

Will Ethiopia's Membership in the World Trade Organization (WTO) Enhance Its Total Exports and Real GDP Growth?

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Abstract

Using a general equilibrium analysis, this study looks into how Ethiopia's entry into the World Trade Organisation (WTO) would affect its exports and Real GDP growth. Although there is a theory that supports trade liberalisation through WTO membership, empirical data indicates that the consequences differ greatly across rich and poor countries. The study uses a thorough general equilibrium approach that encompasses both conditional and full endowment scenarios to estimate trade costs and evaluate their effect on Ethiopia's economy using the General Equilibrium Poisson Pseudo Maximum Likelihood (GEPPML) procedure. The findings suggest that Ethiopia's Real GDP might increase significantly as a result of WTO membership, with projections indicating an increase of 10.608% in the full endowment scenario and 8.683% in the conditional scenario. In a similar vein, the full and conditional scenarios predict increases in total exports by 2.132% and 0.394%, respectively. These results highlight Ethiopia's potential transformation upon becoming a WTO member, indicating that substantial economic growth, industrialisation, and enhanced market access could result from inclusion into the international trading system. The finding adds to the continuing discussion about how WTO participation helps emerging economies prosper economically.

Keywords

Ethiopia, World Trade Organization (WTO), GEPPML, Total Export, Real GDP

1. Introduction

This study explores the potential impact of Ethiopia's accession to the WTO on its total exports and Real GDP growth using a general equilibrium approach. The

WTO, along with its predecessor GATT, has historically played a significant role in promoting global trade liberalization and economic integration among member countries (WTO, 2016). However, empirical evidence on the effectiveness of WTO membership in boosting trade flows and economic growth is mixed, especially for developing countries. Research indicates that the benefits of WTO membership can be uneven, with developed nations often experiencing more advantages than developing ones due to structural and policy differences. This study seeks to answer the question: Will Ethiopia's membership in the WTO enhance its total exports and Real GDP growth?

Joining the WTO can support economic growth for several reasons. First, the WTO works to lower trade barriers, which boosts international trade and, consequently, stimulates economic growth (Larch et al., 2021). Second, the WTO promotes good governance by encouraging countries to implement significant domestic reforms and make binding commitments in various policy areas during the accession process. These commitments help solidify positive reforms and demonstrate a country's commitment to global cooperation (Braga & Cattaneo, 2009). Finally, the WTO contributes to economic growth by creating a more stable trading environment. Economic uncertainty can deter investment and slow capital accumulation, negatively affecting growth. Supporting this, (Mansfield & Reinhardt, 2008) found that membership in the WTO and Preferential Trade Agreements (PTAs) can reduce trade flow volatility. These agreements strengthen the rule of law by enforcing market-access commitments, preventing new protectionist measures, and promoting transparency and policy alignment among member nations.

Ethiopia's accession to the WTO has been a lengthy and complex process, driven by the country's ambition to integrate more effectively into the global economy. The accession process, which began in 2003, has progressed slowly due to a variety of internal and external challenges. These challenges include the need to align Ethiopia's trade policies with WTO standards and implement broader economic reforms necessary for successful integration. Accession to the WTO is considered a crucial step for Ethiopia to enhance its trade integration, improve export competitiveness, attract foreign investment, and finally contribute to its economic growth. This process requires Ethiopia to align its trade laws and practices with WTO rules, which involve commitments to reduce tariffs, eliminate non-tariff barriers, and ensure transparency in trade policies. In recent years, Ethiopia has resumed negotiations for WTO accession, with the government showing a strong commitment to completing the process. This move is part of Ethiopia's broader strategy to strengthen its participation in the global economy and achieve sustainable development.

Ethiopia, a country that has historically remained outside the WTO, faces a pivotal moment in its trade and economic policy. The potential accession to the WTO carries both opportunities and challenges for Ethiopia, particularly in aligning its domestic trade policies with international standards. This study utilizes a comprehensive general equilibrium analysis framework, incorporating conditional and

full endowment scenarios, to assess how Ethiopia's integration into the WTO could influence its economic landscape. The methodology involves using a GEPPML¹ procedure to estimate trade costs and analyze their impact on total exports and overall economic equilibrium. By evaluating Ethiopia's potential membership, the study seeks to provide insights into the broader economic implications of joining the WTO, including expected changes in total export growth, and real GDP growth. The findings will contribute to the ongoing debate on the role of WTO membership in promoting economic development in emerging economies like Ethiopia.

The remainder of the paper is organised as follows: Section 2 provides a brief review of the related studies. Section 3 outlines the methodology used in the research. Section 4 describes the variables and data employed. Section 5 presents the results and discussion, and finally, Section 6 concludes the study.

