International Economic Studies
Vol. 45, No. 2, 2015
pp. 33-42
Received: ……………….. Accepted: ……………….

# Effects of Business Cycles on Bilateral Trade Flows in Eurozone Countries

**Seyed Komail Tayebi**
Department of Economics, University of Isfahan, Iran
**Zahra Zamani***
PhD in Economics, University of Isfahan, Isfahan, Iran
**Behnam Ebrahimi**
PhD in Economics, University of Isfahan, Isfahan, Iran

## Abstract
In economic theory, various determinants are considered to explore their effects on trade patterns. Accordingly, business cycles indicate turbulences in economic activities. Business cycles and their fluctuations cause a change in demand for goods and services from the other country then it can affect trade flows. In this study, by using a gravity model, we study the effects of business cycles on bilateral trade flows within Eurozone countries. In this regard, the challenge is that the countries in the region may be faced whit changes in their trade relation in directions whether parametric or non-parametric manners. To be evident, we have used we have used data from six Eurozone countries, namely Germany, France, Italy, Spain, Portugal and Greece for the period of 1995-2013, and then estimate the model with a semi-parametric panel data approach. The empirical results have shown that business cycles explain trade relations non-parametrically in the region. The results imply a transparent unique exchange policy toward their mutual trade flows to avoid outliers in their economic relations.

**Keywords:** Business Cycle, Bilateral Trade Flows, Gravity Model, Semi-Parametric Estimation, Eurozone Countries.
**JEL Classification:** **C14, F10, E32.**

---
* Corresponding Author, z_zamani85@yahoo.com

## 1. Introduction

The term of Business Cycles (BCs) refer to fluctuations in production, investment and employment over time (Reynisson, 2012). During the expansion phase of BCs, businesses grow and create more jobs in internal and external sectors. This causes an increase in employment and a decrease in the unemployment rate both nationally and internationally.

In general, as Baxter and Kouparitsas (2005) have cited, two important questions have been posed about Business Cycles. First, why are there business cycles? Second, why are business cycles correlated across countries specially in a region? As to the First question, a vast deal of researches has been devoted to understand determinants of real BCs. According to the results of these studies in the literature[1], several real and monetary variables in addition to fiscal/monetary policies and even political, cultural and geographical factors have been recognized as the root cause of BCs.

Answering to the second question has also received a great deal of attention, both in theoretical and empirical work, beginning with the work by Canova and Dellas (1993). Several papers[2] have concluded that intense bilateral trade tends to result in a high degree of synchronization among business cycles, while others[3] have found evidence that the trade effect is smaller than that previously reported. At the same time, Crosby (2003) even concludes that trade does not explain the correlation.

However, existence of BCs synchronization would imply a significant effect of business fluctuations on bilateral trade intensity; otherwise, there should not be BCs synchronization at all. In other words, in case of intensive trade relations economy-wide shocks in one country will generally have an effect on demand for goods from the other country (Inklaar et al., 2008). Therefore, it is expected that GDP fluctuations would have significant effect on trade intensity.

There is still a gap in the literature on this topic. The reason we may not be able to identify a parametric relationship between BCs and bilateral trade flows, due to uncertainty in exchange rate volatility of a singular monetary policy in economic region like Eurozone region. The motivation of this paper is thus to address a non-parametric relationship between trade and real business cycles, being focused on the bilateral trade flows of six selected Eurozone countries: Germany, France, Italy, Spain, Portugal and Greece[4]. To investigate the effects of BCs on bilateral trade we use an augmented semi-parametric gravity model applying countries' GDPs for trends of business cycles. For measuring BCs we then employ Hodrick-Prescott filtering following Artis and Toshihiro (2010).

The remaining of this paper is classified into 5 sections. Section 2 reviews the relevant literature, and then Section 3 discusses methodology in which data description and a model specification are developed in.

Section 4 will analyses the empirical results obtained by the gravity model estimation. Finally, Section 5 concludes and raises relatively policy implications.

## 2. The Relevant Literature

Rana et al. (2012) provide a comparative analysis of the relationship between trade intensities and synchronization of BCs in East Asia and Europe (EU-15). They find that intra-industry trade, rather than inter-industry trade, is the major factor in explaining BCs co-movements in both regions. They also support the hypothesis that the relationship between trade intensity and output co-movement is stronger in East Asia than in Europe.

