Journal of Applied Economic Sciences
Volume XX, Fall, Issue 3(89), 2025

Assessing the Trade and Welfare Impacts of African Continental Free Trade Area (AfCFTA) on Morocco: A Combined Gravity-CGE Analysis

Yassine EL HAJOUI
https://orcid.org/0009-0000-4634-0500
Laboratory of Economic Analysis and Modelling
Mohammed V University in Rabat, Morocco
yassine.elhajoui@um5r.ac.ma

Nabil EL BAOUCHARI
https://orcid.org/0000-0001-6826-9899
Laboratory of Economic Analysis and Modelling
Mohammed V University in Rabat, Morocco
nabil.elbaouchari@um5s.net.ma

Zineb OTMANI
https://orcid.org/0000-0001-8100-9469
Laboratory of Economic Analysis and Modelling
Mohammed V University in Rabat, Morocco
Zineb.otmani@um5s.net.ma

Ayoub KHARBOUCHE
https://orcid.org/0009-0005-0103-2893
Laboratory of Economic Analysis and Modelling
Mohammed V University in Rabat, Morocco
ayoub.kharbouche@um5s.net.ma

Badr ELHAMZAOUI
https://orcid.org/0009-0008-7355-0931
Laboratory of Economic Analysis and Modelling
Mohammed V University in Rabat, Morocco
Badr.elhamzaoui@um5r.ac.ma

Youness EL BAROUDI
https://orcid.org/0009-0003-0825-2878
Laboratory of Economic Analysis and Modelling
Mohammed V University in Rabat, Morocco
youness_elbaroudi@um5.ac.ma

Article's history:

Received 2nd of August, 2025; *Received in revised form* 29th of August, 2025; *Accepted* 12th of September, 2025; *Available online*: 30th of September, 2025. *Published* as article in the Volume XX, Fall, Issue 3(89), 2025.

Suggested citation:

El Hajoui, Y., El Baouchari, N., Otmani, Z., Kharbouche, A., Elhamzaoui, B., & El Baroudi, Y. (2025). Assessing the Trade and Welfare Impacts of African Continental Free Trade Area (AfCFTA) on Morocco: A Combined Gravity-CGE Analysis. *Journal of Applied Economic Sciences*, Volume XX, Fall, 3(89), 463 – 490. https://doi.org/10.57017/jaes.v20.3(89).07

Abstract:

On May 30, 2019, the African Continental Free Trade Area (AfCFTA) came into effect, marking a significant milestone for African leaders in establishing the largest trading area since the founding of the World Trade Organization. Despite numerous studies on its impacts across the continent, limited attention has been devoted to Morocco.

This study evaluates Morocco's trade potential with AfCFTA member states. It examines the economic effects of the agreement using two complementary methods: a gravity model based on CEPII data to explore trade potential and a CGE framework based on the PEP 1.1 model calibrated with SAM 2019 to assess the overall impacts on the Moroccan economy. Results suggest Morocco's simulated exports and imports with Africa could increase by 72% and 65%, respectively. Yet, overall macroeconomic gains are modest: exports rise by only 0.80% and imports by 0.93%. GDP growth is projected to remain limited at 0.76% (basic prices) and 0.55% (market prices), with minimal income improvement for households (0.65%), firms (0.77%), and the government (0.05%). These results underscore the fragility of South-South trade and the need to reinforce North-South cooperation to enhance Morocco's economic benefits from AfCFTA.

Keywords: computable general equilibrium model (CGE); gravity model; trade potential; African Continental Free Trade Area (AfCFTA), Morocco.

JEL Classification: C53; C68; F14; F15; F17; O55.

Introduction

On March 21, 2018, during the 10th Extraordinary Summit of the African Union, nearly all African nations signed the agreement establishing the African Continental Free Trade Area (AfCFTA), marking the creation of the largest free trade area in the world. This agreement united 54 countries and 1.3 billion people, with a combined gross domestic product (GDP) estimated to be 3.4 trillion US dollars.

The AfCFTA aims to address Africa's long-standing economic fragmentation. Despite statutory tariffs being reduced to less than 5% for about half of the countries, trade barriers remain high across the continent, especially in sensitive sectors. Numerous other challenges hinder continental economic integration, including non-tariff barriers, weak and fragmented rules designed to encourage investment and competition, and inadequate institutions, such as customs management, to facilitate trade efficiently.

Indeed, the AfCFTA represents a central initiative of the African Union's Agenda 2063, which outlines the vision and development path of the continent for the next five decades. This initiative aims specifically to strengthen the integration of African markets and significantly increase the volume of intra-African trade.

This study aims to estimate Morocco's trade potential with the other 53 African countries and assess the impact of establishing a free trade area encompassing all 54 nations on the Moroccan economy. To accomplish this, two complementary approaches were employed: a gravity model utilizing CEPII trade data and a computable general equilibrium (CGE) model based on the 2019 HCP Social Accounting Matrix for Morocco.

Regarding the first approach, it is important to note that the gravity model has become a widely used tool for analysing international trade due to its numerous applications. Although we will not detail all its applications here, it is important to recall that the use of gravity principles in economics was initiated by researchers in spatial economics. Reilly (1929) employed it to examine the areas of influence of urban agglomerations; Tinbergen (1962) later integrated the gravity model into the econometric analysis of international trade.

While the gravity model has been widely applied in Europe and Latin America, its use remains limited in African countries. The first known use of the gravity model in Africa was by Foroutan (1993), aiming to quantify potential trade within Sub-Saharan Africa (SSA) and compare it with observed trade levels. His conclusion suggests that intra-SSA trade is limited due to structural factors. Some, like Naudet (1993), argue that the low level of trade results from the underutilization of trade opportunities by countries in the region.

Laporte (1998) applied the model to all countries of the Economic Community of West African States (ECOWAS), highlighting how the West African Economic and Monetary Union (WAEMU) could serve as a driver of sustainable development in the region. To better understand the factors influencing intra-African trade, Elbadawi (1997) adopted the traditional gravity model and included African regional groupings in his analysis. He paid particular attention to the impact of monetary unions on regional trade, following the work of Rose (2002). Rose demonstrated that, at comparable levels of development, countries in a monetary union have trade volumes 3.3 times larger ($.2e^{1.2} \approx 3.3$) than countries outside such unions. However, these results should be qualified considering Nitsch (2002), who analyzed the same sample with corrections for methodological differences.

