

An Investigation of the Effect of a Common Currency on Bilateral Trade

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Developing economic relations with the countries of the world is necessary for any country, and the nations of the world are always looking to build their business. The expansion of the phenomenon of economic globalization has led states to engage in countries' engagement in pursuing their interests in the form of regional cooperation and the formation of monetary unions. Therefore, according to the importance of this issue, the effect of the monetary union on bilateral trade is studied using a gravity pattern based on the panel data approach. Also, the factors affecting bilateral trade between selected countries of the world during the period of 1993-2015 are studied. The results of the research show that the effect of a common currency on bilateral trade is positive, which increases trade between countries. Also, the study of variables shows that GDP variables of states and business partners, common currency, race, and standard language have a positive and significant effect on bilateral trade between nations. Real exchange rate variables and trade openness do not affect, and the distance and GDP per capita variables have a negative and significant impact on the flow of trade between the drains. Hence, it is concluded that countries that are adjacent to each other or have common currency would strengthen the trade between themselves, by creating monetary unions.

Keywords: Monetary Union, Bilateral Trade, the Theory of Optimal Currency Area, the Gravity Model

JEL Classification: E49, F15, F47

1 Introduction

Since the 1990s, the world has experienced a development in the mutual dependency of the countries' economies through an increase in the size and variety of goods, service exchange and capital flows beyond borderlines and also through a closer communication between knowledge and technology. Furthermore, different countries of the world, developing countries, in particular, have sought to increase their contribution to international trade by

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increasing the sizes of their foreign trade and protecting their domestic economies against the process of economic globalization besides the identification of competitive advantages. Thus, many countries' tendency to establish unions, zones, and financial integrity has made some countries react passively, so that they can examine the issue of trade liberalization and extension by participating in these commercial arrangements, and can prepare their domestic economies for confrontation with the process of globalization as well as enjoy the positive, proper economic effects. Hence, an essential factor to be considered in the age of globalization is the formation of a common market among countries. The common market has been formed as a result of interests, and the common interests can be of the economic, political, and cultural types. The establishment of currency unions and adoption of anchor money expands the worldwide financial and commercial relationship, and a promised benefit of a currency union is an increase in trade between the members besides the convergence of their economies. Therefore, countries that are firmly united given their trades and other economic relations can establish an optimal currency area. An optimal currency area is a domain that is optimal for a country's currency and monetary policies (Frankel, 2003). The theory of optimal currency areas took shape completely during the debates on the benefits and costs of particular systems of currency exchange rate after World War II. At that time, many countries had fixed their currencies to the United States dollar. Ever since established by Mundell (1961), this theory has provided a theoretical framework that investigates conditions and platforms that are there in an optimal currency area. It also examines the costs and benefits of fixed and floating exchange rates for different countries (Harvey & Cushing, 2015). As defined, of course, an optimal currency area is a domain where a fixed exchange rate holds. The principal inquiry of the theory concerns the criteria and factors on which basis countries can adopt an appropriate fixed or floating foreign currency system or something in between individually and in groups. Currency unions provide conditions where a group of countries shares a currency while maintaining their monetary independence, and smaller countries usually match themselves to a more robust currency. The fullest, most advanced case, however, is one in which the members abandon their national currencies, and let a single currency circulate in practice as a common currency (Micco et al., 2003).

Furthermore, monetary convergence and establishment of a currency area among countries can facilitate economic and commercial communication among the states in one region and that between them and other countries as a solution. Moreover, these countries can make use of the advantages of the use

of a single currency, involving greater price transparency, an increase in the predictability of manufacturing prices, greater trust in long-term agreements as a result of a decrease in exchange rate variation, and an increase in intra-group and intra-industry trade among the members. Trade is regarded in many developing countries as a factor providing economic convergence, which can help achieve more proper economic conditions.

In general, a key factor thought to support commerce is a standard monetary sector. Different studies demonstrate that trade between countries using a common currency is three times that between countries using different currencies (Glick & Rose, 2002). Formation of a common currency can bring about considerable economic benefits, which can considerably help enforce trade and investment by reducing transaction costs resulting from goods and service trade and eliminating exchange rate risks.

Given the significance of the issue, the most critical factors affecting trade, such as language, race, gross domestic product, exchange rate, and distance between countries, in the world's countries of choice are presented in this paper using the Theory of Optimal Currency Area (OCA) and the Gravity Model. First, the theoretical and experimental literature on the OCA theory and the gravity model is presented, and then, the appropriate econometric model is referred to explicitly, and the desired pattern is estimated.