2. Study Review: A Brief Look

Since its founding, the GATT/WTO has emerged as the main subject of an expanding corpus of empirical research examining the connection between trade flows, membership, and economic expansion. Up until the early 2000s, there was widespread agreement on the critical role that GATT/WTO played in advancing global commerce. (Rose, 2004), however, revealed the startling conclusion that trade patterns between GATT/WTO members and nonmembers were not appreciably different. The finding seriously questioned the GATT/WTO's efficacy and value as a multilateral organization. The conclusion seems to contradict the general consensus about the theoretical models of the GATT/WTO. Their findings have been verified by academics including (Eicher & Henn, 2011); (Roy, 2011) and (Esteve-Pérez et al., 2019). The outcome came as a major shock to policymakers and trade economists. Since then, a lot of studies have tried to solve this problem by looking at the trade margins, both extensive and intensive, and finding possible sources of bias from variables that weren't included. Other studies have also used different econometric techniques to divide the sample into groups of countries, time periods, and sectors.

A further study (Subramanian & Wei, 2007) used a panel data set from 1980 to 2004 to perform a thorough analysis of the WTO's influence on international trade. Using a gravity model that accounts for both country fixed and time effects, as suggested by (Anderson & Van Wincoop, 2003), the authors found that the WTO had a significant and favourable impact on trade in industrialised nations but had less of an effect on emerging nations. The analysis showed that although the WTO had a significant impact on global commerce, its effects were not uniform. Four asymmetries in the GATT/WTO system were identified as the causes of the unevenness: the division between members who are developed and those who are developing countries; differences in imports between members and non-

¹Econometrics tool designed for conducting general equilibrium analyses that enables the estimation of the structural gravity model while facilitating counterfactual assessments (Anderson et al., 2015).

members; engagement between the liberalised and exempted sectors; and differences between members who are new and those who are old. The study revealed some noteworthy findings: trade growth was substantial in countries actively participating in reciprocal trade discussions; bilateral trade flourished when both sides pursued liberalisation; and trade expansion did not occur in sectors that did not pursue liberalization. Because wealthy countries usually used their WTO membership to promote trade liberalisation, developing countries did not, which represents a policy asymmetry. Overall, the results demonstrated that the influence of a nation's GATT/WTO membership is contingent upon the nation's actions inside the organisation, the parties with whom it engages in negotiations, and the goods that are the subject of those negotiations. These results called into question the conclusions drawn by (Rose, 2004) and emphasised the need to take into account sector- and country-specific differences when assessing the influence of the WTO on trade. According to (Subramanian & Wei, 2007), a large number of nations are incorrectly labelled as being outside the GATT. In the end, they decided that WTO membership, which could mean non-formal compliance with GATT/WTO rules (for example, colonies through their metropolitan colonizers or through de facto compliance during negotiations before formal membership), does seem to be a strong driver of trade.

Liu (2009) used a panel dataset with over a million observations that covered the years 1948 to 2003 to study the GATT/WTO's influence in fostering global commerce. Several pairs of countries have zero trade, which is common in traditional gravity specifications; however, the traditional formulation doesn't look at this because it only looks at strictly positive trade flows. The research finding talked about sample selection bias in traditional gravity model specification issues, such as OLS and Tobit models. The researchers used a PPML estimator that accounted for both positive and zero trade flows, as suggested by (Santos Silva & Tenreyro, 2006), to get over these restrictions. The study proved that the wide margin of commerce—a phenomenon where trade between non-trading countries begins—was largely facilitated by the GATT/WTO. The partner-level intense margin, on the other hand, describes increases in trade between partners who already deal with one another. This idea was frequently missed in earlier research that did not include zero-trade observations. A breakdown of the development of trade into partner-level extensive and intensive margins was offered by researchers including (Helpman et al., 2006); (Felbermayr & Kohler, 2006); (Felbermayr & Kohler, 2010), and (Dutt et al., 2013).

The impact of GATT/WTO membership on the flow of both agricultural and non-agricultural commerce was investigated by (Grant & Boys, 2011). They examined a comprehensive dataset that included bilateral trade flows between 215 trading partner nations between 1980 and 2004. Their research revealed a remarkable average increase in agricultural commerce for countries concurrently participating in the GATT/WTO of 161%. In particular, GATT/WTO membership provided significant benefits to least-developed and middle-income developing