On the other hand, the second approach, the CGE models, are widely used in the empirical analysis of trade policy. In the case of the AfCFTA, for instance, several studies are notable:

Chauvin, Nicola, & Ramos (2016) applied the MIRAGE-CGE model to study the impacts of tariff reductions, non-tariff barriers (NTBs), and trade costs. They also used microsimulations to assess the effects of price and wage changes on household welfare in six Sub-Saharan African countries.

Vanzetti et al. (2018) used a standard GTAP model and applied three shocks to measure the quantitative impacts of the AfCFTA: (1) complete elimination of tariffs; (2) elimination of tariffs with exemptions for 5% of sensitive products; and (3) reduction of NTBs without reducing tariffs. Chauvin et al. (2018) adopted a more gradual approach, first eliminating all tariffs on agricultural goods, then on all manufactured goods, followed by a 50% reduction in NTBs and a 30% reduction in transaction costs for all goods. Their results show that eliminating all applied tariffs could increase African trade by up to 3.6 billion US dollars annually, with labour demand, skilled and unskilled, rising significantly, particularly in Kenya, Nigeria, and South Africa. However, the effects vary across the continent; some countries, such as Burkina Faso, Malawi, Mozambique, and Rwanda, could experience reductions in welfare when agricultural tariffs are removed. Introducing a 5% exemption for sensitive products reduces trade gains by more than 60%.

Mevel, Simon, & Karingi (2012) developed a model to assess the potential impacts of the AfCFTA by considering the complete elimination of customs duties between African countries. They observed that trade creation effects outweighed trade diversion effects by using trade data and analytical tools, including the GTAP version 7 database and the dynamic, multisectoral, multi-country MIRAGE model. Their projections suggest that intra-African trade would increase by 52.3% (34.6 billion US dollars) between 2013 and 2022, with industrial exports rising by 53.3% (27.9 billion US dollars). Real wages for both skilled and unskilled workers are expected to increase, with slight employment shifts from agriculture to non-agriculture. Trade facilitation measures are crucial to optimising the AfCFTA's impact on industrialisation and ensuring benefits for all member states.

A joint ILO-UNCTAD (2013) report evaluated the effects of the AfCFTA on African economies using a dynamic and recursive MIRAGE model with GTAP version 7 data. Considering only the goods protocol, the baseline scenario indicated a 50% increase in intra-African trade.

Mureverwi & Brian (2016) applied the dynamic GTAP model (Gdyn) to simulate the effects of 100% tariff liberalisation on goods within the AfCFTA. Based on GTAP 8.1 data, their results indicate that all African countries benefit to varying degrees through increased labour demand, capital accumulation, terms of trade improvements, and efficiency gains in resource allocation. Fifteen of the seventeen countries studied experienced substantial welfare gains. Regional powers, including South Africa, Kenya, and Nigeria, emerged as the principal beneficiaries, although some countries, such as Nigeria, Tanzania, and Zimbabwe, suffered significant revenue losses.

The Economic Commission for Africa (ECA, 2018) analysed updated trade liberalisation scenarios for goods under the AfCFTA. The study projected GDP and export growth under all scenarios using the MIRAGE model with GTAP version 9.2 data and the Market Access Map (MAcMap-HS6). Intra-African trade could rise by 15% – 25% (50 – 70 billion US dollars) by 2040. Tariff elimination alone could increase intra-African trade shares from 40% to over 50%, with industrial products increasing by 25%– 30% (36 – 44 billion US dollars), agricultural products by 20%–30% (9.5–17 billion US dollars), and energy/mining by 5% – 11% (4.5 – 9 billion US dollars).

Abrego (2019) demonstrated that tariff reductions under the AfCFTA could increase welfare by 2.1% on average, with nine countries gaining 5% or more.

In Morocco, Raouf et al. (2021) use a static CGE model based on the 2018 SAM (PEP1-1 framework) to assess the ex-ante impact of the AfCFTA. Their analysis reveals substantial trade creation with African partners, moderate trade diversion from others, and significant export gains, particularly in agriculture, fishing, and food industries (12% – 24%). Imports from Africa also rise, notably in extractive industries and agriculture. The study further reports declining prices (up to 7.64%), rising real wages across all skill levels, and higher household income and consumption, underscoring AfCFTA's potential to boost welfare and integration. Complementing these findings, Bouët et al. (2021) use the MIRAGRODEP global CGE model to explore scenarios up to 2035, highlighting that tariff removal and trade facilitation enhance trade, expand industrial and agricultural exports, and deliver welfare gains, especially when paired with infrastructure, logistics, and industrial policies.

While models and results vary, they converge on a key conclusion: Africa offers substantial opportunities for a mutually beneficial free trade area.

The remainder of the paper is organised as follows: The first section details the methodology and econometric results of the gravity model. The second section presents the justification for complementarity analysis. The second section presents the CGE modelling and simulation outcomes. Finally, we provide economic policy recommendations in the concluding section.

1. Examination of the Determinants of Trade Flows Using a Gravity Model

1.1 Theoretical Foundations and Empirical Justification of the Gravity Model

The concept of gravity theory is inspired by the fundamental law of attraction between bodies, where the attraction between two objects is directly proportional to their respective masses and inversely proportional to the square of the distance between them. By analogy to Newtonian physics, Tinbergen (1962) demonstrated that bilateral trade between two countries is approximately proportional to the economic weight (measured by GDP, GNP, etc.) of the two respective countries and inversely proportional to their geographical distance[1].

$$C_{ij} = G * \frac{Y_i * Y_j}{D_{ij}}$$

where: G: Gravitational constant; C_{ij}: Bilateral trade between *i* and *j* (bilateral export or import); Y_i et Y_j: the respective GDPs of countries *i* and j; D_{ij}: the distance between countries *i* and *j.*

However, this equation has restrictive limitations. Often, in econometric studies, Tinbergen (1962) was able to consider a more general form of this model in 1962:

$$C_{ij} = G * \frac{{Y_i}^{\beta_1} * {Y_j}^{\beta_2}}{{D_{ij}}^{\beta_3}}$$

where β_1, β_2 and β_3 are positive coefficients

The level of development also significantly influences trade, thereby justifying the inclusion of population or, alternatively, GDP per capita in the previous specification:

$$C_{ij} = G * \frac{{Y_i}^{\beta_1} * {Y_j}^{\beta_2} * {pop_j}^{\beta_4} * {pop_i}^{\beta_5}}{{D_{ij}}^{\beta_3}}$$

