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Understanding the Republic of Malawi's Trade Dynamics: A Bayesian Gravity Model Approach

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ABSTRACT

International trade enables countries to expand their markets, access more products, improve resource allocation, and boost economic growth by leveraging comparative advantage and specialization. The aim of this article is to analyze the primary factors that influence Malawi's international trade flows. The study is relevant because it examines Malawi's trade patterns with its main partners, which include surrounding nations and traditional trade allies. The novelty is that, through the analysis, the research offers valuable insights into the primary factors that influence Malawi's international commerce. Panel data is gathered from various sources, including the International Monetary Fund (IMF) and World Bank, covering the period from 2000 to 2023 for 11 countries that are trading partners with Malawi. We employ the Bayesian Mindsponge gravity methodology. The results show that the economic size (characterized by the gross domestic product) of the origin and destination countries, bilateral agreements, and the population size of the destination country have a beneficial impact on Malawi's exports. In conclusion, Malawi's export performance is significantly enhanced by the economic size of both Malawi and its trading partners, the existence of bilateral agreements, and the population size of the destination countries, underscoring the importance of strategic economic partnerships and targeted trade policies in boosting Malawi's international trade. We recommend Malawi authorities focus on strengthening bilateral agreements and targeting trade relationships with larger and more populous economies to boost international trade.

Keywords: Bayesian Mindsponge theory; bilateral trade flows; gravity model of trade; Malawi; Africa; international trade; trade dynamics

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ОРИГИНАЛЬНАЯ СТАТЬЯ

Понимание динамики торговли Республики Малави: подход с использованием байесовской гравитационной модели

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АННОТАЦИЯ

Международная торговля позволяет странам расширять свои рынки, получать доступ к большему количеству продуктов, улучшать распределение ресурсов и стимулировать экономический рост за счет использования сравнительных преимуществ и специализации. **Целью** данной статьи является анализ основных факторов, влияющих на международные торговые потоки Малави. **Актуальность** исследования заключается в том, что в нем рассматриваются модели торговли Малави с ее основными партнерами, в том числе соседними странами и традиционными торговыми союзниками. **Новизна** исследования в том, что проведенный ана-

лиз позволил получить ценные сведения об основных факторах, влияющих на международную торговлю Малави. Панельные данные собраны из различных источников, включая Международный валютный фонд (МВФ) и Всемирный банк, и охватывают период с 2000 по 2023 г. для 11 стран, которые являются торговыми партнерами Малави. Авторы используют **методологию** байесовой гравитации Mindsponge. Результаты показывают, что экономический размер (характеризуемый валовым внутренним продуктом) стран происхождения и назначения, двусторонние соглашения и численность населения страны назначения оказывают благоприятное влияние на экспорт Малави. Автоы делают **вывод**, что экспортные показатели Малави значительно улучшаются за счет экономического размера как Малави, так и ее торговых партнеров, наличия двусторонних соглашений и численности населения стран назначения, что подчеркивает важность стратегических экономических партнерств и целенаправленной торговой политики для стимулирования международной торговли Малави. Авторы **рекомендуют** властям Малави сосредоточиться на укреплении двусторонних соглашений и налаживании торговых отношений с более крупными и густонаселенными экономиками для стимулирования международной торговли.

Ключевые слова: байесовская теория mindsponge; двусторонние торговые потоки; гравитационная модель торговли; Малави; Африка; международная торговля; динамика торговли

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Introduction

International trade plays a vital role in the economic progress of countries, especially developing nations such as Malawi. Gaining insight into the determinants of trade flows can assist policymakers in formulating efficient approaches to strengthen economic growth and facilitate integration into the global market [1, 2].

Malawi, a country located entirely inside the borders of other countries in Southeastern Africa, encounters distinctive difficulties in its patterns of commerce [3]. Malawi's primary export is tobacco, representing 55% of its overall exports. Others include uranium, sugar, tea, and coffee. The European Union (EU) is Malawi's primary export partner, accounting for 50% of its total exports. Additional countries in this category are Zambia, Zimbabwe, South Africa, and the United States [4].