economies—both of which have a strong interest in increasing agricultural exports. The outcomes presented here differed with those of (Subramanian & Wei, 2007) and (Balding, 2010), who examined the total merchandise trade and discovered negligible variations in the trade flows between emerging member nations and non-members. Grant and Boys extended their research by including zero trade streams and a large margin of trade, going beyond the conventional gravity equation. To look into the overall consequences, they employed the PPML estimation technique. Their research revealed that membership in the GATT/WTO not only supported the formation of new trading connections (the extended margin), but also pushed current trading partners to engage in higher trade volumes (the intensive margin). Actually, the large margin of agricultural trade explained almost 72% (82 percentage points) of the observed 114% rise in agricultural trade among GATT/WTO members, as per the PPML statistics. This result emphasizes how important it is for members of the GATT/WTO to support the expansion of existing trade ties and the creation of new ones in the agricultural industry. Despite the delicate nature of agricultural trade and members' unwillingness to implement large economic reforms, these findings generally demonstrated that membership in the WTO has had a significant positive impact on members' agricultural trade.

The effects of Russia's WTO admission on firm-level trade were investigated using a difference-in-difference estimate technique (Cristea & Miromanova, 2022). The researchers examined the short-term changes in the trade operations of Russian enterprises following their country's 2012 WTO membership by analyzing customs quarterly data from 2011 to 2015. The results showed a notable increase in the number of foreign nations with which Russian businesses engaged in trade, both in terms of imports and exports, in contrast to (Rose, 2004) projections. Additionally, there was a discernible increase in the variety of goods shipped. These results suggest that membership in the WTO had a direct impact on the trading patterns of Russian exporters and importers. They did note, however, that the extensive margin of trade experienced a greater influence from WTO membership on changes in export and import activities than the intensive margin. This study's findings and methods are comparable to those of (Lu & Yu, 2015); (Brandt et al., 2017); (Feng et al., 2017) and (Baccini et al., 2019), especially in that they use micro-level data to analyze the economic effects of a big country's entry into the WTO.

In the process of analyzing how membership in the GATT/WTO affects trade and economic growth, scholars have looked into the proper econometric specification for the gravity model. Adding time-invariant country-pair fixed effects is important to account for endogeneity and bilateral heterogeneity that can't be found. Several studies have pointed this out (Egger & Pfaffermayr, 2003); (Cheng & Wall, 2005), and (Baier & Bergstrand, 2007). Moreover, to account for variations in multilateral resistance terms, (Baldwin & Taglioni, 2007) recommend that the gravity model include importer-time and exporter-time fixed effects. The Poisson Pseudo Maximum Likelihood (PPML) estimator is (Santos Silva &

Tenreyro, 2006) final solution for econometric issues caused by heteroskedastic residuals and a high proportion of zeros in bilateral trade flows. An alternate approach to address these issues is the general equilibrium PPML estimator, as proposed by (Anderson et al., 2015).

According to the literature reviews above, academics have been debating the advantages and difficulties of WTO membership on international trade flows for decades, and there is still disagreement over the most accurate methods for estimating these effects. The fact that this subject keeps coming up in studies suggests that there is still disagreement over how well WTO membership promotes global trade. WTO supporters contend that by eliminating tariffs and non-tariff trade obstacles, the organization has increased global trade and contributed significantly to growth and prosperity. Critics counter that the WTO has neglected the development requirements of less developed countries in favor of rich countries and big multinational corporations. Furthermore, there is disagreement concerning the WTO's total contribution because different nations have different effects on trade promotion and economic growth. Limited research has been conducted on the possible impacts of Ethiopia's WTO membership on the nation's exports and welfare advancements.

3. Methods of Estimation

The estimation of the conditional and full endowment general equilibrium effects of Ethiopia's membership in the WTO is measured using the GEPPML procedure, which was developed by (Anderson et al., 2015). This procedure involves a three-step process: first, estimating baseline trade costs using a gravity model; second, determining the conditional general equilibrium effects by analyzing the impact of trade costs on specific sectors while holding certain variables constant; and third, calculating the full endowment general equilibrium effects across the entire economy, considering the interactions between different sectors. This comprehensive approach provides insights into both the direct and indirect effects of trade integration on Ethiopia's economy.

Step I: A baseline scenario

The process begins by calculating bilateral trade costs using the PPML estimator, which helps establish the foundational metrics needed for general equilibrium analysis. Following this, the structural gravity model is applied, which incorporates fixed effects for both exporting and importing countries. It is evaluated using the PPML estimator, as outlined in (1). The combined approach enables a comprehensive understanding of trade flows and their impact on the overall economy by accounting for both direct and indirect effects.

$$X_{ij,t} = \exp(\pi_{i,t} + \chi_{j,t} + \mu_{ij} + t_{ij,t}\beta) * \varepsilon_{ij,t} \quad (1)$$

