Journal of Economic Cooperation and Development, **38**, 2 (2017), 81-108

Investigating the Benefits of a Currency Union to Trade: A Case Study on WAMZ Countries

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This paper assesses the benefits of a currency union by using the West African Monetary Zone (WAMZ) and the traditional gravity model approach. This is the first investigative study on WAMZ's impact on trade using a modified gravity model approach that incorporates the instability index, which characterizes the zone. This approach is useful in checking the impact of a single currency on trade enhancement and the impact of the instability index on economic growth. Using an Ordinary Least Squares (OLS) with different specifications of the gravity model and panel data set consisting of bilateral trade observations on 9 countries from 1980-2014, the empirical findings supported the hypothesis that currency unions do have a significant positive impact on trade flows. The results indicated that impact of the currency union on trade in the West African countries considered exceeds 20 percent. It therefore suffices to state that a currency union leads to trade enhancement.

Keywords: Currency Union; Gravity Model; Trade;

JEL Classification: E52, E63, F15, F43

1. Introduction

The objective of this paper is to estimate the benefit of a currency union on trade flows. Since trade is the engine for growth and a currency union enhances growth through trade and the fact that the West African Monetary Zone (WAMZ[2]) has not progressed much in terms of growth, entering into a monetary union could serve as a stimulus for economic growth. The proponents of fixed exchange rate regimes argue that fixed exchange rates eliminate uncertainty, therefore, encourage trade and

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[2] West Africa Monetary Zone members are Gambia, Ghana, Guinea, Nigeria and Sierra Leone.

investment. Although there are costs associated with forgoing an independent monetary policy, the benefits that come with currency union minimize the costs. Furthermore, currency union tends to increase the degree of business cycles synchronization.[3] This lowers the cost of foregoing national currencies. A currency union may to some extent increase the degree of efficiency and institutional arrangement of member countries. There is also credibility benefit that member countries derive as they enter into a monetary union[4].

Before the European Monetary Union (EMU) came into being, researchers were continuously studying the impact of various exchange rate regimes on trade flows. Empirical results are generally mixed, and, there is no consensus about the impact of exchange rate regimes on trade flows. Since the introduction of the euro in 1999, renewed interest in exchange rate regimes, particularly the irrevocable fixed exchange rate and its impact on macroeconomic variables is gaining momentum in the literature. In the past decade, several studies have been conducted on the impact of currency unions on trade. Almost all the studies show that a currency union enhances trade. Trade enhancement impact came as a result of reduced transaction costs and exchange rate uncertainty; but will WAMZ be beneficial to member countries by enhancing trade? This question is an empirical one and is the main subject of this section. For the observers (Liberia and Cape Verde), the decision on when to join WAMZ may likely hinge upon the potential benefits and costs of joining the currency union. The experience of current WAMZ members since the run-up period (2000) will serve as a basis to determine the potential trade impact of WAMZ. Consequently, this paper answers the following questions: What is the potential impact of WAMZ on the area's trade flows? How has trade impacted by WAMZ changed over time? WAMZ can be viewed as a process because the physical currency notes and coins are not yet introduced. Therefore, any evaluation of the zone has to be taken as work in progress given the prevailing situation since 2000, the run-up period.

[3] Frankel and Rose (1998) examined the relationship between currency unions and business cycles. Their findings reveal that business cycles become more synchronized across countries that are in a monetary union.
[4] See Alesina and Barro (2000)

This paper attempt to contribute to the literature on the impact of monetary union on trade particularly the magnitude of the increased in trade flow. Although Rose (2000) initial estimate of EMU on trade continue to serve as a reference point, it has come under serious criticisms. This paper tries to add to the ongoing argument but focuses on the WAMZ region that have not been explore to larger extent.

The paper is set up as follows: In section 2, the literature pertaining to the impact of currency unions on trade flows is discussed, data set and methodology employed to undertake the empirical assessment is discussed in section 3, the empirical findings are discussed in section 4, and section 5 contains the summary and conclusion.

2. Literature Review

National borders, currency, and political links matter a lot in trade. A large body of research has dealt with the effect of borders on trade flows. McCallum (1995) studied U.S-Canadian trade and noticed a large difference in trade among Canadian provinces and in trade between Canadian provinces and states in the United States. His findings are as follows: trade among Canadian provinces was estimated at 2200 percent larger than trade between a state in the United States and a province in Canada. However, other researchers have questioned McCallum's findings. Anderson and Van Wincoop (2001) disagreed with McCallum and stated that the volume of the US-Canada border trade was over-estimated; their findings nonetheless indicate a large volume. They concluded that the borders inhibit trade among industrialized countries by about 30 percent and between the United States and Canada by 44 percent. These findings highlighted the impact of national borders on trade flows. National borders inhibit trade because of added trade cost.[5] Since borders affect trade flows adversely, eliminating one of the components of border costs[6] can have a huge positive effect on trade flows.