Inklaar et al. (2008) re-examine the relationship between trade intensity and BC synchronization for 21 OECD countries during 1970-2003. They estimate a multivariate model including variables capturing specialization, financial integration, and similarity of economic

[1] See Imbs (2004), Otto et al. (2001), Baxter and Kouparitsas (2005), Schiavo (2008), Stockman (1988), Kalemli-Ozcan et al. (2001), Clark and van Wincoop (2001), Inklaar et al. (2008), Rose and Engel (2002), Calderon et al. (2007), Fidrmuc (2002), Kose et al. (2003), Shin and Wang (2006) and de Haan et al. (2008) for instance.

[2] See Frankel and Rose (1996), Baxter and Kouparitsas (2005) and otto et al. (2001), Inklaar et al. (2008), Imbs (2004), Clark and van Wincoop (2001) for instance.

[3] Gruben et al. (2002) and Inklaar et al. (2008).

[4] The intuition behind choosing these countries is their different situation and affection rate by Euro-Area sovereign debt which makes the results of the study more robust and reliable.

policies. They confirm trade intensity affects BC synchronization, but the effect is so smaller than that previously reported.

Chiquiar and Ramos-Francia (2004) provide evidence that production-side links between Mexico and the U.S. manufacturing sectors became stronger after NAFTA was enacted and, as a consequence, BC in these countries became more synchronized. Such results suggests that the positive effect of bilateral trade on BC synchronization found in previous studies for the case of industrial countries may also hold for industrial and less developed country pairs. The recent entry of other unskilled labor-abundant countries into global trade, however, seems to be affecting Mexico's competitiveness in some industries and causing Mexico to be losing market share in the U.S. import market. As a consequence, this event could lead to a permanent negative shift in Mexico's manufacturing output levels, relative to the U.S., and could possibly weaken the degree of BC synchronization between these countries. A related effect is shown to be that, in some industries where strong Mexico-U.S. production-sharing links persist, overall North American output is apparently being affected by the global movement of these activities toward the Asian block.

Calderon et al. (2007) study whether trade intensity increases cycle correlation among developing countries. They collect annual data for 147 countries over 1960-99 and find empirical results for countries with higher bilateral trade indicate higher BC synchronization. They find that the impact of trade integration on BC is higher for industrial countries than those of both developing and industrial-developing country pairs. However, they do not identify a true parametric or non-parametric relationship between trade and BCs.

Artis and Toshihiro (2010) study the international BCs in Japan. They apply Hodrick-Prescott filter to identify cycles in annual data from 1955 to 1995 and calculate bilateral cross-correlations of prefectural GDPs for all pairs of prefectures. The results show fairly high cross-correlations. Then they use a gravity framework to find out that two prefectures with similar GDPs and a shorter distance between them lead to BC synchronization whilst those with larger regional gaps in factor endowment (like capital, labor and human capital) result in more idiosyncratic BC.

The review of the literature reveals that most of the authors have studied the effect of bilateral trade on synchronization of BCs among trade partners, and have concluded that higher bilateral trade would result in a higher degree of BCs synchronization. However the causality in the opposite side has received a little attention; yet it is theoretically expected that business fluctuations has a significant effect on bilateral trade intensity (Inklaar et al., 2008).

Indeed, it is prescribed that fluctuations of GDPs in an economic region is more pronounced to obey a non-normal distribution and therefore fails to comply with fundamental assumptions of classical parametric models; yet, almost none of the researches has taken this point into account.

Furthermore, applying semi-parametric panel data approach, Ebrahimi et al. (2014) Ohadi Esfahani and Tayebi (2014) conclude non-parametric relationships between bilateral trade flows, European sovereign debt (leverage) crisis and technological distance in selected Asian countries, respectively. However, none of these studies explore an existence relationship between trade and BCs in an economic region. The novelty of this paper is thus to augment such relationship through specify a semi-parametric gravity model.

In this paper, we will use the HP filtered GDP data of 6 selected Eurozone members and appropriate econometric methods to study the effect of selected countries' BCs co-movements on bilateral trade flows.