2 Theoretical Foundations

Today's world is experiencing an extension of commercial relations, an increase in the size of the trade, and an extension of financial markets, etc. The characteristics of the modern world from the economic aspect include globalization and commercial integrity. As a means of globalization, international trade has provided the requirements for international competition, and countries participating in activities where they lack the power to compete can no more survive (Afruz, 2011). Financial integrity concerns the theory of a broader economic unit from a set of smaller national economies. For this purpose, the commercial obstacles and constraints against trade among the integrity plan members are eliminated, extending cooperation and collaboration in commercial, monetary, financial, and economic activities among the members (Gurler, 2000). Foreign trade is a component effective on the development and progress that can be made in different economic, social, etc. aspects (Amini, 2005).

Economic integrity includes different stages, where each step is more evolved than the previous ones, during which more obstacles are eliminated than in the last stage for increasing trade and economic cooperation between

two or more countries (Gurler, 2000). These stages can be summarized as follows.

Preferential Trade Agreement (PTA). In these conditions, the members are confronted with fewer commercial constraints than non-members in their foreign trade. Preferential trade arrangements make up one of the most straightforward patterns of economic integration.

Free trade zone. In these conditions, the members eliminate all the commercial constraints among them, but each country applies its particular commercial restrictions for trading with non-members. Here, the members have eliminated the customs tariffs among them, but each country specifies and receives its own specific customs tariffs concerning importers that are non-members.

Customs union. While enjoying the characteristics of a free trade zone, i.e., having eliminated all commercial constraints among them, the members of a customs union harmonize their commercial policies. For example, they use the same chart of tariffs for non-members.

These three stages of regionalism influence international trade among the members directly and exclusively, and form what has been referred to in the terminology as surface integration together. As stated earlier, a customs union is similar to a free trade zone, different only in that similar customs tariffs are established and applied for non-members.

Common market. Besides enjoying all the characteristics of a customs union, the members of a common market make it possible for manufacturing agents to travel freely among the members.

The common market can be regarded as the first stage of deep economic integration. At this stage, collaboration is established among specific institutional arrangements and trade and tax rules. In addition to the free exchange of goods and service in a common market, manufacturing agents move freely among the members (Rahimi Borujerdi, 2006).

Perfect economic union. This stage involves the most evolved type of integrity. The members of a complete economic union establish a free trade of goods and service among themselves, and standard foreign tariffs are set for non-members; thus, free movement of manufacturing agents becomes possible. At this stage, the members also turn to the procedure of harmonization or the process of unification. In the process of alignment and compatibility, the members seek to adopt policies in harmony, while unification, the members turn into a single economic system, and leave decision-making to a transnational institution to represent all the members (Ali Razini et al., 2011).

At the fifth stage, the economic union makes it possible for a single currency to be established among the countries besides homogenizing the monetary, financial, and commercial policy among the members (Rahimi Borujerdi, 2006). The currency of a country turns into a preferred, global currency when it is used in domestic markets, and there is also demand for purchasing and saving it beyond the borders of the issuing country (Chinn & Frankel, 2007). Given the importance of unions and the adoption of a common currency in the procedure of economic convergence, it is a major purpose of economic policy planning to adopt a currency area or a regional commercial group.

The theory of optimal currency area states that a group of countries belonging to a favorable currency area if the benefits gained from participation in the area are more significant than the specified costs (Marelli & Signorelli, 2017). A currency union consists of costs and benefits, where the former is at a macro-level, and the latter is at a micro-level. In the report presented to the European Central Bank (ECB) in 2002, Mongelli provided a comprehensive division of the evolution process of the theory of optimal currency area. He considered four significant stages for the development of the theory, each with its specific characteristics). The first period, referred to as the *pioneering phase*, lasted from the early 1960s to the early 1970s. The theory was extended during the period first by Mundell (1961) and then by other authors, including McKinnon (1963) and Kenen (1969). Mundell emphasizes four factors as required for an optimal currency area: the amount of trade, similarity between shocks and the business cycle, degree of mobility of the workforce, and money transfer system. The higher the international communication using the four criteria, the more proper a common currency (Saxena, 2005).

McKinnon emphasizes that the need for price consistency in the area and an open economy should be considered for an optimal common currency. He argues that the opener the economy, the more reasons for having a fixed exchange rate, and the more closed the economy, the more useful a flexible exchange rate. McKinnon (1963) also added the importance of mobile factors in industries to Mundell's discussion on the mobility of factors all around the country in the specification of an optimal currency area (McKinnon, 1963). Kenen (1969) emphasized the wide variety of productions and stated that this reduces the need for readjustment of official exchange rates (Zarra Nejad & Fegheh Majidi, 2013). Kenen also argued that diversity in the combination of products of a region could probably be regarded as a more appropriate criterion for workforce mobility, and stated that if different shocks harm the

common currency area, the financial integrity among the regions can reduce the effect through financial transfers (Kenen, 1969).

