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Abstract

The paper attempts to examine Malawi's trade with her major trading partners using an econometric gravity model. In the model, the bilateral trade is a linear function of economic size of the country, geographical distance, and exchange rate volatility, among other factors. Preliminary results show that the fixed effects model is favourable over the random effects gravity model. Specifically, Malawi's bilateral trade is positively determined by the size of the economies (GDP of the importing country) and similar membership to regional integration agreement. On the other hand, transportation cost, proxied by distance, is found to have a negative influence on Malawi's trade. Likewise, exchange rate volatility depresses Malawi's bilateral trade whereas regional economic groupings have had insignificant effect on the flow of bilateral trade.

The implications of these results are many. First, all kinds of barriers to trade must be liberalized to a greater extent to enhance Malawi's trade. One of the main problems of bilateral trade in Africa is transport infrastructure network. Improvement in infrastructure may be a necessary step for successful trade flows within Africa. Second, Malawi can do better if the country trades more with its neighbours. Third, greater stability in the international exchange system would help increase prospects for trade and investments for Southern African countries. Finally, the flow of trade in regional blocks is constrained by problems of compensation issues, overlapping membership, policy harmonization and poor private sector participation.

Key Words: Malawi's trade dynamics, gravity model, panel data, fixed effects model

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Introduction

Malawi's economy largely depends on trade. The country has a diverse range of products mainly in the agricultural sector. Malawi's exports are dominated by four agricultural commodities namely tobacco, sugar, tea and cotton. Over the past five years, exports of coffee and pulses have been rising as a result of efforts towards diversifying into non-traditional crops in order to broaden export base. Imports are dominated by machinery, fuels, transport equipment, chemicals and other intermediate inputs. During years of drought, Malawi's food imports rise significantly.

In recent years, the direction of Malawi's foreign trade has diversified with South Africa emerging as a major trading partner. Zimbabwe is Malawi's largest export market after South Africa. In the period between 2001 and 2005, trade between the two countries grew by about 100 percent from US$14.7m to US$29.5m. Further, through the Cotonou Convention, agricultural products and virtually all manufactured good have preferential access to all European Union (EU) member states. Statistics indicate that in 2001, Malawi's total exports to EU amounted to Euro 211,962,000 while total imports amounted to Euro57,908,000. Malawi's other trading partners are Britain, the United States, the Netherlands and Ireland. At regional level, Malawi is a member of both COMESA and SADC. In additional, Malawi has bilateral agreements with Zimbabwe, South Africa and Mozambique, all of which allow duty free entrance of Malawi's products. Malawi is also currently engaged in negotiations on bilateral trade agreements with Zambia, and Tanzania. To Malawi, SADC represents a very important market in both exports and imports although its regional trade with other SADC members remains relatively low.

Despite having undertaken a number of policy reforms, the Malawi economy still has high concentration among a few products. This leads to high concentration in export products, and in turn to a highly concentrated export destinations. Malawi is thus extremely prone to instabilities emanating from fluctuations in worlds prices in the few goods it trades in and the socio-political instabilities that emerge from time to time in its

trading partners. Additionally, there are supply-side constraints have been identified as Malawi's major obstacles to trade expansion. These include land-lockedness, heavy dependence on agricultural production for exports, smallness of the domestic market, inappropriate technology, limited trade financing, and weak infrastructure. Each of the bottlenecks adds to the costs of trading in Malawi. This study is thus an attempt to find out the major determining factors of Malawi's trade using panel data estimation technique. We apply the gravity model for our analysis of the bilateral trade between Malawi and her major trading partners which comprise Zimbabwe, Zambia, South Africa, Mozambique, United Kingdom and USA.

