THE IMPACT OF PREFERENTIAL TRADE AGREEMENTS ON WORLD TRADE: THE CASE OF ASEAN

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Trade has been an important dimension since time immemorial. The Oriental economic thought in-specific that of Hebrews and Hindus have condemned exports of essential goods and stocking them up in times of famines. There by documenting the existence of trade. The views of Aristotle and Plato on existence of nation states and their importance influenced their opinion on commercial relations and banned trade in precious metals or any other form of trade which in their opinion was mean way to attain livelihood. The Roman's have their own view point on the same, trade existed but was regulated. But it was the Mercantilist's who formally propagated the cause of trade which was induced from wealth accumulation or the concept of treasure (Haney, 2005).

ASEAN is the major trade block in Asia thus the paper has the following objectives: First, to analyse Intra ASEAN trade and its effect on the world trade along with the factors which influence the trade between ASEAN and World. Second, to analyse whether there exists any long term relationship between the intra ASEAN trade and its bilateral trade with World. Thirdly How much are ASEAN member countries trading among themselves. The time period is 1995-2010. The period coincides with the peak of Asian miracle and its downfall too. Along with this there have been various significant events like the attack on world trade centre, Afghanistan war, Iraq war, Sub-prime crisis etc. The paper is empirical in nature and uses apt econometric techniques.

Key words: Intra-regional trade, ASEAN, Time Series, Basic Gravity Model, Cointegration, VECM.

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(I) Introduction:

Trade has been an important dimension since time immemorial. The history of economic thought has established it well. The Oriental economic thought in-specific that of Hebrews and Hindus have condemned exports of essential goods and stocking them up in times of famines. There by documenting the existence of trade. The views of Aristotle and Plato on existence of nation states and their importance influenced their opinion on commercial relations and banned trade in precious metals or any other form of trade which in their opinion was mean way to attain livelihood. The Roman's have their own view point on the same, trade existed but was regulated. But it was the Mercantilist's who formally propagated the cause of trade which was induced from wealth accumulation or the concept of treasure (Haney, 2005).

Trade has inevitably caught the fancies of economists who have termed it as an engine of growth, as a vent for surplus etc. There has been a lot of emphasis on increase of global trade. Trade is considered to be a useful way to integrate the world into one unit. Realizing this there have been continuous and deliberate efforts to increase global trade by freeing trade and expanding it in all four directions. The first such massive effort came in the year 1948 with establishment of GATT with an aim to increase trade and reduce tariffs. Since then in various rounds of GATT, deliberations were made towards enhancing global trade under the agreement. Finally in 1995 GATT gave way to WTO (World trade Organisation). WTO aims at increasing both trade in goods and services. But both GATT and WTO have one central agenda i.e. to reduce barriers to trade and extend the most favoured nation clause to all.

But where all these efforts were being made to convert the world into global village, there have been a trend of mushrooming trade blocks. Various kinds of regional integration like FTA (free

trade agreement) RTA (regional trade agreement) CU (custom union) Common Market etc. have come up. Though, these regional groups enhance overall trade but there is a threat of trade diversion attached to them. Some economists are of the opinion that these regional trading agreements hamper the spirit of multilateral trade negotiation. Multilateral Trade Negotiations according to them are the best form of trade which benefits all. But there are others who do not confirm with this view point, for them regional trading agreements are beneficial for member countries as they lead to growth along with increase in trade.

The inspiration of my paper comes from the book written by Prof. Jagdish Bhagwati "Free Trade Today" (2002). In which he has coined the term 'Spaghetti Bowl' with reference to the mushrooming FTAs and they being a potential threat to the cause of free trade. This paper aims to study Intra ASEAN trade and its effect on the world trade and to see how does the intra regional trade of ASEAN impacts the world trade along with the factors which influence the trade between ASEAN and World. ASEAN is the major trade block in ASIA. The time period I have picked up is 1995-2010. The reason to pick up the time period is the availability of data. The period coincides with the peak of Asian miracle and its downfall too. Along with this there have been various significant events like the attack on world trade centre, Afghanistan war, Iraq war, Sub-prime crisis etc.