We can accurately find baseline costs and MRTs by using the PPML estimates of importer-time and exporter-time fixed effects from the gravity model (2), (3), and (4) along with data on output and expenditure:

$$\left[\hat{t}_{ij,t}^{1-\sigma} \right]^{BLN} = \exp \left[\hat{\mu}_{ij} + t_{ij,t} \hat{\beta} \right] \quad (2)$$

$$\left[\hat{\Pi}_{i,t}^{1-\sigma} \right]^{BLN} = \frac{Y_{i,t}}{\exp(\hat{\pi}_{i,t})} * E_{R,t} \quad (3)$$

$$\left[\hat{P}_{j,t}^{1-\sigma} \right]^{BLN} = \frac{E_{j,t}}{\exp(\hat{\chi}_{j,t})} * \frac{1}{E_{R,t}} \quad (4)$$

The elasticity of substitution employed (4.766) aligns with the conventional value in existing literature. Where, by construction, $Y_{i,t} = \sum_j X_{ij,t}$ and $E_{j,t} = \sum_i X_{ij,t}$.

Step II: Conditional scenario

In this step, a conditional general equilibrium approach is employed to measure the economic welfare changes brought about by Ethiopia's specific trade policies while maintaining constant levels of outputs and expenditures. This methodology involves performing a conditional gravity estimation to develop precise general equilibrium metrics. For this study, the original trade policy dummy variable is refined to introduce new trade policy variables, such as those related to the RTAs and the WTO accession. After these updated trade policy variables are added to the structural gravity model, new fixed effects are found for both exporters and importers, as shown in (5):

$$Trade_{ij,t} = \exp \left(\pi_{i,t}^{CFL} + \chi_{j,t}^{CFL} + \bar{\mu}_{i,j} + t_{ij,t} \bar{\beta} \right) * \varepsilon_{ij,t}^{CFL} \quad (5)$$

where the symbol $\bar{\cdot}$ is used to capture the fact that certain coefficients of the gravity model are constrained to be equal to their baseline values, and the superscript CFL denotes the counterfactual values.

The estimated trade cost coefficients are consistent with those from the initial estimation, indicating that trade flows, outputs, and expenditures have remained constant. The derived fixed effects, including MRTs, align well with both the baseline scenario and the hypothetical scenarios modeled by the dummy variables. When the new directional fixed effects are added to the model, the baseline outputs and expenditures are used to figure out the counterfactual MRTs, which are shown in (6) and (7).

$$\left[\hat{\Pi}_{i,t}^{1-\sigma} \right]_{CDL}^{CFL} = \frac{Y_i}{\exp(\hat{\pi}_{i,t}^{CFL})} * E_{R,t} \quad (6)$$

$$\left[\hat{P}_j^{1-\sigma} \right]_{CDL}^{CFL} = \frac{E_{j,t}}{\exp(\hat{\chi}_{j,t}^{CFL})} * \frac{1}{E_{R,t}} \quad (7)$$

The differences between the baseline and conditional counterfactual indexes show how the chosen trade policy variables would change the general equilibrium. The change in real GDP is used to measure economic welfare.

Step 3 Full endowment scenario

This step involves calculating the "Full Endowment" General Equilibrium indexes, which include changes in Multilateral Resistance Terms (MRTs), output, expenditure, and other relevant factors. These calculations are essential for

translating the conditional general equilibrium effects of MRTs into first-order changes in product prices, as detailed in (8). This process allows for a deeper understanding of how variations in trade policies and economic conditions can impact market prices and overall economic welfare.

$$\Delta P_{i,t}^{CFL} = \frac{P_{i,t}^{CFL}}{P_{i,t}} = \left[\frac{\exp(\hat{\pi}_{i,t}^{CFL}) | E_{R,t}^{CFL}}{\exp(\hat{\pi}_{i,t}) | E_{R,t}} \right]^{\frac{1}{1-\sigma}} \quad (8)$$

To capture the impact of changes in product prices on trade flows, the analysis considers the endogenous response in output/income $Y_{i,t}^{CFL} = \frac{P_{i,t}^{CFL}}{P_{i,t}} * Y_{i,t}$ and ex-

$$\text{penditure } E_{j,t}^{CFL} = \frac{P_{j,t}^{CFL}}{P_{j,t}} * E_{j,t} \quad (9).$$

$$X_{ij,t}^{CFL} = \frac{[\hat{t}_{ij}^{1-\sigma}]^{CFL}}{\hat{t}_{ij,t}^{1-\sigma}} * \frac{Y_{i,t}^{CFL} E_{j,t}^{CFL}}{Y_{i,t} E_{j,t}} * \frac{\Pi_{i,t}^{1-\sigma}}{[\Pi_{i,t}^{1-\sigma}]^{CFL}} * \frac{P_{j,t}^{1-\sigma}}{[P_{j,t}^{1-\sigma}]^{CFL}} * X_{ij,t} \quad (9)$$

