.62)	0.056(0.20)
71 POWER GENERATING MACHINERY	9.300(3.68)**	5.151(2.03)**	1.861(11.05)**	-0.009(0.12)	-0.036(3.77)**
72 MACHINERY SPECIALIZED	8.636(4.31)**	8.102(5.36)**	0.618(1.39)	0.039(2.53)**	-0.012(0.48)
73 METALWORKING MACHINERY	4.135(2.79)**	15.612(3.71)**	3.088(7.62)**	0.011(0.04)	0.001(0.00)
74 GENERAL INDUSTRIAL MACHRY	2.916(2.15)**	9.326(3.15)**	2.135(8.96)**	0.037(0.98)	0.015(0.27)
75 OFFICE MACHINES AND ADP EQUIPMENT	1.999(129)	15.259(1.05)	-0.736(0.15)	0.048(0.28)	-0.015(0.06)
76 TELECOMMUNICATIONS EQUIPMENT	1.703(1.68)*	-1.004(0.00)	4.429(3.44)**	-0.055(0.39)	-0.015(0.06)
77 ELECTRICAL MACHRY, APPARATUS & APPLIANCES	1.859(2.13)**	11.670(2.46)**	-0.279(0.05)	0.024(0.20)	-0.040(1.08)
78 MOTOR VEHICLES	1.391(1.29)	22.272(0.99)	10.111(3.59)**	-0.055(0.09)	-0.105(0.61)
79 TRANSPORT EQUIPMENT	2.555(1.26)	-31.663(1.01)	8.179(1.61)	-0.269(0.89)	-0.124(0.65)
81 PREFAB BUILDINGS; SANITARY, PLUMBING, ETC.	7.601(4.17)**	8.087(4.16)**	1.341(4.96)**	0.044(2.54)**	0.014(0.51)
82 FURNITURE & BEDDING	1.333(1.25)	40.813(1.30)	3.857(1.53)	0.173(1.23)	0.087(0.87)
83 TRAVEL GOODS, HANDBAGS#	2.626(2.65)**	-18.665(1.35)	2.140(1.13)	-0.017(0.03)	-0.018(0.07)
84 ARTICLES OF APPAREL AND CLOTHING	4.520(3.42)**	0.260(0.00)	-0.653(0.65)	0.038(1.10)	-0.005(0.04)
85 FOOTWEAR	2.867(3.08)**	-4.051(0.45)	-2.078(4.62)**	-0.022(0.25)	-0.077(5.45)**
87 PROFESSIONAL SCIENTIFIC INSTRUMENTS	6.947(3.11)**	6.307(4.80)**	1.622(14.17)**	0.022(1.22)	-0.023(2.64)**
88 PHOTO APPT, EQUIPMENT & OPTICAL GOODS	1.722(1.89)*	6.564(0.55)	0.410(0.06)	0.039(0.31)	0.008(0.02)
89 MISCELLANEOUS MANUFACTURED ARTICLES	7.807(4.75)**	3.747(2.77)**	1.242(12.32)**	0.018(1.21)	-0.021(3.19)**
93 SPECIAL TRANSACTIONS	13.189(5.35)**	6.509(6.46)**	-2.265(34.78)**	0.095(23.31)**	0.022(2.36)**
97 GOLD, NONMONETARY	2.933(2.47)**	-28.412(0.48)	5.343(0.92)	-0.017(0.00)	0.060(0.10)
99 LOW VALUE SHIPMENTS	1.850(2.47)**	10.409(1.99)**	3.355(9.85)**	-0.020(0.16)	-0.063(2.96)**

Notes:

a. # indicates that the 2008 Global Financial Crisis dummy was statistically significant (at least at the 10% significance level).

b. * and ** indicate significance at 10% and 5% levels, respectively.

Table 6: Diagnostic Statistics Related to Non-linear ECM Export Demand Function.

Industries	*F*	ECM_{t-1}	*LM*	*RESET*	*CSM(SQ)*	*Adj.* R^2	Wald-S	Wald-L
00 LIVE ANIMALS	2.379	-0.480(3.76)*	9.32**	2.49	S(S)	0.2	0.095	2.865*
01 MEAT AND MEAT PREPARATIONS	1.946	-0.078(1.91)	10.93**	3.55*	S(S)	0.38	0.004	0.016
02 DAIRY PRODUCTS AND BIRDS' EGGS	1.860	-0.212(2.69)	0.02	3.47*	S(S)	0.31	0.459	0.494
03 FISH (EXCEPT MARINE MAMMAL)	4.112*	-0.702(4.44)**	0.66	2.41	S(US)	0.4	11.83**	2.37
04 CEREALS AND CEREAL PREPARATION	3.526	-0.410(3.89)*	0.00	3.33*	S(S)	0.31	0.000	3.32*
05 VEGETABLES AND FRUIT	6.346**	-0.904(5.82)**	2.70	2.65	S(US)	0.35	2.632	23.88**
06 SUGARS, SUGAR PREPARATIONS	1.999	-0.307(2.82)	0.35	3.38*	S(S)	0.27	0.330	0.130
07COFFEE, TEA, COCOA	1.686	-0.352(3.69)*	2.35	1.00	S(S)	0.22	7.591**	0.161
08 FEEDING STUFF FOR ANIMALS	4.240*	-0.375(4.75)**	8.87**	3.47*	S(S)	0.36	2.097	0.153
09 MISCELLANEOUS EDIBLE	3.432	-0.385(4.25)**	4.69**	0.13	S(S)	0.32	0.343	13.33**
11 BEVERAGES	2.222	-0.346(2.49)	1.56	2.17	S(S)	0.31	2.021	2.102
12 TOBACCO AND TOBACCO	2.031	-0.368(0.71)	0.51	0.92	S(S)	0.29	6.28**	0.30
21 HIDES, SKINS AND FURSKINS	1.188	-0.072(1.06)	0.60	3.62*	S(S)	0.28	1.96	0.00
22 OIL SEEDS AND OLEAGINOUS	4.987**	-0.764(5.32)**	13.68**	12.85**	S(US)	0.3	1.373	0.022
23 CRUDE RUBBER	2.655	-0.171(3.93)*	0.29	0.81	S(S)	0.34	1.785	0.213
24 CORK AND WOOD	1.766	-0.100(1.50)	2.25	2.02	S(S)	0.3	2.802*	0.511
25 PULP AND WASTE PAPER	2.857	-0.031(0.66)	0.11	0.93	S(S)	0.32	0.071	0.303
26 TEXTILE FIBERS	2.272	-0.305(3.68)*	0.09	1.18	S(S)	0.36	0.013	0.016
27 CRUDE FERTILIZERS	1.581	-0.335(2.61)	2.94*	0.04	S(S)	0.29	0.089	0.747
28 METALLIFEROUS ORES	2.339	-0.004(0.11)	2.07	6.05**	S(US)	0.34	3.1*	0.013
29 CRUDE ANIMAL AND VEGETABLE MATERIALS	3.610	-0.825(4.51)**	1.16	0.68	S(S)	0.36	0.20	21.96**
32 COAL, COKE AND BRIQUETTES	1.00	-0.309(2.10)	0.22	4.08**	S(S)	0.32	0.003	0.008
33 PETROLEUM, PETROLEUM PRODUCTS	3.23	-0.532(3.64)	3.52*	5.13**	S(S)	0.37	0.81	4.03**
34 GAS, NATURAL AND MANUFACTURED	1.531	-0.029(0.16)	0.55	4.95**	S(S)	0.26	1.08	0.02
41 ANIMAL OILS AND FATS	3.420	-0.633(4.01)**	0.27	1.17	S(S)	0.34	0.47	0.40
42 FIXED VEG. FATS & OILS	2.569	-0.515(3.37)	1.15	1.59	S(S)	0.37	0.092	0.678
43 ANML/VEG FATS/OILS PROCESS/WASTE	2.190	-0.602(3.70)*	5.14**	2.39	S(US)	0.25	0.062	2.475
51 ORGANIC CHEMICALS	4.883**	-0.409(3.86)*	1.73	0.58	S(S)	0.31	0.429	0.383
52 INORGANIC CHEMICALS	1.815	-0.146(1.47)	1.50	1.06	S(S)	0.37	0.032	1.636