(II) Review of Literature:

There has been a lack of consensus as to whether these regional trading agreements are pro multilateralism or anti-multilateralism. One of the earliest analysis of preferential trading agreements has been given by Viner in 1950s, where his prime focus lies on the fact that whether formation of PTA leads to shift in source of imports from efficient to inefficient or conversely

from inefficient to efficient. Former being trade diversion and the later being trade creation (Bhagwati and Panagariya, 1996). The basis of the proposition lied in the welfare approach he followed to assess the impact of these PTAs. If there was an increase in the welfare of the member countries good enough to offset the loss to accrue in form of trade diversion forming a PTA might be a good option (Pant and Sadhukhan, 2009). The ambiguity associated with assessing of the impact of PTAs has led to a seemingly never ending debate on whether PTAs or a specific PTA are desirable or not (Bhagwati and Panagariya, 1996). The spaghetti bowl phenomenon as coined by Jagdish Bhagwati deals with the crisscross relationships being built between one trade block and the other or one country with the others. The proliferation by PTAs poses a potential threat to the very cause of multilateral trade negotiation (Bhagwati and Panagariya, 1996) (Bhagwati, 2002) (Pant and Sadhukhan, 2009).

According to the '*pro-multilateralism'* economists multilateral trade negotiations are the best options as it leads to free and fair trade (Bhagwati 2002). Agreements like free trade areas are not free indeed they have free trade only with the member countries and not with the non member countries (Bhagwati 2002). The regional integration or agreements may not benefit all the member countries or blocks equally one may be benefited more than the other (Ciesilk and Hagemejer, 2009). According to *Pro-Preferential Trading Agreements* economists these PTAs or RTAs are building blocks of the multilateralism (Baldwin, 2006). They give various reasons for regional integration some being geographical proximity, lowering transportation cost and some other formal and informal factors (Lee and Park, 2005). Regional integration may seem competing with the concept of multilateralism but it is not mutually exclusive from a long run perspective (Michlak and Gibb, 1997)

Crawford and Laird in 2001 found RTAs trade with members grew at a much more faster rate than with that of non members. This means the RTAs are discriminatory in nature and they violate the most favoured nation clause. The intra regional trade may not remain the most important one for any form of regional integration over a period of time. There may be some changes in the composition of trade plus the top trading partners (Insel and Tekse, 2011). Thus if a block trades too much within trading block then this trend may or may not hold true in future.

The gap in the literature is that the studies done on the relation between trade blocks and world trade have used modified gravity models using various dummy variables to estimate the factors influencing trade plus to know whether they are trade diverting or trade creating. The studies normally have inter country comparisons or comparisons of various trade blocks together but none of the papers I reviewed had compared a trade block to world i.e. taking up trade block and world as trading partners. Thus I have selected ASEAN and World as trading partners and have gravity model to find the factors important for trade between them and VECM to find out the trade relation they have in long run. Trade intensity index was used to predict a tentative trade trend for future. The following objectives have been formed on the basis of the gap.

(III) Objectives:

- Which factor(s) is important for ASEAN to trade with the rest of the world?
- What is the long term relationship between intra ASEAN trade and bilateral trade with the World?
- How intra regional trade of ASEAN impacts the overall world trade?
- How much are ASEAN member countries trading among themselves?

(IV) Data Sources:

Time series data from 1995 to 2010 has been used. The data on trade has been taken from the website of United Nations Conference on Trade and Development, from its UNCTADSTAT database. The data on tariff has been taken from the website of World Bank.

(V) Models:

The objectives are diverse in character and need different techniques to meet them. To know as to which factors majorly impact the trade between ASEAN and the World '*basic gravity model'* is used. The relationship between intra regional trade of ASEAN and World will be analyzed through VECM (*Vector Error Correction Model*). Trade intensity index has been used to show the extent to which the member countries are trading amongst themselves.

(V.1) *Basic Gravity Model*:

Gravity models are commonly credited to be the workhorse of the applied international trade literature. It is considered to be the key tool for all those who are interested in analyzing trade related policies. The intuitive gravity model basically tells us the factors which influence trade. Though there are many kinds of gravity models based on international trade theories but here in our case we will use the traditional intuitive gravity model or the basic gravity model. (Shepherd, 2012)

The gravity model derives its name from the Newton's Law of Gravity. The economic mass is positively related to trade where as the inversely related to distance a measure of transport cost. But in our case we will take '*tariff*' as proxy of transportation cost. Tariff is a better measure than static distance as it captures the changes in trade cost over a period better than the distance which is time invariant (Novy, 2013).

