Pakistan-EU Commodity Trade: Is there Evidence of J-Curve Effect?

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Abstract

In investigating the short run and the long run impact of currency depreciation on Pakistan's trade balance, previous studies have either relied on using bilateral trade data between Pakistan and her trade partners or between Pakistan and the rest of the world and have found not much support for successful depreciation. Suspecting that these studies may suffer from aggregation bias, in this paper we use disaggregated trade data at commodity level from 77 industries that trade between Pakistan and EU. While we find short-run significant effects in 22 industries, these effects do not last into the long run in most industries. Most of the affected industries are found to be small, as measured by their trade shares.

Keywords: J-Curve, Bound testing, commodity trade, Pakistan, EU.

JEL Classification: F31

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I. INTRODUCTION

Pakistan has a history of running trade deficit. Like many other countries, it has relied upon devaluations as well as depreciations to improve its trade balancet. The first devaluation experienced by Pakistani rupee was in 1952. After that there are frequent instances where Pakistani rupee has faced decline in its value. The most notable devaluation in currency value was in 1972 and 1996. The decrease in value of rupee was expected to promote exports and restrict imports. However, failure to see any improvement in the trade deficit could be due to inflationary effects of nominal depreciation. For this reason we need to incorporate the nominal exchange rate and price changes into one variable and consider changes in the real exchange rate. Since this paper is about Pakistan-EU trade, Figure 1 depicts the nominal and real rupee-euro movement over our study period. As can be seen, while clearly in nominal term rupee has depreciated, in real terms there has been periods of real depreciation and appreciation.

Figure 1 goes about here

In assessing the effects of real exchange rate changes on the trade balance, there is an important underlying assumption that if devaluation or depreciation is to improve the trade balance, the well-known Marshall-Lerner condition must hold. The condition basically states that sum of import and export demand elasticities must exceed unity. Bahmani-Oskooee *et al*. (2013) who provide a comprehensive review of the literature reveal that Pakistan was included in Khan (1974) and Gylfason and Risager (1984) who used aggregate trade data and found support for the Marshall-Lerner condition for Pakistan. However, when Akhtar and Malik (2000) disaggregated Pakistan's trade data by trading partners, the condition was satisfied between Pakistan and Japan as well as U.K., but not between Pakistan and the U.S. and not between Pakistan and Germany. Bahmani-Oskooee and Kara (2005) criticized above studies for not using stationary data and

when they used cointegration approach, they failed to find support for the Marshall-Lerner condition in Pakistan.[5]

Two issues about the Marshall-Lerner condition deserve mention. First, it is a long-run condition that must hold if currency devaluation or depreciation is to improve the trade balance. Second, it is an indirect method of assessing the long-run effects of exchange rate changes. For these reasons more recent studies try to establish a direct link between the trade balance and the real exchange rate. There are a few advantages of this approach. First, this approach allows us to account for the effects of other macroeconomic variables. Second, it allows us to distinguish the short-run effects from the long-run effects. Indeed, the literature supports the notion that due to adjustment lags, currency depreciation worsens the trade balance first and improves it later, hence the J-curve effect.[6] Bahmani-Oskooee (1985) who was the first to introduce a model and the method of testing the J-curve effect was followed by Shahbaz.*et al*. (2009, 2011) who failed to support the J-curve effect in Pakistan. However, Rehman an Afzal (2003) and Aftab and Aurangzeb (2002) confirm the J- curve in Pakistan.

The above studies which found mixed results are criticized for using aggregate trade flows of Pakistan with the rest of the world. To remedy the situation Akhtar and Malik (2000) rely upon a model that uses bilateral trade data between Pakistan and her four major trading partners UK, USA, Germany, and Japan. Not much support is found for the J-curve and for a successful depreciation. The same is true of Aftab and Khan (2008) who tested the phenomenon between Pakistan and her 12 major trading partners. Similarly, while Hameed and Kanwal (2009) confirm positive long run relationship between the exchange rate and the trade balance,

[5] Another body of the literature aims at estimating import and export demand functions separately. Examples include King (1993), Alse and Bahmani-Oskooee (1995), Charos *et al*. (1996),Truett and Truett (2000), Du and Zhu (2001), Love and Chandra (2005), Agbola and Damoense (2005), and Narayan and Narayan (2005).

[6] See Magee (1973) for the origin and the J-curve. See Bahmani-Oskooee and Hegerty (2010) for a review article.

they do not find support for the J-curve effect between Pakistan and her ten trade partners. Hussian and Bashir (2012) and Bahmani-Oskooee and Cheema (2009) are other studies that also use bilateral trade flows. The former confirms existence of J- curve between Pakistan and her two major trade partners UK and the US, while the latter confirms the J-curve in six out of 13 Pakistan's trading partners. Concentrating on the trade between Pakistan and one of her major trading partners, the U.S., Bahmani-Oskooee and Cheema (2009) found no significant effect neither in the short run nor in the long run. Failure to find significant effects was argued by Bahmani-Oskooee *et al.* (2015) to be due to another aggregation bias. Once they disaggregate Pakistan-U.S. trade flows by commodity and consider the experiences of 45 industries that trade between the two countries, they find significant short-run effects of currency depreciation on the trade balance of 17 industries and long-run favorable effects in 15 industries.

In this paper we add to the literature by considering the trade between Pakistan and European Union (EU). More precisely, we investigate the short-run and long-run effects of currency depreciation on the trade balance of 75 industries that trade between the two regions. For this purpose, in Section II we outline the model and explain the method that is based on Pesaran *et al.*'s (2001) bounds testing approach. In Section III we present the empirical results. A summary is provided in Section IV with sources of data in an Appendix.

II. The Model and Methodology

It is now a common practice to include the level of economic activity at home, the level of economic activity abroad and the real exchange rate as major determinants of the trade balance. Therefore, following the literature (e.g., Bahmani-Oskooee and Xu, 2012) we adopt the following model:

$$LnTB_{i,t} = \alpha_0 + \alpha_1 LnY_t^{EU} + \alpha_2 LnY_t^{PAK} + \alpha_3 LnREX_t + \varepsilon_t \qquad (1)$$

where TB_i denotes the trade balance of industry i and is defined as the ratio of Pakistan's exports of commodity i to EU over its import of commodity i from the EU. The measure of economic activity in EU (Pakistan) is denoted by Y^{EU} (Y^{PAK}) and the real bilateral exchange rate by *REX*. As EU grows, her imports from Pakistan (Pakistan's exports) are expected to rise. Hence we expect an estimate of α_1 to be positive. By the same token as Pakistan's economy grows, we expect Pakistan to import more of commodity i. Hence, an estimate of α_2 is expected to be negative. As the Appendix shows, the real bilateral exchange rate, REX, is defined in a manner that an increase reflects an appreciation of the euro or a depreciation of the Pakistan's rupee. Thus, if a real depreciation of the rupee is to have a favorable impact on the trade balance of industry i, an estimate of α_3 should be positive.