Like other countries, Malawi's trade flows are influenced by various factors, such as geographic boundaries, infrastructure quality, and regional trade agreements. The country has a small economy that is primarily agriculture-dependent. Examining these factors offers insights into the forces that influence Malawi's trade patterns. In the context of the study, we consider Malawi as the country of origin. The destination countries would be Malawi's various trade partners (for this study we consider 11 countries), which include countries in the Southern African Development Community (SADC) region, as well as other significant trading partners globally. The gravity model analyzes the trade flows between Malawi (the origin) and its partner countries (the destinations) to identify the factors influencing the trade relationships. The model draws inspiration from Newton's law of gravity in physics and states that the amount of trade between two countries is directly related to their economic sizes (often measured by gross domestic product (GDP) and inversely related to the distance between them [5–7].

Throughout the years, the gravity model has been widely utilized and improved to consider numerous aspects that impact trade. The variables considered include geographical, economic, political, and social factors, such as proximity, linguistic similarities, historical connections, bilateral treaties, and commercial regulations [5, 8]. One area of improvement is in the use of Bayesian estimation to incorporate prior information. The new Bayesian Mindsponge Theory (BMT) has fewer applications in this area. We borrowed the estimation procedure from BMT to estimate a Bayesian gravity model following [9, 10]. This enhances the existing body of knowledge by providing a comprehensive analysis of the elements that impact trade flows, emphasizing the significance of economic scale, distance, and other crucial drivers.

Malawi's exports and imports with its major trading partners

Figs. 1 and *2* demonstrate that a wide variety of imports and exports are involved in Malawi's trading connections with other nations. Malawi's main exports to China are agricultural goods such as tea and tobacco. In exchange, Malawi receives significant supplies of textiles, machinery, and electronics from China. Malawi recently received products from China valued at about $ 333 million. Malawi

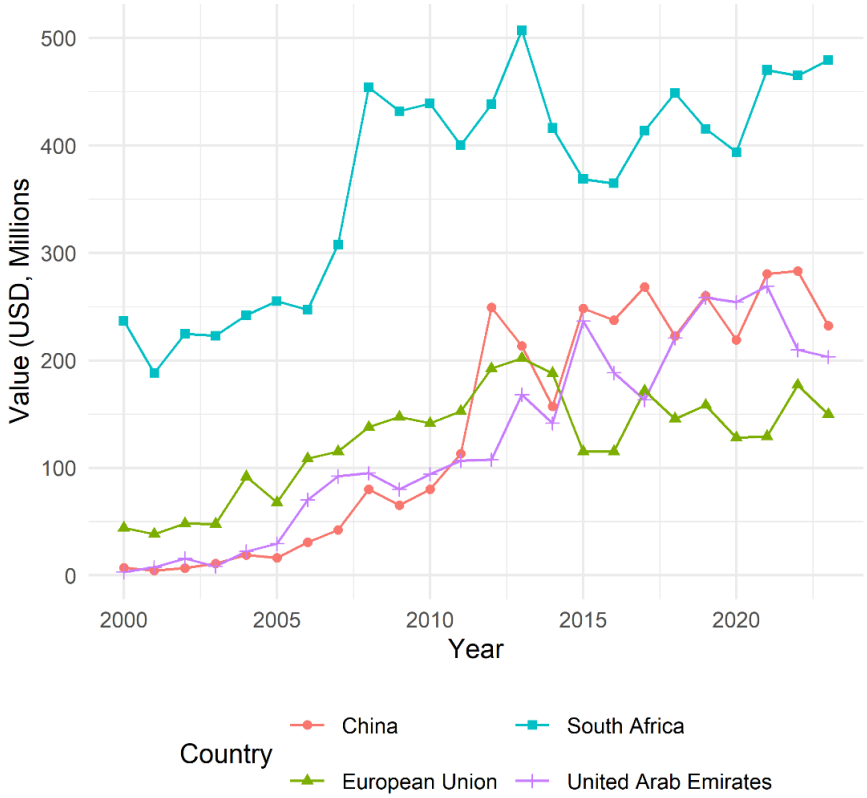

Fig. 1. **Malawi's imports with its major trading partners**

Source: Authors' computations.