Therefore, following equations will be used in this paper to see which factor(s) influence or have an impact on trade between ASEAN and World.

Eq1. World is the importer and ASEAN is the exporter.

$$lnBTwa = \alpha + \beta_1 ln(GDPw*GDPa) + \beta_2 ln(Tariff_a) + \varepsilon_{wa} \quad \text{.....(1)}$$

Eq1. World is the exporter and ASEAN is the importer.

$$lnBTaw = \alpha + \beta_1 ln(GDPa*GDPw) + \beta_2 ln(Tariff_w) + \varepsilon_{aw} \quad \text{.....(2)}$$

Where, lnTwa or lnTaw is the bilateral trade between ASEAN and World, ln(GDPw*GDPa) is the log of multiplicative GDP and ln($Tariff_a$)and ln($Tariff_w$) are the simple average bound tariff rates of ASEAN and World. 'ε' is the error term. Multiplicative GDP is used here as it is established in the literature also in our case we have taken up the case of trade block and the world hence it is not a problem. The problem arises in inter country comparisons are to be done as here one needs to make distinction between two equally large countries or one small and one large country is to be made (Bhattacharyya and Banerjee 2006) .

(V.2) VECM (Vector Error Correction Model)

If two non-stationary series are integrated to the order of one i.e. I(1) and there exists a unit root they are said to be cointegrated. If the series are cointegrated then they establish a long term relationship or equilibrium. The cointegrated series are also taken up as a proxy to pre-testing the regression not being spurious (Gujarati, 2007). The cointegrated series have an error correction representation i.e. they have error correction mechanism (Gunes, 2007). Sargan had used the concept of Error Correction mechanism for the first time in one of his papers, thereafter Engle

and Granger popularized it (Gujarati, 2007). For the series are cointegrated we can now establish causality in Granger sense by using Vector Error Correction Models.

Thus the model we use in this paper to study the nature of long run relationship between bilateral trade between ASEAN and the World and bilateral trade within ASEAN is the vector error correction model specified as follows:

$$\Delta STlnBT_{aw} = \alpha_1 + \beta_{11}STlnBT_{aw-1} + \beta_{12}STlnBT_{asean-1} + \beta_{21}STlnBT_{aw-2} + \beta_{22}STlnBT_{asean-2} + ECT_1[(STlnBT_{aw-1} - STlnBT_{asean-1}) + (STlnBT_{aw-2} - STlnBT_{asean-2})] \quad \textbf{……(3)}$$

$$\Delta STlnBT_{asean} = \alpha_2 + \beta_{21}STlnBT_{asean-1} + \beta_{12}STlnBT_{aw-1} + \beta_{21}STlnBT_{asean-2} + \beta_{22}STlnBT_{aw-2} + ECT_2[(STlnBT_{asean-1} - STlnBT_{aw-1}) + (STlnBT_{asean-2} - STlnBT_{aw-2})] \quad \textbf{…….(4)}$$

In equation (3), ECT_1 is the error correction term which adjusts disequilibrium in short term to maintain the long run equilibrium between the two variables. $STlnBT_{aw}$ i.e. data on bilateral trade between ASEAN and World and $STlnBT_{asean}$ i.e. bilateral trade within ASEAN are both integrated to the order one {I(1)}. These equations show the short run causality in granger sense (Gunes, 2007). Here, $STlnBT_{aw}$ is the dependent variable.

In equation (4), ECT2 is the error correction term which adjusts disequilibrium in short run to ensure long run equilibrium is attained by the two series or variables. Here in the second equation $STlnBT_{asean}$ is the dependent variable. The error correction coefficient symbolizes that by how much would deviation from the long run in one period be corrected in the next period.

VI Econometric Methodology:

(VI. 1) For Gravity Model:

The model is applied in simple OLS form. The times series data on trade was taken up from the website of UNCTAD and the tariff data was taken up from the website of World Bank. The model is compatible with log (natural log) form of data. Thus we converted the data series into natural log form. The equations are in OLS form thus regression was applied to the data and residuals were checked for whether the regression is spurious or not. The analysis was carried out in STATA SE 12 software package.