53 DYEING, TANNING AND COLORING MATERIALS	1.497	-0.154(1.73)	12.75**	1.36	S(S)	0.39	2.367	0.850
54 MEDICINAL AND PHARMACEUTICAL PRODUCTS	1.74	-0.590(3.74)*	4.02**	0.80	S(S)	0.36	0.010	1.289
55 ESSENTIAL OILS	3.771*	-0.313(2.51)	1.74	2.84*	S(S)	0.31	0.148	18.93**
56 FERTILIZERS	1.790	-0.448(3.00)	2.62	2.86*	S(S)	0.39	0.448	0.104
57 PLASTICS IN PRIMARY FORM	3.479	-0.065(1.14)	0.77	1.31	S(S)	0.29	0.000	0.004
58 PLASTICS IN NONPRIMARY FORM	1.902	-0.80(0.98)	0.50	1.82	S(S)	0.28	7.484**	1.572
59 CHEMICAL MATERIALS	2.107	-0.306(2.28)	0.04	0.83	S(S)	0.31	0.167	11.16**
61 LEATHER, LEATHER MFR	1.943	-0.154(1.84)	8.50**	17.17**	S(US)	0.3	0.313	0.643
62 RUBBER MANUFACTURES	1.688	-0.070(1.34)	0.04	1.95	S(S)	0.37	0.449	0.428
63 CORK AND WOOD MANUFACTURES	3.611	-0.226(3.81)*	0.33	1.12	S(S)	0.39	3.092*	0.79
64 PAPER, PAPERBOARD	5.138**	-0.645(4.58)**	2.03	0.43	S(S)	0.22	2.747*	0.214
65 TEXTILE YARN, FABRICS	3.449	-0.068(1.10)	0.36	2.42	S(US)	0.28	5.967**	0.256
66 NONMETALLIC MINERAL	2.096	-0.344(2.44)	11.6**	0.58	S(S)	0.34	1.17	13.6**
67 IRON AND STEEL	4.089*	-0.339(4.25)**	0.01	2.27	S(S)	0.25	0.282	1.242
68 NONFERROUS METALS	1.704	-0.183(2.55)	0.67	2.60	S(S)	0.34	0.168	2.449
69 MANUFACTURES OF METALS	1.757	-0.073(1.04)	1.17	2.11	S(S)	0.38	0.901	1.384
71 POWER GENERATING MACHINERY	2.626	-0.693(3.67)*	2.36	3.04*	S(S)	0.28	0.067	4.3**
72 MACHINERY SPECIALIZED	3.971*	-0.623(4.26)**	1.68	1.90	S(S)	0.4	2.929*	16.7**
73 METALWORKING MACHINERY	2.418	-0.317(2.81)	1.26	0.23	S(S)	0.28	1.023	0.159
74 GENERAL INDUSTRIAL MACHRY	1.914	-0.205(2.16)	0.41	1.10	S(S)	0.34	3.088*	1.947
75 OFFICE MACHINES AND ADP EQUIPMENT	0.785	-0.134(1.22)	2.40	1.15	S(US)	0.33	0.059	1.209
76 TELECOMMUNICATIONS EQUIPMENT	1.147	-0.121(1.70)	1.60	1.488	S(S)	0.31	0.00	0.99
77 ELECTRICAL MACHRY, APPARATUS & APPLIANCES	1.670	-0.123(2.13)	0.00	0.47	S(S)	0.39	0.181	5.975**
78 MOTOR VEHICLES	1.191	-0.101(1.27)	0.87	1.52	S(S)	0.29	2.299	0.476
79 TRANSPORT EQUIPMENT	2.326	-0.195(1.47)	1.32	3.80*	S(S)	0.4	7.635**	0.952
81 PREFAB BUILDINGS; SANITARY, PLUMBING, ETC.	3.504	-0.767(4.17)**	0.85	1.58	S(S)	0.28	0.642	4.59**
82 FURNITURE & BEDDING	1.795	-0.113(1.17)	1.99	0.54	S(S)	0.22	0.936	1.126
83 TRAVEL GOODS, HANDBAGS	3.130	-0.336(2.78)	0.68	0.93	S(S)	0.2	0.637	0.000
84 ARTICLES OF APPAREL AND CLOTHING	2.759	-0.471(3.47)	0.03	1.05	S(S)	0.38	0.133	6.249**
85 FOOTWEAR	1.954	-0.288(3.75)*	1.27	2.69	S(S)	0.31	0.250	6.389**
87 PROFESSIONAL SCIENTIFIC INSTRUMENTS	2.323	-0.498(3.81)*	0.16	1.62	S(S)	0.4	1.859	23.03**
88 PHOTO APPT, EQUIPMENT & OPTICAL GOODS	1.879	-0.138(1.98)	0.57	3.46*	S(S)	0.4	10.47**	1.006
89 MISCELLANEOUS MANUFACTURED ARTICLES	4.11*	-0.595(4.76)**	1.13	0.49	S(S)	0.31	0.005	25.19**
93 SPECIAL TRANSACTIONS	6.161**	-1.159(5.28)**	3.20*	1.64	S(S)	0.38	1.44	69.59**
97 GOLD, NONMONETARY	1.959	-0.462(3.24)	1.10	10.19**	S(S)	0.28	2.083	0.293

99 LOW VALUE SHIPMENTS	1.649	-0.150(2.40)	3.98**	2.78*	S(S)	0.31	0.076	2.466

Notes:
a. The upper bound critical value of the F test at the 5% (10%) significance level is 4.35(3.77) when k=3 (the number of the exogenous variables). These are derived from Pesaran *et al.* (2001. Table CI-Case III. page 300).
b. The upper bound critical value of the test for significance of ECM_{t-1} is -3.99(-3.66) at the 5% (10%) significance level when k=4. These are derived from Pesaran *et al.* (2001. Table CII-Case III. page 303).
c. LM refers to the Lagrange Multiplier test of residual serial correlation. It has the χ^2 distribution with one degree of freedom. Its critical value at 5% (10%) significance level is 3.84(2.71).
d. RESET refers to the Ramsey's test for misspecification. It has the χ^2 distribution with one degree of freedom.
e. Both Wald tests have also the χ^2 distribution with one degree of freedom.
f. *. and ** indicate significance level at 10% and 5%, respectively.