The coefficients associated with population (β_4 and β_5) present some ambiguity. For the exporting country, the sign of the estimated coefficient on population depends either on the idea that a country exports relatively less when it is large (absorption effect) (Leamer and Stern 1970) or on the idea that a large country exports more than a small country (economies of scale effect) (Brada and Mendez 1983). Similarly, the coefficient for the importing country's population can be either positive or negative for similar reasons. In conclusion, population can be viewed both as a significant source of trade opportunities between partners and as a reflection of some level of self-sufficiency in terms of factor endowments (labour, physical capital, and human capital).
The log-linear form of this model is as follows:

$$\ln(C_{ij}) = \ln(G) + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_4 \ln(pop_j) - \beta_3 \ln(D_{ij}) + \beta_5 \ln(pop_i) + e^{C}_{ij,t}$$

In empirical work, it is rare for the previous model to be estimated in this specific configuration. Depending on the objectives defined by the authors, several variables, often referred to as dummy variables, are typically added to capture the specific effects of bilateral trade.

In this context, to identify the factors influencing continental trade, we will develop an augmented gravity model incorporating variables related to cultural affinities and regionalism:

- indicators of 'cultural' factors such as common history (notably former colonial ties) ;
- common language;
- common borders, etc.

[1] Transport costs are usually captured by the distance between co-traders: we can say that distance has a negative correlation with the volume of trade.

When two nations have frequent interactions between their populations, share a language, or have cultural proximity, it significantly boosts their trade exchanges. This proximity facilitates the alignment of consumption patterns and the way business is conducted:

$$\ln(C_{ij}) = \ln(G) + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_4 \ln(pop_j) + \beta_5 \ln(pop_i) + \beta_6 Lang_{ij} - \beta_3 \ln(D_{ij}) + e^{C}_{ij,t}$$

This variable $Lang_{ij}$ takes the value 1 when the partner countries share a common language and 0 otherwise. We expect a positive value for the coefficient β_7 (cultural proximity promotes bilateral trade).

Borders have garnered significant empirical interest, with their role being ambiguous. However, in general, the presence of a common border between two nations enhances their bilateral trade, especially when economic activities transcend these political boundaries.

$$\ln(C_{ij}) = \ln(G) + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_4 \ln(pop_j) + \beta_5 \ln(pop_i) + \beta_6 Lang_{ij} + \beta_7 Front_{ij} - \beta_3 \ln(D_{ij}) + e^{C}_{ij,t}$$

The variable $ColonCom_{i,j}$, which indicates shared colonization between countries i and j after 1945, takes the value 1 in this case and 0 otherwise. Regarding the impact of this variable, the literature does not reach a consensus: Romer and Frankel (1999) observe a negative elasticity, while Ortega et Peri (2014) report the opposite.

$$\ln(C_{ij}) = \ln(G) + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_4 \ln(pop_j) + \beta_5 \ln(pop_i) + \beta_6 Lang_{ij} + \beta_7 Front_{ij} + \beta_8 colncom_{ij} - \beta_3 \ln(D_{ij}) + e^{C}_{ij,t}$$

Thus, our model can be expressed as:

$$\ln(X_{ij}) = \ln(G) + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_4 \ln(pop_j) + \beta_5 \ln(pop_i) + \beta_6 Lang_{ij} + \beta_7 Front_{ij} - \beta_3 \ln(D_{ij}) + e^{X}_{ij,t} \quad (1)$$

$$\ln(M_{ij}) = \ln(G) + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_4 \ln(pop_j) + \beta_5 \ln(pop_i) + \beta_6 Lang_{ij} + \beta_7 Front_{ij} + \beta_8 coloncom_{ij} - \beta_3 \ln(D_{ij}) + e^{M}_{ij,t} \quad (2)$$

where: $X_{ij,t}$: Exports from country *i* to country j; $M_{ij,t}$: Imports by country *i* from country j; $pop_i(\pm)$: Population of country I; $pop_j(\pm)$: Population of country j; $D_{ij,t}(-)$: Distance between the origin country i and the destination country j; $PIB(+)$: Gross Domestic Product ; $LangCom(+)$: A dummy variable for sharing a common language (official and/or ethnic); $\mathrm{FrontCom}(+)$: A dummy variable for whether or not a border is shared between two countries; $\mathrm{ColonCom}(\pm)$ A dummy variable for shared colonization between two countries.

1.2 Estimation of the Model

Data Sources

The data for this study were obtained from the archives of the Centre d'Études Prospectives et d'Informations Internationales (CEPII) (Conte et al., 2022). The analysis period covers 2000 to 2019. The gravity model is estimated using data from all African countries, yielding 57,240 observations (54 countries, 2,862 bilateral trade flows, and 20 periods), thereby providing a strong empirical basis for the analysis. Appendix 2 presents the list of ISO-3 country codes for African countries used in the model.

Estimation Method

Before proceeding with the estimation, it is necessary to determine the appropriate estimation method for each model. To find the most suitable estimation method for each model, follow the steps outlined in the diagram of Appendix 1.

We apply the $Honda$ test on the gravity model databases for exports and imports, and obtain the results described in the Table 1:

Table 1: Honda Test for the Existence of Individual-Specific Effects

	LM-statistic	Critical value	p-value	Decision
$\text{model\_ln}(X_{i,j})$	$\text{LM} = 275{,}11 \gg$	$\chi^2_5 = 11{,}07$	0.0000	$H_0 Rejet$
$\text{model\_ln}(M_{i,j})$	$\text{LM} = 304{,}36 \gg$	$\chi^2_5 = 11{,}07$	0.0000	$H_0 Rejet$

Source: authors using R-Studio

The results in Table 1 indicate that H_0 is rejected for both models, as the calculated statistics ($LM_x = 275.11$ and $LM_m = 304.36$) exceed the theoretical chi-squared values ($\chi^2_{52,x} = 11.07$ and $\chi^2_{52,m} = 11.07$). This confirms the existence of individual-specific effects. Similarly, the Hausman test was applied to the commercial and migratory gravity model datasets, with results summarized in the following table:

Table 2: Results of the Hausman Specification Test

	The export gravitational model: $\ln(X_{ij})$					
	$Fixed$	$Random$	H-statistic	Critical value	p-value	Decision
$\ln(Y_i)$	$\breve{\beta}_{1;Within} = 0{,}54$	$\beta_{1MCG} = 0{,}66$	$H = 161{,}04 \gg$	$\chi^2_5 = 11{,}07$	0.0000	$H_0 Reffuse$
$\ln(Y_j)$	$\breve{\beta}_{2;Within} = 0{,}57$	$\beta_{2MCG} = 0{,}39$				
$\ln(pop_i)$	$\breve{\beta}_{3;Within} = 0{,}02$	$\beta_{3MCG} = 0{,}16$				
$\ln(pop_j)$	$\breve{\beta}_{4;Within} = -0{,}4$	$\beta_{4MCG} = 0{,}05$				
$\ln(D_{ij})$	$\breve{\beta}_{5;Within} = -3{,}16$	$\beta_{5MCG} = -2{,}02$				
	The import gravitational model: $\ln(M_{ij})$					
	$Fixed$	$Random$	H-statistic	Critical value	p-value	Decision
$\ln(Y_i)$	$\breve{\beta}_{1;Within} = 0{,}5$	$\beta_{1MCG} = 0{,}6$	$H = 213{,}93 \gg$	$\chi^2_5 = 11{,}07$	0.0000	$H_0 Reffuse$
$\ln(Y_j)$	$\breve{\beta}_{2;Within} = 0{,}58$	$\beta_{2MCG} = 0{,}37$				
$\ln(pop_i)$	$\breve{\beta}_{3;Within} = -0{,}39$	$\beta_{3MCG} = 0{,}02$				
$\ln(pop_j)$	$\breve{\beta}_{4;Within} = -0{,}10$	$\beta_{4MCG} = 0{,}26$				
$\ln(D_{ij})$	$\breve{\beta}_{5;Within} = 6{,}72$	$\beta_{5MCG} = -1{,}87$				

Source: authors using EViews 12

The Hausman test presented in the Table 2 yields values of 161.04 for the export model and 213.93 for the import model, both exceeding the critical chi-square value of 11.07 (5% significance level, 5 degrees of freedom). Consequently, we reject the null hypothesis of no correlation between random effects and explanatory variables in both models. Hence, the random-effects estimator is biased and inconsistent, whereas the within estimator remains consistent and preferred. For the fixed-effects model residuals tests, the Jarque-Bera test provides the following result:

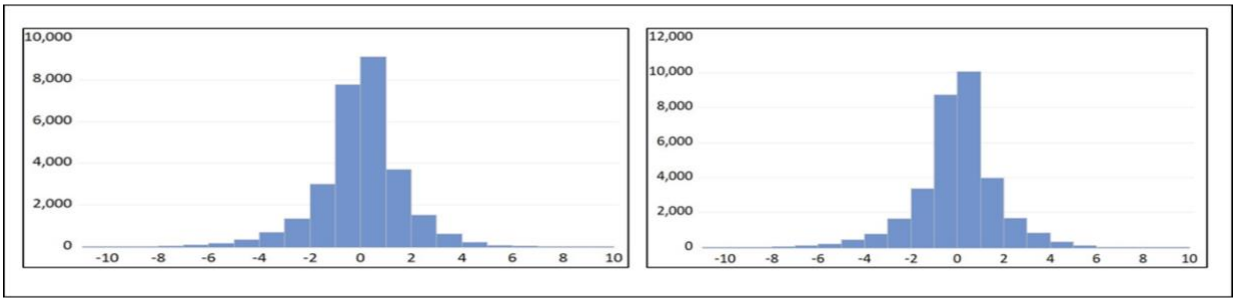
Table 3: Results of the Jarque-Bera Normality Test

	JB-statistic	Critical value	p-value	Decision
$\ln(X_{ij})$	$JB = 11185{,}35 \gg$	$\chi_2^2 = 5{,}99$	0.0000	H_0Rejet
$\ln(M_{ij})$	$JB = 8834{,}6 \gg$	$\chi_2^2 = 5{,}99$	0.0000	H_0Rejet

Source: authors using EViews 12

According to the result described above (Table 3), we observe that the residuals of both models do not follow a normal distribution (see Figure 1):

Figure 1: Distribution of the residuals of the two models X(1) and M(2)



Source: authors using EViews 12

Similarly, the Breusch-Pagan test for heteroscedasticity reports the following result:

According to Table (4), H_0 is rejected for both models as the calculated statistics. Hence, the errors are heteroscedastic. Moreover, the Breusch-Godfrey test reveals autocorrelation in the residuals (table 5) for both models.

Table 4: Results of the Breusch-Pagan test

	BP-statistic	Critical value	p-value	Decision
$\ln(X_{ij})$	$BP = 190{,}43 \gg$	$F(5; 28730) = 4{,}37$	0.0000	$H_0 Rejet$
$\ln(M_{ij})$	$BP = 168{,}97 \gg$	$F(5; 32276) = 4{,}37$	0.0000	$H_0 Rejet$

Source: authors using R-studio

All hypotheses have been violated. To correct heteroscedasticity and inter- and intra-individual correlations, we apply GLS (Generalized Least Squares) estimation to the two fixed-effects models. This method also addresses the non-normality of errors.

Table 5: Results of the autocorrelation test (intra-individual correlation).

	BG-statistic	Critical value	p-value	Decision
$\ln(X_{ij})$	$BG = 1259{,}5 \gg$	$F(5; 28730) = 4{,}37$	0.0000	$H_0 Rejet$
$\ln(M_{ij})$	$BG = 1742{,}1 \gg$	$F(5; 32276) = 4{,}37$	0.0000	$H_0 Rejet$

Source: authors using R-studio

However, GLS has a major limitation: trade between African countries often lacks data for many bilateral relationships, leading to zero trade values. Under a logarithmic specification, these values become indeterminate and cannot be incorporated. Understanding the determinants of such zero flows is crucial. Therefore, we adopt the PPML (Poisson Pseudo Maximum Likelihood) method, as recommended by Silva & Tenreyro (2006), which effectively handles zero trade observations.