## 3. Methodology

### 3.1. Data Description

As discussed previously, we use the selected Eurozone members' (HP) filtered GDP data[1] to constitute the fluctuations of the GDP data employed in the gravity model. To test the validity of the assumption of normal distribution and hence the suitability of using parametric estimation approach, we use the "Normal Distribution Statistic" (NDS) to test if data could belong to a normal distribution with the parameters estimated from the same data. That is, we have first calculated mean and standard deviation of the data set for the period 1994-2013, and then we have used the parameters to check if these data could be related to such

[1] Retrieved from European Central Bank website at: http://sdw.ecb.europa.eu/browse.do?node=bbn192

normal distribution. The NDS shows the Cumulative Distribution Value of the data based on the specified normal distribution. It is clear that, with the commonly used 5% confidence level, the statistic value of greater than 0.95 or less than 0.05 would result in rejection of the hypothesis that the data belong to the specified normal distribution. Table (1) shows the statistic values reporting means and standard deviation of the period 1994-2013.

As it is evident from the table, about 11% of the numbers are less than 0.05 or greater than 0.95, hence the A/F hypothesis could not be easily rejected or left defended. Additionally, Figure (1) displays the trends of the NDS measures for the selected countries over the period.

**Table 1: The NDS Measures of the selected Eurozone members' (HP) filtered GDP data over the Period 1994-2013**

| Year | Italy | Greece | Germany | France | Portugal | Spain |
|---|---|---|---|---|---|---|
| 1994 | 0.11570869 | 0.345751 | 0.41091 | 0.243788 | 0.048368 | 0.321025 |
| 1995 | 0.235655127 | 0.316033 | 0.446021 | 0.241084 | 0.09986 | 0.275369 |
| 1996 | 0.240070546 | 0.295816 | 0.303171 | 0.144145 | 0.162759 | 0.222307 |
| 1997 | 0.315795342 | 0.316033 | 0.355597 | 0.160436 | 0.301821 | 0.244932 |
| 1998 | 0.359441742 | 0.332472 | 0.44558 | 0.32879 | 0.55286 | 0.311078 |
| 1999 | 0.409159045 | 0.355884 | 0.548646 | 0.547842 | 0.73361 | 0.415594 |
| 2000 | 0.713095925 | 0.424045 | 0.862939 | 0.814203 | 0.86984 | 0.568004 |
| 2001 | 0.804232226 | 0.493274 | 0.884639 | 0.828325 | 0.891229 | 0.634599 |
| 2002 | 0.770071503 | 0.54207 | 0.657744 | 0.73623 | 0.863532 | 0.64059 |
| 2003 | 0.685155762 | 0.695743 | 0.268304 | 0.625626 | 0.720623 | 0.684341 |
| 2004 | 0.784955226 | 0.786834 | 0.239025 | 0.774243 | 0.743932 | 0.748448 |
| 2005 | 0.807665299 | 0.806498 | 0.139107 | 0.817083 | 0.714016 | 0.832279 |
| 2006 | 0.914482508 | 0.910232 | 0.658564 | 0.9159 | 0.741569 | 0.921113 |
| 2007 | 0.958438966 | 0.947438 | 0.956529 | 0.9649 | 0.833811 | 0.961977 |
| 2008 | 0.880953418 | 0.92529 | 0.949533 | 0.871516 | 0.769539 | 0.939238 |
| 2009 | 0.217923409 | 0.814575 | 0.004821 | 0.154705 | 0.42486 | 0.570123 |
| 2010 | 0.345529456 | 0.555451 | 0.203916 | 0.203757 | 0.522995 | 0.384735 |
| 2011 | 0.34355839 | 0.201951 | 0.720671 | 0.316373 | 0.326952 | 0.243678 |
| 2012 | 0.097995226 | 0.04188 | 0.605635 | 0.139291 | 0.07829 | 0.067663 |
| 2013 | 0.021918891 | 0.012189 | 0.411778 | 0.055712 | 0.026833 | 0.014029 |