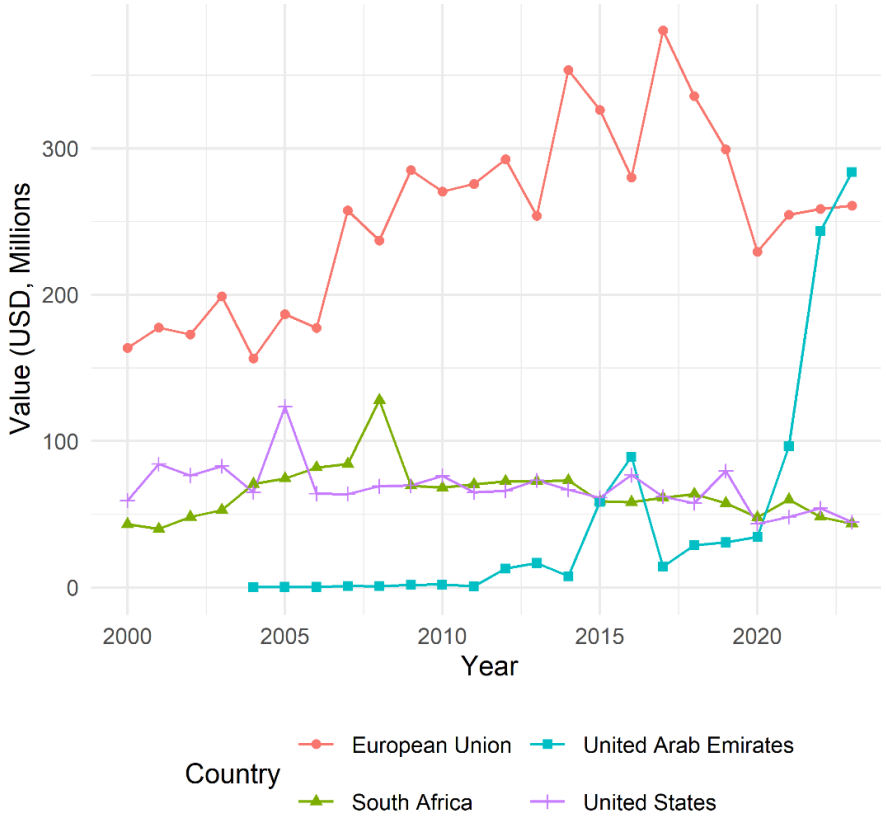

Fig. 2. **Malawi's imports with its major trading partners**

Source: Authors' computations.

and Eswatini have very little trade when compared to other partners. While manufactured items are imported from Eswatini, Malawi's exports to that country are mostly agricultural products, but the trade amounts are not very large.

The EU is an important market for Malawi's agricultural exports, especially tobacco, tea, and sugar. Malawi, on the other hand, imports automobiles, machines, and medications from the EU. Furthermore, the European Union provides Malawi with significant development assistance and backs a range of economic initiatives. India is another country to which Malawi sends beans, pulses, and other agricultural goods. Pharmaceuticals, machinery, and refined petroleum are among India's top exports to Malawi; the value of trade with Malawi last year was approximately $ 132 million. Malawi exports a range of manufactured commodities as well as agricultural products to Mozambique. Trade within the Southern African Development Community (SADC) is facilitated by Malawi receiving energy products and agricultural inputs from Mozambique.

South Africa is another important trading partner for Malawi. It's biggest import partner, South Africa, is a market for its tobacco, tea, and other agricultural exports. With $ 442 million in imports, South Africa provides Malawi with refined petroleum, food products, and manufactured goods. For Malawian tobacco and tea, the United Arab Emirates (UAE) is a significant market. The UAE is Malawi's supplier of petroleum products and other items, and trade between the two countries has increased significantly in recent years. Tobacco, tea, and other agricultural products are imported by the UK from Malawi. Malawi buys automobiles, machinery, and pharmaceuticals from the UK in exchange. Malawi exports agricultural goods, especially tobacco, to the United States. Malawi receives consumer products, automobiles, and machinery from the US. Strong regional trade links are demonstrated by the fact that Malawi exports consumer goods and agricultural products to Zambia, and Zambia supplies Malawi with food products, chemicals, and fertilizers. Finally, Malawi exports certain manufactured items and agricultural products to Zimbabwe. Zimbabwe promotes substantial bilateral trade with Malawi by exporting agricultural items and machinery. In general, Malawi imports manufactured goods and raw materials from its trading partners and exports agricultural products, which mostly dominate its trade.