After the European Monetary Union (EMU) came into existence, many research papers have used the euro area to study the impact of currency

[5] These cost includes trade cost; part of these trade cost is associated with countries using different currencies.
[6] Cost associated with transaction and exchange rate uncertainty.

unions on macroeconomic fundamentals. Among the studies is one conducted on the currency union's (euro) impact on trade flows among its member countries and outside the zone. The research area has grown extensively over the past decade. Rose (2000) reported that bilateral trade between countries that use the same currency is at least 200 percent larger than trade between countries using different currencies. He discovered a significant effect of a currency union on trade flow.[7] According to his findings, a currency union leads to a three-fold increase in bilateral trade among the union's members compared to non-members. A similar conclusion was reached in his article- "One Money, One Market: Estimating the Effect of Common Currencies on Trade".

Frankel and Rose (2000), using a 1970-1995 panel data set of over 180 countries and a five-year interval yielded similar results i.e. when two countries share a currency, trade is multiplied roughly threefold. Though an examination of year-specific effects shows a small tendency for the coefficient to rise over time between the 1970s and 1990s, the results are still significant. The Frankel and Rose (2002) results, when compared to those of McCallum (1995) and Helliwell (1998), received much attention in that the Frankel and Rose (2002) results have no link to geographic, linguistic, or trade policy.[8] This result rekindled interest in the field. Since then both academia and policymakers have shown much interest in the search for the benefits that accrue to members of a common currency, and at the same time for the reliability of the Rose (2000) results.

Although subsequent studies find a smaller effect of a currency union on trade flows, the results still reveal the positive effect of currency unions on trade flows. Rose (2000) estimated the EMU's potential effect on British Trade. Using 1970-1995 bilateral trade observations spanning six different years and employing the gravity with sensitivity test, he concluded that British trade with the Euro-land could increase considerably if the United Kingdom joins the EMU. Therefore, the United Kingdom's trade with the Euro-zone could increase threefold, thus enabling overall British trade to double eventually.

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[7] In testing the robustness of his results, Rose (2000) cites results of qualitative and instrumental variables suggesting that most currency unions were not founded for the purpose of promoting trade among their members.

[8] See Frankel and Rose (2000)

Glick and Rose (2002) contributed to the literature by using panel data techniques, including the "fixed-effect" estimator, which uses only a time-series variation and taking into account entry into and exit from a monetary union. They found a currency union helps trade to double. Alesina and Barro (2002) also investigated the relationship between currency unions and trade flows. In their model, they used the "iceberg"[9] concept as trade costs between two regions or countries and concluded that countries that trade more with each other benefit more if they adopt the same currency. Micco and others (2003) also added to the literature and investigated the impact of the European monetary union on trade. Using a panel of 22 and 15 countries respectively, they investigated the direct contribution of the currency union on trade within the monetary zone. Using the gravity model, they found that the EMU enhances trade integration among the zone's member countries, and its impact rises with time. Barro and Tenreyro (2003), using instrumental variables to address the endogeneity problem that surrounds the Rose (2000) results, arrived at the same conclusion: sharing a currency enhances trade. In their findings, they found that the endogeneity bias is not responsible for the large effect previously documented. Furthermore, using annual data from 1960 to 1997 for all pairs of countries, they employ both Ordinary Least Square (OLS) estimates and Instrumental-Variable (IV) specifications. Their estimate revealed surprising results in that OLS estimates of the currency union's impact on trade surpassed that of the instrumental variable in both cases with and without country-fixed effects[10]. Consequently, their results revealed that endogeneity is not the reason for the large effect indicated by Rose (2000) and his co-authors.

Rose and Van Wincoop (2001) also surveyed the literature using national currency as a barrier to international trade. Using both the traditional gravity model and that of Anderson and Van Wincoop, they arrived at the same results. Although the Anderson and Van Wincoop model revealed relatively smaller results compared to the traditional gravity model, the currency union effect is still large. One beautiful feature of the Anderson and Van Wincoop model is that the currency

[9] The iceberg concept is commonly used in trade theory. It states that the quantity originating from the exporter is not equivalent to the one the importer receives - A fraction is added to it.

[10] Instrumental-Variables (IV) is used to curb the bias that might arise in measuring currency union impact on trade flows, which at the same time serves as a robustness test.

union effect on trade can still be estimated for countries that are yet to enter into a monetary union. Engel and Rose (2002) show that members of currency unions systematically engage in greater international trade. Using a 1995 data set consisting of 150 countries, the gravity model and the OLS estimation and taking into account the effects of output, size, and distance, their result reveals a large effect of common currency on trade. The estimates indicate that two countries that have a common currency trade together by a factor of approximately 6.5. When they included the extra controls, it did not invalidate their finding of an economically and statistically significant positive effect of the currency union on trade flows thus buttressing the previous findings.

Rose's (2000) estimate of the impact of a currency union on trade flows overwhelmed researchers and policymakers. The literature is growing rapidly, about 34 studies are being conducted on the subject, and each differs in magnitude, even though the results remain economically and statistically significant. Although there is considerable variation in the impact of a currency union on trade, the average of the impact on trade in the studies is 60 percent[11]. It is reasonable to conclude that a currency union leads to an increase in the volume of bilateral trade.