***Source***: Authors

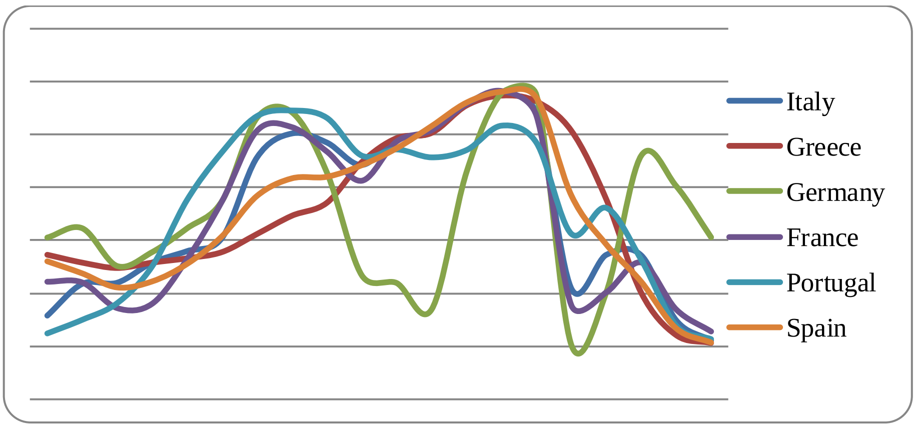



**Figure 1: Trends of NDS Measures for the selected countries over the Period 1994-2013**
***Source***: Authors

Based on the trends of trade the distribution of (HP) filtered GDP variable is near-normal and thereby we have no definite choice to decide whether to use parametric and/or non-parametric methods to estimate the model. Accordingly, in what follows, we use both parametric and semi-parametric methods[1] to estimate the model and compare the results.

## 3.2. The Model

In economic literature, the effect of GDP on trade has been studied by applying gravity approach. Therefore, to investigate the effects of BCs on trade flows, we are able to use gravity model as well, due to its flexibility in theory and data admissibility (Tinbergen, 1962 and Poyhonen, 1963). In the standard Gravity model of bilateral trade, GDP, alongside other gravity variables, is well accepted to significantly explain bilateral trade intensity of a group of countries in a treaty (Mahona and Mjema, 2014). In other words, factors like the GDP variable (as a measure of the size) of countries, distance as well as some other time-invariant cultural factors are main determinants of trade flows between them (Serlenga and Shin, 2007). Hence, trade flow between two countries (*i* and *j*) takes the form of:

$$T_{ij} = G\frac{Y_i Y_j}{Dis_{ij}} \tag{1}$$

where $T_{ij}$ is the trade flow, $Y_i$ and $Y_j$ are the economic masses of each country, $Dis_{ij}$ is the distance between them and $G$ is a constant. In contrast to abstract and simple form of the basic model, in applied works, the model is often extended by including variables to account for language relationships, tariffs, access to sea, colonial history, exchange rate regimes, and other indicators of interest (Mahona and Mjema, 2014).

Since we seek for the effect of GDP fluctuations on bilateral trade, we use cyclical component of GDP time series in the model. To extract the trend from the cyclical component of the GDP time series, various filtering techniques have been proposed in the literature[2]. We thus apply the widely used Hodrick-Prescott (HP) filter to calculate cyclical components. The Hodrick-Prescott filter has been traditional method to decompose cyclical movement of BC from the long-run trend (Buch et al., 2005). The basic idea of the HP filter is to find a balance between the extents to which general growth trend follows the cyclical movement. The HP filter identifies the longer term fluctuations as part of the growth trend while classifying the more jumpy fluctuations as part of the cyclical component.

Technically, the HP filter is a two-sided linear filter that computes smoothed series $s$ of $y$ by minimizing the variance of $y$ around $s$, subject to penalty that constrains the second difference of $s$. That is, the HP filter chooses $s$ to minimize:

$$\sum_{t=1}^{T}(y_t - s_t)^2 + \lambda\sum_{t=2}^{T-1}((s_{t+1} - s_t) - (s_t - s_{t-1}))^2 \tag{2}$$

The penalty parameter $\lambda$ controls for the smoothness of the series $\sigma$. The larger $\lambda$, the smoother $\sigma$. As $\lambda = \infty$, $s$ approaches a linear trend (Hodrick and Prescott, 1997).

If a country and/or its trading partners face economic shocks, their trade flows are affected simultaneously by internal and external shocks since it causes disorganization in their business affairs. Therefore, we use Anderson (1979) and Deardorff (1998) model, which is based on the gravity model extracted initially from the Newton approach, in order to estimate international trade flows, while data are under effects of BC in the main economic indicators. The simplest case when there is no obstacle and no reward, bilateral trade flows can be considered as a direct function of the economic size of the two countries. The trade gravity model can thus be considered as follows:

$$T_{ij} = f(GDP_i, GDPj, POP_i, POPj) \tag{3}$$

where $T_{ij}$ denotes trade flow from country *i* to country *j*. $GDP_i$ and $GDP_j$ show economic size of exporter country *i* and importer country *j*, respectively. $POP_i$ and $POP_j$ stands for population of country *i* and country *j*.

Based on the theoretical literature of international trade (Deardorff, 1998), income convergence/divergence may affect directly/indirectly the countries' trade flows, even co-movements of BC dominants changes of the economic variables in both countries. Therefore, an augmented trade gravity model in logarithmic form is defined, while a Linder variable ($LIND_{ij}$) is applied to explain the role of

[1] Some other variables of the model proved to follow a normal distribution. Accordingly, we do not consider wholly non-parametric estimation.