Literature review

Theoretical review

The gravity model of trade, inspired by Newton's law of gravity, is a powerful tool for analyzing trade flows between countries. The model posits that bilateral trade between two countries is directly proportional to their economic sizes (usually measured by GDP) and inversely proportional to the geographic distance between them. This theoretical framework has been extensively used and validated in empirical trade research. In the context of Malawi, a low-income country heavily dependent on agriculture and primary commodities, understanding trade dynamics through the gravity model can provide crucial insights into the factors influencing its international trade flows.

The gravity model was first introduced to economics by Tinbergen [7]. Tinbergen's work demonstrated that trade between two countries could be predicted based on their economic sizes and the distance between them, like the gravitational force in physics. Over time, the model has been refined to include various other factors such as population size, trade agreements, common languages, colonial history, and infrastructure quality. The basic gravity model can be expressed as:

$$T_{ij} = A\frac{X_i Y_j}{D_{ij}},$$

where T_{ij} represents the trade flow between country i and j, Y_i and Y_j are the economic masses of countries i and j, D_{ij} is the distance between them and A is a constant of proportionality. The model makes assumptions such as: (a) Economic Mass: Larger economies have a greater capacity to produce and consume goods, leading to higher trade volumes. (b) Distance: Greater distances increase transportation costs and reduce trade flows. (c) Additional Factors: Other variables, such as common borders, language, and historical ties, also play significant roles. Over the years, numerous extensions to the basic gravity model have been proposed, for example, [11] introduced the multi-resistance model, accounts for the fact that trade resistance depends not only on bilateral distance but also on the relative distance to all trading partners. Others include the incorporation of factor proportions and endowment as per the Heckscher-

Ohlin model. This helps to explain how different resources influence trade patterns. Further, trade policies, tariffs, and non-tariff barriers significantly impact trade flows and can be incorporated into the model to improve its explanatory power.

Empirical review

Several empirical studies have investigated the factors that influence bilateral trade among origin and destination countries. Tinbergen utilized the gravity model to examine the trade patterns among 42 nations [7]. The findings indicate that the distance elasticity of trade flow is approximately –0.89, and the GDP of both the exporting and importing countries has a favorable impact on trade flows, as anticipated. Eichengreen and Irwin [12] utilized the gravity model within a dynamic framework to examine the influence of history on trade. Countries that have a historical record of engaging in trade with each other, whether due to political, policy, or other grounds, are inclined to maintain their commercial relationships. Consistent with their hypothesis and reasoning, the authors discovered that previous bilateral commerce encourages current trade between partners, even when accounting for the factors considered in the standard gravity model. They argue that neglecting historical considerations leads to an exaggeration of the influence of trading blocs.

Further, the study [13] examined the variables that influence the amount of commerce between 14 nations in the Asia-Pacific area. The study suggested that market size, physical distance, political stability, cultural similarity, membership in the Association of Southeast Asian Nations (ASEAN), and being a newly industrialized country are important factors that influence bilateral trade relationships in the Pacific basin. Similarly, the study [14] demonstrated that the conventional variables play a significant role in determining bilateral trade among the 18 Asia-Pacific economies they examined.

Yu and Zietlow [15] found that the distance between trading partners is a substantial barrier to commerce among the economies in the Asia-Pacific region. Additionally, they stated that the establishment of the Asia-Pacific Economic Cooperation (APEC) has bolstered economic interdependence in regional commerce. In contrast, a study [16] discovered that the elasticity of trade to distance decreases when an additional barrier to trade is considered. This suggests that distance is no longer a significant factor in bilateral commerce. Using a panel data set that included 130 nations from 1962 to 1996, the authors demonstrated that the phenomenon known as the "death of distance" was found to mostly affect trade between wealthy nations. However, Anderson and Van Wincoop [17] demonstrated that national borders have a significant impact on reducing bilateral trade levels by reasonable and meaningful amounts.