Furthermore, the other criteria considered in the first phase for the optimal currency area include inflation rate similarity, financial integration, economic integrity, and political integrity. The biggest problem with this phase was that it failed to provide an alliance in the form of a coherent, integrated framework among different criteria in the optimal currency area, and also that many of the criteria lacked an explicit practical usage (Biyabani et al., 2012).

The second phase, referred to as the Reconciliation Phase, went on during the 1970s. Great efforts were made during this phase to integrate the criteria of the optimal currency area. Discussions were also made during this phase on the qualities, benefits, and costs of the optimal currency area. Economists such as Corden (1972), Mundell (1973) and Tower & Willet (1976) were among the significant theoreticians in this phase. Corden (1972) introduces the currency area as a perfect exchange rate union. More precisely, a currency area, in his opinion, is one where the exchange rates are kept continuously fixed for each other.

Furthermore, Corden considers the flexibility of wages and prices as the most crucial criterion for establishment of a currency area, since non-synchronic shocks can be responded to more rapidly in that case. He also points out that it can be costly to establish a common currency area if the countries have different inflation preferences (Atefi Manesh, 2017). Mundell (1973), on the other hand, argues that establishment of a common currency area will reduce the demand for international reserves, and the benefits gained through coining money will be provided to the countries in that area (Broz, 2005). Willet (2001) states that the theory of optimal currency area is analyzed based on factors that affect the costs and benefits of fixed versus floating exchange rates (Han, 2009). Furthermore, the costs and benefits of the currency union were considered in this phase. The most critical costs include the cancellation of independent monetary policy and use of exchange rate as a tool, and the most important benefits include the elimination of trade costs and the exchange rate risk (Marli & Signorelli, 2017).

The third stage led to the new theory of optimal currency area. In this phase, the attitudes concerning the actual costs and benefits resulting from monetary integration were reviewed. It helped develop the new theory of optimal currency area, resulting in a discussion on the size of the currency area and the opportunity to create Tavlas' (1993) currency area (Mongelli, 2002). The items discussed in this phase included the long-term inefficiency of the monetary policy, retention of the inflation conditions, and cost and flexibility

of wages (Calvo & Reinhart, 2000, Barro & Gordon, 1983, and Atkeson & Bayoumi, 1993).

On the whole, the judgments made in this phase turned out to be in favor of the establishment and survival of currency unions. It currently seems that it is less costly to join a currency union although domestic macroeconomic policies have lost their independence, which is the cost.

The fourth phase is that of empirical studies, which has been in progress for 20 years now. In this phase, characteristics of an optimal currency area that had been reconsidered were reinterpreted. In the empirical studies phase, various qualities of optimal currency area were analyzed and compared, and using econometric methods; several economists sought an answer to the question of why particular groups of countries could establish optimal currency areas. Their purpose, therefore, was to make the theory of optimal currency area operational (Misztal, 2007). As economic research made progress, the theory of optimal currency area needed to be revised. De Grauwe (1992) referred to this new theoretical progress as the modern theory of optimal currency area. The difference between the original and conventional views is that conventionalists tend to focus on potential costs, whereas the new vision addresses the benefits of an optimal currency area.

An investigation of the literature on the effect of a currency union on commerce indicates an extensive, active field of research in the international economy. The primary purpose of a currency union is to promote economic activity by increasing exchange in a single currency area (Costa-Font, 2010). There are several channels through which a currency union can potentially influence commerce. The common currency eliminates bilateral nominal exchange rate variation, as a result of which uncertainty and risk in commercial trade significantly decrease (Frankel & Rose, 1997). In severely-integrated commerce, countries can obtain exceptional expertise. The increase in knowledge may reduce international communication from income given supply shocks, which are sufficiently big (Krugman, 1993). An increase in trade in unions can lead to more efficient use of available resources and, finally, development (Micco et al., 2003). Moreover, the results of Frankel and Rose's (1998) research demonstrate that a decrease in exchange rate variation and progress toward currency unions increases trade (Costa-Font, 2010). Finally, Persson (2001) argues that the effect of a common currency in commerce depends on the precise relationship between economics and the factors affecting it in different countries.