Table 1: Malawi's Exports by Country of Destination (K' mn)

Year/ countries	**1998**	**1999**	**2000**	**2001**	**2002**	**2002**	**2004**
SADC	**3,041**	**3,866**	**4,261**	**6,344**	**7,365**	**11,771**	**14,380**
Mozambique	148	397	615	1,788	1,201	1,894	3,090
South Africa	2,251	2,281	2,098	3,081	4,847	7,865	7,706
Zambia	69	275	568	382	364	910	1,145
Zimbabwe	335	477	433	554	507	851	1,002
Other SADC countries	238	435	547	539	446	251	1437
EU	**6,626**	**8,459**	**8,521**	**9,874**	**10,228**	**16,992**	**17,099**
UK	1,375	1,813	2,305	3,211	2,905	3,821	5,197
German	1,850	3,107	2,911	3,407	3,324	3,655	3,974
Other EU countries	3401	3539	3305	3256	3999	9516	7928

USA	**2,125**	**2,713**	**2,444**	**2,216**	**2,840**	**6,990**	**6,834**
COMESA (minus SADC)	**1,334**	**2,551**	**3,612**	**7,946**	**4,653**	**10,330**	**5,932**
Other Countries	4316	2729	4786	5436	6330	5636	8455
Total (World)	**17,442**	**20,318**	**23,624**	**31,816**	**31,416**	**51,719**	**52,700**

Table 2: Malawi's Imports by Country of Origin (K'mn)

Years /countries	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
SADC	**9,633**	**13,591**	**17,260**	**22,468**	**30,766**	**44,066**	**58,081**
Mozambique	281	238	366	1,184	3,491	4,061	13,714
South Africa	6,274	9,198	13,222	17,206	22,244	30,621	32,125
Zambia	272	476	550	692	968	2,172	3,918
Zimbabwe	2,289	2,967	2,155	2,406	3,118	4,996	4,801
Other SADC countries	571	712	967	980	948	2'216	3523
EU	**4,151**	**8,191**	**7,213**	**5,973**	**7,220**	**9,350**	**13,355**
UK	2,543	4,470	3,640	3,179	2,801	4,079	5,258
Other EU countries	1608	3721	3573	2794	4419	5271	8097
USA	**300**	**619**	**594**	**1,413**	**2,264**	**2,874**	**2,755**

COMESA (less SADC)	**3,554**	**4,597**	**4,045**	**5,523**	**9,103**	**14,621**	**27,814**
Total (world)	**18,233**	**28,497**	**32,282**	**39,335**	**53,656**	**76,651**	**101,334**

3.0 Literature Review

Achay L. (2006) investigated the determinants of trade flows between various countries of the world. He applied the gravity model on a sample of 146 countries for the five-year sub-periods between 1970 and 2000. His model included such determinants of trade as GDP, distance, and regional integration agreement. His findings showed that all estimated coefficients were statistically significant and their signs were in conformity with expectations. The adjustment quality of the model as measured by determination coefficient (adjusted R^2) was quite high, standing at 71%. He found that GDP, GDP per capita, common frontier, common official language, common currency or common colonial past have a positive impact on the volume of bilateral trade. On the other hand, the geographical distance factor had a negative effect on the volume of trade.

Filippini C, (2003) used a gravity equation model to analyze trade flows between East Asian industrializing countries (including China) and some developed countries in order to show the surprising trade performance of East Asian countries. He found that all signs of coefficients were consistent with model assumptions. He also found high propensity of Asian countries (including China but excluding Japan), to exchange high-tech manufactured products with Japan and USA. Another interesting result was that among the East Asian economies, China plays a very important role as an exporter and as importer too in recent years.

Geda (2002) tested the determinants for trade using COMESA as a case study. He found that almost all the standard gravity model variables had plausible (except for proximity) and statistically significant coefficients. Another important result he found was that good macroeconomic policies (such as financial deepening and infrastructure development) are

important determinants of bilateral trade in Africa. The results also showed that all proxies used to measure political instability (except war) had the expected signs. But regional integration arrangements failed to positively affect intra-regional trade. COMESA intra-trade was found not to be significantly different from its trade with non-member countries.

Martinez-Zarzoso (2003) applied the gravity model to annual bilateral exports between 19 countries. His results indicated exporter and importer incomes, as expected, had positive influence in bilateral trade flows. Exporter population had a large and positive impact on exporters, indicating that bigger countries import more than small countries. Regarding transport infrastructure, he found that exporter infrastructure fosters trade.