Table 7: Long-Run Coefficient Estimates of Non-Linear ECM Import Demand Function

Industries	*Constant*	*Ln* Y_t^{USA}	*Ln* RE_t	MIS_t^+	MIS_t^-
00 LIVE ANIMALS#	2.953(2.17)**	8.987(2.70)**	5.156(3.29)**	-0.034(0.18)	0.062(0.40)
01 MEAT AND MEAT PREPARATIONS	3.572(3.14)**	1.028(0.12)	3.302(4.44)**	0.009(0.32)	0.047(0.71)
02 DAIRY PRODUCTS AND BIRDS' EGGS#	7.061(4.06)**	-0.152(0.01)	0.196(0.08)	0.026(1.46)	0.001(0.00)
03 FISH (EXCEPT MARINE MAMMAL)	5.766(3.69)**	1.608(2.05)**	2.55(15.09)**	-0.036(3.38)**	-0.019(1.08)
04 CEREALS AND CEREAL PREPARATION	4.982(2.96)**	3.103(2.86)**	1.549(2.58)**	-0.022(0.55)	0.018(0.42)
05 VEGETABLES AND FRUIT	2.274(2.13)**	1.251(0.26)	2.623(3.84)**	-0.024(0.34)	-0.008(0.03)
06 SUGARS, SUGAR PREPARATIONS	4.495(3.89)**	2.537(3.91)**	1.845(6.74)**	-0.032(2.31)**	-0.015(0.56)
07COFFEE, TEA, COCOA	2.689(1.96)**	2.111(1.66)*	2.378(5.37)**	0.005(0.02)	0.014(0.17)
08 FEEDING STUFF FOR ANIMALS#	1.271(1.50)	6.790(1.26)	5.560(3.81)**	-0.232(4.90)**	-0.207(4.65)**
09 MISCELLANEOUS EDIBLE	6.319(3.37)**	-0.343(0.36)	0.280(0.82)	0.028(8.38)**	-0.019(3.84)**
11 BEVERAGES	5.472(2.87)**	2.056(1.75)*	0.0425(0.24)	0.038(2.22)**	0.024(0.93)
12 TOBACCO AND TOBACCO	9.346(3.16)**	-3.180(1.64)*	-2.468(1.84)*	0.122(6.12)**	0.104(5.66)**
21 HIDES, SKINS AND FURSKINS#	7.319(3.45)**	-12.448(5.42)**	-2.91(0.46)	0.082(0.68)	0.044(0.22)
22 OIL SEEDS AND OLEAGINOUS	2.567(3.55)**	10.546(7.60)**	3.656(2.84)**	-0.012(0.03)	0.049(0.62)
23 CRUDE RUBBER#	1.974(2.82)**	1.829(0.28)	7.912(19.63)**	-0.133(6.20)**	-0.105(4.05)**
24 CORK AND WOOD	0.978(1.51)	6.549(1.90)*	-6.032(2.05)**	0.147(0.97)	0.114(0.74)
25 PULP AND WASTE PAPER#	5.664(3.99)**	1.223(0.15)	2.762(2.13)**	-0.178(8.78)**	-0.204(12.63)**
26 TEXTILE FIBERS	0.610(1.06)	17.856(1.17)	10.065(2.10)**	-0.131(0.58)	0.031(0.01)
27 CRUDE FERTILIZERS	12.642(4.38)**	4.462(34.04)**	1.764(18.16)**	-0.042(11.64)**	-0.019(2.39)**
28 METALLIFEROUS ORES#	8.829(4.11)**	4.169(6.56)**	1.234(1.80)*	0.007(0.06)	-0.002(0.00)
29 CRUDE ANIMAL AND VEGETABLE MATERIALS	-0.356(0.20)	1.711(0.03)	-3.232(0.03)	0.080(0.07)	0.056(0.07)
32 COAL, COKE AND BRIQUETTES	10.391(4.11)**	19.968(19.74)**	-4.008(0.15)	-0.148(3.84)**	0.033(0.18)

33 PETROLEUM, PETROLEUM PRODUCTS	3.139(1.60)	8.769(1.40)	-1.232(0.11)	0.191(1.75)*	0.258(2.31)**
41 ANIMAL OILS AND FATS	-0.289(0.45)	-30.300(0.56)	14.744(1.27)	-0.100(0.09)	-0.242(0.57)
42 FIXED VEG. FATS & OILS	9.505(4.86)**	1.873(6.46)**	1.339(11.17)**	-0.038(9.88)**	-0.050(18.16)**
43 ANML/VEG FATS/OILS PROCESS/WASTE	3.742(2.52)**	6.815(4.80)**	3.635(4.47)**	0.027(0.31)	0.025(0.25)
51 ORGANIC CHEMICALS	1.043(0.84)	3.84(0.69)	2.522(0.89)	0.30(0.05)	0.036(0.05)
52 INORGANIC CHEMICALS	9.168(3.91)**	1.677(3.50)**	3.576(55.83)**	-0.075(29.61)**	-0.060(19.92)**
53 DYEING, TANNING AND COLORING MATERIALS	1.634(1.45)	4.420(3.47)**	4.424(5.23)**	0.011(0.06)	0.078(1.19)
54 MEDICINAL AND PHARMACEUTICAL PRODUCTS	1.473(1.09)	0.675(0.02)	0.151(0.00)	0.074(0.54)	0.038(0.13)
55 ESSENTIAL OILS#	4.706(3.06)**	2.155(2.09)**	3.395(11.43)**	-0.033(1.65)*	-0.028(1.61)
56 FERTILIZERS	4.761(3.09)**	7.150(0.95)	11.772(8.89)**	0.064(0.28)	0.192(2.59)**
57 PLASTICS IN PRIMARY FORM#	2.483(2.78)**	5.658(7.88)**	2.866(6.88)**	0.006(0.03)	0.011(0.11)
58 PLASTICS IN NONPRIMARY FORM	-0.371(0.62)	-9.128(0.22)	1.222(0.06)	-0.045(0.13)	-0.166(0.64)
59 CHEMICAL MATERIALS	6.983(3.79)**	0.864(1.26)	1.564(14.06)**	-0.005(0.16)	-0.027(4.07)**
61 LEATHER, LEATHER MFR#	5.523(4.10)**	2.548(6.13)**	1.396(6.19)**	-0.015(0.77)	-0.008(0.21)
62 RUBBER MANUFACTURES	1.141(1.61)	12.993(5.32)**	7.454(9.20)**	-0.099(2.88)**	0.020(0.08)
63 CORK AND WOOD MANUFACTURES	0.444(0.56)	17.004(0.41)	5.204(0.38)	0.051(0.06)	0.223(0.25)
64 PAPER, PAPERBOARD	2.885(2.19)**	3.912(3.61)**	2.154(3.82)**	-0.028(0.94)	-0.012(0.19)
65 TEXTILE YARN, FABRICS#	2.108(1.65)*	3.141(2.49)**	2.368(3.68)**	-0.025(0.64)	-0.008(0.05)
66 NONMETALLIC MINERAL	-0.521(0.39)	-10.327(0.08)	-10.269(0.12)	0.047(0.08)	-0.152(0.11)
67 IRON AND STEEL#	1.427(1.97)**	16.324(10.05)**	4.087(2.31)**	-0.103(1.54)	-0.005(0.00)
68 NONFERROUS METALS	0.295(0.295)	39.993(0.13)	-9.462(0.04)	0.236(0.04)	0.398(0.06)
69 MANUFACTURES OF METALS	-0.173(0.15)	-29.15(0.01)	-6.742(0.01)	-0.752(0.01)	-1.274(0.01)
71 POWER GENERATING MACHINERY	0.61(0.69)	14.632(0.61)	8.931(0.83)	-0.052(0.22)	0.085(0.16)
72 MACHINERY SPECIALIZED	0.355(0.44)	14.16(0.24)	3.823(0.25)	0.001(0.00)	0.092(0.05)
73 METALWORKING MACHINERY	0.221(0.28)	41.471(0.07)	30.948(0.07)	-0.407(0.06)	0.141(0.03)
74 GENERAL INDUSTRIAL MACHRY	1.085(0.91)	3.591(0.89)	2.657(1.62)	0.031(0.12)	0.054(0.19)
75 OFFICE MACHINES AND ADP EQUIPMENT#	3.251(3.10)**	2.052(1.59)	3.100(12.27)**	-0.070(6.15)**	-0.051(3.73)**
76 TELECOMMUNICATIONS EQUIPMENT#	2.551(2.27)**	5.952(5.02)**	4.471(7.85)**	-0.104(4.25)**	-0.076(3.68)**
77 ELECTRICAL MACHRY, APPARATUS & APPLIANCES#	3.493(2.76)**	2.199(4.15)**	2.613(14.6)**	-0.025(1.94)*	-0.021(0.22)
78 MOTOR VEHICLES	0.526(0.58)	7.481(0.50)	1.792(0.23)	0.166(0.26)	0.219(0.23)
79 TRANSPORT EQUIPMENT	1.408(1.62)	8.158(4.12)**	4.415(4.61)**	0.022(0.08)	0.076(0.59)
81 PREFAB BUILDINGS; SANITARY, PLUMBING, ETC.	2.899(1.44)	3.857(3.39)**	1.479(0.77)	0.026(0.88)	0.049(2.87)**
82 FURNITURE & BEDDING	-1.130(0.86)	-1.055(0.04)	-1.711(0.31)	-0.147(0.66)	-0.239(0.79)
83 TRAVEL GOODS, HANDBAGS	0.515(0.37)	14.375(0.18)	11.610(0.21)	-0.097(0.14)	0.133(0.13)
84 ARTICLES OF APPAREL AND CLOTHING	3.098(1.97)**	4.300(2.79)**	3.897(7.74)**	-0.082(4.24)**	-0.043(1.60)