Baldwin, Skudenlny and Taglioni (2005) studied the impact of EMU on trade using a proposed theoretical model and sectoral dataset. According to their theoretical model, in a monopolistic competition set-up the effect of exchange rate uncertainty on trade has a non-linear feature suggesting that EMU and exchange rate uncertainty jointly significant. Their empirical findings revealed that currency union have a trade creating effect between 108 and 140 percent and between 54 to 88 percent in a pool regression and individual sector estimates respectively. They also found that third countries (non-EMU countries) would increase their trade with EMU by 27 percent since the creation of the EMU.

Baldwin and Taglioni (2007) provided a minimalist deviation of the gravity model and used it in identifying common errors. They argued that the gravity model originates from one of the principles of physics and not a model by itself, which unfortunately is apply in trade theory.

[11] See Rose, Andrew K. (2004a) "A Meta-Analysis of the Effect of Common Currencies on International Trade"

Hence, in the gravity model, endogenous variables are regressed on endogenous variables. They criticized earlier estimations using the gravity model by Rose et al (2000) which they summarized as Gold, Silver and Bronze medal errors.

Frankel (2008) investigated why the large differences between Rose (2000) estimates of currency union effect on trade and the estimates by Micco, Ordonez and Stein done after the introduction of EMU. He used three possible explanations to explain the 15% and 200 % gap namely Euro is still at early stage, the size of the Euro member countries are larger than countries who had formed currency unions and endogeneity effect which could lead due to spurious which is a revelation of reserve causality. However, his finding revealed no evidence that these factors could explained large gap between Rose estimates and estimates by others.

Baier and Bergstrand (2009) motivated to solve the border puzzle of Canadian-U.S. trade, theoretical foundations for the gravity equation of international trade focusing more endogeneity of multilateral resistance term developed by Anderson and van Wincoop (2003). They found that multilateral resistance are critical but nonlinear estimation are not hence identical results are obtained even by using *bonus vetus* ordinary least squares estimation method. They recommend the use of Taylor series expansion to estimate the multilateral resistance term. The log-linear estimation approach helped in estimating the relationship among bilateral trade flows, regional and world income, and bilateral, multilateral, and world resistance terms.

Cham (2011) investigated the cost of membership in the West African Monetary Zone (WAMZ) region from 1980 to 2005 using General Least Squares (GLS) and single equation method to estimate the real exchange rate misalignment. The empirical findings revealed that real exchange rate variability has increased across WAMZ from 2000 to 2005, which indicates that monetary union imposed high cost to member countries and hence called for member countries to put their macroeconomic fundamentals in order.

De Sousa (2012) used theoretical model spanning 60 year period from 1948 to 2009, he found that currency union impact on trade showing a decline trend. In addition, his findings revealed that trade and financial

globalization currency unions become less important in enhancing trade. Cindea and Cindea (2012) performed a meta-analysis of 28 most recent studies on currency union effect on trade to assess how significant has trade been impacted since the introduction of the euro using Rose's initial estimates as beach mark. Their findings revealed that even though recent estimates of the currency union impact on trade flow has been relatively below that of Rose, trade has intensified since the introduction of the single currency which is one of the successes of euro. They concluded that the recent low estimates need to be considered as a work in progress since the euro is relatively young and it will take time for the Euro impact on trade to reach its optimum percentage point. They concluded that Rose estimates should be used as a reference point in further research in the field. Prera (2012) used the stochastic frontier analysis to study the effects of political stability and economic integration on technical efficiency using a set of industries in Central America. They found economic integration had a negative effect on technical efficiency during the period although the effect of political instability depends on the type of event, both at the industry and national level. Cham (2016) investigated the relationship between monetary integration, foreign direct investment (FDI) and trade in WAMZ using annual data from 1980 to 2013. He found monetary integration positively influenced FDI flows. According to his empirical results, FDI and trade are complementary.

3. Data and Methodology

3.1. Data

The trade data set consists of bilateral trade observations spanning 35 years. We used annual bilateral trade data from WAMZ member countries with rest of the world from 1980 through 2014. Trade on FOB exports and CIF imports are recorded in U.S. dollars. We used exports plus imports as a percentage of GDP to measure bilateral trade. We then added a number of other requisite variables to estimate the gravity model. We added population and real GDP (Gross Domestic Product) per capita as dependent variables. These variables were obtained from the World Bank's World Development Indicators (WDI 2015) database. However, some observations were omitted because of unavailable data.

Information on land areas, common borders, common languages, common colonizers, and free trade agreements are extracted from the CIA's 'World Fact Book'. Distance is determined from the great circle distance measured as distance between countries' principal cities. We used kilometers per square as a measurement scale for distance. The instability index data used are the ones developed by Anthony Annett. Finally, we added information country-pairs that are in a currency union. By currency union, we mean that money is interchangeable between the two countries at a one to one par for an extended period; so prices of commodities need not be converted when trade is between a pair of countries. Standard Augmented Dickey-Fuller (ADF) unit root test suggests that all variables are stationary at level. Appendix A, Table A1 contains the unit root tests results.