Rahman (2004) applied a generalized gravity model to analyze Bangladesh trade flows with its trading partners using the panel data estimation techniques. They estimated the gravity model of trade (sum of imports and exports). The results showed that Bangladesh's trade is positively determined by the size of the economies, per capita GNP differential of the countries involved and openness of the trading countries. The major determinants of Bangladesh's exports were found to be exchange rate, partner countries' total import demand, and openness of the Bangladesh's economy. All these factors affected the Bangladesh's exports positively. Transportation cost was found to be a significant factor in influencing Bangladesh's trade negatively.

3.0 Methodology – The Gravity Model

The gravity model has its origins in Newton's law of gravitation in seventeenth century. Newton's law of gravity in mechanics states that two bodies are subjected to a force of attraction force that depend positively on the product of their masses and negatively on their distance. Social scholars, a few centuries later, applied this law to social phenomena of quite different nature the common character of which was transfers or flows between two or more entities or sources. Thus migration or traffic laws (not only of cars but of information too) were examined using this 'law'. Economists too applied it and Tinbergen (1962) is credited for his study of international trade flows using a gravity model.

The gravity model is analogous to Newton's law of gravity. The analogy is that bilateral trade is a function of attraction factors such as 'economic mass' (generally measured by GDP) and resistance factors such as distance 'economic centers of gravity' or various obstacles to trade.

In constructing our empirical model, we consider a sample of eight countries (Malawi, Zambia, Zimbabwe, Mozambique, South Africa, UK and USA. The time period under study goes from 2000 to 2004. The use of panel data has several advantages over cross sectional analysis. First, panels make it possible to capture the relevant relationships about variables over time. Second, a major advantage is the ability to monitor the possible unobserved trading-pair individual effects. When individual effects are omitted, OLS estimates will be biased if individual effects are correlated with regressors. The gravity model is estimated in the context of a simple OLS model, a fixed effects model and a random effects model. The regression equation puts the product of the trade between two trading countries as a dependent variable. The pooled ordinary least squares (OLS) regression is as shown below:

$$Log\ (X_{ijt}\ X_{jit}) = \alpha_t + \beta_{ij} + \delta_1 log\ (GDP_{it}\ GDP_{jt}) + \delta_2 log\ (DIST_{ij}) + \delta_3 log\ (EXVOL_{ijt}) \delta_4 logCBORD_{ij} + \delta_5 REG_{ijt} + \varepsilon_{ijt} \quad (1)$$

where X_{ijt} is stands for total trade between Malawi (country i) and country j at time t, GDP_{it} is the real GDP of country i; $EXVOL_{ijt}$ is the exchange rate volatility that is defined as the annual standard deviation of the log of value of the monthly bilateral real exchange rates (between the country i and country j); $DIST_{ij}$ is the geographical distance between the country i and country j (measured in kilometers as the direct line distance between the capital cities of the two countries); REG is a dummy for membership to similar regional integration agreement at time t, which takes the value of 1 if the two trading partner countries are members and 0 otherwise; *CBORD* is the dummy for a common border. If the two trading partner countries share a borderline, the value of this variable is 1, and it is 0 otherwise; and α_t stands for the individual effects. Since individual effects are included in the regressions, we have to decide whether they are treated as fixed or as random. From an a priori point of view, the random effects model (REM) would be more

appropriate when estimating typical trade flows between a randomly drawn sample of trading partners from a larger population. On the other hand, fixed effects model (FEM) would be a better choice than REM when one is interested in estimating typical trade flows between an ex ante predetermined selection of nations (Eggar, 2000). Since our study analyzes trade among Malawi's major trading partners in Southern Africa and Europe, our intuition leads us to think that this view is consistent with a fixed effect specification.