3 Background

Kunroo et al. (2016) investigated the commercial criteria for the use of Euro for the economy of the European Union and the Eurozone using the generalized gravity model and the panel data set from 29 countries in the Economic and Monetary Union of the European Union during the period from 1994 to 2011. The results demonstrate that the ratification of the Euro has a considerable positive statistical effect on bilateral trade. Moreover, the reported results indicate that the confirmation of Euro has increased electronic commerce by about 14 percent and business in the Eurozone by about 20 percent.

Messer (2014) investigated the effect of the Economic and Monetary Union on financial development in commerce. He utilized the bilateral trade observations from 1960 to 1997 and the gravity model. Evidence from the research demonstrates that there is a negative relationship between financial development and the effect of the Economic and Monetary Union. In other words, countries with low levels of financial development have gained more benefit from trade than highly-developed countries since the Economic and Monetary Union was established.

Vahalík (2014) has made a regional analysis of bilateral trade in the European Union, China, and ASEAN using indices of regional trade intensity and trade complementarity during the 1995-2012 period. The study of bilateral trade flows demonstrates that changes in the geographic locations of countries cause the European Union to affect trade in Southeast Asia. It also indicates that China's commercial dominance in Southeast Asia is developing, while its commercial concentration on the ASEAN countries is becoming weaker. It is also suggested in terms of trade complementarity that the European Union is a better commercial partner for China than the ASEAN countries.

Miron et al. (2013) investigated the effect of exchange rate vibration and the Economic and Monetary Union on international trade using the gravity model for 182 of the world's countries during the period from 1980 to 2010. The results of their research enhanced Rose's (2000) empirical findings for the period before 1999, but they found that the effect suggested by Rose had gradually reduced during the 2000-2010 period when Euro was added to the artificial zone of the Economic and Monetary Union. The results also demonstrated that the effect of the Economic and Monetary Union on trade is much more significant than that of exchange rate vibration.

Barr et al. (2003) investigated the effect of the Economic and Monetary Union on trade with Rose's (2000) standard gravity model, consisting of 17 European countries and data from 1987:1 to 2000:1. They sought an answer

to the question of whether the establishment of the Economic and Monetary Union had increased trade, or the members' big business had caused the establishment of the European Union. Their estimation of the effect of the Economic and Monetary Union was considerably lower than Rose's (0.29 rather than 0.300). The exchange rate variation estimated by Barr et al., however, was higher than that obtained by Rose (2000).

Rasekhi & Hoseyni (2017) have investigated the regional economic convergence in the Caspian Sea region for the littoral countries during the 2003-2013 period using the gravity model. The results of the research demonstrate that per capita income range decreases for some of the states following economic convergence, and increases for the others. Moreover, the results of the observation indicate that the increase in the portion of these countries' total trade dedicated to trans-regional trade has decreased the intensity of intra-regional trade in the period under investigation.

Pur Rostami (2015) investigated the factors effective on economic convergence in East Asian countries during the period from 1980 to 2012 using the gravity model. The results of the study suggest the presence of and an increase in economic convergence among the 15 countries under investigation. The confluence among the six countries Japan, Singapore, Hong Kong, Brunei, South Korea, and China is more significant than that among all the states. Moreover, the occurrence of crises, such as the 1997-98 crisis, the 2008 crisis, and the tsunami in Japan, has not affected the convergence among the East Asian countries.

Sa'adat & Mohseni (2014) investigated the economic convergence between Iran and the other littoral countries of the Caspian Sea, including Azerbaijan, Kazakhstan, Russia, and Turkmenistan. Therefore, they used a gravity model and Matyas' (1997) specification thereof for the 1998-2008 period. The results demonstrate that the economic cooperation between Iran and the other littoral countries of the Caspian Sea leads to a considerable increase in bilateral trade flows. Furthermore, the lowest resistance against imports in this group belongs to Iran, ranked second in terms of exporting capability. If Iran establishes the free trade plan along with the countries in the region, therefore, the most significant effect of development of trade may occur in Iran's market. Furthermore, it was found that the long-term elasticity of exports is higher than that of imports.

Zarra Nejad & Fegheh Majidi (2013) investigated the effect of the establishment of a currency union on trade among the members of the Organization of the Islamic Conference (OIC). In this research, performed on 49 Islamic countries in the 1990-2011 period, they used the OCA theory and

the generalized gravity model. The results of the study demonstrate that common borders, common languages, and presence of trade unions have had significant positive effects, and exchange rate vibration, being surrounded by water, and the distances between the source and target countries have had significant adverse effects on trade flows among Islamic countries. Moreover, the establishment of currency unions has a significant positive impact on trade flows in the OIC countries.