85 FOOTWEAR	4.628(1.38)	2.407(1.76)*	1.634(3.33)**	-0.021(0.93)	0.006(0.09)
87 PROFESSIONAL SCIENTIFIC INSTRUMENTS	3.218(2.77)**	2.272(3.76)**	2.307(10.1)**	-0.020(0.90)	-0.022(1.42)
88 PHOTO APPT, EQUIPMENT & OPTICAL GOODS	5.054(2.97)**	0.961(1.65)*	0.288(0.38)	0.034(8.13)**	0.037(9.59)**
89 MISCELLANEOUS MANUFACTURED ARTICLES	6.187(2.81)**	1.322(2.006)**	0.462(0.80)	-0.002(0.02)	-0.003(0.05)
93 SPECIAL TRANSACTIONS	16.234(5.10)**	1.167(10.22)**	-0.507(6.656)**	0.023(14.97)**	-0.026(21.26)**
95 COIN INCLUDING GOLD	7.226(3.42)**	2.263(0.42)	10.003(28.74)**	-0.077(1.78)*	-0.005(0.00)
96 COIN (OTHER THAN GOLD)	4.163(3.78)**	5.304(3.72)**	4.921(11.32)**	-0.128(8.12)**	-0.109(6.17)**
97 GOLD, NONMONETARY#	5.451(3.48)**	-7.486(1.71)*	-0.472(0.02)	-0.111(1.27)	0.119(1.55)
98 ESTIMATE OF LOW VALUED IMPORT TRANSACTIONS	3.020(3.55)**	4.670(11.56)**	1.161(3.19)**	-0.027(2.09)**	-0.017(0.79)

Notes:

a. # indicates that the 2008 Global Financial Crisis dummy was statistically significant (at least at the 10% significance level).

b. * and ** indicate significance at 10% and 5% levels, respectively.

Table 8: Diagnostic Statistics Related to Non-linear ECM Import demand Function.

Industries	***F***	ECM_{t-1}	***LM***	***RESET***	***CSM(SQ)***	***Adj. R^2***	**Wald-S**	**Wald-L**
00 LIVE ANIMALS	3.806*	-0.385(2.65)	4.87**	0.86	(S)(S)	0.35	4.462**	2.77*
01 MEAT AND MEAT PREPARATIONS	3.662	-0.392(3.16)	3.64*	0.89	(S)(S)	0.43	3.797*	2.137
02 DAIRY PRODUCTS AND BIRDS' EGGS	6.501**	-0.925(4.18)**	1.70	0.92	(S)(S)	0.38	0.745	5.62**
03 FISH (EXCEPT MARINE MAMMAL)	2.937	-0.417(3.66)*	8.86**	6.71**	(S)(S)	0.35	0.026	2.673
04 CEREALS AND CEREAL PREPARATION	1.771	-0.476(2.96)	1.71	2.17	(S)(S)	0.34	0.686	0.055
05 VEGETABLES AND FRUIT	1.254	-0.169(2.05)	6.62**	2.55	(S)(S)	0.4	0.103	0.621
06 SUGARS, SUGAR PREPARATIONS	2.870	-0.405(3.86)*	1.68	2.18	(S)(S)	0.37	1.933	2.524
07COFFEE, TEA, COCOA	2.070	-0.242(1.97)	2.19	2.50	(S)(S)	0.41	1.024	0.239
08 FEEDING STUFF FOR ANIMALS	3.861*	-0.119(1.49)	1.69	4.35**	(S)(S)	0.5	0.047	0.307
09 MISCELLANEOUS EDIBLE	2.326	-0.592(3.71)*	5.13**	1.82	(S)(S)	0.39	0.128	92.85**
11 BEVERAGES	1.560	-0.587(2.86)	6.33**	2.22	(S)(S)	0.28	1.103	1.058
12 TOBACCO AND TOBACCO	2.907	-1.036(3.85)*	0.25	0.36	(S)(S)	0.37	0.622	0.619
21 HIDES, SKINS AND FURSKINS	2.345	-0.964(3.24)	2.70	1.81	(S)(S)	0.28	0.002	0.251
22 OIL SEEDS AND OLEAGINOUS	3.001	-0.270(3.64)	6.14**	2.07	(S)(S)	0.34	0.811	2.787*
23 CRUDE RUBBER	2.153	-0.223(3.69)*	2.01	1.16	(S)(US)	0.36	0.582	1.021
24 CORK AND WOOD	1.420	-0.076(1.32)	0.47	2.02	(S)(S)	0.34	1.439	0.536

25 PULP AND WASTE PAPER	3.167	-0.939(4.11)**	0.68	1.97	(S)(S)	0.37	0.035	1.404
26 TEXTILE FIBERS	0.761	-0.053(0.98)	7.04**	0.74	(S)(S)	0.7	0.002	0.897
27 CRUDE FERTILIZERS	3.459	-1.068(4.35)**	3.24*	2.36	(S)(S)	0.33	2.129	13.64**
28 METALLIFEROUS ORES	3.522	-0.875(4.05)**	0.14	1.22	(S)(S)	0.37	0.010	0.404
29 CRUDE ANIMAL AND VEGETABLE MATERIALS	0.238	0.036(0.26)	1.27	1.39	(S)(S)	0.31	1.404	0.036
32 COAL, COKE AND BRIQUETTES	3.311	-0.981(4.18)**	9.59**	6.28**	(S)(S)	0.39	0.056	15.52**
33 PETROLEUM, PETROLEUM PRODUCTS	1.340	-0.273(1.73)	1.33	1.47	(S)(S)	0.4	4.714**	0.939
41 ANIMAL OILS AND FATS	2.257	0.062(0.75)	4.76**	3.64*	(S)(S)	0.34	0.71	0.341
42 FIXED VEG. FATS & OILS	4.389**	-1.143(4.86)**	0.44	0.62	(S)(S)	0.37	1.401	3.483*
43 ANML/VEG FATS/OILS PROCESS/WASTE	1.949	-0.545(2.73)	13.7**	1.38	(S)(S)	0.38	1.374	0.002
51 ORGANIC CHEMICALS	1.008	-0.074(0.80)	0.01	4.11**	(S)(S)	0.31	0.020	0.016
52 INORGANIC CHEMICALS	5.180**	-0.710(3.89)*	8.39**	1.37	(S)(S)	0.3	0.095	4.659**
53 DYEING, TANNING AND COLORING MATERIALS	2.922	-0.148(1.54)	2.70	1.75	(S)(S)	0.29	6.526**	2.143
54 MEDICINAL AND PHARMACEUTICAL PRODUCTS	1.340	-0.109(1.02)	0.69	3.22*	(S)(S)	0.24	0.416	1.911
55 ESSENTIAL OILS	3.788*	-0.395(3.13)	6.00**	9.82**	(S)(S)	0.41	11.43**	0.070
56 FERTILIZERS	1.610	-0.453(2.88)	1.00	1.96	(S)(S)	0.43	1.065	4.268**
57 PLASTICS IN PRIMARY FORM	2.432	-0.211(2.77)	0.08	0.19	(S)(S)	0.38	4.832**	0.096
58 PLASTICS IN NONPRIMARY FORM	0.987	0.036(0.72)	0.58	0.45	(S)(S)	0.32	1.667	0.561
59 CHEMICAL MATERIALS	2.798	-0.558(3.80)*	2.68	2.35	(S)(S)	0.37	0.105	10.86**
61 LEATHER, LEATHER MFR	3.241	-0.468(4.10)**	8.44**	2.45	(S)(S)	0.29	2.492	0.729
62 RUBBER MANUFACTURES	2.121	-0.084(1.63)	2.31	3.23*	(S)(S)	0.37	1.172	3.823*
63 CORK AND WOOD MANUFACTURES	1.105	-0.032(0.57)	2.55	2.44	(S)(S)	0.29	3.408*	0.315
64 PAPER, PAPERBOARD	1.799	-0.214(2.21)	4.98**	2.68	(S)(S)	0.22	5.236**	0.647
65 TEXTILE YARN, FABRICS	4.458**	-0.144(1.67)	0.70	4.69**	(S)(S)	0.41	4.118**	0.542
66 NONMETALLIC MINERAL	1.529	0.033(0.36)	7.34**	10.7**	(S)(S)	0.38	6.06**	0.140
67 IRON AND STEEL	1.878	-0.106(1.94)	0.77	1.43	(S)(S)	0.37	0.992	5.472**
68 NONFERROUS METALS	1.131	-0.013(0.33)	0.42	2.28	(S)(S)	0.38	0.005	0.093
69 MANUFACTURES OF METALS	2.774	0.009(0.13)	7.39**	5.264**	(S)(S)	0.36	4.952**	0.017
71 POWER GENERATING MACHINERY	2.050	-0.045(0.69)	1.05	1.10	(S)(S)	0.29	2.309	0.334
72 MACHINERY SPECIALIZED	0.562	-0.022(0.37)	1.64	0.32	(S)(S)	0.4	1.635	0.089
73 METALWORKING MACHINERY	1.732	-0.017(0.25)	0.47	1.95	(S)(S)	0.42	6.542**	0.058
74 GENERAL INDUSTRIAL MACHRY	0.885	-0.070(0.89)	1.63	3.90**	(S)(S)	0.29	0.216	0.188
75 OFFICE MACHINES AND ADP EQUIPMENT	3.935*	-0.189(3.83)*	2.23	1.26	(S)(S)	0.37	4.857**	2.837*
76 TELECOMMUNICATIONS EQUIPMENT	2.452	-0.156(3.70)*	3.33*	1.18	(S)(S)	0.29	6.744**	1.143
77 ELECTRICAL MACHRY, APPARATUS & APPLIANCES	2.171	-0.218(2.77)	2.56	3.96**	(S)(S)	0.22	7.05**	0.18

