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Common Currency and Bilateral Trade: A spatial econometrics Approach

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Abstract

The common currency is a legitimate recognition of political commitment to ensuring regional integration. Geographic distance and common currency as spatial variables are one of the most important determinants of regional integration and trade. This paper aims to investigate the spatial effects of common currency on bilateral trade using the spatial dynamic panel data model during 2006- 2016. The results show that the effect of common currency and geographic distance on bilateral trade is positive and significant, statistically. Hence, it can be concluded that countries that are adjacent to each other or have common currency would strengthen the trade between themselves, by creating monetary unions. In addition, the results indicate that the effect of other variables based on spatial econometric approach, GDP and trade openness -in three spatial matrices-had a positive and significant effect on bilateral trade. The exchange rate had a negative and significant effect on the geographical distance matrix and it had no effect on bilateral trade (in the common currency matrix and the modified currency matrix).

Keyword: Monetary Union, Spatial Econometrics, Common Currency, Bilateral trade, Spatial Panel.

JEL classification: C21, C33, F15.

1. Introduction

Nowadays intra-regional trade with major global unions has grown dramatically, and regional integration has been introduced as one of the main characteristics of world politics and the global economy. In this regard, the creation of monetary unions has a fundamental role (effect) in convergence and the achievement of economic integrity between countries. According to the importance of unions in economic convergence process, choosing a union or regional business group is one of the major goals of economic policy planning. Although monetary unions offer conditions that group of countries maintaining their money independently, but the most complete and advanced state are the status that member states set aside their national currency, in fact, they choose the unique currency as a common currency in the commercial process.

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Mundell (1961) believes that creating a unique common currency can lead to lower business costs, price convergence, stability and consolidation of regional markets. However, costs of losing monetary independence depend on how much countries depend on their monetary policy before joining the monetary union. Also, monetary union helps to increase the political discipline of the national economy with regard to regional economic monitoring. The main advantage of a common currency is that trade (in both groups of goods and services) and investment among union countries (and hence the growth of income in the region) will increase by reducing the cost of trading in the border trade and eliminating the fluctuation in exchange rate across the union (Madhur, 2004). The effect of the monetary union of trade has a wide field of research in the economy. Benefits the common currency achieved directly from international trade. Researchers such as Rose and Engel (2000) and Rose (2006) shown that creating common currency has the greatest impact on trade between countries. The common currency eliminates the fluctuations in the nominal bilateral exchange rate and thus reduces uncertainty and risk in commercial transactions. In the integrated trade union, countries would be more specialized. Then, increasing trade through unions lead to efficiently more use of resources and ultimately higher economic growth. In general, if trade integration with the partner countries grew, benefits from the exchange rate will grow more and if international trade between the two countries grows, the transaction costs will reduce more.

According to the Tobler's first geography theory (1979), everything is related to everything else but near (adjacent/vicinal/proximate) things are more related than distant things. No region is isolated, but every region always has a development status according to its correlation between other regions. In the real world, science, technology, communication, products, elements, and information are in continuous exchange, the cost of which is positively correlated with distance. As a result, interactions between proximity regions with close spatial positions are also relatively significant. Omitting the spatial correlations between econometric analyses while variables are spatially correlated would lead to bias in econometric estimation (Anselin, 1988).

This study is organized as follows: the introduction is the first section. Data and estimation strategy are explained in Section 2, while Section 3 next presents the monetary union and trade, the spatial weight matrix, and the proposed hypotheses to test. Section 4 discusses the estimation results and Section 5 discussion and concludes with some policy implications.