Results of the Gravity Models

The results of the gravity model for bilateral trade are presented in Table 6. The results in the first two columns are based on the linear GMM estimator. The results in the last two columns rely on the non-linear PPML (Poisson Pseudo Maximum Likelihood) estimator for gravity models. This approach takes into account the possible over-representation of zero bilateral trade flows, as well as potential heteroscedasticity biases induced by the log-linear model and the logarithmic transformation of zero trade flows.

Table 6: Estimation of the import and export gravity model

	Bilateral Exports		Bilateral Imports	
	MCG lnX	PPML X	MCG lnM	PPML M
$lnPIBj$	1,06 (32,35)*	0,68 (24,34)*	0,57 (13,55)*	0,48 (-18,00)*
$lnPIBi$	0,46 (13,01)*	0,83 (25,85)*	0,08 (2,07)**	1,08 (39,83)*
$lnPOPi$	-0,79 (-6,57)*	-0,033 (-1,01)	-0,401 (-2,41)**	-0,22 (-7,93)*
$lnPOPj$	-1,23 (-10,42)*	-0,098 (-3,70)*	1,10 (6,52)*	-0,072 (-2,99)*
$lndistCap$	-9,30 (-7,98)*	-0,62 (-16,39)*	8,04 (2,57)**	-0,64 (-17,28)*
$ColonCom$	-	-0,86 (-4,03)*	-	-0,33 (-2,15)**
$FrontCom$	-	1,75 (15,43)*	-	1,5 (12,56)*
$LangCom$	-	0,93 (10,81)*	-	0,91 (-10,86)*
$ColonCom^*LangCom$	-	0,20 (0,87)	-	-0,43 (-0,43)*
$FrontCom$ $^*LangCom$	-	-0,97 (-7,12)*	-	-0,66 (-5,10)*
$FrontCom^*ColonCom$	-	-0,31 (-1,05)	-	-0,82 (-3,10)*
$FrontCom^*ColonCom^*LangCom$	-	0,76 (2,39)**	-	1,5 (5,31)*
$constant$	-	-10,37 (-21,78)**	-	-9,65 (18,33)*
$Number\ of\ observations$	28730	51831	32276	51831
R^2	79,62%	27%	79,70%	40%

Note: The numbers in parentheses are the t-statistics; *, ** , and *** denote coefficients significant at the 1%, 5%, 10% levels, respectively.
Source: authors using EViews 12.

The 1st specification (Exportation)

$$\ln(X_{ijt}) = -10.37 + 0.83\ln(Y_{it}) + 0.68\ln(Y_{jt}) - 0.098\ln(pop_{jt}) - 0.033\ln(pop_{it}) + 0.93Lang_{ij} + 1.75Front_{ij} - 0.86Clon_{ij} - 0.62\ln(D_{ijt}) + 0.20Lang_{ij}Clon_{ij} + 0.76Front_{ij}Clon_{ij}Lang_{ij} - 0.31Front_{ij}Clon_{ij} - 0.97Front_{ij}Lang_{ij}.$$

Various lessons emerge from this analysis. First, several variables in both approaches exhibit the expected signs. For instance, export flows between two countries are positively correlated with the GDP of both the origin and destination countries. The elasticities are estimated at 0.83 for the origin country and 0.68 for the destination country. This indicates that a 1% increase in the origin country's GDP raises exports by 0.83%, higher than the 0.68% effect of a similar increase in the destination country's GDP.

The elasticity of distance is estimated at 0.62, meaning a 1% increase in distance reduces bilateral exports by 0.62%. These findings align with results from Romer and Frankel (1999) and Ortega and Peri (2014). Given the relative proximity of African countries, the effect of distance may be amplified by gaps or low-quality road infrastructure.

The destination country's population has a negative and statistically significant effect (1%) on exports from the origin country. This suggests that larger African countries import less due to economies of scale (Brada & Mendez, 1983). In contrast, the origin country's population elasticity is negative but not significant.

Cultural proximity, measured by shared language or ethnicity, boosts bilateral exports. PPML estimates show that if two African countries share the same language, exports increase by a factor of $e^{0.93}$, or approximately 2.53. For instance, if Morocco and South Africa share a language, Moroccan exports to South Africa would rise by 153%. Sharing a common border has a positive effect; the coefficient is $e^{1.75}$, about 5.75, implying neighboring countries trade almost six times more than comparable non-neighboring countries. Conversely, sharing a colonizer after 1945 has a statistically significant negative effect, contrary to expectations. While common borders, shared language, and historical colonization influence trade significantly, interaction terms between indicators are inconsistent and often insignificant. This may be due to geopolitical tensions in Africa, where culturally or geographically close countries may have contested borders, weakening trade relations (Mendez-Parra et al., 2025).

The 2nd specification (Imports):

$$\ln(M_{ijt}) = -9.65 + 1.08\ln(Y_{it}) + 0.48\ln(Y_{jt}) - 0.072\ln(pop_{jt}) - 0.22\ln(pop_{it}) + 0.91Lang_{ij} + 1.5Front_{ij} - 0.33Clon_{ij} - 0.64\ln(D_{ijt}) - 0.43Lang_{ij}Clon_{ij} + 1.5Front_{ij}Clon_{ij}Lang_{ij} - 0.82Front_{ij}Clon_{ij} - 0.66Front_{ij}Lang_{ij}.$$

The second part of the Table 6 presents the results of the gravity model estimated for inter-country imports within the African continent. These results are also interesting for several reasons: The coefficients for the traditional variables in the gravity model all show the anticipated signs and are statistically significant. The exception is the population of the destination country. We find that imports between countries are significantly negatively related to distance. The impact of distance is substantial, with an elasticity greater than 0.5 in absolute value. This value also exceeds that estimated by Ortega and Peri (2014) for a much larger set of developed and developing countries.
The positive effect of the economic size of both the destination country (GDPd) and the origin country (GDPo) is expected. The effect of shared borders is also anticipated, as it is consistent with the export model. As with exports, we find that cultural proximity promotes imports between countries. Finally, as before, the coefficients related to the interaction of different indicator variables are difficult to interpret, which also relates to the geopolitical aspect.

Calculation of Trade potential

The ratio of predicted to observed trade represents the trade potential. This calculation compares Morocco with all African countries. The export and import flows between Morocco and these countries are summarized in Table 7 below.