78 MOTOR VEHICLES	1.218	-0.036(0.57)	1.32	0.07	(S)(S)	0.32	1.857	0.135
79 TRANSPORT EQUIPMENT	1.555	-0.116(1.58)	1.62	0.30	(S)(US)	0.37	0.598	1.485
81 PREFAB BUILDINGS; SANITARY, PLUMBING, ETC.	1.857	-0.202(1.48)	6.35**	8.60**	(S)(S)	0.29	13.2**	0.631
82 FURNITURE & BEDDING	2.346	0.072(0.86)	2.68	12.9**	(S)(S)	0.37	0.423	0.873
83 TRAVEL GOODS, HANDBAGS	1.350	-0.035(0.39)	1.26	1.18	(S)(S)	0.29	4.436**	0.178
84 ARTICLES OF APPAREL AND CLOTHING	1.366	-0.194(3.71)*	2.70	7.55**	(S)(S)	0.22	5.496**	2.747*
85 FOOTWEAR	2.088	-0.289(1.40)	10.4**	1.96	(S)(S)	0.41	4.609**	2.765*
87 PROFESSIONAL SCIENTIFIC INSTRUMENTS	2.544	-0.229(2.78)	8.14**	1.46	(S)(S)	0.37	6.192**	0.035
88 PHOTO APPT, EQUIPMENT & OPTICAL GOODS	4.763**	-0.354(3.98)*	1.13	3.52*	(S)(S)	0.38	2.994*	0.097
89 MISCELLANEOUS MANUFACTURED ARTICLES	2.096	-0.370(2.83)	2.39	12.7**	(S)(S)	0.36	4.765**	0.012
93 SPECIAL TRANSACTIONS	5.327**	-1.252(5.11)**	5.28**	1.92	(S)(S)	0.29	4.138**	4.266**
95 COIN INCLUDING GOLD	3.219	-0.877(3.75)*	0.51	2.94*	(S)(S)	0.4	0.130	6.067**
96 COIN (OTHER THAN GOLD)	2.980	-0.683(3.89)*	1.99	0.08	(S)(S)	0.42	0.278	0.743
97 GOLD, NONMONETARY	2.262	-0.631(3.05)	1.14	0.61	(S)(S)	0.38	7.65**	0.05
98 ESTIMATE OF LOW VALUED IMPORT TRANSACTIONS	3.561	-0.219(3.68)*	0.82	1.22	(S)(S)	0.31	0.443	0.730

Notes:

a. The upper bound critical value of the F test at the 5% (10%) significance level is 4.35(3.77) when k=3 (the number of the exogenous variables). These are derived from Pesaran *et al.* (2001. Table CI-Case III. page 300).

b. The upper bound critical value of the test for significance of ECM_{t-1} is -3.99(-3.66) at the 5% (10%) significance level when k=4. These are derived from Pesaran *et al*. (2001. Table CII-Case III. page 303).

c. LM refers to the Lagrange Multiplier test of residual serial correlation. It has the χ^2 distribution with one degree of freedom. Its critical value at 5% (10%) significance level is 3.84(2.71).

d. RESET refers to the Ramsey's test for misspecification. It has the χ^2 distribution with one degree of freedom.

e. Both Wald tests have also the χ^2 distribution with one degree of freedom.

f. *. and ** indicate significance level at 10% and 5%, respectively.

Appendix B: Robustness

Table 9: Long-Run Coefficient Estimates of Non-Linear ARDL Export Demand Model with break.