where $\hat{t}_{ij}^{1-\sigma}$ —matrix of baseline (BLN) trade cost computed as:

$$[\hat{t}_{ij,t}^{1-\sigma}]^{BLN} = \exp[\hat{\mu}_{ij} + t_{ij,t} \hat{\beta}] \quad \text{and, } [\hat{t}_{ij,t}^{1-\sigma}]^{CFL} \text{ —matrix of counterfactual (CFL) bi-lateral trade cost computed as: } [\hat{t}_{ij,t}^{1-\sigma}]^{CFL} = \exp[\hat{\mu}_{ij} + t_{ij,t} \hat{\beta}].$$

Upon reaching convergence, the most recent set of fixed effects can be utilized alongside the original and updated (representing full general equilibrium) data on output and expenditure. These components are then employed to construct the multilateral resistance's full endowment general equilibrium values (10) and (11):

$$[\Pi_{i,t}^{1-\sigma}]_{FULL}^{CFL} = \frac{Y_{i,t}^{FULL}}{\exp(\hat{\pi}_{i,t}^{FULL})} * E_{R,t}^{FULL} \quad (10)$$

$$[P_{j,t}^{1-\sigma}]_{FULL}^{CFL} = \frac{E_{j,t}^{FULL}}{\exp(\hat{\chi}_{j,t}^{FULL})} * \frac{1}{E_{R,t}^{FULL}} \quad (11)$$

Using the iterative procedure, the latest PPML estimates of exporter-time and import-time fixed effects $\hat{\pi}_{i,t}^{FULL}$ and $\hat{\chi}_{j,t}^{FULL}$ are obtained for the “Full Endowment” scenario. The corresponding output and expenditure values, along with other endogenous variables, can be easily computed using (12), (13), (14) and (15).

$$\frac{P_{i,t}^{FULL}}{P_{i,t}^{BLN}} = \left[\frac{\exp(\hat{\pi}_{i,t}^{FULL}) | E_{R,t}^{FULL}}{\exp(\hat{\pi}_{i,t}^{BLN}) | E_{R,t}^{BLN}} \right]^{\frac{1}{1-\sigma}} \quad (12)$$

$$Y_{i,t}^{FULL} = \frac{P_{i,t}^{FULL}}{P_{i,t}^{BLN}} * Y_{i,t}^{BLN} \quad (13)$$

$$E_{i,t}^{FULL} = \phi_i Y_{i,t}^{FULL} \quad (14)$$

$$X_{ij,t}^{FULL} = \frac{Y_{i,t}^{FULL} E_{j,t}^{FULL}}{Y_{i,t}^{FULL}} \frac{(\hat{t}_{ij}^{CFL})^{1-\sigma}}{[\hat{\Pi}_{i,t}^{1-\sigma}]_{FULL}^{CFL} [\hat{P}_{j,t}^{1-\sigma}]_{FULL}^{CFL}} \quad (15)$$

4. Variables and Data

Although panel data, which tracks changes over time, would typically be ideal for observing welfare changes, its application to a large number of countries presents significant challenges. These challenges stem from data limitations and the computational complexities associated with managing numerous fixed effects across such a broad dataset. To overcome these issues, the analysis instead uses cross-sectional data derived from (Herman, 2023). This dataset comprehensively captures both international and domestic trade flows for the year 2018, allowing the analysis to explore the potential impact of the WTO accession on Ethiopia's total exports and welfare.

Table 1 provides summary statistics that highlight the key characteristics of the dataset used in the analysis. These statistics contains trade values incorporates both international and domestic trade data, offering a comprehensive view of trade dynamics. The dataset includes 29,756 bilateral trade flows, representing the trade volume between various country pairs. These bilateral trade flows have a mean value of 545 million US dollars, indicating the average trade value between countries. The standard deviation reveals considerable variability in these trade flows, reflecting significant fluctuations in trade values globally. Additionally, the base model used in the analysis shows strong explanatory power, capturing approximately 89% of the observed variation in bilateral trade flows when estimated using PPML estimator (**Table 2**). This high R-squared value indicates that the model effectively identifies the key factors influencing trade flows, offering a robust framework for analysing trade dynamics among the countries under study.

Table 1. Summary statistics of the cross-sectional data (2018).