Estimate of equation (1) by any method yields only the long-run coefficient estimates. Since the J-curve concept is a short-run phenomenon, in order to evaluate it, we need to incorporate the short-run adjustment process into (1) by specifying it in an error-correction format such as specification (2) below:

$$\Delta LnTB_{i,t} = \alpha + \sum_{k=1}^{n} \beta_{t-k} \Delta LnTB_{i,t-k} + \sum_{k=0}^{n} \delta_{t-k} \Delta LnY_{t-k}^{EU} + \sum_{k=0}^{n} \gamma_{t-k} \Delta LnY_{t-k}^{PAK} +$$
$$\sum_{k=0}^{n} \pi_{t-k} \Delta LnREX_{t-k} + \lambda_1 LnTB_{i,t-1} + \lambda_2 LnY_{t-1}^{UEU} + \lambda_3 LnY_{t-1}^{PAK} +$$
$$\lambda_4 LnREX_{t-1} + \mu_t \qquad (2)$$

Specification (2) follows Pesaran *et al.*'s (2001) bounds testing approach where they have replaced the lagged error term from (1) by linear combination of lagged level variables.

Cointegration among the variables then is established by applying the F test for joint significance of lagged level variables in (2). They tabulate new critical values for this F test which accounts for integrating properties of variables where variables could be I(0) or I(1). If variables are to be cointegrated, the calculated F statistic should exceed the upper bound critical value that Pesaran *et al*. (2001) provide. Once cointegration is established, estimates of λ_2-λ_4 normalized on λ_1 will yield long-run effects. The short-run effects are embodied in the estimates of coefficients attached to first-differenced variables. The J-curve effect is confirmed when estimates of π are negative at lower lags and positive at higher lags. We estimate error-correction model (2) for each of the 75 industries in the next section.[7]

III. The Results

In this section error-correction model (2) is estimated for each of the 77 industries that trade between Pakistan and EU using annual data over the period 1980-2013. However, as a preliminary exercise and in order to update previous research we first estimate the model using total trade between Pakistan and EU. Since data are annual, following the literature a maximum of four lags are imposed on each first-differenced variable and SBC criterion is used to select optimum number of lags or optimum model. Therefore, the reported results belonging to an optimum model for each industry as well as for total trade. While Table 1 reports coefficient estimates, Table 2 reports diagnostic statistics.

Tables 1 and 2 go about here

[7] For other applications of this approach see Bahmani-Oskooee et al. (2005), Bahmani-Oskooee and Hegerty (2007), Halicioglu, F., (2007, 2013), Narayan et al. (2007), Tang (2007), Mohammadi et al. (2008), Wong and Tang (2008), De Vita and Kyaw (2008), Payne (2008), Bahmani-Oskooee and Gelan (2009), Dell'Anno, R. and Halicioglu, F. (2010), Chen and Chen (2012), Wong (2013), Hajilee et al. (2014), and Tayebi, S. K., and M. Yazdani, (2014).

Due to volume of the estimates, we have restricted ourselves to reporting short-run estimates for the real exchange rate only. However, long-run coefficient estimates are reported for all three exogenous variables. From the first row in Table 1 which reports the results for total trade model it is clear that no short-run estimate is significant. The same is true of long-run coefficient estimates. At the 10% significance level, only EU income carries a significant coefficient with a negative sign. This negative coefficient implies that as EU grows, it produces more of import-substitute goods and imports less from Pakistan (Bahmani-Oskooee, 1986). As mentioned before, these results using aggregate bilateral trade flows suffer from aggregation bias. Clearly, there could be some industries that may react to exchange rate changes. In order to identify these industries, we shift to estimates of error-correction model (2) for each of the 75 industries.

From the short-run estimates, we gather that at the 10% level of significance there are 21 industries in which the real exchange rate carries at least one significant coefficient. Therefore, unlike the results using total trade flows, trade balance of 21 industries react to exchange rate changes in the short run. However, only in industries coded 073 and 723 negative coefficients are followed by positive ones, supporting the J-curve effect. Furthermore, while the first industry is small measured by its trade share, the second industry is relatively large, having 2.62% of trade share. If we rely upon Rose and Yellen (1989) and define the J-curve as short-run negative effects combined with long run positive effects, then we can add industries 276, 540 and 667 to the list since the real exchange rate carries significantly positive coefficient in the long run. Clearly, the real rupee-euro rate does not play any major role in the trade between the two regions. Nor do the level of economic activities. Pakistan's own income carries expectedly negative and significant coefficient only in eight industries coded 073, 247, 553, 652, 718, 892,

893, and 894 and EU income carries expectedly positive and significant coefficient in industries coded 052, 247, 652, and 893.

Staying with the long-run estimates, there are only 14 industries in which at least one of the exogenous variables carry significant coefficient. These industries are coded as 052, 073, 121, 247, 276, 540, 553, 652, 665, 681, 718, 892, 893, and 894. In order for the long-run estimates not to be spurious, we need to establish cointegration. To this end we shift to Table 2 which reports the results of the F test along with several other diagnostics. Given its critical value of 3.53, clearly our calculated F statistic is significant and supports cointegration in all of these industries except in 553, 893, and 894.[8] In these industries we use an alternative test which is based on lagged error-correction term. Under this approach, long-run normalized coefficient estimates and long-run model (1) are used to generate the error term, called usually error-correction term denoted by ECM. Then linear combination of lagged level variables is replaced by ECM_{t-1} and each model is re-estimated at the same optimum lags. A significantly negative coefficient obtained for ECM_{t-1} will support cointegration or convergence toward long-run equilibrium. However, this ECM test has new critical values that Banerjee *et al*. (1998, Table 1) tabulate. Given their critical value of -3.67, cointegration is not supported in any of remaining three industries. The fact ECM_{t-1} carries a significantly negative coefficient in 47 industries implies that we have estimated equilibrium models.

Several other statistics are also reported in Table 2. To test for serial correlation in each optimum model, we report the Lagrange Multiplier test (LM) statistic. This statistic has a χ^2 distribution with one degree of freedom. Given its critical value of 3.84 at the 5% level of significance, this statistic is significant only in industries coded 621, 629, 666, 691, and 717. Thus, in 69 optimum

[8] Note that since our sample is small, we use critical values tabulated by Narayan (2005, p. 1987). Pesaran *et al.*'s (2001) critical values are for large samples.

models residuals are autocorrelation free. Table 2 also reports Ramsey's RESET statistic which is used to identify misspecified models. It also has χ^2 with one degree of freedom. This statistic is significant only in 11 models coded 062, 276, 540, 629, 666, 671, 681, 831, 890, 893, and 897. This, only 11 optimum models are misspecified. In order to establish stability of short-run and long-run coefficient estimates, we follow Brown *et al*. (1975) and apply their CUSUM and CUSUMSQ tests to the residuals of each optimum model. We have indicated stable coefficients by "S" and unstable ones by "US". Clearly, almost all estimates are stable.[9] Lastly, we have reported the size of adjusted R^2 so that we can judge the goodness of fit.