3.1 Expected signs of the coefficients

The product of GDP is considered as the size of the economy. If GDP of a country increases, the country is expected to import more from foreign countries. Accordingly, δ_1 is expected to be positive. In gravity model, distance is a resistance factor and has a negative impact on volume of bilateral trade. As the distance between the exporting and importing countries becomes larger, exports will fall. The distance is a factor, which is used as a proxy to consider the impact of transport costs and other transaction costs. One of the major barrier to trade flows is higher transportation cost. As a result, δ_2 is expected to be negative. Most empirical works treat exchange rate volatility as a risk discouraging international trade. Higher risk means higher cost for risk-averse traders, which therefore leads to less international trade. Even if hedging in forward markets is possible, there are limitations and costs. Moreover, exchange rate risk for developing countries it is generally not hedged because forward markets are either not available or are not accessible to all traders. So δ_3 is expected to be negative. As the existence of a common border usually facilitates trade, we expect the elasticity of *CBORD* to be positive. In addition, because of various trade boosting efforts among member countries, REB may have a positive impact on exports among member countries. Accordingly, δ_5 is expected to be positive.

4.0 Estimation Results

The regression results of the gravity are listed in table 3 for the simple OLS simple pooled data model, fixed effects model, and random effects model. Some dummy variables are excluded in the fixed effects and random effects models to avoid generating

a near singular matrix. The results for the simple OLS model show that the estimated coefficient values for GDP, is positive and significant as expected. This implies that Malawi tends to trade more with large economies. Malawi's trade with country j increases by 1.11% (almost proportional) as the product of Malawi's GDP and country j's GDP increase. The distance variable is insignificant but has the anticipated negative sign, which indicates that Malawi trades more with its neighbouring countries. Similarly, the border dummy (CBORD) is found to be insignificant and has positive sign. Because the distance between the two countries sharing a border will be relatively shorter, they are expected to trade more products. The regional economic grouping dummy variable (REG) is also insignificant but positive. This implies that trade gains from the regional trade agreements have been minimal. Finally, the coefficient for exchange rate volatility is negative but insignificant.

Table 3: Regression Results for the gravity model

Variable (Coefficient)	**Common coefficient**	**Fixed effects**	**Random effects**
Constant	10.654 (8.741)		8.759 (6.653)
GDP_iGDP_j (δ_1)	1.112 (3.316)	2.114 (4.844)	0.865 (1.225)
DIST (δ_2)	-0.204 (-1.172)	-0.287 (-1.134)	-0.254 (-1.126)
EXVOL (δ_3)	-0.876 (1.238)	-0.765 (0.128)	-0.066 (0.018)
CBORD (δ_4)	2.252 (3.313)	1.574 (3.108)	0.977 (1.230)
REB (δ_5)	0.052 (0.015)	0.049 (0.012)	0.025 (0.008)
R^2	0.608	0.716	0.5854

5.0 Conclusion and Policy Recommendations

The objective of this paper is to apply a gravity model to Malawi's trade with her major trading partners using the panel data estimation technique.

Preliminary results indicate that the fixed effects model is preferred to the random effects gravity model. Malawi's trade is positively determined by the size of the economies (GDP of the importing country) and similar membership to regional economic body. On the other hand, transportation cost is found to have a negative influence on Malawi's trade. This implies Malawi can do better if the country trades more with its neighbours. Similarly, exchange rate volatility depresses bilateral trade. Likewise, exchange rate volatility depresses Malawi's bilateral trade whereas regional economic groupings have had insignificant effect on the flow of bilateral trade.

The implications of these results are many. First, all kinds of barriers to trade must be liberalized to a greater extent to enhance Malawi's trade. Second, greater stability in the international exchange system would help increase prospects for trade and investments for Southern African countries. Third, one of the main problems of intra-African trade is transport infrastructure network. Improvement in infrastructure may be a pre-requisite for successful trade flows within Africa. Viewing infrastructure as an international public good raises the question of how the investment in infrastructure should be shared between trading partners. Fourth, all partners propensity to export and import must be taken into account sufficiently and adequately when trade policy is set as Malawi's trade is not sufficiently independent of country specific effects. Finally, regional economic groupings have had insignificant effect on the flow of bilateral trade. The Flow of trade in regional blocks is constrained by problems of similar comparative advantages, compensation issues, overlapping membership, policy harmonization and poor private sector participation. Addressing these problems will depend on the extent to which African leaders (and other stakeholders) are ready o overcome past constraints and adopt new approaches.

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