3.2. Methodology

The gravity model has been a successful tool in rendering empirical work in international economics in general and in trade in particular. This device has been in use for more than a quarter of a century, particularly in policy studies and in international macroeconomics. The works of Leamer and Stern (1970) shed light on the gravity model, and they noted that bilateral trade is unjustified in the absence of trade cost, such as transportation expenses. Anderson (1979) formulated a neat eloquent theoretical foundation of the gravity equation. In his work, he developed a linear expenditure system on the assumption that the preferences for a country's goods are homothetic and uniform across importing countries. In his setting, the gravity model is specified so that the share of national expenditure is accounted for by spending on tradable goods in a reduced-form function of income and population.[12] Put differently, trade flow is positively related to the income and population of the two regions or countries that engage in trade. Though the model has the advantage of conducting cross-sectional budget studies, its main limitation is the bias of measuring transit cost. However, he subsequently improved the model to gain support at the expense of cost bias. Integrating distances which is used as a proxy to transport cost and border taxes produces a full model that may

[12] In his expenditure model of the gravity equation, the flow of goods or factor input from one region to another depends on the combination of income and population of the two regions or countries.

subsequently lead to the need for tariff elasticity[13]. Anderson's conclusion on the subject is that the need to keep a trade-off between efficiency and bias characterized the gravity model.

Bergstrand (1985) approached the subject from a utilitarian viewpoint. This approach helped him to prove that imports are a closer substitute for each other than for domestic goods.[14] In his work, the imperfect substitution theory incorporated a role of shipping costs, which is regarded as modern-day distance. It has been subsequently argued that the best equation for the gravity model depends on the product of the GDPs. This piece of work came as a contribution made by Helpman (1987), Helpman, and Krugman (1985). The authors, however, claimed that the classical Heckscher-Ohlin theory of comparative advantage does not have the property that indicates that bilateral trade depends on the product of incomes as it does in the gravity model. Deardorff (1984) agreed to this argument, and his work provided the partial foundation of the gravity equation. However, recently, Deardorff (1997) discovered the way to formulate the gravity equation from the Heckscher-Ohlin theory in a way similar to the way it was derived from the imperfect substitution theory. Though he came up with different empirical results using the two theories, the theme was to show that there are alternative ways to derive the gravity equation from other theories.

Linguistic and other historical and cultural affinities help to reduce trade cost. Such cost is sometimes referred to as "cost of unfamiliarity". Linnemann (1966) and Garnaut (1994) called this type of cost psychic and subjective resistance respectively. The basic gravity model includes income and distance. Over the years, there have been extensions to the model. Frankel et al (1997) have incorporated per capita in the model. These three variables form the full gravity model. Subsequently, numerous extensions have been made to the model.

We recognized that currency unions are not exogenous variable and are non-linear. However, taking logarithm of the variables and a currency

[13] The simplest gravity that can be obtained from the expenditure model type is a situation in which there is no tariff and/or transport cost and the same proportion of income spent on tradable goods by all countries is the same.

[14] His gravity equation is known as the generalized gravity model in that it also included price terms.

union dummy as a proxy for volatility in the exchange rate will allow us to apply OLS estimation method. This argument is in line with Baldwin et al. (2005) in that the effect of exchange rate uncertainty on trade has non-linear features, which implies that currency union should have an effect when the exchange rate volatility is equal to zero. Hence, marginal increase in trade gets larger as volatility declines towards zero.

The impact of a currency union on trade is estimated through two approaches. First, we use the traditional gravity model to investigate the impact of a currency union on trade. Since international trade is affected by many factors apart from cost relating to exchange rate uncertainty, the gravity model accounts for these factors. In a traditional gravity model, trade is affected positively by country size but negatively by distance. We followed Rose et al. and added additional variables, which include product of per capita income, whether the countries have a common language, a common border, a common colonizer or belong to a common regional FTA. We added an instability index variable, which we have not come across in any expanded gravity model. The justification is that the zone is prone to instability because of military coups as well as civil, religious, and tribal strife. In addition, a dummy variable, which is one if the two countries are in a monetary union and zero if otherwise, is included. In such a setting, the value will be one if the two countries are members of the WAMZ zone and zero if otherwise. In addition to WAMZ members, two of the observers (Cape Verde and Liberia) and two current WAEMU members (Guinea-Bissau and Senegal) have been added. These two countries have been chosen because they share a lot in common with WAMZ members. The traditional and augmented gravity model is given respectively as

$$\ln(\tau_{ij}/GDP_i) = \alpha_0 + \alpha_1 \ln D_{ij} + \alpha_2 \ln Area_1 + \alpha_3 \ln Pop_1 + \alpha_4 InArea_2 + \alpha_5 \ln Pop_2 + e_{ij} \quad (1)$$

whereas

τ_{ij} is bilateral trade between countries *i* and *j* (measured as export flows),