Table 7: Predicted vs. observed Intra-African Trade flows and potential exports/imports (USD millions)

	Export		Import		Potential	
	Observed	Predicted	Observed	Predicted	Export	Import
AGO	28,97	33,49	39,58	27,93	1,16	0,71
BDI	0,54	10,02	0,93	19,56	18,69	21,15
BEN	26,89	14,08	17,96	16,14	0,52	0,90
BFA	24,64	18,40	22,22	20,56	0,75	0,93
BWA	0,05	11,19	0,60	12,75	248,10	21,23
CAF	2,18	4,72	0,73	7,08	2,17	9,71
CIV	76,36	34,06	89,28	30,39	0,45	0,34
CMR	31,03	26,22	36,09	24,11	0,84	0,67
COD	11,12	37,08	20,53	38,46	3,33	1,87
COG	31,85	14,06	10,72	14,88	0,44	1,39
COM	1,37	1,93	0,75	3,38	1,41	4,50
CPV	1,55	5,35	2,52	8,88	3,46	3,53
DJI	20,73	3,96	0,28	5,88	0,19	20,85
DZA	119,78	682,33	129,81	611,91	5,70	4,71
EGY	84,93	194,58	56,22	134,15	2,29	2,39
ERI	0,11	2,77	0,09	4,57	24,75	51,30
ETH	33,45	19,60	85,08	27,86	0,59	0,33
GAB	28,11	21,19	18,74	20,63	0,75	1,10
GHA	52,81	26,88	70,41	26,33	0,51	0,37
GIN	42,35	12,81	32,21	15,48	0,30	0,48
GMB	11,49	3,66	1,73	6,86	0,32	3,97
GNB	2,76	3,46	2,06	6,55	1,26	3,17
GNQ	30,22	40,16	32,03	44,22	1,33	1,38
KEN	8,57	21,91	8,37	20,09	2,56	2,40
LBR	4,34	4,09	4,25	7,05	0,94	1,66
LBY	54,92	154,60	41,53	128,79	2,81	3,10
LSO	0,07	4,53	0,07	5,30	62,06	63,82
MDG	3,56	8,16	3,56	9,06	2,29	2,07
MLI	37,88	19,67	37,88	21,71	0,52	0,58
MOZ	8,78	7,31	8,78	12,40	0,83	15,61
MRT	90,10	45,58	90,10	78,33	0,51	1,04
MUS	5,44	21,08	5,44	23,50	3,88	3,65
MWI	0,07	4,60	0,07	7,45	69,76	5,77
NAM	6,04	9,43	6,04	10,95	1,56	1,40
NER	12,27	14,11	12,27	17,04	1,15	2,38
NGA	60,34	100,64	60,34	64,91	1,67	2,87
RWA	0,71	16,22	0,71	21,40	22,71	9,54

	Export		Import		Potential	
	Observed	Predicted	Observed	Predicted	Export	Import
SDN	20,26	111,80	20,26	95,54	5,52	7,23
SEN	108,86	24,25	108,86	25,13	0,22	0,41
SLE	6,22	6,24	6,22	9,68	1,00	3,93
SOM	1,74	18,67	1,74	25,84	10,71	13,98
STP	0,25	1,39	0,25	5,03	5,47	12,23
SWZ	0,27	5,36	0,27	8,57	20,24	33,63
SYC	0,14	8,05	0,14	13,43	57,17	76,97
TCD	4,17	15,40	4,17	17,09	3,69	3,86
TGO	26,51	9,07	26,51	11,85	0,34	1,03
TUN	82,12	66,75	82,12	55,95	0,81	0,64
TZA	6,24	15,51	6,24	15,57	2,48	3,22
UGA	0,90	12,43	0,90	13,71	13,88	16,10
ZAF	20,62	65,81	20,62	41,80	3,19	1,40
ZMB	0,23	11,90	0,23	13,45	52,80	3,75
ZWE	0,12	8,29	0,12	9,83	68,43	87,31
Afrique	1235,04	2034,86	1112,55	1919,03	1,65	1,72

Source: authors using Excel

The results indicate that, in most cases, predicted exports and imports are higher than the observed values. For example, between 2000 and 2019, Morocco could increase its exports to Angola by 4.52 million USD and its imports from this country by 18.63 million USD. Exports to Chad could rise by 11.23 million USD, while imports from the same country could increase by approximately 12.92 million USD. However, for some country combinations, the observed trade exceeds the model's predictions. For instance, between 2000 and 2019, the predicted exports of Morocco to Benin, Burkina Faso, and Côte d'Ivoire represent only 52%, 75%, and 45% of the observed trade, respectively. The same applies to imports from these countries. Generally, except for a few states, the predicted trade between Morocco and African countries is at least 50% higher than the observed trade for each country, suggesting a potential for increasing trade between Morocco and Africa. More specifically, if African countries behaved like the benchmark, Moroccan exports and imports to Africa would be 65% and 72% higher, respectively, compared to their observed levels. Therefore, the estimated potentials can serve as encouragement for implementing trade policies, such as the adaptation of a continental free trade area.

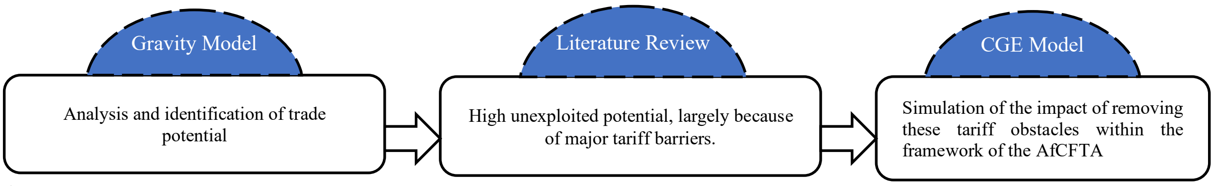
2. Need a Complementarity Tool?

This study employs a sequential and complementary analytical framework to assess the impact of the African Continental Free Trade Area (AfCFTA) on the Moroccan economy (Figure 2). The methodology integrates two established modelling techniques, bridged by a synthesis of the existing literature, to move from identifying specific trade potential to simulating its economy-wide effects.