2. Materials and Methods

To investigate the impact on common currency on bilateral trade, we determine the factors affecting bilateral trade. According to Anselin and Bera (1998), spatial autocorrelation can be loosely defined as the coincidence of value similarity with locational similarity. On the other hand, high or low values of a random variable tend to cluster in space (positive spatial autocorrelation) or locations tend to be surrounded by neighbors with very dissimilar values (negative spatial autocorrelation). There are two types of spatial autocorrelation, positive autocorrelation is by far more intuitive. Negative spatial autocorrelation implies a checkerboard pattern of values and does not always have a meaningful substantive interpretation (Viton, 2010). Using aggregate data onto different geographic regions (such as countries) in the regression analysis, the existence of spatial autocorrelation in the error terms seem to be natural. The spatial heterogeneity between the studied regions will be of great importance as well. It should be noted that the term spatial heterogeneity mentions the deviation from the existing relations between observations at the geographical location level in the space. For this purpose, due to the existence of spatial heterogeneity and spatial autocorrelation, spatial econometrics

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should be used. For describing the spatial heterogeneity, a linear relationship is considered as follows:

$$y_i = X_i \beta_i + \varepsilon_i \qquad (1)$$

Where i stands for the observations gathered at i= 1,…,n points in space, Xi represents a matrix of explanatory variables by a related set of βi parameters, Yi is the dependent variable at observation (or location) i and εi indicates a stochastic disturbance (random error). Equation (1) represents a spatial simple model (Lesage, 1999). Causal relationships as compared to the single equation cross-sectional setting, which was the primary focus of the spatial econometrics literature for a long time. Panel data are generally more informative, and they contain more variation and often less collinearity among the variables. The use of panel data results from a greater availability of degrees of freedom, and hence increases efficiency in the estimation. Panel data also allow for the specification of more complicated behavioral hypotheses, including effects that cannot be addressed using pure cross-sectional data (Elhorst, 2014).

The four following ways are used to represent the spatial location: (1) Determining location on screen coordinates; (2) Vector of distances, and (3) Geographically Weighted Regression (GWR) method (4) GeoDist. In this study, we use GeoDist which, provides several geographical variables, in particular, bilateral distances measured using city-level data to account for the geographic distribution of the population of each nation. As spatial matrix has been used to represent the spatial contiguity. in this study, spatial contiguity needs to be reflected as a matrix in the model. Hence, geographically weighted regression method was used to weigh each variable. In this method, y represents the N×1 vector of dependent variable observations collected at n points in space, X is N×K matrix of explanatory variables, and ε N ×1 vector of normal errors, which has constant variance. Assume Wi represents the N×N diagonal matrix containing distance-based weights reflecting the distance between observations i and other observations, the GWR model can be as follow:

$$W_i y = W_i X \beta_i + \varepsilon_i \qquad (2)$$

Whereas, i in βi is the indicator of the K×1 vector of i observation related parameter. The GWR Model estimates n cases of such vectors, which each represents an observation (McMillen, 1996).

Mostly, autoregressive spatial models are categorized into five different models: (1) First order Spatial Autoregressive Model (FAR), (2) Spatial Autoregressive Model (SAR), (3) Spatial Error Model (SEM), (4) Spatial Durbin Model (SDM), (5) Spatial Autoregressive Model with Auto Regressive disturbances (SAC).

This technique reflects the relative position in the space of a single regional observation unit, compared to other units. The criteria of contiguity have been determined using the information obtained from a distance between capital countries. In this matrix N×N (N number of the country) if countries sit nearly proximate to each other we use number one, for other cases we use zero. After that, we should make the standard matrix. We sum each horizontal row that should be equal to one. However, this matrix because of giving similar weight to all countries, have flaws. We used the spatial weight matrix to solve this problem. In this matrix, each diagonal element equals $\frac{1}{d_{ij}}$ or $\frac{1}{d_{ij}^2}$. d_{ij} is the distance between the capital of two countries. With this matrix, we can use the proximate variable for study spatial effect on bilateral trade.