Variable	Observation	Mean	Standard deviations	Minimum	Maximum	Sources
Trade flow (MUSD)	29,756	545.44	5862.42	0.00	444,407.20	Herman, 2023
RTA, dummy (0, 1)	29,929	0.17	0.38	0.00	1.00	Larch's RTA
WTO, dummy (0, 1)	29,929	0.73	0.45	0.00	1.00	WTO database
Distance	29,929	8.76	0.82	0.63	9.89	CEPII database
Contiguity, dummy (0, 1)	29,929	0.02	0.13	0.00	1.00	CEPII database
Common language, dummy (0, 1)	29,929	0.15	0.35	0.00	1.00	CEPII database
Common colony, dummy (0, 1)	29,929	0.10	0.30	0.00	1.00	CEPII database

Source: Authors' calculations.

5. Estimations and Results

5.1. Estimation of the Baseline

The baseline of the structural gravity model applied in this study is expressed by (16).

$$Trade_{ij} = \exp\left(\pi_i + \chi_j - 0.728(LNDIST_{ij}) + 0.345CNTG_{ij} + 0.255LANG_{ij} + 0.452CLNY_{ij} + 0.296RTA_{ij} - 0.958WTO_{ij}\right)\varepsilon_{ij} \quad (16)$$

The initial bilateral trade flow is calculated using the PPML estimator, which includes variables like WTO membership, participation in Regional Trade Agreement (RTA), distance between trading partners, contiguity, shared language, and historical colonial ties. The estimate of trade flow for 2018, as shown in **Table 2**, is based on (16) and offers insights into the effects of these variables on trade flows between countries during that period.

Table 2. Estimated values of trade cost functions.

Variables	(1) OLS		(2) PPML	
RTA	0.552 (0.048)**	73.67%	0.296 (0.067)**	34.45%
wto	0.213 (0.213)	–	–0.958 (0.330)**	–61.63%
Distance	–1.564 (0.029)**	–1.56%	–0.728 (0.036)**	–0.728
Contiguity	0.630 (0.124)**	87.76%	0.345 (0.071)**	41.20%
Language	0.732 (0.057)**	107.92%	0.225 (0.071)**	25.23%
Colonial ties	1.054 (0.075)**	186.91%	0.452 (0.147)**	57.15%
<i>Observation</i>	21536		29756	
Exporter-time-fixed effects	Yes		Yes	
Importer-time-fixed effects	Yes		Yes	
Exporter-importer fixed effects	No		No	
R-Squared	0.757		0.889	

Source: Authors' calculations. Notes: This analysis's estimates are based on intra- and international trade flow data from 2018. For column (1), OLS is the estimation technique used, while for column (2), PPML. To account for MRTs, all estimations include importer-time and exporter-time fixed effects; however, the precise numbers are not disclosed here. Statistically significant variables are expressed as percentages (%), and standard errors are shown in parenthesis, clustered by country pair. The way to interpret the p-values is as follows: "+p < 0.10," "*p < 0.05," and "***p < 0.01," which denote the significance level of the estimates.

The analysis begins with an estimation of the trade flow function using OLS based on 2018 data, presented in column (1) of **Table 2**. The results show that the

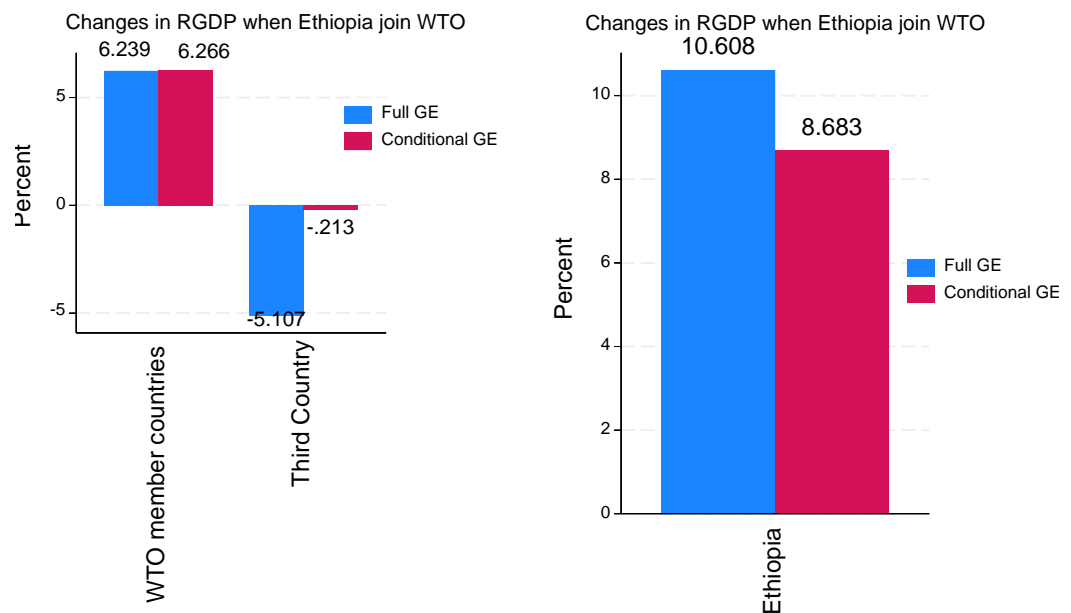
majority of the bilateral trade flow variables, such as distance, shared language, and trade agreements, are statistically significant and behave as expected, reinforcing the model's reliability. However, the variable representing WTO membership does not follow the anticipated trend.