The first stage, section 1, already completed, utilized a Gravity Model to analyse and identify Morocco's untapped trade potential with its African partners. This empirical analysis, drawing on insights from studies like Geda & Yimer (2023) and Ngepah & Udeagha (2018), confirmed the existence of high unexploited potential, which is largely constrained by major tariff barriers and other obstacles. This step provided a quantitative baseline, estimating the significant export growth possible if these barriers were removed. Building on this foundation, the next phase employs a Computable General Equilibrium (CGE) Model (section 3).

The CGE model is tasked with the simulation of the impact of removing these tariff obstacles within the framework of the AfCFTA. It takes the tariff reduction scenarios and potential trade flows identified by the Gravity Model and projects their holistic effects across the entire Moroccan economy, including on GDP, sectoral output, employment, and income distribution. This transition from the partial equilibrium focuses of the Gravity Model to the general equilibrium scope of the CGE model, contextualized by literature on non-tariff barriers (Turkson et al., 2023) and the mixed effects of African trade agreements (Chigeto et al., 2025), ensures a robust and comprehensive evaluation of the AfCFTA's potential economic outcomes for Morocco.

Figure 2: From gravity model to CGE model



Source: authors.

3. Analysis Using a Computable General Equilibrium Model

3.1. Presentation of the Social Accounting Matrix (SAM)

The Social Accounting Matrix (SAM) is an accounting framework and an annual summary that provides a comprehensive view of an economy's transactions. It represents all economic transaction flows occurring within an economy, regional or national, providing the most exhaustive representation possible. The SAM is presented in a matrix format, which facilitates the verification of national account balances. Typically created for a specific country and year, it can also be expanded to include accounting flows beyond national borders and extended to cover larger regions.

The Table 8 below presents the adopted schema in its condensed form. To complete the Social Accounting Matrix (SAM), it is necessary to define classifications for activities, goods and services, production factors, and institutional sectors. Our SAM-2019 for Morocco was created by combining multiple data sources from HCP (2024) and integrating five core accounts:

1) Factors of Production: Labour and capital. The SAM disaggregates the factor account beyond the standard binary classification. Capital is treated as a single homogeneous factor. Labour, however, is subdivided into three categories based on workers' educational attainment and skill levels:
   - Unskilled labour: Workers with no formal diploma or vocational training.
   - Medium-skilled labour: Workers holding a basic education certificate, secondary school diploma, or equivalent.
2) Skilled labour: Workers with a higher education diploma, professional qualification. Institutional Agents: A representative household, enterprises, government, and the rest of the world. The institutional account is segmented into four primary agents:
   - Households: a single representative household.
   - Enterprises: Comprising both financial and non-financial corporations.
   - Government: Representing all government activities.
   - Rest of the World: Disaggregated into two regions: Africa and the rest of the world (excluding Africa), a distinction critical for analysing continental trade agreements.
3) Accumulation: Investment and savings.
4) Goods and Services: 22 distinct product categories.
5) Production Activities: 22 economic sectors.

Table 8: Structure of the Different Accounts in the SAM

	factor of production	Agents	production sectors	local market products	export to the rest of the world (excluding Africa)	export to Africa	accumulation	total
factor of production			factor remuneration by industry					Factor remuneration
Agents	Remuneration of agents for their factor services	Flows between agents	Production taxes Taxes on factor remuneration	Import taxes Product tax Import (at CAF price)	export taxes	export taxes		Total income of agents
production sectors				Goods and services produced by sectors evaluated at factor cost.	Export to the rest of the world (excluding Africa) valued at factor cost	Export to Africa valued at factor cost		Production at factor cost
local market products		Final consumption of agents (households and government)	Intermediate consumption	Margins	Export margins	Export margins	INV; V. in stock	Demand
export to the rest of the world (excluding Africa)		Export to the rest of the world (FOB price)						Export to the rest of the world (at FOB price)
export to Africa		Export to Africa (FOB price)						Export to Africa (at FOB price)
accumulation		*Savings of agents*						Savings
total	Factor remuneration	Total expenditure of agents	Production at factor cost	Demand at acquisition price	Export to the rest of the world (at FOB price)	Export to Africa (at FOB price)	investment	

Source: Authors

The accounts for production activities and goods and services are both aggregated into 21 sectors. The product nomenclature was designed to align with production activities, following the classification established by Morocco's High Commission for Planning (HCP) in its national accounts.

Additionally, we remove the territorial correction account (U99) primarily reflects the direct purchases made by Moroccan residents abroad (direct imports) and by Moroccan non-residents in a given country (direct exports).

$$\underbrace{Direct\ value\ of\ importation\ (U99)}_{\text{SAM: Exportation}} - \underbrace{Direct\ value\ of\ exportation\ (U99)}_{\text{SAM: Importation}} = \underbrace{Net\ value\ of\ importation\ (U99)}_{SAM\text{: Moroccan consumption}}$$

Given that the SAM should only account for the consumption of Moroccan residents within the territory, the territorial correction account must be adjusted. The adjustment of the territorial correction account is carried out in 5 steps:

- The net (direct) value of imports is calculated by subtracting the direct value of exports from the direct value of imports.
- The share of private final consumption expenditures is calculated for imported products.
- Distribute the net value of imports among the private final consumption products using the calculated shares (considering only expenditures on imported products).
- Distribute the direct import value (U99) among import products using the calculated shares (the share of private final consumption expenditures).
- Distribute the direct export value (U99) among export products using the calculated shares (the share of private final consumption expenditures).
- Remove the territorial correction account from the SAM.

The Table 9 present the nomenclature of sectors/products used in SAM-2019 Morocco:

Table 9: Sectors/products Used in SAM-2019 Morocco.

Code	Sector / product
A00	Agriculture and Forestry
A05	Fishing and Aquaculture
B00	Mining
CA0	Food and Beverage Manufacturing
CB0	Textile Manufacturing and Clothing Articles
CC0	Wood and Paper Products Manufacturing
CED	Chemical Industry
CF0	Basic Pharmaceutical Products Manufacturing
CGM	Mechanical and Electrical Industry
DE0	Electricity and Gas Distribution
F00	Construction
G00	Wholesale and Retail Trade; Repair of Motor Vehicles
H00	Transportation and Warehousing
I00	Accommodation and Food Services
J00	Information and Communication
K00	Financial and Insurance Activities
L68	Real Estate Activities
MN0	Research and Development and Other Professional Services
O84	Public Administration; Social Security
PQ8	Education, Human Health, and Social Action Activities
RS0	Other Services

Source: authors, based on HCP classification.