IV. Summary and Conclusion

A steady depreciation of Pakistani rupee and its impact on Pakistan's trade balance has been the focus of many previous studies. They have either relied upon estimating the indirect approach of Marshall-Lerner condition or direct approach of relating the trade balance to its determinants such as income levels and the real exchange rate. No matter which approach was used, not much support was found for favorable effects of depreciation on Pakistan's trade balance. These studies used either aggregate trade flows of Pakistan with the rest of the world or bilateral trade flows between Pakistan and it major trading partners.

Suspecting that previous studies may suffer from aggregation bias, our intention in this paper is to consider the impact of currency depreciation on the trade balance between Pakistan and European Union (EU). We test for the short-run effects, hence the J-curve and the long-run effects using Pesaran *et al*.'s (2001) bounds testing approach using aggregate trade flows between the two regions first. Since no short-run effects and no long-run effects are discovered, we disaggregate the trade flows by commodity and estimate a trade balance model for each of the 77 industries that trade between the two regions. We find significant short-run effects in 21 industries. However, the short-run effects lasted into long-run favorable effects only in two industries.

[9] For a graphical presentation of these tests see Bahmani-Oskooee et al. (2005).

APPENDIX

Data Definition and Sources

Empirical analysis is based on annual data over the period 1980-2013. Data come from the following sources:

a. World Bank

b. International Financial Statistics

Variable Definitions

TB_i= measure of trade balance for industry i defined as the ratio of Pakistan exports of commodity i to EU over its import of commodity i from EU. Industry level data come from source a.

Y_{PAk} = Pakistan's income measured by its real GDP. Data come from source b.

Y_{EU} = EU income measured by its real GDP. Data come from source b.

REX= Real bilateral exchange rate between Euro and Pakistani Rupee. It is defined as (CPI_{EU} * NEX / CPI_{PAK}) where NEX is the nominal bilateral exchange rate defined as number rupees per euro and CPI is price level. Thus, an increase in REX is a reflection of real depreciation of the Pakistani rupee.

References

Aftab Z. and Khan S. (2008). Bilateral j-curve between Paksitan and her trading partners, PIDE working paper No 2008:45.

Aftab Z. and Aurangzeb (2002). The long run and short run impact of exchange rate devaluation on Pakistan's trade performance, *The Pakistan Development Review*, 4(3); 277-286.

Agbola, F. W. and M. Y. Damoense, 2005. "Time-Series estimation of import demand functions for India", *Journal of Economic Studies*, 32: 146-157.

Akhtar, S. and Malik, F. (2000). Pakistan Trade Performance Vis-a- vis its Major Trading Partners. *The Pakistan Development Review*, 39(1), 37-50.

Alse, J. and M. Bahmani-Oskooee, 1995. Do devaluations improve or worsen the terms of trade*? Journal of Economic Studies*, 22: 16-25.

Bahmani-Oskooee, M. 1985). Devaluation and j-curve: Some Evidence from LDCs. *The Review of Economic and Statistics*, 500–504.

Bahmani-Oskooee, M. 1986, Determinants of international trade flows: The case of developing countries. *Journal of Development Economics*, 20: 107-123.

Bahmani-Oskooee, M. and O. Kara, 2005. Income and price elasticities of trade: Some new estimates. *International Trade Journal*, 19: 165-178.

Bahmani-Oskooee, M. and S.W. Hegerty, 2007. Exchange rate volatility and trade flows: A review article. *Journal of Economic Studies*, 34: 211-255

Bahmani-Oskooee, M. and A. Gelan, 2009. How stable is the demand for money in African countries. *Journal of Economic Studies*, 36: 216-235

Bahmani-Oskooee, M., Cheema, J., (2009). Short-run and long-run effects of currency depreciation on the bilateral trade balance between Pakistan and her major trading partners. *Journal of Economic Development*, 34(1), 19-46.

Bahmani-Oskooee, M. and S. Hegerty, (2010), "The J- and S-Curves: A Survey of the Recent Literature", *Journal of Economic Studies,* Vol. 37, pp. 580-596.

Bahmani-Oskooee and Xu (2012), "Is there Evidence of the J-Curve in Commodity Trade between the U.S. and Hong Kong?", *The Manchester School*, Vol. 80, pp. 295-320.

Bahmani-Oskooee, M., C. Economidou, and G. G. Goswami., 2005. How sensitive are Britain's inpayments and outpayments to the value of the British pound? *Journal of Economic Studies*, 32: 455-467.

Bahmani-Oskooee, M., H. Harvey, and S. Hegerty, (2013), "Empirical Tests of the Marshall-Lerner Condition: A Literature Review", *Journal of Economic Studies*, Vol. 40, pp. 411-443.

Banerjee, A., J. Dolado, and R. Mestre (1998), "Error-Correction Mechanism Tests in a Single

Equation Framework," *Journal of Time Series Analysis* 19, 267–85.

Brown, R. L., J. Durbin, and J. M. Evans (1975), "Techniques for Testing the Constancy of Regression Relations Over Time", *Journal of the Royal Statistical Society*, Series B, Vol. 37, (1975), pp. 149-163

Charos, E. N., E. O. Simos, and A. R. Thompson, 1996. Exports and industrial growth: A new framework and evidence. *Journal of Economic Studies*, 23: 18-31.

Chen, S.-W. and T.-C. Chen, 2012. Untangling the non-linear causal nexus between exchange rates and stock prices: new evidence from the OECD countries. *Journal of Economic Studies*, 39: 231-259.

Dell'Anno, R. and Halicioglu, F., 2010. An ARDL model of recorded and unrecorded economies in Turkey. *Journal of Economic Studies*, 37: 627-646.

De Vita, G. and K. S. Kyaw, 2008. Determinants of capital flows to developing countries: A structural VAR analysis. *Journal of Economic Studies*, 35: 304-322.

Du, H. and Z. Zhu, 2001. The effect of exchange-rate risk on exports: Some additional empirical evidence. *Journal of Economic Studies*, 28: 106-121.

Gylfason, T. and O. Risager, 1984. Does devaluation improve the current account?, *European Economic Review*, 25: 37-64.

Hajilee, Massomeh, and Omar M. Al-Nasser, (2014), "Exchange Rate Volatility and Stock Market Development in Emerging Economies", *Journal of Post Keynesian Economics,* Vol. 37, pp. 163-180.