In column (2) of **Table 2**, the analysis shifts to using the PPML estimator. This method better accounts for the heteroscedasticity and zero-trade flows commonly seen in trade data. The results confirm the robustness of the model, with all bilateral trade costs showing strong statistical significance. Nevertheless, the WTO membership variable again deviates from expectations, revealing a negative impact on trade flows among member countries. Specifically, the coefficient indicates that WTO membership is associated with a 61.63% reduction in bilateral trade flows, suggesting potential inefficiencies or adverse effects tied to WTO policies.

The analysis then broadens its scope to consider the macroeconomic consequences of Ethiopia potentially joining the WTO. This section delves into how such an accession might influence the country's export performance and overall economic growth. By examining the equilibrium effects, the study provides insights into the interplay between Ethiopia's integration into global trade frameworks and its broader economic health. The findings underscore the complex relationship between WTO membership and national economic outcomes, emphasizing the need for careful consideration of trade policies in shaping Ethiopia's future.

5.2. Conditional and Full Endowment General Equilibrium Impact of WTO on the Real GDP of Ethiopia

Graph 1 provides a detailed analysis of the potential economic impact that Ethiopia might experience upon joining the WTO. The analysis is grounded in two



Source: Authors' calculations.

Graph 1. Conditional and Full Endowment Real GDP when Ethiopia Joins WTO.

distinct economic models: full endowment general equilibrium and conditional general equilibrium.

In the full endowment general equilibrium scenario, the country's real GDP is expected to rise by 10.608%, which is indicative of a profound economic transformation. This projection suggests that Ethiopia could experience rapid and significant economic growth, characterised by accelerated industrialisation, increased foreign investments, and enhanced productivity. The substantial growth is also likely to bring about broader economic prosperity, improving the standard of living for a significant portion of the population.

Conversely, the conditional general equilibrium scenario presents a more conservative growth rate of 8.683%. While this is slightly lower, it still represents a positive and notable growth trajectory. The more measured increase in Real GDP may be attributed to various factors, such as the need for sector-specific adjustments, challenges in transitioning to the new trade environment, or different policy responses that might be required to effectively manage this transition.

Both scenarios, despite their differences in projected growth rates, underscore the significant potential benefits of Ethiopia's WTO membership. This move could enhance the country's global competitiveness, open up new and diversified markets, and lay a foundation for sustainable development. The economic integration facilitated by WTO membership may also enable Ethiopia to align more closely with global trade norms, thus attracting more international trade partnerships and fostering long-term economic stability and growth.

Ethiopia's potential accession to the WTO holds significant implications for global economic dynamics, particularly in terms of Real GDP growth across different countries. Should Ethiopia become a member, WTO countries are expected to see a modest but positive impact on their real GDP growth rates, with increases projected at 6.266% under a conditional general equilibrium scenario and 6.239% in a full endowment scenario, indicating enhanced economic activity as a result of Ethiopia's participation. Conversely, non-member countries, often referred to as third countries, may face a decline in their real GDP growth rates, with decreases anticipated at 5.107% in the full endowment scenario and 0.213% in the conditional scenario (**Graph 1**).

As stated in **Table 3**, the global economy is expected to experience an average

Table 3. Conditional and full endowment general equilibrium effects of Ethiopia WTO accession, measures from the changes in total exports and real GDP.