Cheng and Wall [18] conducted a comparative analysis of several specifications of the gravity model of trade. The researchers also analyzed the influence of regional integration on trade volumes by studying five regional trading blocs: the European trading bloc, the North American trading bloc, Mercosur, the Australian-New Zealand Closer Economic Relations, and the Israel-USA Free Trade Agreement. The authors utilized many specifications, including the pooled cross-section model and fixed effects model. The researchers discovered that the impact of the European trade bloc on trade volume is quite small. The fixed effect model indicates that the trading bloc had a statistically significant impact of 8.2%.

Kimura and Lee [19] analyzed the determinants that impact the trade of services between ten Organization for Economic Co-operation and Development (OECD) nations and other economies in comparison to the trade of goods. Empirical evidence suggests that the gravity equation exhibits higher performance when used to international trade in services as opposed to trade in products. Moreover, it has often been noted that the distance between locations has a more substantial influence in the trade of services as compared to the trade of goods. Similarly, the conclusions reported by [13, 20] observe that membership in a regional trade agreement significantly influences commerce. The study undertaken by Ceglowski [21] revealed that economic size, geographical proximity, and linguistic links are significant determinants of services trade between countries. When applying the gravity model to the Gulf Cooperation Council (GCC) countries, Boughanmi [22] discovered that the trade between these countries is twice as high as what would be expected based on the basic gravity model.

In Africa, Boughanmi [23] used the gravity model to compare the trade-creating effect of the

main African Regional Trading Agreements (RTAs). The research found an overall positive impact of African RTAs is estimated to be approximately 27–32% after accounting for publication bias. The origin of upward bias is not solely restricted to the selection of publications, as the impacts of RTA tend to be greatly overstated when zero flows and MRT are not adequately controlled for.

Osabuohien et al. [24] investigated the operations of regional trade agreements within the Economic Community of West African States (ECOWAS), with a specific emphasis on the bilateral trade obstacles that impact trade movements across member nations. The research highlights trade barrier indicators that are not frequently examined, such as the multilateral resistance term, trade complementarity, and economic integration agreements. They utilize an enhanced gravity model to determine that trade complementarity has a substantial positive impact on bilateral commerce within the region. In addition, the reluctance to commerce between many countries and the agreements for economic integration, such as the West African Economic and Monetary Union (WAEMU), are important factors in improving trade between the ECOWAS member countries.

Mwangi [25] investigated the factors that influence agricultural imports in Sub-Saharan Africa (SSA) by using an enhanced gravity model on a dataset that includes information from 37 SSA nations between 1995 and 2018. The findings indicate that factors such as GDP, arable land endowment, membership in regional trade agreements, cultural proximity (measured by the sharing of a common language), inflation, and governance quality have a positive and significant impact on agricultural imports.

Ali-Ismaiel et al. [26] demonstrate that a mere 1% increase in export pricing results in a substantial 3.97% surge in the volume of Egyptian rice shipments to partner nations. According to economic theory, increased transportation costs have a negative impact on trade volumes for both exports and imports. The varying distance between capitals has a detrimental impact on Egyptian exports.

In Malawi, there are few studies in this area. Simwaka [27] investigated Malawi's trade relationships with its major trading partners by employing an econometric gravity model. This model assesses bilateral trade as a function of factors such as the economic size of the countries involved, geographical distance, and exchange rate volatility. Key findings from the study reveal that Malawi's bilateral trade is positively influenced by the economic size of its trading partners, specifically the GDP of the importing country, and by shared membership in regional integration agreements. In contrast, transportation costs, as indicated by the distance between trading partners, negatively impact Malawi's trade. Additionally, exchange rate volatility is found to depress bilateral trade, while regional economic groupings have an insignificant effect on trade flows.

Despite extensive research on the factors influencing bilateral trade and the impact of RTAs, research gaps remain, particularly in the context of Malawi. Previous studies, such as [27], have explored various determinants of trade flows, including economic size, geographical distance, and historical trade relations. However, there is no recent study on Malawi's international trade flows utilizing the gravity model. Addressing this research gap would significantly enhance our understanding of trade dynamics in Malawi and inform the formulation of more effective trade policies and strategies.