Halicioglu, F., 2007. The J-curve dynamics of Turkish bilateral trade: A cointegration approach. *Journal of Economic Studies*, 34: 103-119.

Halicioglu, F. (2013) "Dynamics of Obesity in Finland", *Journal of Economic Studies,* Vol.40, pp. 644-657.

Hameed, A. and S. Kanwal. (2009). Existence of a J-Curve-The Case of Pakistan". *Journal of Economic Cooperation and Development*. 30 (2) :75-98.

Hussain M. and Bashir, U. (2012). Dynamics of Trade Balance and the J-Curve Phenomenon: Evidence from Pakistan. *Journal of Commerce,* Vol. 5 (Issue 2), pp. 16-31.

Khan, Mohsin S. (1974), "Import and Export Demand in Developing Countries", *IMF Staff Papers*, Vol. 21, pp. 678-693.

King, A., 1993. The functional form of import demand: The Case of UK motor vehicle imports, 1980-90. *Journal of Economic Studies*, 20: 36-50.

Love, J. and R. Chandra, 2005. Testing export-led growth in South Asia. *Journal of Economic Studies*, 32, 132-145

Magee, S.P. (1973). Currency Contracts, Pass Through and Devaluation, *Brooking Papers on Economic Activity*, 1, 303-325.

Mohammadi, H., M. Cak, and D. Cak, 2008. Wagner's hypothesis: New evidence from Turkey using the bounds testing approach., *Journal of Economic Studies*, 35: 94-106.

Narayan, P.K., 2005. The saving and investment nexus for China: Evidence from cointegration tests. *Applied Economics*, 37: 1979-1990.

Narayan, S. and P. K. Narayan, 2005. An empirical analysis of Fiji's import demand function. *Journal of Economic Studies*, 32: 158-168.

Narayan, P.K., S. Narayan, B.C. Prasad, and A. Prasad, 2007. Export-led growth hypothesis: Evidence from Papua New Guinea and Fiji. *Journal of Economic Studies*, 34: 341-351.

Payne, J. E., 2008. Inflation and inflation uncertainty: Evidence from the Caribbean region. *Journal of Economic Studies*, 35: 501-511.

Pesaran, M.H., Y. Shin and R.J. Smith,(2001). Bounds testing approaches to the analysis of level relationships. *J. Applied Econometrics*, 16: 289-326.

Rehman, H. and Afzal, M. (2003). J-curve Phenomenon: An Evidence from Pakistan. *Pakistan Economic and Social Review*, 41(1), 45-57.

Rose, A.K., and Yellen, J.L. 1989. Is There a J-Curve? *Journal of Monetary Economics* 24(1), 53-68.

Shahbaz, M., (2009). On nominal and real devaluations relation: an econometric evidence for Pakistan, *International Journal of Applied Econometrics and Quantitative Studies*, 9, pp, 86-108.

Shahbaz, M., Awan, R. U., Ahmad, K., (2011). The exchange value of the Pakistan rupee & Pakistan trade balance: An ARDL bounds testing approach. *The Journal of Developing Areas*, 44, 69-93.

Tang, T.C., 2007. Money demand function for Southeast Asian countries: An empirical view from expenditure components. *Journal of Economic Studies*, 34: 476-496.

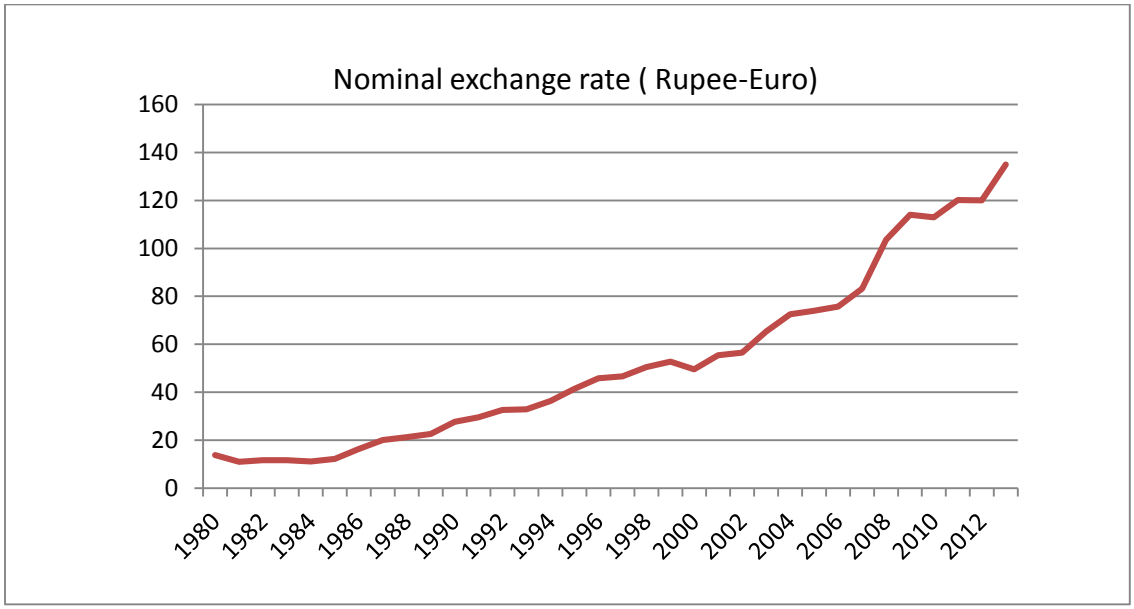
Tayebi, S. K., and M. Yazdani, 2014. Financial crisis, oil shock and trade in Asia. *Journal of Economic Studies*, 41: 601-614.

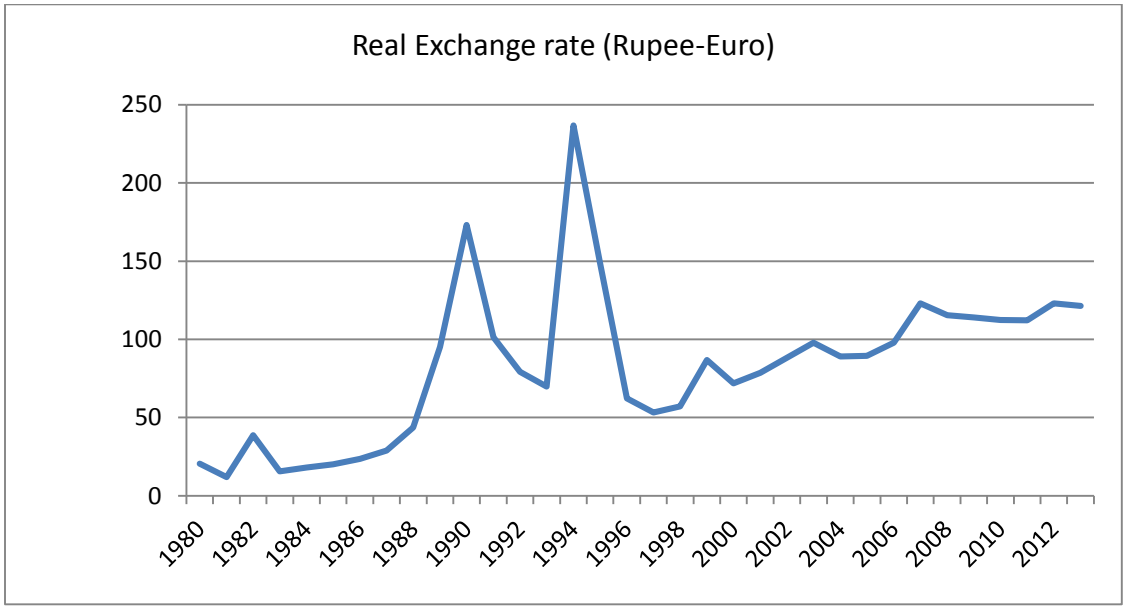
Truett, L. J. and D. B. Truett, 2000. The demand for imports and economic reform in Spain. *Journal of Economic Studies*, 27: 182-199.