D_{ij} is the distance between them,

Area is the area measured in square kilometers

Pop is the total population

$$\ln(X_{ijt}) = \beta_0 + \beta_1 \ln(Y_i Y_j)_t + \beta_2 \ln(Y_i Y_j / Pop_i Pop_j)_t + \beta_3 \ln D_{ij} + \beta_4 Lang_{ij} + \beta_5 Border_{ij} + \beta_6 FTA_{ijt} + \beta_7 \ln(Area_i Area_j) + \beta_8 ComCol_{ij} + \beta_9 InStab_{ijt} + \gamma CU_{ijt} + \varepsilon_{ijt} \quad (2)$$

where *i* and *j* denotes countries, *t* denotes time, and the variables are defined as:

X_{ijt} denotes the average value of bilateral trade between *i* and *j* percent of *i*'s GDP at time *t*

Y is real GDP

Pop is population

D is the distance between *i* and *j*

Lang is a binary variable, which is unity if *i* and *j* have a common language

Border is a binary variable, which is unity if *i* and *j* share a border

FTA is a binary variable, which is unity if *i* and *j* belong to the same regional trade agreement

Area is the area of the country in square kilometers

ComCol is a binary variable, which is unity if *i* and *j* belong to the same colony

InStab represents the stability index associated with country *i* and *j* at time *t*

CU is a binary variable, which is unity if *i* and *j* use the same currency at time *t*

ε_{ij} represents the residuals; other factors that influence bilateral exports

Second, the Anderson and Van Wincoop (2001) model is employed through a linear combination of the controls. They derived a simple theoretical model that estimates the impact of a currency union on trade

flows and can be applied to countries that are in a monetary union. This method, therefore, serves as a tool for answering the question: What is the potential benefit that WAMZ brings to its members via trade? It also provides some insights into the welfare implications of a currency union. We followed Rose and Van Wincoop (2001) to estimate the potential impact of a currency union (WAMZ) on trade flows. Following Anderson and Van Wincoop (2001) in assuming constant elasticity of substitution (CES), the Anderson and Van Wincoop gravity model is given as:

$$x_{ij} = \frac{y_i y_j}{y^W}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma} \tag{3}$$

Whereas; x_{ij} is the nominal value of exports from *i* and *j*, y_i is the nominal GDP of country *i*, y^W is the nominal value of world output, σ is the elasticity of substitution between the countries' goods, t_{ij} is the gross price markup due to trade costs, and P_i is *i's* "multilateral trade resistance," a price index that depends positively on trade barriers between *i* and all of its trading partners not just *j*.

We followed Rose and Van Wincoop (2001) and estimated the Anderson and Van Wincoop using a linear combination of controls in equation *2* instead of area and gross domestic product controls for the bilateral trade barrier t_{ij}. Following Rose and Van Wincoop (2001), we estimated the model with country-fixed effects in place of the multilateral resistance terms. Nine countries with complete bilateral trade data from 1980 to 2014 was used to show the impact of currency unions on multilateral resistance and trade.

From the model above, bilateral trade between two countries in a monetary union depends on their bilateral trade barrier relative to the average barrier with other trading partners. The theory stems from the fact that each country produces a certain quantity of goods that have to be sold. Consequently, fewer barriers to trade imply more exports and imports or greater trade between one region and another. The implication is that as countries form a monetary union, trade barriers are

minimized since part of the barriers is due to national money.[15] In addition, as countries enter into a monetary union, the cost associated with currency exchange is eliminated and this reduces the multilateral resistance of the country with other members of the union. The implication is that the ratio of trade cost to multilateral resistance falls and thus cushions the impact of the currency union on trade as compared to the traditional gravity model that neglects multilateral resistances. Nevertheless, a currency union still has an impact on trade.[16]

4. Empirical Results

4.1. Gravity Results

The equation results for traditional bilateral trade are contained in Table 1. The column shows the estimated coefficients and standard errors on variables of the minimal specification of the bilateral trade equation. The results have the expected signs. Distance has a large negative impact on bilateral trade flows. The elasticity of bilateral trade with respect to distance is less than 1 (in absolute value).

The OLS results with different specifications of the gravity model are contained in Table 2. All the specifications include standard gravity model regressors, and controls for common language, common border, common colonizer, and membership of a free trade association. The variable of interest is the coefficient on the dummy variable, which is unity if the two countries belong to a common currency area. The panel data set consisted of observations from almost 2,388 country-pair observations about 9 countries from 1980-2014. The standard errors reported (in parentheses) are robust.

The specification of the model in Table 2 fits the data well. The coefficient of determination is above 41 percent, which explains the variation in the data. The coefficients for the traditional gravity regressors are highly and statistically significant. The coefficient on long distance is negative 0.98 indicating that trade between a pair of countries

[15] See Anderson and Van Wincoop (2001)

[16] Rose and Van Wincoop (2001) used the two methods. The traditional method (without multilateral resistance) and the one developed by Anderson and Van Wincoop but the second method still reveals a large positive effect of currency union on trade.

falls by almost one percent for every one percent increase in the distance between them. The coefficient on size (log product of real GDP) is positive 0.001 and statistically insignificant. The coefficients for the common border and common colonizer have negative and positive signs respectively. While common colonizer is statistically significant, common border is not statistically significant. However, when distance is not included in the specification, the common border coefficient is positive and statistically significant. In the same token, the common colonizer is positive and marginally significant when common language is not included in the regression. The last two columns of Table 2 contain the results. The coefficient of the log product of real GDP is positive and statistically significant. The coefficient of the log product of population is positive. The coefficient is positive and statistically significant, which indicates that rich countries trade proportionately more than poor countries.