Also, we use Matrix of the common currency. The matrix of a common currency is formed based on having a common currency between countries so that for creating this matrix,

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each country that has common currency takes one and otherwise it takes zero. Furthermore, the modified matrix has also been used. For this matrix, using the standardized weight matrix of the geographical distance (SWD) and the multiplication in the matrix of weighting common currency (WC), the common currency matrix is modified based on the geographical distance. This modification was applied: $wcd_{ij} = wc_{ij}.\frac{d_{ij}}{\sum d_{ij}}$, where in wcd_{ij} Is an element of row i and the j column are the weight of the common weight matrix based on geographical distance, wc_{ij} from the rows i and the column j, weighted matrices was common currency and $\frac{d_{ij}}{\sum d_{ij}}$ An element of row i and column j weight matrix are row standardized geographical distance.

The reason why panel data has been used in the present study is that it gives a cross-sectional and chronological estimation of the model at the same time and subsequently better results could be obtained. In fact, the present study consists of complete and comprehensive data for a long period, so that the results would be more reliable and lead to decisions that are more accurate. The general form of the spatial panel model is as follows (Belotti et al., 2013):

$$y_{it} = \alpha + \tau y_{it-1} + \rho \sum_{j=1}^{n} w_{ij} y_{it} + \sum_{k=1}^{K} x_{itk} \beta_k + \sum_{k=1}^{K} \sum_{j=1}^{n} w_{ij} x_{jtk} \theta_k + \mu_i + \gamma_t + v_{it} \quad (3)$$

$$v_{it} = \lambda \sum_{j=1}^{n} m_{ij} v_{it} + \varepsilon_{it}$$

$$i = 1, \ldots, n$$

$$t = 1, \ldots, T \quad (4)$$

Where, θ, λ, ρ are the spatial parameters of the model. Given θ=0, the model is SAC; λ=0 it is SDM; λ=0 and θ=0, it is SAR; ρ=0 and θ=0, it is SEM. In fact, all of the models consider a weight matrix, but the considering weight matrix of each one is different.

This research utilizes the LR test for spatial panel data derived. In these tests, whether the non-spatial model can be rejected is determined by the significance of the statistics. If the results of the LR test are not statistically significant, the traditional panel model should be chosen; if it is significant, then the spatial econometric model should be utilized to capture the spatiality.

2.1 Methodology and Data Set

We estimated a spatial econometric model of international trade, which was conventional for the time. The spatial model of this research is based on theoretical literature of research and previous studies, derived from the model of Kelejian et al. (2012), which it is in the form of relation (6):

$$Limex_{ij} = \beta_0 + \beta_1 Lnreer_{it} + \beta_2 Lngdp_{it} + \beta_3 Lopenness_{it} + \beta_4 U_{ij}^{t} + \varepsilon_i \quad (6)$$

Where i and j denote countries, t denotes time, and Lnimex: the LN bilateral trade (Which is the sum of bilateral exports and imports between the countries and partners), Lngdp: the LN GDP (constant 2010 US$), Lnopenness: the (import +export)/GDP (constant 2010 US$), Lnrer is currency exchange rates, and U_{ij}^{t}: the spatial effects of shared money and geographical distance.

3 Theory/calculation

3.1 Theory of optimum currency region

In the 1990s, significant progress has been made in regional integration in the most economic literature (Yang and Martinez, 2014). An optimum currency area (OCA) is defined as the optimal geographical area for a single currency or for several currencies, whose exchange rate is irrevocably pegged and might be unified. The single currency or the pegged currencies can fluctuate jointly against other currencies of the world (Mongelli, 2008: 2). There are two possible positions in a currency region: currency areas can have an individual currency and there are currency areas with more than one currency. In a currency region with a single currency there has to be a single central bank (with note-issuing powers) and as a result a potentially elastic supply of interregional means of payments. In a currency region including more than one currency the cooperation of many central banks characterizes the supply of international means of payment; if a central bank raises its liabilities much faster than other central banks it loses reserves and damages convertibility. In a currency region with many different currencies, the policy of surplus countries to prevent inflation has the tendency to lead to a recession (Bogdan, 2009:25).