Research methodology

Data

We obtained the data from diverse sources. The trade data is obtained from the International Monetary Fund (IMF) trade statistics section. The World Bank's World Trade Indicators database provides the data for GDP, per capita GDP, and population figures. The data is from 2000 to 2023 for Malawi and its trading partners: China, Eswatini, European Union, India, Mozambique, South Africa, United Arab Emirates, United Kingdom, United States, Zambia, Zimbabwe. This results in panel data of 23 years and across 11 countries. Descriptive statistics are used to present a comprehensive analysis of Malawi's trade patterns.

Method

Model specification

The basic gravity model may be supplemented with many auxiliary variables to account for a wide range of trade-influencing circumstances. Cultural considerations, geographical factors, historical factors, and other factors are examples of these. Cultural factors determine whether countries have comparable ethnic groupings and

share language, culture, and habits. Geographic variables explain whether countries have shared boundaries, are landlocked, or are island states. The historical nature of the connection between countries demonstrates whether one colonized the other or whether they share a common colonizer. When all conceivable variables impacting commerce between nations are considered, the remaining unexplained portion is the effect of artificial trade barriers.

The article employs a Bayesian formulation for the gravity model. In this model, we consider Malawi's exports as the dependent variable. The model is formulated as follows:

$$\ln(Y_{ij}) \sim \text{normal}(\mu, \sigma),$$
$$\mu_i = \alpha + \beta_1 \ln(\text{GDP}_i) + \beta_2 \ln(\text{GDP}_j) + \beta_3 \text{PoP}_i + $$
$$+ \beta_4 \text{PoP}_j + \beta_5 \text{B}i_{ij},$$
$$\alpha \sim \text{normal}(\text{M}_\alpha, \text{S}_\alpha),$$
$$\beta_i \sim \text{normal}(\text{M}_\beta, \text{S}_\beta).$$

In this model, the probability around the mean μ is determined by the shape of the normal distribution, where the width of the distribution is specified by the standard deviation σ. The variables are defined as: $\ln(Y_{ij})$ is the exports between country *i* and *j*, $\ln(\text{GDP}_i)$ = log of GDP of country *i*, $\ln(\text{GDP}_j$ = log of GDP of country *j*, PoP_i = population of country i, PoP_j = population of country *j* and B_i is whether country i and j have bilateral agreements. β_i = regression coefficients. Incorporating GDP and population in the same equation can provide valuable insights into economic relationships, but it is crucial to recognize and address the endogeneity problem to obtain meaningful and accurate results.

Estimation and validation

This study employed a framework that synergizes the reasoning strengths of the BMT with the inferential advantages of Bayesian analysis [9]. The Bayesian approach treats all properties, including unknown parameters, probabilistically, facilitating accurate predictions through simple models [28]. The application of the Markov chain Monte Carlo technique permits the fitting of complex models, such as polynomial and nonlinear regression structures [29]. In comparison to the frequentist approach, Bayesian inference provides several benefits, such as the utilization of credible intervals and the determination of parameter probabilities instead of binary decision-making based on p-values [30]. To accommodate the exploratory nature of this study, models were constructed with uninformative priors or flat prior distributions, offering minimal prior information for model estimations [31]. To assess the models' goodness-of-fit with the data, Pareto-smoothed importance sampling leave-one-out (PSIS-LOO) diagnostics were employed, as outlined in equation (1) below and previous literature [31, 32]:

$$\text{LOO} = -2\text{LPPDloo} = -2\text{s}\sum i = $$
$$= 1\text{nlog}\int \text{p}(yi \mid \theta)\text{ppost}(-i)(\theta)\text{d}\theta. \qquad (1)$$

The posterior distribution derived from the data minus the data point *i* is ppost(−*i*)(θ). The R loo package employs the PSIS technique for leave-one-out cross-validation. This technique integrates k-Pareto values to identify influential observations. However, precisely computing leave-one-out cross-validation becomes challenging when dealing with observations that possess k-Pareto values exceeding 0.7 — which are generally considered significant. A widely accepted criterion for assessing the goodness-of-fit of a model involves k values below 0.5.