[2] See Gachter et al. (2012) for a detailed discussion.

income convergence/divergence in their trade relations during the periods of BC:

$$EX_{ijt} = \alpha_0 + \alpha_1 SGDP_i + \alpha_2 SGDP_j + \beta_1 POP_i + \beta_2 POP_j + \gamma_1 EX_e + \gamma_2 EX_i + \gamma_3 LIND_{ij} + \varepsilon_{ij} \quad (4)$$

$EX_{ijt}$ denotes exports from country $i$ to country $j$ at time $t$. $SGDP_{it}$ and $SGDP_{jt}$ denote fluctuation in GDP of exporter country $i$ and importer country $j$ at time t, respectively. $POP_{it}$ and $POP_{jt}$ show population of country $i$ and j country at time t. Finally, $LIND_{ijt}$ explains the role of income convergence/divergence in their trade relations. $\varepsilon_{ijt}$ is an error term which is distributed identically and independently.

Equation (4) is re-specified to a semi-parametric one in respect to BCs of GDP of each country member. $GDPhh_{ijt}$ denotes a HP filtering variable of the cross GDPs (GDP of country $i$) and GDPs (GDP of country $j$) in form of $GDP_i$* $GDP_j$ at time $t$.

The general form of a semi-parametric panel data model is defined as follows:

$$y_{it} = X_{it}\theta + f(z_{it}) + \alpha_i + \varepsilon_{it} \quad i = 1, \dots, N; \quad t = 1, \dots, T \text{ where } T < N \quad (5)$$

$y_{it}$ is a dependent variable and $X_{it}\theta$ is the parametric section of the model containing ordinary variables, and $f(z_{it})$ is the second part of the model which is non-parametric piece reflecting the BCs changes.

Finally, based on a semi-parametric version, Equation (4) is defined as follows:

$$EX_{ijt} = \alpha_0 + \beta_1 POP_i + \beta_2 POP_j + \gamma_1 EX_e + \gamma_2 EX_i + \gamma_3 LIND_{ij} + m(GDPhh_{ijt}) + \varepsilon_{ij} \quad (6)$$

where estimation results obtained by an innovative syntax of semi-parametric method will be analysed in the next section.

## 5. Empirical Results

This paper explores empirically the impacts of cycles of GDP as well as a set of gravity variables on Eurozone Countries' bilateral trade flows through a parametric and semi-parametric gravity model. Tables (1), (2) and (3) report the results of estimating Equation (6) using the panel data approach with the context of non-parametric estimation process for the selected Eurozone Countries, as referred previously, during 1995-2013. Data on GDPs, populations and exchange rates have been collected from the World Bank database, export data from the Uncomtrade site and distance are taken from Indo, respectively. Overall, having applied applying the various options of non-parametric estimation, we are able to reproduce the values of the fitted dependent variable of bilateral exports in the specific confidence intervals, which are set to 95% default. To this end, we have the chance to recover the error component residuals - the left hand side of Equation (6) - which can then be used to draw any kind of non-parametric regression (Three cases of the Stata command options for *xtsemipar* are considered to the estimation process of Equation (6). To fit the regression properly, each case includes the same *spline, ci* and *cluster*, but different *knots1*.5).

**Table 1: Estimation of Panel Semi-parametric Gravity Model for Bilateral Trade: GDP BC Effect, Case I, (2 knots)**

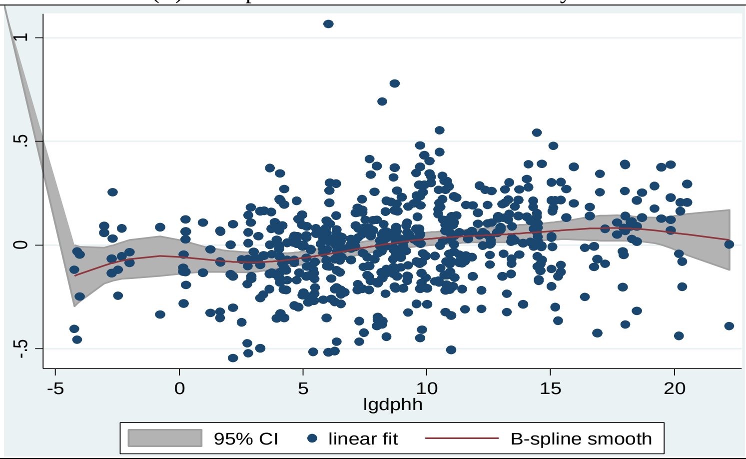
| Part (A): *Parametric Estimates for the Gravity Model* | | | |
|---|---|---|---|
| Variable (log) | *Parametric Estimates for the Gravity Model* (*Part A*) Coefficient | t statistics | Pr > \|t\| |
| *lpope* | 2.82 | 3.41 | 0.004 |
| *lpopi* | 4.78 | 5.29 | 0.000 |
| *lexe* | .920 | 5.47 | 0.000 |
| *lexi* | .925 | 4.45 | 0.001 |
| *lLin* | .064 | 0.52 | 0.612 |
| Part (B): Non-parametric Results for the Gravity Model | | | |