The theory of optimal monetary region simply expresses that if for a group of countries, the benefits of participating in the monetary union are higher than certain costs, they will belong to a desirable currency region. It is possible to recognize four main stages in the development of optimum currency region Theory. The first was the (pioneering stage) from the early 1960s to the early 1970s. The achievement of this stage was to put on the optimum currency area (OCA) criteria, debate with the borders of a currency region and initiate the analysis of the benefits and costs of monetary integration. To the OCA criteria were numbered (Fidrmuc, 2004). The first theory was developed during this period by Mundell (1961) and then by other economists, such as McKinnon (1963) and Kenen (1969). Many of the literature presented by Mundell (1961) was based on four relationships between the members of a potential OCA. Thus they were: 1) the extent of trade; 2) the similarity of the shocks and business cycles; 3) the degree of labor mobility, and 4) the system of fiscal transfers. The greater the international trade linkages using any of the four criteria, the more suitable a common currency (Saxena, 2005:5).

McKinnon (1963) emphasizes the need for price stability within the region and the trade openness of the economies that must be considered optimum for a single currency. McKinnon (1963) also added the importance of factor mobility across industries to Mundell's argument about factor mobility across the country in defining an optimum currency region (Harvey & Cushing, 2015:54). Kenen (1969) confirmed the high diversity of products. He states that a high diversification in consumption and production, in the "portfolio of jobs", and correspondingly in exports and imports, dilutes the possible impact of shocks specific to any particular sector. Consequently, diversification reduces the need for a change in the terms of trade with the nominal exchange rate and provides "insulation" against a variety of disturbances (Kenen, 1969).

In the next stage (reconciliation stage) during the 1970s, the second set of contributions jointly examined the properties of optimum currency region. The debate on the OCA properties and the benefits and costs received an impetus from the second wave of contributions such as Corden (1972), Mundell (1973), Ishiyama (1975), as well as Tower and Willet (1976). The competency of these authors was to interpret the diverse properties. This reconciliation strengthened the interpretation of some properties and led to diverse fresh insights such as the role of likeness to economic shocks (Misztal, 2007:543). Corden (1972), explains a currency region as a complete exchange-rate union, argues that joining a common currency region with a group of partner countries causes a loss of direct control over the monetary policy and exchange rate. He also points out that, if countries have different inflation rate preferences, the formation of a common currency region can be costly (Broze, 2005:59). Ishiyama (1975), distinguishes the limitations of defining OCAs based on a single property and postulates that each country should evaluate the costs and benefits of participating in a currency region from the point of view of its own self-interest and welfare (Mongelli, 2002:12). Willett (2000) explains that basis analyzing the theory of optimal monetary region is factors that effect on costs and benefits from fixed exchange rate versus floating (Han, 2009). Also in this stage, we discuss the benefits and costs of monetary union. The most important costs can be an abdication of an autonomous (national) monetary policy and it uses of the exchange-rate instrument and the most important benefits can be the elimination of transaction costs and exchange-rate risk (Marelli, & Signorelli, 2017:21.

The third stage was the (Reassessment stage) from the 1980s to the early 1990s. Several authors noted that this pause is also explained by the loss of momentum toward monetary integration. When interest in European monetary integration re-emerged in the middle 1980s, both economists and policymakers looked back at the OCA theory, but could not find out clear answers to the question whether Europe must proceed toward complete monetary integration? Therefore, that reassessment leads in fact to a reconsideration of the effective benefits and costs of monetary integration. (Mongelli, 2002:14).

The fourth stage called as (empirical stage) includes the last 15 -20 years. In this stage, the property of optimum currency region was revised and reinterpreted. In empirical studies by analyzing and comparing a variety of OCA properties and applying several econometric techniques; economists sought to answer why particular groups of countries may form an optimum currency region. Therefore, they aimed to operationalize the OCA theory (Misztal, 2007:543).