(VI. 2) For VECM:

The actual time series data was checked for stationarity at first using Dickey Fuller Test. The calculated value came more than the table values at all 1, 5, 10 percent level of significance. Then to make data stationary we transformed the actual data series in log form and applied Dickey Fuller Test statistics. The result was still non stationary series. There after the series were differenced to the first order and dickey fuller was applied and in both cases the calculated value came less than the table value thus the series were integrated to the order one i.e. I(1). The series were regressed on each other with $STlnBT_{aw}(1)$ being the dependent variable and $STlnBT_{asean}(1)$ being the independent variable. The residuals were predicted and dickey fuller test was applied to check if unit root existed. The calculated value of Dickey fuller came out to be less than the table value hence unit root exists i.e. the series are cointegrated. Now, when the series are cointegrated we use VECM to establish causality between variables and determine the long run relationships. To find the lag order selection we use the command *varsoc* followed by the names of the variables in order of dependent followed by independent. After the numbers of lags were

selected we see the rank of cointegration using the command vecrank followed by the variable names. The rank of cointegration came out to be 1 implying there will be one cointegrating equation. Then VEC model is computed using the command *vec* $STlnBT_{aw}$ $STlnBT_{asean}$, *rank(1), lags(3).* Then finally we get the model with a two parts one which shows the short run relation and ECM coefficient and the other which shows the long run relationship between the variables.

(VII) Analysis and Discussion:

(VII. 1) Basic Gravity Model:

The basic gravity model which is inspired from the Newton's law of gravity shows the factor(s) which influences trade between two trading partners. According to the basic gravity model trade between two partners is positively related to the economic 'mass' or 'size' and inversely related to the costs. Normally the costs are taken in terms of distance as variable but in our case we have picked up tariffs to account for cost. The reason for the choice of variable follows from the fact that distance between ASEAN and World cannot be accounted. As, in gravity models distances are usually measure from country's capital to the other country's capital. In our case we are analyzing trade between ASEAN and World, even though we take headquarter of ASEAN instead of country capital which country/place would we take for world capital of headquarter. Therefore we chose tariff as a proxy for trade costs. Besides this distance is time invariant proxy of trade cost which itself is dynamic and changes very fast thus distance is not a very good factor too, here tariffs fair off better (Novy, 2013).

lnBTaw= -5.0571 + .5763lnGDPaw[.000] + .1952lntarfiffa[.808] ***…….(5)***

In equation (5), the values in parentheses are the p-values associated with each variable. Here, the multiplicative GDP in equation 1 has been rewritten as GDPaw for simplicity. Now, the result for economic mass comes consistent with basic proposition of being positively related to the trade between two countries (Wintersb and Soloaga, 2001) (Felicitas, Inmaculada and Zarzoso, 2003) (Ghosh and Steven, 2004). A percent increase in economic size will bring about an increase in bilateral trade by .6 percent approximately. The coefficient is significant as the p value is .000. This is also true from the fact that ASEAN majorly trades with either the developed or emerging economies more as its major trade partner regions being ASEAN itself, BRICS, NAFTA, EU27 etc (DG Trade Statistics, 2013) Where-as, in case of ASEAN and the World the tariff is positively related instead of being negatively related as per basic proposition of the model. But it ceases to impact the trade between two as the p value shows an insignificant relation to the dependent variable.

The regression is not spurious as it does not suffer from the problem of autocorrelation and heteroskedasticity. The Durbin Watson d statistics test was used to check for autocorrelation and the computed value was 1.188639 which falls in the acceptable range of 1 to 3 i.e. there is no chronic problem of autocorrelation. The heteroskedasticity is checked using Breusch-Pagan test with null hypothesis of constant variance or no heteroskedasticity. The chi2(1) value was 0.15 and the probability value was .6993 i.e. the value is significantly greater than .05 thus null hypothesis is not rejected. Therefore there is no problem of heteroskedasticity either. *(Refer to Appendix 1)*

The gravity model herein highlights the economic size being the major factor for trade between ASEAN and the World and Tariffs being insignificant.

(VII. 2) VECM Model:

The VECM model is used to establish the long run relation between bilateral trade of ASEAN and the world and the Bilateral Trade within ASEAN. We first declared the series time series and checked for stationarity using Dickey Fuller test. The original and the log transformed series were not stationary according to the dickey fuller test.