Wong, K. N. and T. C. Tang, 2008. The effects of exchange rate variability on Malaysia's disaggregated electrical exports. *Journal of Economic Studies*, 35: 154-169.

Wong, H. T., 2013. Real exchange rate misalignment and economic growth in Malaysia. *Journal of Economics Studies*, 40: 298-313.

Figure 1: Plot of Nominal and Real Exchange Rate





Note: The exchange rate is defined as number of rupees per euro.

Table 1: Short-Run and Long-Run Coefficient Estimates										
			SHORT RUN ESTIMATES					***LONG RUN ESTIMATES***		
SITC	INDUSTRY	Trade Shares	Δ Ln REX_t	Δ Ln REX_{t-1}	Δ Ln REX_{t-2}	Δ Ln REX_{t-3}	*CONSTANT*	*Ln* Y^{PAK}	*Ln* Y^{EU}	*Ln REX*
	Aggregate industry		-0.002(-0.22)	-0.002(0.42)			0.147(0.87)	0.005(0.21)	-0.009(1.82)	0.0009(0.46)
001	Live animals	(0.02)%	-4.10(-0.68)				-76.14(-0.34)	-2.59(-0.51)	4.76(0.43)	-0.48(-0.17)
013	Meat in airtight containers n.e.s	(0.11)%	-11.36(-1.73)				441.85(1.03)	10.02(1.08)	-22.29(-1.20	-4.78(-0.82)
022	Milk and cream	(0.20)%	-1.71(-0.31)	2.33(0.29)	-7.93(-1.36)		-7.11(-0.03)	0.79(0.17)	-0.50(-0.05)	0.49(0.19)
031	Fish, fresh & simply preserved	(0.18)%	-3.54(-0.40)				221.69(0.63)	2.69(0.34)	-9.27(-0.53)	-2.25(-0.54)
032	Fish, in airtight containers, n.e.s	(0.18)%	0.31(0.25)	-1.45(-0.39)			79.81(0.43)	-1.78(-0.07)	-0.62(-0.07)	-3.53(-1.49)
033	Fruit, fresh, and nuts excl. Oil nuts	(1.42)%	0.27(0.03)				518.66(1.46)	9.80(1.23)	-24.94(1.43)	-3.06(-0.68)
041	Wheat including spelt	(0.34)%	-2.38(-0.18)				-58.92(-0.11)	-5.56(-0.40)	7.10(0.26)	-3.18(-0.46)
042	Rice	(0.05)%	1.88(0.21)	-10.09(0.81)			-17.54(-0.05)	-2.16(-0.28)	2.56(0.16)	-1.11(-0.26)
052	Dried fruit including artificially	(0.72)%	-1.14(-0.27)	-1.83(-0.41)	-3.51(-0.88)		-248.75(-1.72)	-4.33(-1.41)	11.84(1.74)	0.28(0.14)
053	Fruit, preserved and fruit preparations	(0.03)%	22.83(0.88)	10.11(1.04)	11.56(0.51)		677.18(0.73)	2.71(0.15)	-23.06(1.54)	-10.64(-0.81)
054	Vegetables, roots & tubers, fresh	(1.08)%	-13.40(-3.55)				-99.41(-0.71)	1.34(0.43)	1.72(0.25)	2.86(1.62)
055	Vegetables, roots & tubers preserved	(0.001)%	0.03(0.01)				-24.28(-0.31	-0.07(-0.04)	0.68(0.18)	1.15(1.16)
061	Sugar and honey	(0.02)%	6.52(1.63)	5.78(1.21)	4.34(1.17)	3.58(1.11)	-42.82(-0.28)	-2.80(-0.83)	3.85(0.52)	-0.55(-0.29)
062	Sugar confectionery, sugar preparations.	(0.004)%	-0.49(-0.11)				-47.28(-0.28)	-2.3(-0.56)	3.55(0.41)	-0.23(-0.11)
073	Chocolate & other food preparations.	(0.12)%	-4.4(-0.88)	17.22(3.13)	4.55(0.99)		25.40(0.15)	-6.20(-1.64)	4.84(0.60)	-3.13(-1.27)
074	Tea and mate	(5.81)%	-3.11(-0.57)	-3.83(-1.41)	-0.19(-0.01)		-203.80(-1.02)	-2.67(-0.59)	8.77(0.89)	1.57(0.64)
081	Feed stuff for animals	(0.25)%	-7.93(-1.21)				-184.07(-0.74)	-1.60(-0.29)	7.14(0.58)	1.90(0.64)
112	Alcoholic beverages	(0.18)%	5.17(0.42)	-7.65(-0.59)	2.11(0.17)	-6.60(-0.66)	-3.84(-0.01)	3.99(0.44)	-3.57(-0.18)	2.32(0.36)
121	Tobacco, unmanufactured	(0.34)%	4.65(0.56)	-14.49(-1.54)	3.12(0.44)		469.87(1.70)	9.02(1.46)	-22.38(1.70)	-4.88(-1.21)
122	Tobacco manufactured	(0.07)%	4.96(0.45)	0.11(0.01)	0.20(0.02)	5.20(0.59)	284.42(0.74)	5.64(0.70)	-13.74(0.77)	-2.60(-0.46)
211	Hides & skins, excluding fur skins	(0.23)%	1.30(0.22)				-26.41(-0.12)	-0.91(-0.18)	1.80(0.16)	-1.07(-0.38)
221	Oil seeds, oil nuts and oil kernels	(1.42)%	5.26(0.79)				-10.00(-0.04)	0.21(0.03)	0.03(0.001)	0.83(0.26)
243	Wood, shaped or simply worked	(0.24)%	-2.58(-1.01)				11.21(0.12)	0.60(0.29)	-0.96(-0.21)	0.54(0.46)
244	Wood manufactures, n.e.s	(0.02)%	-20.11(-3.72)	9.61(2.57)	-17.68(-2.33)	-10.68(-3.20)	-193.58(-0.86)	1.35(1.22)	4.67(1.10)	3.82(1.04)
247	Works of art, collectors pieces	(0.03)%	0.65(0.06)				-235.63(1.70)	-4.67(-2.03)	11.60(3.48)	0.87(0.04)
276	Other crude minerals	(0.05)%	-2.12(-0.62)	-0.65(-0.06)	1.38(0.16)	-0.98(-0.12)	18.04(1.42)	4.65(1.22)	-4.90(-1.23)	2.69(1.88)
283	Ores & concentrates of non-ferrous metals	(0.06)%	-4.00(-0.46)				-378.47(-1.20)	-5.11(-0.72)	16.02(1.04)	5.25(1.32)
284	Non-ferrous metal scrap	(0.06)%	0.09(0.02)				-97.57(-0.62)	-0.12(-0.04)	2.92(0.38)	2.75(1.38)
292	Crude vegetable materials	(0.17)%	-2.73(-1.84)				31.22(0.55)	0.72(0.56)	-1.59(-0.57)	-0.32(-0.46)
512	Organic chemicals	(0.04)%	5.25(1.01)	6.94(1.02)			-32.70(-2.20)	-1.97(-0.32)	2.87(0.39)	-0.84(-0.52)
540	Inorganic chemicals	(0.03)%	2.14(0.58)	-2.14(-1.60)	3.25(0.64)	0.94(0.23)	-232.18(-1.35)	-1.02(-0.58)	8.33(1.09)	5.83(2.07)
541	Medicinal & pharmaceutical products	(2.51)%	-0.13(-0.08)				0.29(0.001)	-0.54(-0.41)	0.50(0.17)	-0.37(-0.50
542	Other electrical machinery and apparatus	(0.69)%	-0.04(-1.78)	-0.08(1.02)	-0.06(-0.90)	-0.07(-0.68)	-3.65(0.22)	-0.01(0.33)	0.11(-0.27)	0.08(-0.24)