The literature review examining the impact on currency unions of trade represents an extensive and active field of research in international economics. The main purpose of a currency union is to promote economic activity by increasing exchanges of a common currency region (Costa-Font, 2010:4). In general; the channels through which monetary unification may potentially affect trade are numerous. Common currency eliminates bilateral nominal exchange rate volatility, consequently substantially reduces the uncertainty and risk involved in trade transactions. (Micco & Et al, 2003:5). In higher level of integrated trade, countries can find more expertise. Increasing the expertise can reduce the international connection to income to shocks that are large enough (Krugman, 1993). Improved trade can lead to a more efficient use of the available resources and ultimately, higher growth (Micco & Et al, 2003:7). Most of the new interests in that field were sparked by Rose (2000) who discovered a surprising cross-section result that trading partners belonging to a currency union experienced a three-fold increase in bilateral trade compared to other trading partners (Fotopoulos & Psallidas, 2009:664). Krugman (1993) has pointed out that as trade becomes more highly integrated, countries can specialize more. Increased specialization can decrease the international correlation between incomes, given sufficiently large supply shocks. Likewise, Persson (2001) argued that the effect of a common currency in commerce depends on the precise relationship between business and the factors affecting it across countries.

4.1 Result

We extracted data from the World Bank, International Monetary Fund's and UNCTAD. Selecting the sample based on the restriction of data. Our sample includes 24 countries i.e. Austria, Bulgaria, Canada, Switzerland, China, Germany, Finland, France, United Kingdom, Greece, Iran, Italy, Japan, Malaysia, Netherland, Norway, Pakistan, Poland, Portugal, Romania, Russian, Singapore, Sweden, the United States over 2006-2016. Total GDP of the world in the years 2006 to 2016 was 6122620306 billion dollars, and GDP of the sample was 5133264685 billion dollars, which represents about 84% of the world's GDP in this period.

Table 1: Summary Statistics

		Lnimex	*Lngdp*	*Lnopenness*	*Lnrer*
24 country	Min	0	24.5611	-1.406869	-10.69756
	Max	27.21584	30.45954	1.485243	10.69926
	Mean	21.09333	27.35677	-0.3208468	1.39e-06
	SD	4.83214	1.359717	0.5616192	3.231526

Note: Number of observations= 6336 (24 countries, 24 partner and 11 times). Each observation represents a country with their partner in a year.

According to the table (1), the mean of bilateral trade was 21.09, the mean of GDP was 27.36, the mean of trade openness index was -0.32 and the mean of the common currency was 1.39e-06.

Table 2: Spatial autocorrelation test with the geographic distance matrix

	SAR	*SEM*	***SDM***	*SAC*
LR Test	305.2346	12.5831	**1125.7187**	308.3342

Table (2) illustrates the spatial autocorrelation tests using the geographic distance matrix. The results of these tests, according to the LR test, show that the zero hypothesis (not spatial autocorrelation exist) is rejected for SDM model and spatial autocorrelation cannot be rejected, which indicates the neighborhood effects. Therefore, according to theoretical literature and previous studies the Kelejian et al (2012) extended that the effect of monetary union on bilateral trade in 24 countries using geographic distance matrix should be estimated. The results show in Table 3.

According to Table (3), the results show that the spatial autoregressive coefficient (ρ) is positive and statistically significant, so the geographical dimension has particular importance among the selected countries. In addition, if the trade volume weight average neighboring countries of a country from 24 selected countries one percent increase, on average, trade volume of that country will increase by 0.42%. The coefficient of spatial autoregressive is positive and statistically significant, it indicates that one part of the bilateral trade of each country is because of the effect of proximity or distance and positive auto cycle bilateral trade exist between selected countries. The relationship between GDP and bilateral trade is a positive relationship and with increasing one percent of GDP, bilateral trade between countries will increase by 0.9501 present. The coefficient of the GDP is positive, consequently if the larger the size of a larger economy, the more productive it produces, the more productive it will be at a lower cost. Therefore, there is the comparative advantage in international markets and export of that country will grow. On the other hand, the domestic market has attraction power of foreign goods thus, the volume of foreign trade that country will be increasing.