***Source***: Authors

**Table 2: Estimation of Panel Semi-parametric Gravity Model for Bilateral Trade: GDP BC Effect, Case II, (4 knots)**

| Part (A): *Parametric Estimates for the Gravity Model* | | | |
|---|---|---|---|
| Variable (log) | *Parametric Estimates for the Gravity Model (Part A)* Coefficient | t statistics | Pr > \|t\| |
| *lpope* | 2.76 | 3.26 | 0.006 |
| *lpopi* | 4.71 | 4.98 | 0.000 |
| *lexe* | .938 | 5.66 | 0.000 |
| *lexi* | .943 | 4.41 | 0.001 |
| *lLin* | .072 | 0.56 | 0.583 |

Part (B): Non-parametric Results for the Gravity Model

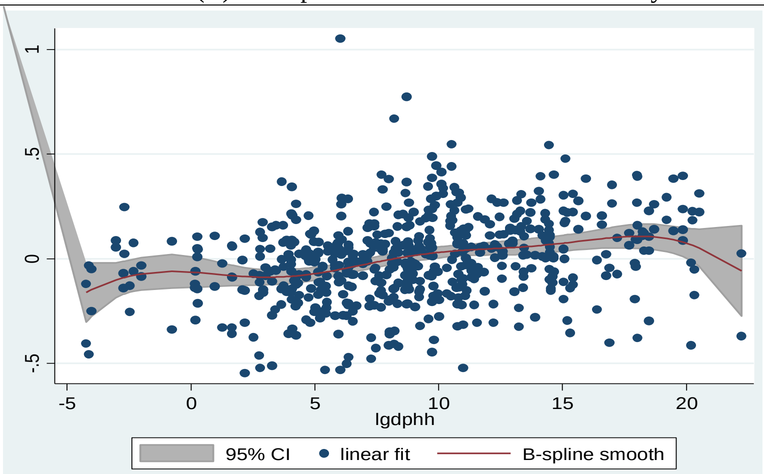



***Source***: Authors

**Table 3: Estimation of Panel Semi-parametric Gravity Model for Bilateral Trade: GDP BC Effect, Case III, (6 knots)**

| Part (A): *Parametric Estimates for the Gravity Model* | | | |
|---|---|---|---|
| Variable (log) | *Parametric Estimates for the Gravity Model (Part A)* Coefficient | t statistics | Pr > \|t\| |
| *lpope* | 2.65 | 3.10 | 0.008 |
| *lpopi* | 4.61 | 4.94 | 0.000 |
| *lexe* | .937 | 5.47 | 0.000 |
| *lexi* | .943 | 4.29 | 0.001 |
| *lLin* | .070 | 0.57 | 0.581 |

Part (B): Non-parametric Results for the Gravity Model




***Source***: Authors

The results presented in the tables include two parts: Part A and Part B. The first part (Part A) indicates the parametric effects of the gravity variables on bilateral trade which are statistically significant (except for Linder variable). The significant effects of populations imply the significant role of the market size in the region. The results also indicate the significant and positive effects of effective bilateral exchange rates on the trade flows of the selected Eurozone countries. From the supply point of view, the results obtained are expected while the countries need to benefit from a transparent unique exchange policy under Euro anchor.