553	Perfumery, cosmetics, dentifrices, etc.	(0.07)%	4.73(2.28)	2.29(0.79)	4.18(1.90)		-7.40(-0.11)	-3.43(-2.03)	3.33(1.01)	-1.32(-1.17)
554	Soaps, cleansing & polishing preparations	(3.39)%	4.41(-0.03)				-38.24(-0.20)	-1.49(-0.34)	2.64(0.28)	-0.76(-0.31)
621	Materials of rubber	(0.19)%	-6.13(-0.66)				-203.49(-0.59)	-3.59(0.57)	9.56(0.57)	1.28(0.29)
629	Articles of rubber, n.e.s.	(0.22)%	-13.11(-3.48)	-3.37(-0.82)	-4.31(-1.39)		-61.35(-0.49)	0.68(0.25)	1.39(0.23)	0.40(0.22)
631	Veneers, plywood boards & other wood	(0.001)%	-6.32(-1.45)				-54.31(-0.33)	0.14(0.04)	1.51(0.19)	1.07(0.51)
641	Paper and paperboard	(1.06)%	5.04(0.74)				151.60(0.69)	1.39(0.29)	-5.84(-0.56)	-2.15(-0.69)
651	Textile yarn and thread	(0.15)%	-3.39(-2.76)	0.68(0.05)	2.83(1.55)	-0.56(0.05)	10.83(0.21)	0.65(0.55)	-0.93(-0.36)	0.18(0.27)
652	Cotton fabrics, woven	(0.14)%	-1.62(-0.36)	4.37(1.15)			-251.64(-1.70)	-6.19(-1.90)	13.54(1.89)	0.001(0.001)
655	Special transactions not classified according to kind	(0.23)%	14.94(3.83)	3.98(0.19)	2.84(0.49)	0.58(0.23)	304.74(0.19)	0.36(0.01)	-8.56(-1.09)	-11.96(-1.43)
655	Special textile fabrics and related	(0.02)%	-2.63(-0.58)				74.28(0.44)	2.56(0.67)	-4.69(-0.56)	0.54(0.25)
656	Made up articles, wholly or chiefly	(1.13)%	-15.36(-3.73)	7.59(1.72)	-7.19(-2.04)		-50.83(-0.37)	0.87(0.29)	0.73(0.11)	1.40(0.70)
661	Lime, cement & fabricated building materials	(0.08)%	8.65(2.06)				243.49(1.65)	3.75(1.14)	-10.71(1.48)	-3.17(-1.70)
662	Clay and refractory construction material	(0.33)%	3.29(0.45)	-7.00(-0.94)	-1.65(-0.28)		21.78(0.09)	3.36(0.65)	-3.73(-0.33)	1.26(0.36)
664	Glass	(0.20)%	-1.13(-0.19)				-141.45(-0.64)	-2.81(-0.57)	6.92(0.64)	0.85(0.31)
665	Glassware	(1.64)%	3.33(0.58)	-8.13(-1.60)	3.25(0.63)	0.93(0.23)	-227.18(-1.35)	-2.02(-0.58)	8.33(1.09)	5.83(2.07)
666	Pottery	(0.21)%	-72.13(-1.03)				-52.02(-2.09)	21.07(1.45)	1.19(0.22)	2.85(0.69)
671	Pig iron, spiegeleisen, sponge iron	(0.01)%	-9.63(-0.87)	-2.34(0.59)	4.10(1.21)	-0.48(0.21)	-112.36(-0.51)	-0.36(-0.01)	3.65(1.01)	2.39(0.81)
676	Essential oils, perfume and flavor	(0.32)%	0.28(0.22)				-3.78(-0.52)	-0.14(-0.02)	0.23(0.41)	0.05(0.32)
681	Silver and platinum group metals	(0.70)%	2.75(0.48)				53.53(0.19)	0.95(0.15)	-2.52(2.11)	-0.3(0.45)
682	Copper	(0.13)%	-1.34(0.01)	2.81(0.73)			31.72(-1.43)	1.49(-1.45)	-2.23(1.53)	-0.47 (0.11)
692	Metal containers for storage and transport	(2.15)%	9.95(0.84)	-10.15(0.84)	-5.52(-0.41)		-163.79(-0.55)	1.27(0.15)	3.62(0.19)	4.90(0.85)
693	Wire products	(0.03)%	-10.83(-1.43)				-143.83(-0.55)	-2.36(-0.39)	6.40(0.49)	2.17(0.68)
696	Cutlery	(0.01)%	5.34(1.88)	-1.39(-0.50)			38.98(0.42)	-1.04(-0.50)	-0.25(-0.06)	-1.08(-0.85)
711	Power generating machinery	(0.21)%	7.81(0.88)	-1.38(-0.19)			31.41(0.11)	1.65(0.26)	-2.46(-0.18)	0.26(0.07)
712	Agricultural machinery and implement	(0.32)%	-4.23(-0.50)				221.34(0.76)	5.57(0.87)	-11.54(0.81)	-2.97(-0.84)
714	Office machinery	(0.13)%	0.17(1.31)	0.002(0.02)	0.101(0.82)		1.46(0.35)	-0.03(-0.22)	-0.01(-0.33)	-0.05(-0.73)
717	Textile and leather machinery	(0.04)%	-0.01(0.21)	1.25(0.94)	-8.74(-1.98)		-31.92(0.40)	0.98(0.35)	-2.39(-0.39)	-0.53(-0.32)
676	Essential oils, perfume and flavor	(0.32)%	0.28(0.22)				-3.78(-0.52)	-0.14(-0.02)	0.23(0.41)	0.05(0.32)
718	Machines for special industries	(0.02)%	25.71(4.23)	9.27(1.29)	-3.76(-0.62)	3.36(0.64)	-200.3 (-0.99)	-9.42(-2.18)	14.30(1.53)	1.60(0.51)
719	Machinery and appliances non electrical	(0.95)%	-0.02(-0.65)	0.04(1.55)	0.01(0.36)	-0.01(0.55)	-0.62(-0.73	-0.02(-1.08)	0.04(0.91)	0.01(0.39)
723	Equipment for distributing electric	(2.62)%	-17.09(-2.04)	15.78(1.85)	3.83(0.56)		110.71(0.41)	-0.21(-0.04)	-3.31(-0.26)	-1.17(-0.30)
724	Telecommunications apparatus	(2.22)%	-5.16(-0.36)				-139.84(-0.10)	-2.84(-0.30)	6.97(0.21)	0.23(-0.40)
812	Sanitary, plumbing, heating & light	(0.01)%	-2.40(-0.39)	0.03(0.22)	-1.26(-0.51)		-6.51(-1.51)	-0.17(-0.01)	0.37(0.11)	-0.09(-0.01)
821	Furniture	(0.03)%	0.78(0.35)				-3.89(-0.87)	-0.99(-0.35)	1.04(0.51)	-0.48(-0.11)
831	Travel goods, handbags and similar articles	(0.27)%	-24.03(-3.69)	-3.51(-0.27)			-105.71(-0.60)	2.53(0.23)	0.83(0.27)	3.50(1.33)
841	Clothing except fur clothing	(0.04)%	-2.52(-0.84)				12.11(0.12)	0.24(0.10)	-0.62(-0.12)	0.07(0.05)