The relationship between openness and bilateral trade is positive and with increasing one percent in openness, bilateral trade between countries will increase by 0.665%, which will increase the level of product, income and financial and business relations. Hence, joining a larger common monetary area would be more beneficial, for a small open economy, because if whatever economy was smaller, the probability of that openness will be larger. A small open economy is incapable of producing all that is needed, so for this country having a relationship with foreign trade has more benefits and produce goods with comparative advantage. On the other hand, a large economy is self-sufficient and it usually an only smaller part of gross domestic product relatives of foreign trade, therefore it has less openness; this result is consistent with Broz's study (2005).

Table 3: Estimation of spatial panel models with the geographic distance matrix

Variable	*SAR*	*SEM*	*SDM*	*SAC*
Constant	-5.368106*** (-11.03)	-4.213721	**-4.2934*** (-10.02)**	-4.4496*** (-9.29)
LNGDP	0.9845497*** (54.37)	0.9752798*** (640.52)	**0.95013*** (59.22)**	0.9462*** (54.75)
LNopenness	1.144146*** (25.62)	1.038287*** (26.02)	**0.665186*** (12.01)**	1.0348*** (23.54)
LNrer	0.0669489*** (10.11)	0.0406588*** (5.84)	**-0.60692*** (-6.43)**	0.0286*** (3.80)
LNGDP* W			**-0.0296091*** (-28.38)**	
LNopenness*W			**0.1613*** (6.33)**	
LNrer*W			**0.01826*** (15.96)**	
ρ	0.0039858*** (17.47)		**0.42502*** (33.61)**	0.01446*** (17.56)
δ	1.624105*** (110.16)	1.665224*** (109.73)	**1.40624*** (107.38)**	1.4671*** (107.64)
λ		0.0028188*** (3.55)		0.0295*** (24.07)

*, **, and *** denote significance at 10%, 5%, and 1% level. The numbers in the () are the *z*–statistic.

The relationship between real exchange rate and bilateral trade is negative and with increasing one percent of the real exchange rate, bilateral trade between countries will decrease by 0.607%. The coefficient of the real exchange rate is negative, therefore it indicates that with decreasing to the real exchange rate (the devaluation of the national currency), the trade will improve, and the prices of the produced goods in the country will increase relative to the price of the competed goods in the global market, and exports will increase.

Table 4: Estimation of spatial panel models with the common currency matrix

	SAR	*SEM*	*SDM*	*SAC*
LR Test	109.7139	10.9990	**233.4098**	169.1876

Table (4) shows the spatial autocorrelation tests using the common currency matrix. According to the LR test, the zero hypothesis (not spatial autocorrelation exist) is rejected for SDM model and spatial autocorrelation cannot be rejected, so it shows the neighborhood effects of this group of countries. Table (5) displays the estimation model with the common currency matrix.

Table (5) represents the coefficients of GDP, trade openness index and spatial autoregression were positive and significant effects on bilateral trade, statistically. In this model, the real exchange rate was not statistically significant.

Table (6) represents the spatial autocorrelation tests using the modified matrix. According to the LR test, the zero hypothesis (not spatial autocorrelation exist) is rejected for the SDM model and spatial autocorrelation cannot be rejected. Table (7) indicates the estimation model with the modified matrix.

Table (7) demonstrates the coefficients of GDP, trade openness index and spatial autoregression were positive and statistically significant effects on bilateral trade. In this model, the real exchange rate was not statistically significant.

Table 5: Estimation of spatial panel models with the common currency matrix.