Lotfali Pur et al. (2011) investigated the success or failure of the formation of blocs and its effect on the amount of increase in bilateral trade between Iran and Latin American countries. They used the generalized gravity model for this purpose and the multivariate regression method of econometrics with panel data for sixteen countries in the 2001-2009 period for estimation of the model. The results demonstrate that the presence of economic cooperation between Iran and Latin America leads to a considerable increase in bilateral trade flows. In other words, an economic bloc can increase trade among the members by 89 percent.

4 Methodology

4.1 Gravity Model

The gravity model is a very appropriate model that is of great importance in the explanation of bilateral trade flows and provides a proper statement of commercial potentials. The gravity model was first used by Tinbergen in 1962 for the explanation of bilateral trade flows. Since presented by Tinbergen, the model has gone through a very purposeful theoretical evolution during the past half a century of an investigation by economists in the field of international commerce. Due to the dynamic nature of this theory, new issues of modeling, specification, and even formulation have yet been suggested regarding it. Although all these issues initially and mainly specify the gross domestic product and the geographic distance between the two countries, considerable delicacies and innovative aspects are observed as well throughout the historical background.

This model is a moderated version of Newton's law of universal gravitation. According to this law, the gravity between two objects is a function of their masses and the distance between them. The gravity that is investigated in economics examines the role of the economic conditions of the two regions and the geographic distance between them. Based on this model, the greater the economies of the two regions and the shorter the geographic distance between them, the higher the amounts of trade flow, workforce

(immigration), and information exchange between the two regions. Gradually, other factors such as GDP per capita, regional agreements, and cultural and religious occasions have been added to the gravity model. These models are appropriate tools and are used extensively in international commerce for an explanation of bilateral trade flows. Within the framework of this model, the available obstacles and incentives can be entered into the model as quantitative variables or qualitative variables quantified in particular, acceptable markets, and their effects on bilateral trade can be investigated (Fegheh Majidi, 2012). In the simplest case, where there is no particular obstacle or incentive, bilateral trade flows can be considered using a gravity model as a direct function of the two countries' economic sizes and a reverse function of the geographic distance between them, as in Equation 1:

$$X_{i,j} = a \frac{M_1^{\beta_1} \times M_2^{\beta_2}}{D_{ij}^{\beta_3}} \quad (1)$$

Where $X_{i,j}$ represents the size of trade flow between the two regions, a is the coefficient of proportionality, M_1 indicates the GDP of the first region, M_2 shows the GDP of the second region, and D_{ij} is the geographic distance between the two regions. In this model, GDP, or gross domestic product, represents the economic sizes of the two countries. As Gross Domestic Product increases, the country becomes more capable of attracting and manufacturing products. That is, there will be more excellent supply and demand for bilateral trade between the two countries. In other words, the gross domestic product has a positive effect on bilateral trade flows. Furthermore, D_{ij} indicates the result of geographic distance on trade flows. The result is negative, suggesting that the longer the geographic distance between the two countries, the smaller the size of the commercial relations between them. It is because of goods transportation cost and time increase. Observations of the patterns of trade in countries, however, have not always demonstrated this. The United States and China, for instance, are each other's most exceptional commercial partners. If linear forms in logarithms are used, the power of the variables will indicate the elasticity of the dependent variable to the changes in the independent variable (Feenstra, 2015). Through various observations in some countries, economists have realized that the size of trade between two countries with similar Gross Domestic Product is larger than that between two different countries in terms of GDP, which is in line with the literature on economic convergence. The same criterion is, in fact, one of the most important reasons for a country to join or not to join a trade agreement, a

regional agreement, or a customs union. That is, a very large and a tiny country would not tend to trade widely. In other words, there are greater amounts of bilateral trade among developed countries, enjoying high GDP; i.e., there is more significant bilateral trade among developed countries than among corresponding industrial or developing countries (Helpman, 1984).

4.2 Data

In this research, the World Bank data, the database of the International Monetary Fund, and CEPII were utilized. The countries under investigation include 24 of the world's selected countries, and the studied period is that from 1993 to 2015. The investigated countries include Austria, Canada, Bulgaria, Switzerland, China, Germany, Finland, France, England, Greece, Iran, Italy, Japan, Malaysia, the Netherlands, Norway, Pakistan, Poland, Portugal, Romania, Russia, Singapore, Sweden, and the United States of America.