851	Footwear	(0.05)%	4.88(1.13)	5.01(1.08)	-4.50(-1.28)		-128.37(-0.91)	-3.26(-1.07)	6.69(1.00)	1.91(0.94)
890	Articles of artificial matter	(0.01)%	0.23(-1.89)				-47.35(-0.91)	-0.69(-0.84)	2.13 (0.91)	0.20(0.66)
892	Printed materials I	(0.01)%	5.27(2.18)				-47.60(-0.53)	-3.73(-1.85)	4.93(1.12)	-1.45(-1.27)
893	Articles of artificial plastic mate	(0.03)%	-5.90(0.43)	-0.17(-0.31)			`-103.7(-2.72)	-2.12(-1.87)	5.07(2.63)	0.94(0.75)
894	Perambulators ,toys, games and sporting goods	(0.03)%	4.70(2.45)	1.47(0.63)	3.9(2.44)		-12.98(-0.20)	-3.06(-2.15)	3.16(1.04)	-1.04(-1.14)
897	Jewellery and gold/silver smiths wares	(0.02)%	-2.68(-0.51)				-1.42(-0.31)	-0.09(-0.11)	0.22(0.31)	-0.69(0.51)
899	Manufactured articles, n.e.s	(0.21)%	-1.83(-1.45)	2.50(1.85)	0.36(0.25)	-1.54(0.22)	23.85(0.54)	0.33(0.03)	-0.76(-0.35)	-0.42(-0.60)

Notes: a. Number inside the parenthesis next to each coefficient is the t-ratio.

b. Trade shares of each industry is calculated as sum of exports and imports by that industry as a per cent of sum of total exports and imports The totals includes even industries for which no data were available. These shares are only for 2013.

c. n.e.s. = not elsewhere specified.

Table 2: Diagnostic Statistics								
SITC	**INDUSTRY**	**F**	**ECM_{t-1}**	**LM**	**RESET**	**CUSUM**	**CUSUMSQ**	**Adj. R2**
	Total trade	1.1408	0.12 (0.014)	0.41	1.17	S	S	0.141
001	Live animals	2.636312	-0.77 (-3.05)	0.13	3.35	S	S	0.36
013	Meat in airtight containers n.e.s	4.30487	-1.06(4.43)	0.97	3.5	S	S	0.499
022	Milk and cream	6.51471	-0.96(-4.95)	0.11	0.30	S	S	0.408
031	Fish, fresh & simply preserved	1.172439	-0.42(-1.74)	2.24	1.63	S	S	0.093
032	Fish, in airtight containers, n.e.s	2.673524	-0.56(-3.45)	2.52	0.14	S	S	0.288
033	Fruit, fresh, and nuts excl. Oil nuts	6.259067	-1.17(-5.79)	0.79	0.32	S	US	-0.064
041	Wheat including spelt	4.38418	-0.77(-3.98)	1.38	0.05	S	S	0.289
042	Rice	6.477831	-1.22(-5.53)	0.47	0.42	S	US	0.484
052	Dried fruit including artificially	12.00752	-0.05(-0.28)	3.34	0.04	S	S	0.104
053	Fruit, preserved and fruit preparations	2.12434	-0.63(-2.77)	2.98	1.12	S	S	0.841
054	Vegetables, roots & tubers, fresh	4.5174	-0.53(-4.12)	1.08	0.11	S	S	0.298
055	Vegetables, roots & tubers preserved	1.15362	-1.12(-3.26)	1.08	0.11	S	S	0.298
061	Sugar and honey	2.582591	-0.72(-4.40)	2.87	0.12	S	S	0.388
062	Sugar confectionery, sugar preparations	7.55638	-0.75(-4.03)	2.32	4.15	S	US	0.294
073	Chocolate & other food preparations	5.80771	-1.01(-5.28)	1.71	0.009	S	S	0.493
074	Tea and mate	1.676577	-0.2(-1.43)	1.06	1.26	S	S	0.013
081	Feed stuff for animals	0.90138	-0.34(-1.86)	1.3	2.5	S	S	0.078
112	Alcoholic beverages	4.43057	-1.01(-4.10)	0.61	1.43	S	S	0.31
121	Tobacco, unmanufactured	5.607404	-0.19(-1.30)	0.7	0.11	S	S	0.148
122	Tobacco manufactured	3.957476	-0.93(-3.87)	2.59	2.51	S	S	0.223
211	Hides & skins, excluding fur skins	4.259741	-0.57(-3.25)	0.36	1.68	S	S	0.189
221	Oil seeds, oil nuts and oil kernels	1.7277	-0.59(-2.88)	0.45	0.47	S	S	0.161
243	Wood, shaped or simply worked	4.12342	-0.93(-4.31)	0.84	1.72	S	S	0.303
244	Wood manufactures, n.e.s	6.084043	-1.35(-6.82)	0.93	1.93	S	S	0.729