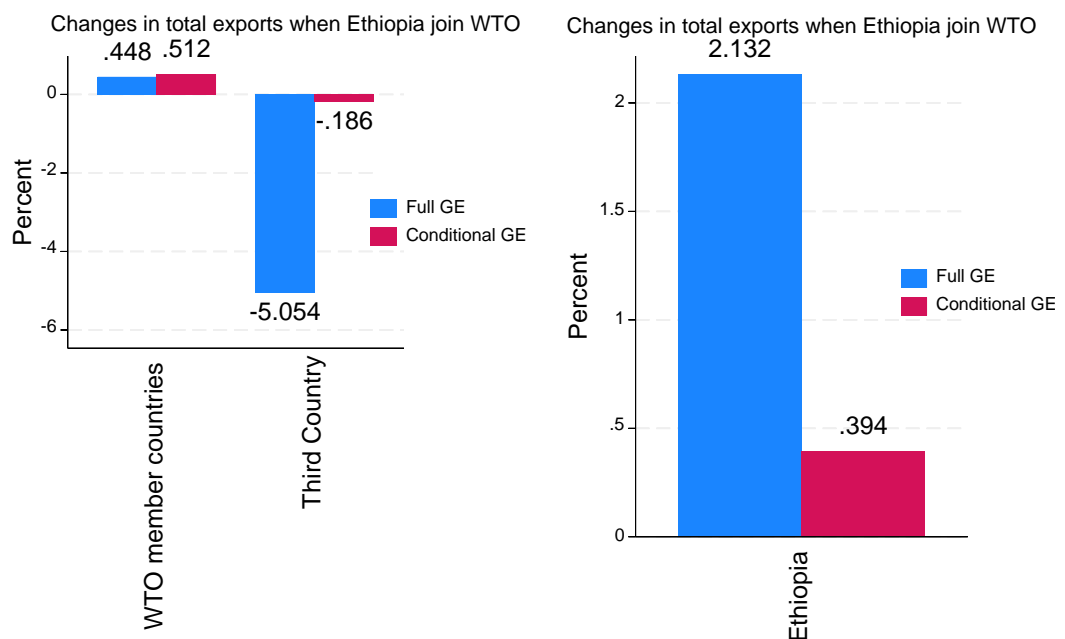
Country	Conditional GE		Full Endowment GE	
	% exports	%Δ real GDP	% exports	%Δ real GDP
WTO member countries	0.512	6.266	0.448	6.239
Third Countries	-0.186	-0.213	-5.054	-5.107
World average	0.411	5.33	-0.347	4.599

Source: Authors' calculations.

real GDP gain of 5.330% in the conditional general equilibrium scenario and 4.599% in the full endowment scenario. These varying impacts underscore the intricate and interconnected nature of global trade, where the accession of a new member like Ethiopia can yield both positive and negative economic effects across different regions and countries.

5.3. Conditional and Full Endowment GE Impact of WTO Accession on Total Export of Ethiopia

Graph 2 shows how total exports are expected to change for Ethiopia, WTO member countries, and non-member countries in two different situations: full endowment GE and conditional GE. These situations relate to Ethiopia's potential membership in the WTO. Ethiopia is expected to gain a lot from joining the WTO. Their total exports are expected to rise by 2.132% in the full-endowment GE scenario and 0.394% in the conditional GE scenario. This shows how joining the WTO is beneficial when all economic factors and endowments are taken into account. In contrast, existing WTO members are expected to see a more modest export growth of 0.448% under Full GE and 0.512% under Conditional GE, reflecting their already established and mature economies within the WTO framework. Non-member countries, on the other hand, are likely to face a significant decline in total exports, with anticipated decreases of 5.054% in the full endowment GE scenario and 0.186% in the conditional GE scenario, suggesting that these countries may suffer from increased competition or trade barriers following Ethiopia's WTO accession. Interestingly, **Table 3** reveals a global total export gain of 0.411% under the conditional GE scenario but a loss of 0.347% under the full



Source: Authors' calculations.

Graph 2. Conditional and full endowment of total export when Ethiopia joins WTO.

endowment GE scenario, which contradicts the theory that global total exports should generally improve with trade integrations like Ethiopia joining the WTO. Overall, while Ethiopia's WTO accession is likely to significantly enhance its total export performance, offering smaller gains to existing WTO members and the global market, it may negatively impact non-member countries, highlighting the complex and varied effects of global trade integration.

6. Conclusion

Using a general equilibrium framework, the study explored the potential effects of Ethiopia's accession to the WTO on its total export levels and Real GDP growth. The results indicate that WTO membership could provide substantial benefits to Ethiopia's economy by improving its global competitiveness and promoting sustainable economic development. In the "full endowment" scenario, where all resources are fully utilised, Ethiopia's real GDP is expected to increase by 10.608%. This scenario suggests that the country's economic potential would be significantly enhanced through better resource allocation and greater market access. In the "conditional general equilibrium" scenario, which considers specific constraints on resource use, the real GDP is projected to rise by 8.683%.

Additionally, the study found that WTO accession could positively impact Ethiopia's total exports, with an increase of 2.132% under the full endowment scenario and 0.394% in the conditional general equilibrium scenario. These findings underscore the substantial economic benefits that WTO membership could bring to Ethiopia, highlighting its transformative potential in fostering economic growth, industrialisation, and increased participation in global trade.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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