The selected sample includes the world's best countries in terms of gross domestic product in the investigated period. For sample selection, the world's gross domestic product in the period from 1993 to 2015 was first obtained, which amounted to \$ 10335929 billion. Then, the gross domestic product of the above set in the above period was obtained, which amounted to \$ 8673605 billion. Therefore, the above set of countries involves about 84 percent of the entire world's gross domestic product in the above period.

4.3 Results

As stated earlier, an appropriate model for investigation of the factors effective on international trade is the gravity model, which has been used extensively in international relations, including commercial relations and immigration. The advantages of the gravity model include the controllability of the data and the appropriate number of variables. Based on this model, two groups of gravity and repulsion factors explain the trade flows from the source countries toward the target countries. The purpose of this research is to investigate the effect of the currency union on bilateral trade. Therefore, imaginary variables are used. According to the theory of economics, the trade between two countries depends on its cost and the cost of trade with other commercial partners; as a result of the establishment of currency unions, therefore, trade among the members increases as compared to that with other countries (as with the Euro members, for instance). Consequently, the currency union is expected to have a significant positive effect on bilateral trade among nations. In fact, economic, social, cultural, and political variables explain trade flows from the source country to the target country, where gross national product,

gross domestic product per capita, real exchange rate, degree of commercial openness, trade size, and common currency are among the economic factors, and the political factors determining bilateral trade flows among countries in this research include geographic distance, common language, and common ethnicity.

It should, of course, be mentioned that if the model is estimated as a time or cross-sectional series, it will be biased since it has disregarded the heterogeneity among countries. Bilateral trade among countries may be affected by factors such as cultural, political, ethnic, and historical factors, which are not directly observable and do not enter the model. For this reason, the panel data method has been used in recent years in the gravity model, which enters the individual effects into the model (Lotfali Pur et al., 2011).

In this research, it is regarded as a major purpose to investigate the factors effective on bilateral trade among the selected countries. Therefore, the appropriate model for explanation of bilateral trade via the gravity model can be considered as a linear-logarithmic equation, as specified in Equation 2.

$$\text{Ln}mex_{ij} = \beta_0 + \beta_1 \text{Ln}rreer_{it} + \beta_3 \text{Ln}gdp_{it} + \beta_4 \text{Ln}gdp_{jt} + \beta_5 \text{Ln}gdp_{jt} + \beta_6 \text{openness}_{it} + \beta_7 \text{Ln}dis_{ij} + \beta_8 cc_{ij} + \beta_9 \text{comcol}_{ij} + \beta_{10} \text{comlang}_{ij} \quad (2)$$

The variables in Equation 2 are as follows:

$\text{Ln}mex_{ij}$, the logarithm of trade size between a country and its commercial partners (sum of the bilateral exports and imports between countries and their partners)

$\text{Ln}rreer_{it}$, the logarithm of the real exchange rate of country i at time t (Nominal exchange rate was first obtained, and it was then multiplied by foreign consumer price index and divided by domestic consumer price index.)

$\text{Ln}gdp_{it}$, the logarithm of country i 's gross domestic product at time t

$\text{Ln}gdp_{jt}$, the logarithm of country j 's gross domestic product at time t

$\text{Ln}gdp_{jt}$, the logarithm of country j 's gross domestic product per capita at time t

openness_{it} , commercial openness index of country i at time t (sum of exports and imports divided by gross domestic product at the fixed 2010 price of the United States Dollar)

dis_{ij} , the distance between the two countries

What is meant by distance is surveying distance, which is calculated with the great-circle formula, obtained using longitudes and latitudes from the most important counties (those with the highest population densities). Given that observations that are closer to each other should reflect greater effects than

those farther away from each other, this variable has been considered in terms of the reverse of the distance between each observation and the others.

cc_{ij} , the common currency variable, which is assumed to be one if there is a currency in common between the countries, and is assumed to be zero otherwise

$comcol_{ij}$, the variable of race in common between the two countries, which is assumed to be one if there is a race in common between the nations, and is assumed to be zero otherwise

What is meant by common race is the national race of a country, i.e. a race featured by at least 20 percent of the country's population (and those of the world's other countries).

$comlang_{ij}$, the variable of language in common between the two countries, which is assumed to be one if there is a language in common between the states, and is considered to be zero otherwise.

What is meant by a common language is the official, national language of a country, i.e. a language spoken by at least 20 percent of the country's population (and those of the world's other countries).

The regressions investigated in this research include two dimensions: time and location. The time dimension has been 24 years (the 1993-2015 period), and the location dimension has been 552 given the trade flow. Therefore, the number of observations for each variable has been 13248.