Variable	*SAR*	*SEM*	*SDM*	*SAC*
Constant	-5.040175***	-5.875012***	**-4.930463*** **	-5.164879***
	(-10.18)	(-12.17)	**(-10.53)**	(-10.67)
LNGDP	0.9912414***	1.030254***	**0.9883653*** **	0.9904688***
	(53.76)	(58.30)	**(56.59)**	(56.10)
LNopenness	1.05116***	1.118951***	**1.04286*** **	1.048247***
	(23.05)	(24.83)	**(21.13)**	(23.78)
LNrer	0.063446***	0.0544602***	**-0.0081284**	0.0584129***
	(9.34)	(7.87)	**(-0.90)**	(8.40)
LNGDP* W			**-0.0279428*** **	
			(-13.77)	
LNopenness*W			**-0.1028651** **	
			(-2.07)	
LNrer*W			**0.0235078*** **	
			(10.47)	
ρ	0.0034736***		**0.0381207*** **	0.0112642***
	(10.47)		**(15.28)**	(11.72)
δ	1.650311***	1.675751***	**1.551146*** **	1.577338***
	(110.12)	(109.43)	**(104.36)**	(104.45)
λ		-0.0034715***		0.0236247***
		(-3.32)		(12.07)

*, **, and *** denote significance at 10%, 5%, and 1% level. The numbers in the () are the *z*–statistic. S

Table 6: Estimation of spatial panel models with the modified matrix

	SAR	*SEM*	*SDM*	*SAC*
LR Test	106.0361	62.8188	**112.2405**	98.2899

Table 7: Estimation of spatial panel models with the modified matrix

Variable	*SAR*	*SEM*	*SDM*	*SAC*
Constant	-4.7431***	5.3707***	**-4.940014*** **	-4.696303***
	(-9.54)	(-12.20)	**(-9.66)**	(-9.41)
LNGDP	0.9801***	1.0085***	**0.9853229*** **	0.9793027***
	(52.78)	(62.08)	**(51.77)**	(52.38)
LNopenness	1.0726***	1.1136***	**0.7988925*** **	1.073614***
	(23.64)	(25.24)	**(10.80)**	(23.60)
LNrer	0.0620***	0.0618***	**-0.0130098**	0.0627058***
	(9.17)	(9.21)	**(-1.29)**	(9.30)
LNGDP* W			**0.0051684**	
			(1.64)	
LNopenness*W			**0.2447343*** **	
			(3.78)	
LNrer*W			**0.0366531*** **	
			(10.08)	
ρ	0.0050***		**0.0018545**	0.0037748***
	(10.30)		**(0.48)**	(4.37)
δ	1.6481***	1.6862***	**1.638491*** **	1.659207***
	(110.02)	(10.30)	**(100.64)**	(100.58)
λ		0.0158***		-0.0054022*
		(-7.93)		(-1.69)

*, **, and *** denote significance at 10%, 5%, and 1% level. The numbers in the () are the *z*–statistic.

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5. Discussion

In this study, first of all, the spatial effects of geographic distance, the common currency, and a modified matrix were performed, which confirmed the spatial effects of all three matrices. Thus, the spatial effects of common currency, the formation of monetary unions, geographic distance and modified matrix on bilateral trade were positive and significant, it confirmed by Rose (2000), Rose and Van Wincoop (2001) and Porjan (2001). This issue indicates that importance of the formation of monetary unions on trade between countries. After that, the results represent that GDP and trade openness had a positive and significant effect on bilateral trading flow, it confirmed by Broz (2005), McKinnon (1963) and Fegheh Majidi (2014). Finally, the real exchange rate with geographic distance matrix had the negative effect of bilateral trade, it confirmed by Fegheh Majidi (2014).

6. Conclusions

We employ a spatial panel data approach to estimate the effect of common currency on bilateral trade with a sample of 24 countries over the period 2006–2016. We find that spatial effects were confirmed in all countries. Also, GDP, trade openness index and spatial autoregression are the positive effects on bilateral trade in all three geographic distance, the common currency, and modified matrix. In addition, real exchange rate just with considering geographic distance is negative and statistically significant on bilateral trade but in other matrix was not statistically significant. It is suggested that a country increases its commercial and political relationship with countries that have similar, common currency and geographical distances, which is the factor that increases the formation of monetary unions and, as a result, increases trade of countries.

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