Industries	*break date*	*F*	ECM_{t-1}	$Ln\ IP_t^{CH}$	$Ln\ REX_t$	MIS_t^+	MIS_t^-
00 LIVE ANIMALS	2015M01	3.41	-0.67(5.22)**	-6.27(0.33)	2.25(0.49)	-0.07(0.27)	-0.17(0.24)
01 MEAT AND MEAT PREPARATIONS	2018M01	1.86	-0.09(3.24)	-9.25(0.39)	-2.58(0.69)	-0.16(0.16)	-0.13(0.65)
02 DAIRY PRODUCTS AND BIRDS' EGGS	2013M04	3.17	-0.34(4.53)**	5.37(0.15)	-0.23(0.91)	0.01(0.85)	-0.09(0.30)
03 FISH (EXCEPT MARINE MAMMAL)	2011M07	10.42**	-1.05(8.62)**	6.08(0.00)**	-1.77(0.05)*	0.05(0.03)**	-0.20(0.00)**
04 CEREALS AND CEREAL PREPARATION	2011M05	3.84*	-0.40(4.79)**	19.00(0.11)	-3.08(0.63)	0.23(0.10)	0.58(0.06)*
05 VEGETABLES AND FRUIT	2012M10	6.87**	-0.79(7.20)**	2.12(0.18)	-1.47(0.13)	0.07(0.02)**	-0.07(0.06)*
06 SUGARS, SUGAR PREPARATIONS	2011M11	2.06	-0.37(3.96)*	6.62(0.14)	-0.76(0.77)	0.02(0.79)	-0.11(0.32)
07COFFEE, TEA, COCOA	2011M06	4.29*	-0.58(5.48)**	5.12(0.09)*	-0.45(0.79)	0.01(0.78)	-0.16(0.04)**
08 FEEDING STUFF FOR ANIMALS	2013M04	2.73	-0.23(4.27)**	9.21(0.14)	6.09(0.09)*	0.10(0.32)	0.28(0.07)*
09 MISCELLANEOUS EDIBLE	2017M04	4.60**	-0.41(5.93)**	14.20(0.00)**	2.23(0.18)	0.09(0.00)**	0.09(0.32)
11 BEVERAGES	2012M09	4.57**	-0.65(5.40)**	-1.87(0.50)	1.21(0.44)	0.01(0.74)	-0.07(0.24)
12 TOBACCO AND TOBACCO	2017M03	4.54**	-0.73(4.37)**	-5.85(0.81)	-5.47(0.63)	0.19(0.44)	-0.25(0.83)
21 HIDES, SKINS AND FURSKINS	2018M01	4.29*	-0.57(5.68)**	5.79(0.00)**	-1.50(0.06)*	0.06(0.00)**	-0.08(0.03)**
22 OIL SEEDS AND OLEAGINOUS	2016M10	9.42**	-0.63(8.29)**	-24.40(0.07)*	9.34(0.18)	-0.33(0.01)**	0.00(0.98)
23 CRUDE RUBBER	2014M05	5.12**	-0.51(6.14)**	9.37(0.00)**	0.59(0.55)	-0.01(0.40)	-0.08(0.07)*
24 CORK AND WOOD	2016M05	3.00	-0.20(3.05)	7.36(0.06)*	-3.27(0.11)	0.16(0.00)**	-0.00(0.98)
25 PULP AND WASTE PAPER	2015M03	2.76	-0.25(3.96)*	2.36(0.30)	0.38(0.73)	-0.03(0.08)*	-0.04(0.38)
26 TEXTILE FIBERS	2006M08	6.42**	-0.45(7.11)**	7.86(0.04)**	0.17(0.94)	-0.07(0.07)*	-0.06(0.51)
27 CRUDE FERTILIZERS	2017M01	5.59**	-0.61(6.07)**	1.40(0.37)	1.82(0.02)**	-0.00(0.72)	0.00(0.94)
28 METALLIFEROUS ORES	2018M01	4.25*	-0.43(5.49)**	6.66(0.00)**	-2.22(0.05)*	0.03(0.06)*	-0.16(0.00)
29 CRUDE ANIMAL AND VEGETABLE MATER	2015M03	6.35**	-0.87(7.22)**	1.78(0.07)*	1.25(0.01)**	0.02(0.03)**	-0.02(0.39)
32 COAL, COKE AND BRIQUETTES	2013M05	1.43	-0.32(3.00)	3.26(0.95)	13.80(0.62)	-0.30(0.67)	-0.86(0.40)
33 PETROLEUM, PETROLEUM PRODUCTS	2017M05	4.16*	-0.59(5.08)**	0.21(0.96)	1.54(0.56)	0.06(0.20)	0.08(0.60)
34 GAS, NATURAL AND MANUFACTURED	2016M10	3.23	-0.57(4.60)**	14.44(0.46)	5.41(0.65)	0.70(0.00)**	2.01(0.00)
41 ANIMAL OILS AND FATS	2006M08	3.29	-0.57(4.59)**	8.48(0.26)	9.06(0.04)**	-0.03(0.64)	0.21(0.22)
42 FIXED VEG. FATS & OILS	2010M07	4.99**	-0.67(5.98)**	-1.59(0.88)	4.35(0.44)	-0.00(0.95)	0.37(0.19)
43 ANML/VEG FATS/OILS PROCESS/WASTE	2004M12	3.79*	-0.66(5.14)**	-9.11(0.11)	4.60(0.15)	-0.02(0.70)	0.23(0.10)
51 ORGANIC CHEMICALS	2015M10	3.42	-0.48(4.98)**	6.16(0.00)**	1.08(0.36)	0.01(0.57)	-0.03(0.59)
52 INORGANIC CHEMICALS	2009M07	2.81	-0.39(4.10)**	6.97(0.02)**	3.79(0.00)**	-0.08(0.00)**	-0.02(0.74)

53 DYEING, TANNING AND COLORING MAT	2010M03	2.84	-0.30(4.01)**	4.04(0.13)	2.47(0.08)*	-0.08(0.00)**	0.04(0.52)
54 MEDICINAL AND PHARMACEUTICAL PRO	2014M07	6.11**	-0.88(6.62)**	-1.59(0.28)	2.30(0.00)**	0.00(0.63)	0.01(0.65)
55 ESSENTIAL OILS	2015M03	3.87*	-0.56(5.42)**	3.05(0.00)**	-0.66(0.28)	0.02(0.02)**	-0.03(0.20)
56 FERTILIZERS	2007M02	7.09**	-1.08(7.91)**	8.42(0.10)	17.63(0.00)**	-0.10(0.08)*	0.01(0.91)
57 PLASTICS IN PRIMARY FORM	2009M04	4.59**	-0.30(4.88)**	5.62(0.00)**	-1.69(0.14)	0.03(0.12)	0.03(0.50)
58 PLASTICS IN NONPRIMARY FORM	2015M03	2.73	-0.39(4.37)**	4.56(0.00)**	0.34(0.59)	-0.00(0.96)	-0.03(0.32)
59 CHEMICAL MATERIALS	2013M05	3.97*	-0.62(5.45)**	4.99(0.00)**	0.77(0.21)	0.01(0.35)	-0.01(0.55)
61 LEATHER, LEATHER MFR	2017M11	8.38**	-0.55(7.53)**	9.84(0.00)**	-0.88(0.43)	0.07(0.00)**	-0.07(0.20)
62 RUBBER MANUFACTURES	2013M03	3.26	-0.29(4.03)**	7.94(0.00)**	-1.18(0.43)	0.00(0.96)	-0.04(0.51)
63 CORK AND WOOD MANUFACTURES	2018M01	3.99*	-0.40(4.68)**	3.21(0.31)	-4.21(0.02)**	0.12(0.00)**	0.02(0.83)
64 PAPER, PAPERBOARD	2011M02	5.28**	-0.57(6.27)**	2.84(0.00)**	-0.12(0.79)	0.02(0.00)**	-0.02(0.31)
65 TEXTILE YARN, FABRICS	2010M03	4.42**	-0.43(5.23)**	4.74(0.00)**	-1.60(0.00)**	0.03(0.00)**	-0.03(0.25)
66 NONMETALLIC MINERAL	2014M08	6.77**	-0.81(6.93)**	5.36(0.00)	0.42(0.33)	0.00(0.38)	-0.05(0.00)**
67 IRON AND STEEL	2009M11	2.83	-0.31(4.76)**	8.34(0.06)*	2.48(0.26)	0.02(0.58)	0.07(0.49)
68 NONFERROUS METALS	2018M01	4.95**	-0.48(6.38)**	6.91(0.01)**	-4.89(0.00)**	0.01(0.73)	-0.04(0.53)
69 MANUFACTURES OF METALS	2014M03	2.93	-0.33(3.99)*	4.05(0.02)**	-0.08(0.92)	-0.01(0.35)	-0.07(0.07)*
71 POWER GENERATING MACHINERY	2016M10	5.94**	-0.91(6.17)**	2.38(0.10)	0.78(0.28)	-0.01(0.36)	-0.02(0.59)
72 MACHINERY SPECIALIZED	2015M02	4.91**	-0.62(6.34)**	5.13(0.00)**	2.01(0.03)**	-0.00(0.99)	0.06(0.12)
73 METALWORKING MACHINERY	2007M01	4.59**	-0.56(5.55)**	5.04(0.01)**	0.50(0.73)	-0.00(0.78)	-0.09(0.07)*
74 GENERAL INDUSTRIAL MACHRY	2011M03	3.70	-0.49(5.11)**	3.43(0.00)**	-0.28(0.58)	0.03(0.01)**	-0.06(0.02)**
75 OFFICE MACHINES AND ADP EQUIPMENT	2011M06	3.94*	-0.58(4.65)**	1.19(0.31)	-2.54(0.00)**	0.02(0.12)	-0.09(0.00)**
76 TELECOMMUNICATIONS EQUIPMENT	2017M09	5.26**	-0.61(5.97)**	-0.83(0.40)	-1.14(0.04)**	0.03(0.00)**	-0.01(0.50)
77 ELECTRICAL MACHRY, APPARATUS & APP	2013M03	2.15	-0.22(3.80)*	4.83(0.02)**	-1.22(0.32)	-0.02(0.51)	-0.01(0.79)
78 MOTOR VEHICLES	2013M02	4.09*	-0.50(5.51)**	10.73(0.00)**	-2.14(0.11)	0.14(0.00)	-0.05(0.34)
79 TRANSPORT EQUIPMENT	2013M06	3.38	-0.43(4.37)**	-1.14(0.80)	-2.94(0.27)	0.01(0.79)	-0.38(0.00)**
81 PREFAB BUILDINGS; SANITARY, PLUMBIN	2017M06	5.39**	-0.79(6.33)**	4.93(0.01)**	3.26(0.00)**	0.00(0.87)	0.09(0.15)
82 FURNITURE & BEDDING	2013M05	4.98*	-0.34(4.81)**	10.85(0.00)**	-0.30(0.83)	0.04(0.33)	-0.04(0.48)
83 TRAVEL GOODS, HANDBAGS	2015M08	2.35	-0.37(3.81)*	-1.04(0.86)	-1.89(0.55)	0.02(0.66)	-0.31(0.05)*
84 ARTICLES OF APPAREL AND CLOTHING	2017M05	6.03**	-0.63(6.73)**	1.96(0.34)	-2.13(0.04)**	0.06(0.00)**	0.00(0.98)
85 FOOTWEAR	2017M09	2.11	-0.27(3.85)*	1.48(0.65)	-0.73(0.69)	0.00(0.95)	-0.00(0.95)
87 PROFESSIONAL SCIENTIFIC INSTRUMENT	2012M05	5.01**	-0.79(6.14)**	3.18(0.00)**	-0.04(0.93)	0.02(0.11)	-0.03(0.12)
88 PHOTO APPT, EQUIPMENT & OPTICAL	2009M05	3.77*	-0.59(5.30)**	2.07(0.12)	-2.54(0.00)**	0.03(0.00)**	-0.08(0.00)**
89 MISCELLANEOUS MANUFACTURED ARTI	2014M03	4.55**	-0.53(5.72)**	4.13(0.00)**	0.54(0.45)	-0.01(0.26)	-0.00(0.93)
93 SPECIAL TRANSACTIONS	2015M08	3.94*	-0.84(5.76)**	-0.76(0.70)	-1.72(0.11)	0.02(0.15)	-0.06(0.21)
97 GOLD, NONMONETARY	2018M01	4.39**	-0.66(5.69)**	1.87(0.87)	-3.40(0.62)	0.06(0.59)	-0.64(0.04)**