In the regression under investigation, the time dimension is minimal as compared to location. Therefore, it is not of much importance to investigate the reliability of the variables that are used and the issue of co-integration. The test of statics of the variables under investigation, however, was conducted. For this purpose, the Fisher-PP test has been used. The results of the tests are as in Table 1.

Table 1
Results of the Test of the Reliability of the Variables Given the Gravity Model

Variable	PP	Lag Number
limex _{ij}	9471.99 (0.0000)	I(0)
lreer _i	9100.22 (0.0000)	I(0)
lgdp _i	9099.36 (0.0000)	I(0)
lgdp _j	7226.43 (0.0000)	I(0)
lgdpp _j	8638.03 (0.0000)	I(0)
openness _i	9101.85 (0.0000)	I(0)
dis _{ij}	11313.3 (0.0000)	I(0)
cc _{ij}	7836.38 (0.0000)	I(0)
comcol _{ij}	5320.87 (0.0000)	I(0)
comlang _{ij}	1043.18 (0.0000)	I(0)

Reference: Findings of the research

As observed in Table 1, an investigation of the values of the calculated statistics and the probability of their acceptance for the variables using the Fisher-PP test demonstrates that the null hypothesis, stating that the variables are unreliable at the 95-percent level of confidence, is rejected for all the variables, and the results suggest that the examined variables are reliable.

After the unit root tests are conducted, diagnostic tests need to be undertaken for the specification of the type of the estimated model. The purpose is to select the best method for estimation of bilateral trade flows, also involving the individual effects concerning each of the trade party countries. The results obtained from conducting these tests for 24 of the selected countries around the world are presented in Table 2. For selection between the panel data and mixed data methods, the F-Limer method has been used. Based on the F statistic, the null hypothesis, suggesting the choice of the mixed data method, is rejected; therefore, the panel data method can be used for estimation of the model. There are two alternatives for a model with panel data: a model with random effects and a model with fixed effects. In the next step, the Hausman test is used for selection between the fixed- and random-

effect models. In the Hausman test, hypothesis H_0 , suggesting the compatibility of the random-effect estimates is examined against hypothesis H_1 , implying the compatibility of the fixed-effect estimates. If the null hypothesis H_0 is rejected, the fixed-effects method should be used for estimation. Otherwise, estimation is carried out using the random-effects method.

According to the results in Table 2, the null hypothesis H_0 , suggesting equal y -intercepts, is rejected for all the above countries, and different y -intercepts should be considered in the estimation. Consequently, the panel method can be used for estimation.

Table 2
Results of the Individual Fixed-Effects Test

Effects Test	Test Statistic	Degree of Freedom	prob.
Cross-F Section	2.2249	(575.1266)	0.0000
Cross-Section Chi square	1275.0867	575	0.0000

Reference: Findings of the research

Now, as stated earlier, the Hausman test should be examined for the specification of the type of estimation method in terms of fixed or random effects.

Table 3
Results of the Hausman Test

Effects Test	Test Statistic	Degree of Freedom	prob.
Cross-Section random	992.6948	9	0.0000

Reference: Findings of the research

According to the results of the Hausman test, as in Table 3, hypothesis H_0 , suggesting the compatibility of the random-effect estimates in the sample under investigation, is rejected, and the fixed-effects method should be applied.

The results obtained from the estimation of the specified model with the fixed-effects method are shown in Table 4.

Table 4
Results of Estimation of the Gravity Model

Variable	Coefficient	Standard Deviation	t Statistic	prob.
C	-165.9067	57.83501	-2.8684	0.0041
lreer _{ij}	0.2505	1.1856	0.2113	0.8327
lgdp _i	6.6975	2.1444	3.1231	0.0018
lgdp _j	0.2554	0.0283	9.0166	0.0000
lgdpp _j	-0.2860	0.03465	-8.2542	0.0000
openness _i	0.3769	0.1954	0.3153	0.7525
dis _{ij}	-0.8599	0.0894	-9.6112	0.0000
cc _{ij}	5.8001	0.1116	51.9623	0.0000
comcol _{ij}	3.0164	0.1516	19.8905	0.0000
comlang _{ij}	0.8673	0.3818	2.2712	0.0231
R ²			0.29	
\bar{R}^2			0.26	
Durbin-Watson			2.037	
F Statistic			8.9960	

Reference: Findings of the research

The results of the estimation demonstrate that the effect of the establishment of currency unions among the selected countries on bilateral trade among them has not been confirmed based on the gravity model.

The estimated coefficient for the variable real exchange rate is 0.25 percent, which is not statistically significant at any level of confidence, meaning that bilateral trade among the selected countries is not affected in the long run by the real exchange rate in the gravity model.