Results

Model results

In this analysis, we explore the posterior summaries of parameters from a Bayesian econometric model examining exports. The Bayesian framework provides a comprehensive view of parameter estimates, including credible intervals, which offer insights into the uncertainty surrounding these estimates.

Table 1 presents the model fit summary. The Bayesian results provided include the posterior summaries for several parameters related to an econometric model of exports. The breakdown the key statistics for each parameter: a_Exports: Mean: 0.02, with a credible interval from −1.90 to 1.22. This suggests the effect is centered around zero, indicating no strong effect. n_eff and Rhat: High n_eff and Rhat close to 1 indicate good convergence and reliable estimates. b_GDP_Origin_Exports: Mean: 0.15, with a credible interval from −1.22 to 1.80. This suggests a slight positive effect, but with considerable uncertainty. n_eff and Rhat: High n_eff and Rhat close to 1 indicate good convergence. b_GDP_Destination_Exports:

Table 1
Model fit summary

	mean	se_ mean	sd	2.50%	25%	50%	75%	97.50%	n_eff	Rhat
a_Exports	0.02	0.82	1.16	−1.90	−0.24	0.37	0.63	1.22	2.00	40131.75
b_GDP_Origin_ Exports	0.15	0.79	1.11	−1.22	−0.59	0.01	0.75	1.80	2.00	26183.37
b_GDP_ Destination_ Exports	0.87	0.72	1.01	−0.44	0.04	0.96	1.79	1.97	2.00	30166.63
b_Bilateral_ Exports	0.16	0.77	1.09	−1.71	−0.04	0.67	0.87	1.00	2.00	27142.35
b_Population_d_ Exports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	1.88
b_Population_o_ Exports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	25.25

Source: Developed by the authors.

Mean: 0.87, with a credible interval from −0.44 to 1.97. This indicates a stronger positive effect of the GDP of the destination country on exports. n_eff and Rhat: High n_eff and Rhat close to 1 indicate good convergence. b_Bilateral_Exports: Mean: 0.16, with a credible interval from −1.71 to 1.00. This suggests a modest positive effect, with substantial uncertainty. n_eff and Rhat: High n_eff and Rhat close to 1 indicate good convergence. b_Population_d_Exports and b_Population_o_Exports: Mean: 0.00, with essentially no variation (sd = 0.00). This suggests these parameters were either not identified or have no effect in the model. n_eff and Rhat: Low effective sample sizes and Rhat values indicate potential issues with these parameters.

The parameters generally have means close to zero, indicating that the model does not find strong evidence for large effects. The credible intervals are wide for most parameters, reflecting considerable uncertainty. High n_eff and Rhat values near 1 for most parameters indicate good convergence of the MCMC sampler, suggesting the estimates are reliable. The zero variance in population-related parameters suggests potential issues with model specification or identification. Overall, the results indicate that while GDP of the destination country (b_GDP_Destination_Exports) has a somewhat stronger and more positive effect on exports, other parameters show weak or negligible effects with considerable uncertainty. The model appears to have converged well for most parameters, except those related to population.

In a gravity model of trade, the expected signs for the variables GDP_origin, GDP_destination, Bilateral agreements, Population_o, and Population_destination are as follows: (a). GDP_origin (Gross Domestic Product of the exporting country): Positive. A higher GDP in the origin country indicates a larger economic capacity to produce goods for export, thus leading to higher trade flows. (b). GDP_destination (Gross Domestic Product of the importing country): Positive. A higher GDP in the destination country suggests greater economic capacity to consume imports, leading to higher trade flows. (c). Bilateral agreements: Positive. The presence of bilateral trade agreements typically reduces trade barriers, facilitating higher trade volumes between the countries involved. (e) Population_o (Population of the exporting country): Ambiguous, but often positive. A larger population can imply a larger market and more production capacity, potentially leading to more exports. However, if the domestic market is large enough to absorb most of the production, it could result in less export activity. (f) Population_destination (Population of the importing country): Positive.