99 LOW VALUE SHIPMENTS	2010M01	2.92	-0.26(4.70)**	3.38(0.11)	-0.35(0.74)	0.00(0.64)	0.04(0.41)

Notes:

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

b. Number inside the parenthesis next to ECM_{t-1} is the absolute value of the t-ratio. Its upper bound critical value at the 5%(10%) significance level is -3.99(-3.66) when k=4. These come from Pesaran *et al*.(2001. Table CII-Case III. page 303).

c. Numbers inside the parentheses are absolute value of t-ratios.

d. * and ** indicate significance at 10% levels and 5% level respectively.

Table 10: Long-Run Coefficient Estimates of Non-Linear ARDL import Demand Model with break.

Industries	*break date*	*F*	ECM_{t-1}	$Ln\ IP_t^{USA}$	$Ln\ REX_t$	MIS_t^+	MIS_t^-
00 LIVE ANIMALS	2011M12	2.48	-0.43(3.85)*	-2.52(0.77)	-0.11(0.98)	0.16(0.22)	-0.60(0.00)**
01 MEAT AND MEAT PREPARATIONS	2011M09	5.17**	-0.64(6.55)**	9.29(0.01)**	-2.31(0.33)	0.07(0.18)	0.00(0.97)
02 DAIRY PRODUCTS AND BIRDS' EGGS	2011M07	7.65**	-0.90(7.87)**	1.32(0.63)	-0.16(0.92)	-0.01(0.57)	0.11(0.10)
03 FISH (EXCEPT MARINE MAMMAL)	2018M01	3.62	-0.44(5.63)**	1.78(0.40)	-1.48(0.26)	-0.00(0.75)	-0.10(0.06)*
04 CEREALS AND CEREAL PREPARATION	2014M06	3.33	-0.63(5.16)**	4.35(0.09)*	-0.03(0.98)	-0.04(0.15)	-0.04(0.45)
05 VEGETABLES AND FRUIT	2011M06	3.00	-0.28(4.31)**	5.57(0.05)*	0.22(0.89)	-0.06(0.05)*	-0.01(0.82)
06 SUGARS, SUGAR PREPARATIONS	2012M07	5.13**	-0.42(6.19)**	3.31(0.17)	-3.29(0.03)**	0.01(0.81)	-0.12(0.03)**
07COFFEE, TEA, COCOA	2015M03	6.07**	-0.65(6.96)**	5.39(0.00)	-0.67(0.38)	0.02(0.06)*	-0.03(0.25)
08 FEEDING STUFF FOR ANIMALS	2010M04	3.31	-0.41(4.95)**	13.77(0.00)**	-0.44(0.79)	-0.14(0.00)**	-0.10(0.14)
09 MISCELLANEOUS EDIBLE	2015M01	5.16**	-0.75(6.28)**	0.16(0.85)	0.70(0.21)	0.00(0.85)	-0.03(0.09)*
11 BEVERAGES	2017M10	4.96**	-0.75(5.95)**	-0.29(0.90)	0.06(0.96)	0.03(0.09)*	-0.13(0.04)**
12 TOBACCO AND TOBACCO	2006M04	6.04**	-1.14(6.60)**	-9.27(0.04)**	-0.68(0.82)	0.15(0.00)**	-0.01(0.89)
21 HIDES, SKINS AND FURSKINS	2009M02	2.63	-0.65(4.17)**	-21.96(0.16)	16.20(0.04)**	0.00(0.99)	0.00(0.98)
22 OIL SEEDS AND OLEAGINOUS	2010M04	4.30*	-0.38(5.49)**	15.78(0.00)**	4.67(0.14)	-0.05(0.18)	0.01(0.88)
23 CRUDE RUBBER#	2011M08	4.00*	-0.43(5.20)**	4.10(0.24)	5.04(0.02)**	-0.13(0.00)**	-0.20(0.02)
24 CORK AND WOOD	2011M09	2.10	-0.24(3.96)*	9.66(0.00)**	-9.77(0.00)**	0.06(0.16)	-0.21(0.00)**
25 PULP AND WASTE PAPER	2017M11	3.62	-0.73(5.16)**	-9.27(0.16)	9.67(0.01)**	-0.10(0.24)	-0.35(0.02)**
26 TEXTILE FIBERS	2009M02	2.12	-0.23(3.76)*	10.84(0.02)**	1.79(0.52)	-0.15(0.00)**	-0.07(0.57)
27 CRUDE FERTILIZERS	2009M02	5.17**	-0.88(6.16)**	2.98(0.11)	0.04(0.97)	-0.02(0.06)*	-0.14(0.00)**
28 METALLIFEROUS ORES	2017M12	3.75	-0.74(5.16)**	-2.24(0.57)	3.92(0.11)	-0.01(0.65)	-0.13(0.16)
29 CRUDE ANIMAL AND VEGETABLE MATER	2008M11	4.01*	-0.54(5.39)**	1.85(0.16)	-1.38(0.08)*	0.02(0.03)**	-0.07(0.03)**
32 COAL, COKE AND BRIQUETTES	2008M09	5.06**	-0.74(5.86)**	6.12(0.60)	17.60(0.01)**	-0.33(0.00)**	0.31(0.29)
33 PETROLEUM, PETROLEUM PRODUCTS	2011M09	3.79*	-0.55(4.76)**	-10.61(0.18)	-1.77(0.69)	0.09(0.08)*	-0.48(0.01)**
41 ANIMAL OILS AND FATS	2016M05	1.76	-0.17(2.18)	8.81(0.50)	6.08(0.46)	-0.25(0.21)	-0.59(0.09)*
42 FIXED VEG. FATS & OILS	2014M06	9.18**	-1.03(8.13)**	4.80(0.03)**	0.48(0.63)	-0.04(0.02)**	0.02(0.60)
43 ANML/VEG FATS/OILS PROCESS/WASTE	2015M03	7.28**	-1.10(7.42)**	3.64(0.21)	-3.58(0.05)*	0.03(0.29)	-0.23(0.00)**
51 ORGANIC CHEMICALS	2009M02	3.13	-0.35(4.71)**	4.11(0.03)**	2.40(0.04)**	-0.06(0.00)**	-0.11(0.01)**
52 INORGANIC CHEMICALS	2017M12	4.35**	-0.64(5.64)**	1.75(0.34)	1.19(0.28)	0.06(0.00)**	-0.15(0.00)**
53 DYEING, TANNING AND COLORING MAT	2014M12	5.07**	-0.48(5.42)**	6.07(0.00)**	-1.01(0.24)	-0.02(0.08)*	-0.04(0.26)
54 MEDICINAL AND PHARMACEUTICAL PRO	2015M08	2.51	-0.36(4.16)**	-0.58(0.74)	3.32(0.00)**	-0.04(0.01)**	-0.03(0.43)
55 ESSENTIAL OILS	2015M11	6.89**	-0.63(7.55)**	4.77(0.01)***	-0.81(0.47)	-0.03(0.10)	-0.09(0.03)**
56 FERTILIZERS	2014M04	4.25*	-0.64(5.48)**	28.59(0.03)**	8.03(0.24)	-0.05(0.64)	0.52(0.08)*