For Part B, we have used a kernel-weighted local polynomial fit based on an Epanechnikov kernel, confidence intervals at the level of 95% and standard errors clustered at the geographical distance level. The variable of geographical distance is a major determinant bilateral trade, which helps to smooth B-splines. However, different values are used for *knots1* to show smoother quadratic splines: (0(2)8) in Case I, (0(4)8) in Case II and (0(6)8) in Case III, respectively. Overall, Figures shown in the tables display the average non-parametric fit of the cycles of GDPs in a linear dotted fit and a linear B-spline smooth. Based on the results shown in 3 cases, Case III indicates a better fit, revealing the fact that there has been a nonparametric relationship between bilateral trade and business (GDP) cycles. The reason is that most knots that explain such relationship for each country member are in the 95% confidence interval.

The results support the idea that GDP cycles have no essentially a parametric relationship with trade, due to its various interpretation and proxies in use. Since data has not confirmed strongly non- parametric relationships between bilateral trade and GDP fluctuations. To observe and compare the results, we have re-estimated the model by using a parametric approach to explore the parametric effect of the GDPs' cycles on Eurozone Countries' bilateral trade flows (See Table 4). The results show that GDP fluctuations have affected positively and unexpectedly trade flows. The conclusion is that industry shocks dominate economic fluctuations while we would expect indirect effects of cycles on trade.

**Table 4: Panel Estimation Results for Selected Countries Bilateral Trade based on Cross-Sectional Time-series FGLS Regression, Using GDP BC**

| Variable | Coefficient | P>\|Z\| | Z |
|---|---|---|---|
| *Cons* | -35.58 | -18.49 | 0.000 |
| *lpope* | 1.45 | 50.72 | 0.008 |
| *lpopi* | 0.94 | 33.10 | 0.000 |
| *lexe* | 2.17 | 6.59 | 0.000 |
| *lexi* | 2.53 | 7.70 | 0.000 |
| *lgdpch* | 0.032 | 2.06 | 0.039 |
| *ldis* | -1.21 | -28.64 | 0.000 |
| *lLin* | -.039 | -4.30 | 0.000 |
| Wald chi2 (4) = 8267.73, Prob.> chi2 = 0.0303 | | | |
| LR chi2(29) = 251.62, Prob> chi2 = 0.000 | | | |

***Source***: Authors

## 6. Conclusion

In this paper the relationship between business cycles and bilateral trade flows was investigated for the selected Eurozone country members by specifying a semi-parametric gravity model over 1995-2013. The results confirmed that there was a parametric and nonparametric relationship between bilateral trade flows and cycles of GDPs in the selected countries during the period under consideration. It has indicated that, real business cycles play a crucial role in an economy, affecting trade, and transmitting various shocks to international trade through demands and supplies in the international markets. Hence, our findings imply integrated policies taken by the members in time of fluctuations and cycles.

## Reference


1. Anderson, E. J. (1979), “A Theoretical Foundation for the Gravity Equation,” *The American Economic Review*, 69 (1), 106-116.
2. Artis, M. and T. Okubo (2010), The International Business Cycle in Japan, *CPER Discussion Paper*, No 6686.
3. Baxtera, M. and M.A. Kouparitsas (2005), “Determinants of Business Cycle Co-movement: A Robust Analysis,” *Journal of Monetary Economics*, 52, 113–157.
4. Buch, M., C.J. Doepke and C. Pierdzioch (2005), “Financial Openness and Business Cycle Volatility,” *Journal of International Money and Finance*, 24(5), 744-765.