Table 2
Expected and realised signs for the various dependent variables

Variable	Expected Sign	Actual sign
GDP_origin	+ve	+ve
GDP_destination	+ve	+ve
Bilateral agreements	+ve	+ve
Population_o	Ambiguous, but often positive	Ambiguous
Population_destination	Positive	Ambiguous

Source: Developed by the authors.

A larger population in the destination country indicates a larger market size and greater demand for imports. From *Table 2*, it is clear that, as expected for Malawi, all the variables behave as expected, except for the population of the destination country.

Discussion

This study investigates the trade dynamics of Malawi by utilizing a gravity model of trade. This research offers insights into the primary factors that influence Malawi's international commerce by examining its trade patterns with important partners, including surrounding nations and historic trade allies. We have developed a Bayesian Mindsponge gravity model that is fully implemented in R software. The results suggest that the economic sizes, measured by the GDP of the origin and destination nations, bilateral agreements, and the population size of the destination country, have a beneficial impact on Malawi's exports, which are the products originating from Malawi.

There are few studies on Malawi's international trade using the gravity model. Our results concur with those of Simwaka [27]. They established that the extent of Malawi's commerce is influenced by the economic size (GDP) of the importing country and its membership in the same regional economic organization. However, the expense of transportation has been observed to have a detrimental impact on Malawi's trade. This suggests that Malawi has the potential to improve its economic performance by increasing its commerce with neighboring countries.

Other studies on globalization and economic growth in Malawi include report by Thindwa [33]. The study examined the impact of the China-Malawi connection on the economic growth of Malawi. The volume of exports from Malawi to China was relatively small in comparison to the volume of exports from China to Malawi. This results in trade deficits for Malawi, which consequently has ramifications for both its development and society.

A study [34], examined the possible consequences of the African Continental Free Trade Area (AfCFTA) on Least Developed Countries (LDCs), specifically highlighting the case of Malawi. Results showed that implementing the AfCFTA in Malawi is expected to result in a steady and progressive decrease in trade-tax revenues. Malawi is classified as a Least Developed Country (LDC) that heavily relies on international trade levies, which account for over one-third of its total revenue. To achieve this objective, it is necessary to formulate policies and implement measures that will guarantee the AfCFTA's inclusivity and benefit for all member nations.

In relation to South Africa, Macheso [35] revealed that the commercial connections between Malawi and South Africa, albeit unequal, yet demonstrate significant reciprocity for both countries and their interests. The study found that despite being lopsided, the formal trade between the two nations has experienced significant expansion and continues to do so, albeit with some fluctuations. Additionally, it has been discovered that there have been observed alterations in trade patterns and Foreign Direct Investment (FDI) between the two trading partners. Ultimately, the analysis revealed that the trade connections between Malawi and South Africa, despite being unequal, still demonstrate significant reciprocity for both countries and their respective interests.

Conclusion and recommendations

The gravity model of trade has allowed for a thorough analysis of Malawi's trade dynamics in this study. Using this model, we have verified that the economic size and distance between Malawi's trading partners have a considerable impact on the country's trade flows. The results highlight how proximity and economic size influence trade connections. Greater trade activity between Malawi and larger economies and those located closer to the country are common. Additionally, by lowering barriers and promoting economic cooperation, regional trade agreements — particularly those within the Southern African Development Community (SADC) —have been essential in facilitating commerce.

Based on the findings of this study, we suggest the following to improve Malawi's trade performance and inclusion into the global economy considering the knowledge gained from this study: (a). Strengthen trade agreements with regions: Malawi should keep up its active participation in and bolstering of regional trade accords, especially those that are part of the SADC. Improving collaboration and increasing integration with surrounding nations can aid in lowering trade obstacles, decreasing transaction expenses, and expanding market accessibility. (b) Expand the list of trade partners: diversifying trade partners beyond conventional and regional friends helps reduce risks connected with economic downturns in particular regions, even though proximity and economic size are still significant factors. Finding new markets to explore and building trade relationships with developing nations may open new economic prospects. (c) Support export competitiveness: measures like incentives for value addition, quality enhancement, and adherence to international standards can enhance Malawi's export competitiveness and help the nation establish a larger presence in international markets.

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