57 PLASTICS IN PRIMARY FORM	2015M03	4.70**	-0.61(6.13)**	1.50(0.30)	-2.08(0.02)**	0.00(0.93)	-0.29(0.00)**
58 PLASTICS IN NONPRIMARY FORM	2018M01	2.41	-0.18(3.30)	8.69(0.00)**	-2.42(0.20)	-0.02(0.38)	-0.18(0.01)**
59 CHEMICAL MATERIALS	2010M07	8.83**	-0.71(8.64)**	6.38(0.00)**	-1.05(0.16)	-0.02(0.01)**	0.04(0.21)
61 LEATHER, LEATHER MFR	2012M03	5.72**	-0.48(6.62)**	7.42(0.00)**	-3.47(0.00)**	-0.01(0.26)	-0.06(1.49)
62 RUBBER MANUFACTURES	2012M04	3.52	-0.21(4.35)**	11.20(0.00)**	-1.70(0.36)	-0.10(0.02)**	-0.18(0.01)
63 CORK AND WOOD MANUFACTURES	2012M05	3.39	-0.20(3.91)*	10.03(0.00)**	-4.99(0.01)**	-0.06(0.22)	-0.11(0.12)
64 PAPER, PAPERBOARD	2018M01	5.85**	-0.35(5.56)**	3.86(0.04)**	-3.19(0.01)**	0.04(0.15)	-0.13(0.00)**
65 TEXTILE YARN, FABRICS	2015M03	6.61**	-0.53(6.66)**	7.69(0.00)**	-2.68(0.00)**	-0.02(0.01)**	0.00(0.77)
66 NONMETALLIC MINERAL	2009M03	5.04**	-0.46(5.52)**	4.25(0.00)**	-2.11(0.00)**	-0.00(0.74)	-0.10(0.00)**
67 IRON AND STEEL	2010M09	4.90**	-0.15(3.06)	13.90(0.04)**	2.98(0.47)	0.15(0.00)**	-0.25(0.11)
68 NONFERROUS METALS	2015M01	1.25	-0.14(2.31)	19.07(0.00)**	-4.42(0.26)	-0.06(0.29)	-0.09(0.58)
69 MANUFACTURES OF METALS	2015M03	3.33	-0.30(3.99)*	5.25(0.00)**	-0.83(0.35)	-0.03(0.04)**	-0.06(0.06)**
71 POWER GENERATING MACHINERY	2015M03	3.01	-0.30(4.16)**	7.58(0.00)**	0.58(0.60)	-0.05(0.00)**	-0.10(0.02)**
72 MACHINERY SPECIALIZED	2015M08	3.76	-0.25(4.74)**	-8.93(0.00)**	-2.84(0.03)**	-0.01(0.51)	-0.15(0.00)**
73 METALWORKING MACHINERY	2015M03	3.95*	-0.36(4.78)**	7.06(0.00)**	-2.33(0.08)*	-0.02(0.37)	-0.19(0.00)
74 GENERAL INDUSTRIAL MACHRY	2009M10	8.11**	-0.49(7.90)**	6.27(0.00)**	-0.99(0.14)	-0.03(0.00)**	-0.07(0.00)**
75 OFFICE MACHINES AND ADP EQUIPME	2009M05	3.19	-0.28(4.50)**	8.75(0.00)**	-4.99(0.00)**	-0.02(0.12)	-0.12(0.02)
76 TELECOMMUNICATIONS EQUIPMENT	2004M08	4.01*	-0.32(5.39)**	6.96(0.00)**	-3.01(0.03)**	-0.03(0.12)	-0.13(0.01)**
77 ELECTRICAL MACHRY, APPARATUS & APP	2015M03	6.38**	-0.43(6.47)**	4.31(0.00)**	-1.31(0.05)**	-0.02(0.00)**	-0.08(0.00)**
78 MOTOR VEHICLES	2014M05	3.20	-0.31(4.47)**	7.29(0.00)**	-1.48(0.12)	-0.02(0.10)	-0.06(0.07)*
79 TRANSPORT EQUIPMENT	2015M05	2.89	-0.32(4.11)**	-7.83(0.00)**	0.08(0.96)	-0.07(0.01)**	-0.15(0.02)**
81 PREFAB BUILDINGS; SANITARY, PLUMBIN	2015M03	5.52**	-0.66(6.49)**	3.47(0.00)**	-3.02(0.00)**	0.03(0.00)**	-0.06(0.00)**
82 FURNITURE & BEDDING	2017M12	2.80	-0.27(3.38)	6.09(0.00)**	-3.09(0.02)**	-0.00(0.80)	-0.09(0.07)*
83 TRAVEL GOODS, HANDBAGS	2012M06	4.65**	-0.36(4.93)**	2.73(0.15)	-0.70(0.54)	-0.01(0.46)	-0.10(0.03)
84 ARTICLES OF APPAREL AND CLOTHING	2017M11	7.75**	-0.49(7.60)**	5.33(0.00)**	-1.23(0.24)	-0.03(0.23)	-0.07(0.07)*
85 FOOTWEAR	2014M09	9.78**	-1.05(9.00)**	0.98(0.14)	-0.76(0.05)*	0.00(0.79)	-0.03(0.02)**
87 PROFESSIONAL SCIENTIFIC INSTRUME	2010M05	4.56**	-0.37(5.20)**	5.09(0.00)**	-1.86(0.05)*	-0.01(0.25)	-0.06(0.06)*
88 PHOTO APPT, EQUIPMENT & OPTICAL G	2012M07	2.91	-0.38(4.39)**	0.85(0.54)	-1.97(0.01)*	0.04(0.00)**	-0.02(0.44)
89 MISCELLANEOUS MANUFACTURED ARTI	2017M11	11.21**	-0.56(8.97)**	1.11(0.32)	-1.44(0.05)**	-0.01(0.34)	-0.04(0.09)*
93 SPECIAL TRANSACTIONS	2014M02	6.41**	-0.93(7.36)**	2.79(0.00)**	-1.43(0.02)**	0.01(0.04)**	-0.00(0.99)
95 COIN INCLUDING GOLD	2010M10	5.22**	-0.98(6.69)**	7.66(0.21)	2.39(0.54)	-0.00(0.94)	-0.03(0.80)
96 COIN (OTHER THAN GOLD)	2016M04	4.24*	-0.73(6.01)**	5.22(0.30)	0.95(0.74)	-0.12(0.00)**	-0.13(0.26)
97 GOLD, NONMONETARY	2011M02	3.03	-0.84(4.88)**	20.39(0.03)**	-0.89(0.84)	-0.11(0.16)	0.08(0.70)
Notes:							

a. At the 5% (10%) significance level when there are three exogenous variables (k=3). the upper bound critical value of the F test is 4.35(3.77). These come from Pesaran *et al.* (2001. Table CI-Case III. page 300).
b. Number inside the parenthesis next to ECM_{t-1} is the absolute value of the t-ratio. Its upper bound critical value at the 5%(10%) significance level is -3.99(-3.66) when k=4. These come from Pesaran *et al.*(2001. Table CII-Case III. page 303).
e. Numbers inside the parentheses are absolute value of t-ratios.
f. * and ** indicate significance at 10% levels and 5% level respectively.