5. Calderon, C., A. Chong and E. Stein (2007), "Trade Intensity and Business Cycle Synchronization: are Developing Countries any Different?" *Journal of International Economics*, 71(1), 2-21.
6. Canova, F. and H. Dellas (1993), "Trade Interdependence and the International Business Cycle," *Journal of International Economics*, 34(1-2), 23–47.
7. Chiquiar, D. and M. Ramos-Francia (2004), Bilateral Trade and Business Cycle Synchronization: Evidence from Mexico and United States Manufacturing Industries, *Bank de Mexico Working Paper*, No.2004-05.
8. Clark, T. E. and E. van Wincoop (2001), "Borders and Business Cycle," *Journal of International Economics*, 55 (1), 59-85.
9. Crosby, M. (2003), "Business Cycle Correlations in Asia-Pacific, *Economics Letters*, 80(1), 35–44.
10. Deardorff, V.A. (1998), Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World? In: Frankel, J. A. The Regionalization of the World Economy. Chicago: University of Chicago Press.
11. de Haan, J., R. Inklaar, and R. Jong-A-Pin (2008), Will Business Cycles in the Euro area converge? A Critical Survey of Empirical Research," *Journal of Economic Surveys*, 22(2), 234–273.
12. Ebrahimi, B., Z. Zamani and S. K. Tayebi (2014), "Effects of European Sovereign Debt (Leverage) Crisis on Bilateral Trade Flows," *International Journal of Business and Development Studies*, 6(2), 57-78.
13. Fidrmuc, J. (2002), "The Endogeneity of the Optimum Currency Area Criteria, Intra-industry Trade, and EMU Enlargement. Contemporary Economic Policy," 22(1), 1-12.
14. Frankel, J. and A. Rose (1996), The Endogeneity of the Optimum Currency Area Criteria, NBER Working Paper, No. 5700.
15. Gächter, M., A. Riedl, and D. Ritzberger-Grüunwald (2012), "Business Cycle Synchronization in the Euro Area and the Impact of the Financial Crisis," *Monetary Policy & the Economy* (2), 33-60.
16. Gruben, W., J. Koo, and E. Millis (2002). How much does international trade affect Business Cycle synchronization? Federal Reserve Bank of Dallas Working Paper, No. 0203.
17. Hodrick, R. and E. C. Prescott (1997), "Postwar U.S. Business Cycle: An Empirical Investigation," *Journal of Money, Credit, and Banking*, 29 (1), 1–16.
18. Imbs, J. (2004), "Trade, Finance, Specialization, and Synchronization," *The Review of Economics and Statistics*, 86(3), 723-734.
19. Inklaar, R., R. Jong-A-Pin, and J. de Haan (2008), "Trade and Business Cycle Synchronization in OECD countries: A re-examination," *European Economic Review*, 52(4), 646–666.
20. Kalemli-Ozcan, S., B. Sorensen and O. Yosha (2001), "Economic Integration, Industrial Specialization, and the Asymmetry of Macroeconomic Fluctuations, *Journal of International Economics*, 55(1), 107–137.
21. Kose, M., E. Prasad and M. Terrones (2003), How Does Globalization Affect the Synchronization of Business Cycle?," *American Economic Review*, 93(2), 57–62.
22. Mahona, B.K. and G. D. Mjema (2014), "Determinants of Tanzania and Kenya Trade in the East African Community: A Gravity Model Approach," *Journal of Economics and Sustainable Development*, 5(4), 13-23.
23. Ohadi Esfahani, S. and S. K. Tayebi (2014), "The Role of R&D in Trade Expansion: A Semi-parametric Gravity Specification for East and West Asia," *International Economic Studies*, 44(1), 15- 26.
24. Otto, G., G. Voss and L. Willard (2001), Understanding OECD output correlations, *Reserve Bank of Australia Research Discussion Paper*, No. rdp2001-05.
25. Poyhonen, P. (1963), "A Tentative Model for the Volume of Trade between Countries," *Welwirtschaftliches Archiv*, 90 (1), 93-99.
26. Rana, P. B., T. Cheng and W. N. Chia (2012), "Trade Intensity and Business Cycle Synchronization: East Asia versus Europe," *Journal of Asian Economics*, 23(6), 701-706.
27. Reynisson, T. M. (2012), A Business Cycle Analysis with Large Factor Model: Construction of a Smooth Indicator Free from Short Run Dynamics, Master's Thesis, University of Iceland, Reykjavik, Iceland, http://skemman.is/en/stream/get/1946/10534/26238/1/MS_Lokaverkefni_TomasMichaelReynisson.pdf.
28. Rose, A.K. and C. Engel (2002), "Currency Unions and International Integration,"

*Journal of Money, Credit and Banking*, 34(4), 1067–1089.

29. Serlenga, L. and Y. Shin (2007), "Gravity Models of Intra-EU Trade: Application of the CCEP-HT Estimation in Heterogeneous Panels with Unobserved Common Time-Specific Factors," *Journal of Applied Econometrics*, 22(2), 361-381.
30. Schiavo, S. (2008), "Financial Integration, GDP Correlation and the Endogeneity of Optimum Currency Areas," *Economica*, 75(297), 168–189.
31. Shin, K. and Y. Wang (2006), "Trade Integration and Business Cycle Synchronization in East Asia," *Asian Economic Papers*, 2(3), 1-20.
32. Stockman, A. (1988), "Sectoral and Aggregate National Disturbances to Industrial Output in Seven European Countries," *Journal of Monetary Economics*, 21(2-3), 387–409.
33. Tinbergen, J. (1962), Shaping the World Economy: Suggestions for an International Economics Policy, the Twentieth Century Fund. New York.