Two Step *Engle Granger Test of Cointegration*:

We differenced the series to the first order and checked stationarity using dickey fuller test. The dickey fuller test statistic value for $STlnBT_{aw}$ was -4.136 and for $STlnBT_{asean}$ was -3.916 which was less than all the critical values at 1, 5, 10 percent level, this showed stationary which means the series were integrated to the order on I(1). These integrated series were regressed and the residuals were predicted thereafter on the residual the dickey fuller test was applied. The test statistic value for dickey fuller was -3.851 which was less than all the critical values at 1, 5, 10 percent level. Thus the unit root existed and the series are cointegrated. This process of finding out unit root and then cointegration is also said as two Step *Engle Granger test of cointegration*. *(Refer to Appendix 2)*

On knowing the series are cointegrated we apply VECM to find the long term relationship. The VECM model reconciles both long term and short term relationship. We first find out the number of lags we need to incorporate in the model using varsoc command. We have a three lag VECM model. The table below shows the selection criteria for the number of lags.

Table 1: Lag Selection Order Criteria

Selection-order criteria
Sample: 2000 - 2010 Number of obs = 11

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	25.6054				.000047	-4.2919	-4.3375	-4.21955
1	27.4759	3.741	4	0.442	.000071	-3.90471	-4.04152	-3.68768
2	32.235	9.5181	4	0.049	.000069	-4.04272	-4.27074	-3.681
3	42.4015	20.333*	4	0.000	.000031*	-5.16391*	-5.48313*	-4.6575*
4	45.8169	6.8308	4	0.145	.000083	-5.05762	-5.46805	-4.40652

Endogenous: STlnBTaw STlnBTasean
Exogenous: _cons

Here, according to all the criteria lag three is the optimal. Thus we selected lag three and applied a VEC model with three lags.

The next step is to find the rank of cointegration thus we use the command vecrank to find the rank of cointegration. The rank comes out to be one.

Table 2: Rank of Cointegration

Johansen tests for cointegration
Trend: constant Number of obs = 12
Sample: 1999 - 2010 Lags = 3

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	10	36.290263	.	18.9141	15.41
1	13	44.381928	0.74040	2.7308*	3.76
2	14	45.747333	0.20353		

Here in this case the * appears on the first rank there for we select rank one. Now while applying VECM we specify the rank as 1 and the lags as 3. Therefore we get the following *equations in short run.*

$$\Delta STlnBT_{aw} = .00074 + .9405STlnBT_{aw-1} - 1.115STlnBT_{asean-1} + .1302STlnBT_{aw-2} - .4950STlnBT_{asean-2} + -4.082996[(STlnBT_{aw-1} - STlnBT_{asean-1}) + (STlnBT_{aw-2} - STlnBT_{asean-2})] \quad \textbf{...(6)}$$

In equation (6), the error correction term is -4.082 and is significant which means a deviation from the long run equilibrium in one period will be corrected by over 4 percent in the next period. The negative sign of the error correction term implies the trend exhibited by the series is of convergence in long run i.e. the series will not drift away from the equilibrium. In short run all the beta values are insignificant i.e. there is no short term causality between the variables. *(Refer to Appendix 2)*

$$\Delta STlnBT_{asean} = -.00062 - 2.111STlnBT_{asean-1} + 2.015STlnBT_{aw-1} - .9434STlnBT_{asean-2} + 2829STlnBT_{aw-2} + -4.082873[(STlnBT_{asean-1} - STlnBT_{aw-1}) + (STlnBT_{asean-2} - STlnBT_{aw-2})] \quad \textbf{...(7)}$$

In equation 7, the value of error correction term is -4.082873 which is significant too implying a deviation from the long run equilibrium in one period will be corrected by over 4 percent in the next period. Here too the sign is negative which shows that the series will not drift away in long run. For all the beta coefficients being insignificant the short tern causality between variables seizes to exist. *(Refer to Appendix 2)*

The long run relationship:

$$STlnBT_{aw} = -.0181 - .6511STlnBT_{asean} [0.000]$$

The long run relationship is significant but inverse. The bilateral trade of ASEAN and World are inversely related with bilateral trade within ASEAN in long run. If bilateral trade within ASEAN

increases by a percent then it will bring down the trade that ASEAN does with the rest of the world. *(Refer to Appendix 2)*