When countries belong to the same free trade agreement, trade increases roughly by more than tenfold in two specifications. When the instability index for country *i* and country *j* are included in the regression, it has a negative sign and is statistically significant. The implication is that the instability index for a country has an adverse effect on trade. The instability index impact on bilateral trade flow is found in Column 3 of Table 2. The instability index does not only have a negative sign, it also increases the coefficient of the currency union dummy. The main theme of the section is the currency union coefficient, which is estimated at around 1.48. The point estimates of the currency union effect indicate that two countries that use the same currency trade more. The estimated exp (1.48), which is approximately equal to 4.40, the estimate without country-fixed effects indicates that currency union is in line with trade increase of about more than 439 per cent (similar to the estimate in Rose et al. (2001)). The effect is not only statistically significant but also economically too. The robust t-statistics is 4.70, despite the presence of eight other controls. Adding the country effect reduces both economic and statistical impact of the currency union effect but it remains significant.

To address the issue of home bias and reduce or eliminate it, we included other measures that are shared not only within a country but with other countries as well. Consequently, we followed earlier researchers and incorporated variables such as common language,

common colonizer, etc. These additional variables are positive but are not all statistically significant in all specifications. Contrary to earlier research, the FTA dummy is negative in some specifications.

Several robustness checks were performed to strengthen our assessment**.** First, on stability diagnostics of the estimated coefficients in the estimated models using the tests of Brown et al. (1975), known as the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ). The results are presented in Appendix B, figure B1. As seen from the figures, all most all the plots of statistics CUSUMSQ are inside the critical bound at 5 percent level of significance, which entails that all the coefficients are constant. Second, Wald test was performed on the variables in the model. The test indicated that all coefficients are significantly different from zero and the residuals look well behaved with a mean around zero as shown in Appendix B, figure B2.

4.2. The Potential WAMZ Impact on Trade

To estimate the potential WAMZ impact on trade, we employed the Anderson and Van Wincoop (2001) model (see equation 3).[17] We followed Rose and Van Wincoop (2001) by using a linear combination of the controls in Table 2 (other than area and the GDP controls) for the bilateral trade barrier. We estimated the model with country-fixed effects in place of the country-specific multilateral resistance terms. Annual data from 1980-2014 is used for a set of nine countries for which we have complete bilateral data, which allows us to determine the impact of a currency union on trade flows. Even though the currency union coefficient decreases, it remains large. The coefficient estimate is 1.28; the robust t-statistic is 4.28. Therefore, the potential WAMZ impact on trade flows is exp (1.28) which is approximately 3.60. In other words, bilateral trade will increase about 366 percent when the zone enters into a monetary union. When the instability index for country *i* and country *j* are included in the Anderson and Van Wincoop (2001) model, the coefficient has a negative sign and is statistically significant. When the product of the two countries' instability indexes is included in the gravity model, the respective coefficients show a negative sign and are statistically significant.

[17] See Anderson and van Wincoop (1979) for the theoretical gravity equation

From the theory, the estimate is equivalent to $[(\sigma-1)\ln m]$, whereby $(m-1)$ is the tariff equivalent of the national monetary barrier. We followed Rose and Van Wincoop (2001) and use David Hummels's (2000) estimate of $\sigma = 5$, the tariff equivalent of the monetary barrier to trade is estimated to be 34 percent. The estimate is slightly higher than the findings by Rose and Van Wincoop (2001).[18] The currency union, which is estimated to increase bilateral trade by 366 percent, does not take into account multilateral trade resistance. The intuition is that there is a negligible amount of trade within the zone. Bilateral trade in the zone is relatively low. In order to estimate the effect of a currency union precisely, there is a need to incorporate the multilateral trade resistance effect. The effect is taken into account in Table 3 for the potential WAMZ zone and the likely adherents. The Anderson and Van Wincoop (2001) equation permits us to estimate the impact of a currency union on any potential country that has already entered or on the verge of entering into a monetary union. Following Rose and Van Wincoop (2001) and assuming that the reduction in bilateral trade barriers for union members has been the same, the average percentage change in trade among WAMZ member countries together with their standard error is tabulated in the first column. The corresponding welfare effect is shown in the second column of Table 3 along with the standard error.

By comparison, the effects of a currency union were larger in Table 2 than in Table 3. Instead of WAMZ causing trade to increase by 439 percent or 366 percent in the WAMZ zone, trade is estimated to increase by 22.8 per cent within the zone. The multilateral effect dampens the currency union effect on trade. Although relatively low, the effect is large considering the low level of bilateral trade within the zone. A potential early adherent such as Cape Verde (observer at the moment) will not post any adverse effect by joining the zone although her entry according to the permutation will reduce the trade increase from 22.8 percent to 21.88 percent[19]. Our results concurred with that of Rose and Baldwin et al. (2005) that currency union positively impact trade. In addition, taking into account the small size of countries in WAMZ, the impact of the union will be greater than when the countries are larger. Hence our estimate is in line with Frankel (2008) that the magnitude of

[18] They found the tariff equivalent of the monetary barrier to trade as 26 percent.
[19] See Rose and van Wincoop (2001)

currency union impact on trade is larger with smaller countries. On the one hand, our results indicates that trade in WAMZ will increased by more than 300 percent, on the other hand, trade will increase by at most 22.8 percent when multilateral resistance effect is taken into account. The conclusion is that in either of these methods, trade will increased.