The variable gross national product of each country and its commercial partners has a significant positive effect with the values 6.69 and 0.25 percent, respectively, which means that gross national product has had a determining role in the specification of the countries' sizes of bilateral trade. This result is in line with the central hypothesis of the gravity model, stating that trade sizes increase as economic scale does. The positive effect of economic benefits on bilateral trade has been confirmed in Egger (2002) and Grossman and Helpman (2005).

The effect of the variable coefficient of gross domestic product per capita of the commercial partners is negative, calculated as 0.28 percent, which means that each one-percent increase in the commercial partners' gross domestic product leads to a decrease by 0.28 percent in bilateral trade between the countries. In other words, if the gross domestic product per capita of a country decreases, so does people's purchasing power, and local products are

sufficient for people's use, as a result of which the size of trade flows between the countries decreases.

Although positive, the effect of the variable coefficient of commercial openness is not significant at any level of confidence.

The distances between countries have a significant adverse effect with a value of -0.85 percent, which demonstrates that each one-percent increase in the gap between the commercial partners leads to a decrease by 0.85 percent in bilateral trade between them, which is in accordance with Zarra Nejad et al.'s (2013) findings. The greater the geographic distance between the countries, the smaller the size of the commercial relations between them. It can result from the unavailability of common markets, an increase in transportation costs and, consequently, higher prices of goods imported from more distant countries, cultural unfamiliarity, and obstacles against access to the market.

The variable coefficient of a common currency is statistically significant with a positive sign and a value of 5.8 percent and has a positive effect on bilateral trade among the countries. The countries' bilateral trade will increase by 5.8 percent if there is a common currency, and other conditions are constant, which is in line with Rose's (2000) and Rose & Van Wincoop's (2001) findings. It suggests that a currency union has a considerable effect on bilateral trade among countries.

Another variable that affects the size of bilateral trade between two countries according to the gravity model is a race in common between them, which in turn suggests a cultural similarity. The results indicate the significance of this variable in the estimated model. The coefficient obtained for the variable is 3.01 percent, which means that a common race is a positive factor effect on the size of bilateral trade among countries with high cultural similarity.

The effect of the imaginary variable common language is statistically significant with a positive sign and a coefficient of 0.86 percent, which demonstrates that countries with a common language enjoy greater trade than countries with different languages, where other conditions are constant. The reason is that countries with similar languages are in close proximity to each other, have extensive political and economic relations with one another, and are willing to establish greater trade and commercial convergence.

5 Conclusion

One of the best approaches to the development of trade and enjoyment of the resulting benefits involves precise identification of the business partners'

commercial and economic potentials and investigation of methods of increasing economic cooperation and commercial exchange to the desired level. For this reason, the establishment of currency unions among countries can facilitate commercial relations among them. The conducted research demonstrated that although a significant number of the factors forming an optimal currency area are political, other factors, such as political and cultural factors, also play important roles in the establishment and survival of an optimal currency area. Theoretically, therefore, countries with workforce mobility, wage and price flexibility, high degrees of economic openness, similar inflation rates, and political determination to quit their currencies and adopt a new one can be beneficial to all the members if a common monetary policy is adopted.

In this research, the effect of a common currency on bilateral trade among the world's selected countries has been investigated using data from the period from 1993 to 2015 in the framework of the gravity model. The statistical results demonstrate that the variables gross national product of the country, the gross national product of the commercial partners, common currency, common language, and common race have significant positive effects on bilateral trade among nations, an increase in each of which increases bilateral trade among nations. The variables per capita income and geographic distance are significantly but negatively related to bilateral trade among countries, meaning that an increase in them decreases bilateral trade among countries. The positive value of countries' domestic national product and the negative value of the distance between two countries confirms the central hypothesis of the gravity model, stating that bilateral trade between two countries is directly related to their sizes and inversely related to the distance between them. Moreover, the variables commercial openness real exchange rate are not significant at any level of confidence although they have positive signs. In the long run, therefore, trade between the two countries is not affected by the variables commercial openness and real exchange rate, according to the gravity model.

Given the findings of the research, since the common currency has had a positive effect on trade among the countries under investigation, it is suggested that the states for which estimations have been made can establish a currency union, so that they can benefit from the advantages resulting from the common currency through an increase in trade. Furthermore, a country can provide the requirements for trade with others that are more similar to it in terms of economic factors such as country size and cultural factors such as common languages and races. For this purpose, governments need to take

measures to improve transportation costs, revise customs laws, and eliminate customs tariffs.

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