(VII. 3) Trade Intensity:

The VECM model explains the relationship between the series but the trade intensity of the trade block is not measured by it. For this we will use the trade intensity index developed by Anderson and Norheim in 1993.

$$\frac{(Xij/Xiw)}{(Mwj-Xij)/(Mww-Xij)}$$

If the value for the index is more than one there is biasedness in the choice of trading partner or the choice of the geographical region (Carrillo, Carlos and Carmen, 2004). The table in appendix shows the value of trade intensities for the years 1995 to 2010. The value is far greater than one rather it is greater than 7.5 for all 15 years under study thereby indicating that the trade is a lot biased towards ASEAN. *(Refer to Appendix 3)*

VIII Conclusion:

Thus, taking into consideration the inverse relationship between bilateral trade between ASEAN and World and bilateral trade within ASEAN and the values of biased trade intensities together there is a possibility of concentration of trade within the trade block itself which could be trade distorting in nature. If such a situation arises then the spirit of multilateral trade negotiations would be hampered. This would defeat the cause of integrating the world using trade as an integrating force and would diminish the objectives of firstly fair and free trade, secondly to bring in growth to all member countries by way of trade. In process of doing so ASEAN might lose upon a better trade deal from a non member country

relative to the one offered by a member country. But this conclusion may seen a little too harsh on ASEAN as the recent trend shows that ASEAN's trade agreements with other major economies of the world has been proliferating in nature. The intra regional trade may not remain the most important one for any form of regional integration over a period of time. There may be some changes in the composition of trade plus the top trading partners (Insel and Tekse, 2011). Thus ASEAN's trade is driven by the economic size of the trading partner predominantly (Wintersb and Soloaga, 2001) (Felicitas, Inmaculada and Zarzoso, 2003) (Ghosh and Steven, 2004). There exists an inverse relation between the intra ASEAN trade and bilateral trade between ASEAN and the world. There is trade biasedness i.e. out of the total trade ASEAN countries do significant part of it is intra ASEAN trade (Crawford and Laird, 2001).

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Appendix 1 (Gravity Model)

```
. reg lnBTaw lnGDPaw lntariffA

      Source |       SS       df       MS              Number of obs =      16
-------------+------------------------------           F(  2,    13) =  207.14
       Model |  2.21215542     2  1.10607771            Prob > F      =  0.0000
    Residual |  .069417647    13  .005339819           R-squared     =  0.9696
-------------+------------------------------           Adj R-squared =  0.9649
       Total |  2.28157307    15  .152104871           Root MSE      =  .07307

------------------------------------------------------------------------------
       lnBTaw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
     lnGDPaw |   .5763694   .0414527    13.90   0.000     .4868162    .6659226
   lntariffA |   .1952325   .7855389     0.25   0.808    -1.501821    1.892286
       _cons |  -5.057161   3.68385    -1.37   0.193    -13.01563    2.901313
------------------------------------------------------------------------------

. predict res, resid

. dwstat

Durbin-Watson d-statistic(  3,    16) =  1.188639

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lnBTaw

         chi2(1)      =     0.15
         Prob > chi2  =   0.6993
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```
. reg lnBTaw lnGDPaw lntariffW

      Source |       SS       df       MS              Number of obs =      16
-------------+------------------------------           F(  2,    13) =  211.72
       Model |  2.21361281     2  1.1068064             Prob > F      =  0.0000
    Residual |  .067960261    13  .005227712           R-squared     =  0.9702
-------------+------------------------------           Adj R-squared =  0.9656
       Total |  2.28157307    15  .152104871           Root MSE      =   .0723

------------------------------------------------------------------------------
       lnBTaw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
     lnGDPaw |   .5735173    .028823    19.90   0.000     .5112489    .6357857
   lntariffW |   .1481126   .2533139     0.58   0.569    -.3991387     .695364
       _cons |  -4.832996   1.427585    -3.39   0.005    -7.917105   -1.748886
------------------------------------------------------------------------------

. predict resid, resid

. dwstat

Durbin-Watson d-statistic(  3,    16) =  1.354261

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lnBTaw

         chi2(1)      =     0.11
         Prob > chi2  =   0.7348
```