247	Works of art, collectors pieces	3.497327	-0.62(1.92)	2.37	12.59	S	S	0.378
276	Other crude minerals	8.71301	0.29(2.66)	0.27	4.044719	S	US	0.68
283	Ores & concentrates of non-ferrous metals	1.17582	-0.26(-0.47)	0.28	2.76	S	S	0.329
284	Non-ferrous metal scrap	2.33423	-0.53(3.31)	1.2	0.41	S	US	0.336
292	Crude vegetable materials	3.108699	-0.53(-2.67)	0.05	0.254375	US	S	0.078
512	Organic chemicals	4.35933	-0.96(-5.50)	0.12	0.02	S	S	0.431
540	Inorganic chemicals	3.497327	-0.62(-4.47)	2.37	12.59	S	S	0.378
541	Medicinal & pharmaceutical products	1.45872	-0.77(-3.90)	0.45	2.488	S	S	0.015
542	Other electrical machinery and apparatus	2.184792	-0.61(-2.16)	0.02	0.13	S	US	0.145
553	Perfumery, cosmetics, dentifrices, etc.	2.70664	-0.95(-3.46)	0.7	0.7	S	S	0.353
554	Soaps, cleansing & polishing preparations	1.99622	-0.72(-3.71)	1.54	0.53	S	S	0.258
621	Materials of rubber	5.661642	-0.01(-0.02)	5.54	2.59	S	S	-0.162
629	Articles of rubber, n.e.s.	4.67312	-0.84(-4.74)	8.71	15.52	S	S	0.161
631	Veneers, plywood boards & other wood	0.91253	-1.28(-7.00)	0.89	0.78	S	S	0.719
641	Paper and paperboard	7.13609	-0.99(-4.47)	0.16	0.505	S	US	0.349
651	Textile yarn and thread	4.326284	-0.75(-4.15)	1.23	0.017201	S	S	0.375
652	Cotton fabrics, woven	3.544737	-0.09(-0.57)	2.52	0.14	S	S	0.051
655	Special transactions not classified according to kind	2.19829	-0.88(-3.90)	0.86	1.41	S	S	0.456
655	Special textile fabrics and related	5.664	-1.3(-5.84)	0.36	0.27	S	S	0.512
656	Made up articles, wholly or chiefly	7.083378	-0.93(-4.88)	1.23	1.323326	S	US	0.625
661	Lime, cement & fabricated building materials	7.4738	-0.80(-5.61)	3.09	0.07	S	S	0.52
662	Clay and refractory construction material	5.36779	-0.91(-4.20)	1.11	2.923008	S	S	0.294
664	Glass	5.417447	-0.87(-4.38)	1.26	0.18	S	S	0.335
665	Glassware	5.44938	-0.6(-2.66)	0.26	0.000911	S	S	0.261
666	Pottery	5.8115	-1.57(-7.96)	3.95	5.53	S	S	0.759
671	Pig iron, spiegeleisen, sponge iron	4.815270	-0.86(-3.76)	0.71	13.74	S	S	0.609
676	Essential oils, perfume and flavor	8.5287	0.28(1.50)	-1.39	2.85	S	S	0.729

681	Silver and platinum group metals	10.45241	-0.03(-0.39)	0.11	3.97	S	S	-0.346
682	Copper	1.544737	-0.21(-1.32)	1.31	1.05	S	S	0.125
692	Metal containers for storage and transport	6.728833	-1.36(-6.46)	2.16	0.28	S	S	0.575
693	Wire products	2.328685	-0.84(-3.67)	0.35	0.493456	S	S	0.314
696	Cutlery	2.34815	-0.53(3.07)	0.04	3.44	S	S	0.308
711	Power generating machinery	8.84263	-0.91(-4.38)	0.731403	1.24	US	S	0.303
712	Agricultural machinery and implement	2.59221	-0.75(-4.66)	0.11	0.04	S	S	0.513
714	Office machinery	3.209342	-1.17(-5.03)	0.3	2.480104	S	US	0.423
717	Textile and leather machinery	16.82966	-1.28(-6.33)	6.27	0.18	S	S	0.586
718	Machines for special industries	8.5287	-1.39(-6.70)	2.85	1.3	S	S	0.729
719	Machinery and appliances non electrical	13.41448	-1.44(-6.78)	0.4	0.45	S	S	0.621
723	Equipment for distributing electricity	8.3424	-0.75(-3.61)	1.01	11.4	S	S	-0.073
724	Telecommunications apparatus	7.4078	-1.00(-5.43)	0.06	0.13	S	S	0.473
812	Sanitary, plumbing, heating & light	3.00975	-0.74(-3.81)	2.49	0.496034	S	S	0.239
821	Furniture	5.82728	-0.65(3.45)	0.68	2.51	S	S	0.19
831	Travel goods, handbags and similar articles	8.19318	-1.02(-5.02)	0.24	4.54	S	US	0.475
841	Clothing except fur clothing	2.476322	-0.86(-3.96)	0.59	1.442178	S	S	0.222
851	Foot ware	3.01861	-0.83(-4.22)	2.22	3.64	S	S	0.429
890	Articles of artificial matter	2.55067	-0.72(-2.69)	2.32	4.29	S	US	0.321
892	Printed material	5.811875	-0.65(-3.70)	1.88	0.3	S	S	-0.196
893	Articles of artificial plastic material	2.550673	-0.72(0.004)	2.32	4.29	S	US	0.321
894	Perambulators ,toys, games and sporting goods	1.823073	-0.86(4.55)	0.08	0.225022	S	S	0.577
897	Jewellery and gold/silver smiths wares	5.105120	-0.79(4.01)	2.65	3.93	S	S	0.323
899	Manufactured articles, n.e.s	2.03556	-0.67(-5.24)	0.4	0.008477	S	S	0.389

a. LM: Lagrange multiplier test of residual serial correlation.
b. RESET: Ramsey's test for function form.
c. CUSUM: Cumulative Sum of Recursive Residuals
d. CUSUMSQ: Cumulative Sum of Squares of Recursive Residuals
5. Number inside the parenthesis next to a coefficient is absolute value of the t-ratio.