5. Summary and Conclusions

In this study, we examined the effect of currency union on trade in WAMZ countries. We applied traditional and modified gravity models. The results revealed that currency union have a positive impact on trade in all specifications. The estimate results without country fixed effect revealed that currency union increased trade by more than 300 percent despite the presence of other controls variables. Our results is in line with findings by Rose et. al (2001). Furthermore, the results from the traditional gravity model are in line with economic theory that larger population size and large income positively affect trade. The coefficient for distance is negative suggesting that the greater the distance between two countries the lower the trade. Interestingly, the finding revealed that the coefficient for free-trade agreement (FTA) is negative and statistically significant. This is contrary to earlier findings and not in line with economic theory. This finding however offered an insight in that FTA should not be view as a prerequisite for the formation of monetary zone.

To estimate precisely the effect of currency union on trade, we incorporated the multilateral trade resistance and applied Anderson and Van Wincoop (2001) model. This offered us the opportunity to estimate trade effect for potential currency unions. The results revealed that trade is increased by 22 percent for WAMZ members. Potential joiners such as Cape Verde and Guinea-Bissau will enhance trade by 21.88 and 21.51 percent respectively. The intuition is that once countries formed a monetary union, other countries can join the union as well on a gradual basis without an adverse effect on trade. The findings offered a convincing argument for the promotion of monetary union in Africa taking into account its impact on trade, which is engine for economic growth.

Individual country currency can be a barrier to trade. Our empirical findings revealed that individual currency cause trade to decline by 34

percent though higher than Rose and Van Wincoop (2001) estimate. Hence, African countries and other countries need take advantage of monetary integration rather than safeguarding their individual national currencies.

For WAMZ to reap its optimal benefits there is a need to foster peace and ensure stability in the region. Hence, Economic Community of West African States (ECOWAS), African Union (AU) and regional bodies need to have peace and stability as a top priority in their agenda. In doing so, peace will continue to prevail in the region which will create the conductive environment in enhancing trade among member countries.

Authorities in the zone need to encourage and ease travels within the zone. An individual from countries within the zone should be able to travel, work and school freely in any country within zone. This can minimize language barriers, which can further enhance trade. Similarly, since the region is constantly confronted with economic shocks such as drought, affected individual members in the zone will be able to move and gain employment in less affected areas. The net effect will boost aggregate demand and enhance growth.

Since distances between countries impedes trade, gradual formation of currency union can start with countries that are much more closer and expand thereafter but take into account the Optimum Currency Area (OCA) criteria. Member countries should continue to strive for sustainable economic growth and fiscal discipline for the monetary union to be sustainable and beneficial for all members.

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Table 1: The Bilateral trade equation

Dependent variable : Trade	
Variable	
Constant	-0.537*** (0.66)
Ln Distance	-0.88*** (0.06)
Ln Population (country i)	1.02*** (0.08)
Ln Area (country i)	-0.22** (0.08)
Ln Population (country j)	0.73*** (0.08)
Ln Area (country j)	0.05 (0.07)
Sample size	2388
R^2	0.40

The dependent variable is trade share. The coefficients of the variables are listed and standard errors are in parentheses.
*** 1% significance level, ** 5 % significance level, and * 10 % significance level

Table 2: The Effect of Currency Union on Trade using Gravity Model

Dependent Variable: Trade				
Variable	**1**	**2**	**3**	**4**
Currency Union	1.48*** (0.32)	1.28*** (0.30)	1.51*** (0.30)	0.90** (0.28)
Log Distance	-0.98*** (0.07)	-0.91*** (0.07)	-1.08*** (0.07)	
Log Product Real GDP	0.001 (0.00)	0.001 (0.00)	0.001*** (0.00)	0.001** (0.000)
Common Language	0.30** (0.13)	0.29** (0.13)	0.24* (0.13)	
Common border	-0.12 (0.16)	-0.01 (0.15)	-0.34** (0.16)	
Common Colonizer	0.16* (0.15)	0.21* (0.14)	0.28** (0.14)	0.23** (0.22)
Common FTA	-4.10*** (0.78)	-3.42*** (0.70)	1.12 (0.92)	-3.67*** (0.71)
Log Product Population	0.89*** (0.07)		0.64*** (0.03)	0.56*** (0.02)
Log Area	-0.12** (0.30)		0.001*** (0.001)	
Stability			-0.19*** (0.04)	
R^2	0.41	0.41	0.41	0.33
RMSE	0.77	0.77	0.77	0.82
No. Observation	2387	2387	2387	12387