Appendix 2 (VECM)

```
. tsset year, yearly
        time variable:  year, 1995 to 2010
                delta:  1 year

. dfuller stlnbtaw

Dickey-Fuller test for unit root                    Number of obs   =        14

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -4.136            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0008

. dfuller stlnbtasean

Dickey-Fuller test for unit root                    Number of obs   =        14

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -3.916            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0019

. dfuller residualBT

Dickey-Fuller test for unit root                    Number of obs   =        14

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -3.851            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0024

. varsoc STlnBTaw STlnBTasean

   Selection-order criteria
   Sample:  2000 - 2010                         Number of obs      =        11

+---------------------------------------------------------------------------+
| lag |    LL      LR      df    p      FPE       AIC      HQIC      SBIC    |
|-----+---------------------------------------------------------------------|
|   0 |  25.6054                        .000047  -4.2919  -4.3375  -4.21955  |
|   1 |  27.4759   3.741    4  0.442   .000071  -3.90471  -4.04152  -3.68768  |
|   2 |   32.235  9.5181    4  0.049   .000069  -4.04272  -4.27074    -3.681  |
|   3 |  42.4015  20.333*   4  0.000   .000031* -5.16391* -5.48313* -4.6575*  |
|   4 |  45.8169  6.8308    4  0.145   .000083  -5.05762  -5.46805  -4.40652  |
+---------------------------------------------------------------------------+
   Endogenous:  STlnBTaw STlnBTasean
    Exogenous:  _cons
```

```
. vecrank STlnBTaw STlnBTasean, trend(constant) lags(3)

                    Johansen tests for cointegration
Trend: constant                                      Number of obs =      12
Sample:  1999 - 2010                                       Lags =       3
------------------------------------------------------------------------------
                                                              5%
maximum                                            trace     critical
  rank     parms       LL          eigenvalue    statistic     value
    0        10     36.290263           .          18.9141     15.41
    1        13     44.381928       0.74040        2.7308*     3.76
    2        14     45.747333       0.20353
------------------------------------------------------------------------------
```

```
. vec STlnBTaw STlnBTasean, rank(1) lags(3)

Vector error-correction model

Sample:  1999 - 2010                            No. of obs      =         12
                                                AIC             = -5.230321
Log likelihood =  44.38193                      HQIC            = -5.424812
Det(Sigma_ml)  =  2.10e-06                      SBIC            = -4.705006

Equation           Parms      RMSE     R-sq      chi2      P>chi2
------------------------------------------------------------------
D_STlnBTaw             6      .135159  0.8019    24.2897   0.0005
D_STlnBTasean          6      .126815  0.8648    38.36622  0.0000
------------------------------------------------------------------
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_STlnBTaw						
_ce1						
L1.	-4.082996	1.872973	-2.18	0.029	-7.753955	-.4120372
STlnBTaw						
LD.	.9405602	1.84776	0.51	0.611	-2.680982	4.562103
L2D.	.1302778	1.30857	0.10	0.921	-2.434472	2.695028
STlnBTasean						
LD.	-1.115206	1.375689	-0.81	0.418	-3.811506	1.581095
L2D.	-.4950383	1.022136	-0.48	0.628	-2.498388	1.508312
_cons	.0007437	.0407529	0.02	0.985	-.0791304	.0806179
D_STlnBTasean						
_ce1						
L1.	-4.820873	1.757347	-2.74	0.006	-8.26521	-1.376536
STlnBTaw						
LD.	2.015649	1.733691	1.16	0.245	-1.382322	5.41362
L2D.	.2829845	1.227787	0.23	0.818	-2.123434	2.689403
STlnBTasean						
LD.	-2.111564	1.290762	-1.64	0.102	-4.641411	.4182842
L2D.	-.9434581	.9590359	-0.98	0.325	-2.823134	.9362177
_cons	-.0006299	.038237	-0.02	0.987	-.0755731	.0743134

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	1	55.1387	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
STlnBTaw	1	.	.	.	.	.
STlnBTasean	-.6511453	.0876899	-7.43	0.000	-.8230144	-.4792762
_cons	-.018121	.	.	.	.	.

Appendix 3 (Trade Intensities)

Rij
10.54001
10.23311
9.540551
7.780247
7.691873
8.390179
8.445298
8.646735
10.46043
10.66029
11.02099
10.42863
11.05133
11.41428
9.784743
9.521772

Here Rij is the trade intensity index.