The dependent variable is trade share. The coefficients of the variables are listed and standard errors are in parentheses.
*** 1% significance level, ** 5 % significance level, and * 10 % significance level

Table 3: Impact of Currency Union on Trade using the Anderson and van Wincoop (2001) Model

Union	Trade (Percentage increase)
WAMZ	22.8 (0.59)
WAMZ + Cape verde	21.88 (0.57)
WAMZ + Guinea-Bissau	21.51 (0.33)
WAMZ + Senegal	13.79 (2.35)
WAMZ + the three*	15.15 (2.02)

Note: Standard errors are reported in parenthesis
* consist of Cape Verde, Guinea-Bissau and Senegal put together with WAMZ

APPENDIX A: TABLES

Table A1: Augmented Dicky-Fuller Unit Root Test 1/ 2 / 3 /

Dependent Variable: Bilateral trade		
Variable	**Level**	**1st difference**
Trade	0.000	Not needed
Real GDP	0.000	Not needed
Population	0.000	Not needed
Area	0.000	Not needed
Distance	0.000	Not needed

1/ All variables are in natural logarithm.
2/ P-values are reported for the Null hypothesis: Ho: series have a unit root.
3/ All tests include intercept and the number of lags is based on Schwartz Information Criterion.

APPENDIX B

Figure B1: Cumulative Sum Squares

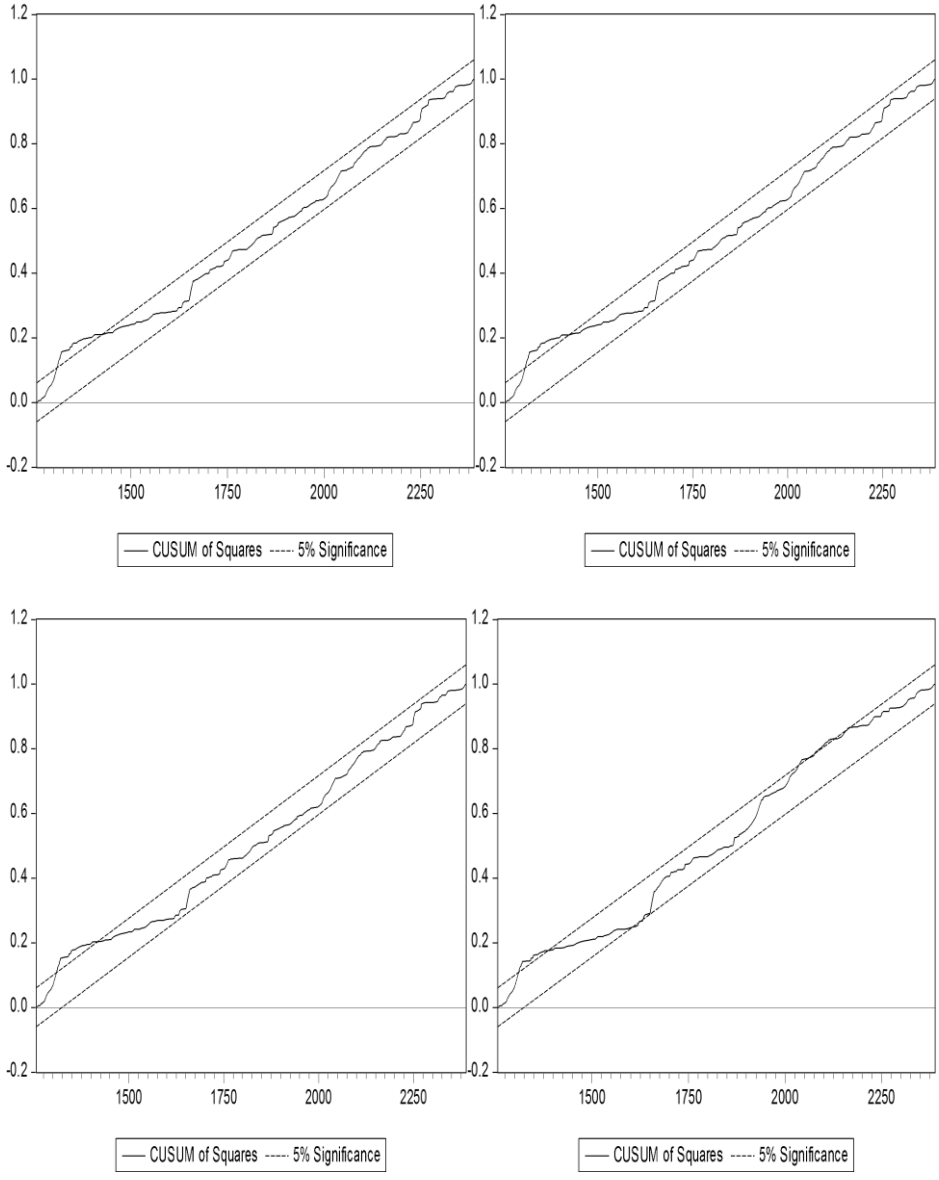

Figure B2: OLS Regressions and Residuals and Fitted Values