The SAM-2019 Morocco dataset is constructed from complementary sources of national accounts, ensuring internal consistency across activities, institutional sectors, and external flows. Core inputs include the Supply and Use Table (SUT), which details production and product accounts; the Integrated Economic Accounts (IEA), which capture institutional sector and external accounts; and the MCS-HCP 2019 Social Accounting Matrix, which provides data for transfers and household and government accounts. On this basis, the dataset is organized into the following accounts:

- *Household Account (MEN):* Household income is allocated to direct taxes (IEA: D.5), consumption of goods and services, transfers, and savings (IEA: D.8b). Transfers and final consumption are detailed in the MCS-HCP.
- *Enterprise Account (FIRM):* Enterprise revenues are distributed to direct taxes (IEA: D.5), transfers (MCS-HCP), and savings (IEA: D.8b).
- *Government Account (GOV):* Government revenue finances consumption (MCS-HCP), transfers (MCS-HCP), and savings (IEA: D.8b).
- *Rest of the World (ROW):* ROW income is allocated to national product purchases (exports in SUT), transfers (MCS-HCP), and savings (IEA: B.12). For modelling, ROW is split into Africa and Non-Africa, using foreign exchange office data (converted from SH to NCN).

- *Economic Activity Sectors:* Revenues are used to remunerate factors of production, purchase inputs (MCS-HCP), pay taxes and receive subsidies (SUT), and generate capital income through Gross Operating Surplus (GOS). Labour income is disaggregated into three categories using the Mincer equation and Heckman method, following Khalaf (2015).
- *Composite Product Account (i):* Revenues cover purchases (MCS-HCP), import-related indirect taxes (SUT), and transport margins. Indirect product taxes are calculated residually: Net indirect taxes on products (excluding imports) = Net indirect taxes on products (SAM-HCP) – Net indirect taxes on imports (SUT).
- *Accumulation Account:* Savings finance gross fixed capital formation and inventory changes (SUT). Gross fixed capital formation includes net acquisition of valuables (SUT).
- *Other Data:* Customs duties are weighted by sector and region (WTO database). CET and CES elasticities are sourced from the Ministry of Foreign Trade (2011) and the Department of Forecasting and Prospective (DPP-HCP). EU elasticities apply to non-Africa trade, while HUE elasticities apply to African trade.

3.2. The PEP 1.1 Model: General Description

Our CGE model is based on the "Partnership for Economic Policy" (PEP-1-1) model (Decaluwé et al., 2013). It is a static, multisectoral computable general equilibrium model for a country. The model includes three categories of labour and one category of capital, as well as several fiscal instruments. It relies primarily on the following assumptions: in a competitive market, agents optimize their objective functions under specific constraints, and adjustment occurs through relative price changes to achieve equilibrium. Labour and capital are perfectly mobile across sectors, but production factors are immobile internationally.

There is perfect Leontief complementarity (zero technical substitution elasticity) between intermediate inputs on the one hand and between these inputs and value-added on the other. The value-added of each industry is composed of composite labour and capital, following a constant elasticity of substitution (CES) specification. Composite labour is a CES combination of different labour categories.

Products demanded in the domestic market are composite goods combining locally produced goods and imports. The imperfect substitutability between them is modelled using a CES aggregation function. Similarly, the relationship between product ranges making up total industry output, and between production for domestic consumption and exports, is modelled using a constant elasticity of transformation (CET) function.

Household utility maximization follows a linear expenditure system (LES) under a budget constraint, while government consumption and investment follow Cobb-Douglas type functions.

Modelling of international trade

To simulate the impact of the ZLECAF on the Moroccan economy, we incorporate adjustments that distinguish between the African market and the rest of the world at two levels: exports and imports. Exports are categorized into those directed to Africa and those directed elsewhere, while imports are similarly divided between African and non-African origins.

The export of each product from an industry is distributed between markets (African-AF or the rest of the world-RM excluding Africa), always aiming to maximize the company's total export revenues, taking into account the demand in each market and the various applicable taxes. It is assumed that the export destined for one market is somewhat different from the export destined for another market. This imperfect substitutability is represented by means of a constant elasticity of transformation (CET) aggregation function, which describes the ease with which the export can be redirected from one market to another:

$$EX_{j,i} = B_{j,i}^{EX} * \left[\beta_{i,j}^{EX} * \left(EX_{j,i}^{AF}\right)^{\rho_{i,j}^{X}} + \left(1 - \beta_{j,i}^{EX}\right) * \left(EX_{j,i}^{RM}\right)^{\rho_{i,j}^{X}}\right]^{\frac{1}{\rho_{j,i}^{EX}}} \quad (1)$$

where: $EX_{j,i}$: Quantity of product i that sector j exports; $EX_{j,i}^{AF}$: Quantity of product i that sector j exports to Africa; $EX_{j,i}^{RM}$: Quantity of product i that sector j exports to the rest of the world excluding Africa; $B_{j,i}^{EX}$: Scale parameter (CET – exports to Africa and the rest of the world excluding Africa); $\beta_{i,j}^{EX}$: Share parameter (CET – exports to Africa and the rest of the world excluding Africa); $\rho_{i,j}^{EX}$: Elasticity parameter (CET – exports to Africa and the rest of the world excluding Africa) $1 < \rho_{i,j}^{EX} < \infty$.

Relative export functions are derived from the first-order conditions of revenue maximization subject to the CET (Constant Elasticity of Transformation) aggregation function (1):

$$EX_{j,i}^{AF} = \left[\frac{1 - \beta_{j,i}^{EX}}{\beta E_{j,i}^{X}} * \frac{PE_i^{AF}}{PE_i^{RM}}\right]^{\sigma_{j,i}^{EX}} EX_{j,i}^{RM} \quad (2)$$

where: PE_i^{AF}: Price received for the exported product i to Africa (excluding export taxes); PE_i^{RM}: Price received for the exported product i to the rest of the world excluding Africa (excluding export taxes); $\sigma_{j,i}^{EX}$: Transformation elasticity (CET – exports to Africa and the rest of the world excluding Africa) $0 < \sigma_{j,i}^{EX} < \infty$.

According to the algebra of the transformation function CET : $\rho_{i,j}^{EX} = \frac{1+\sigma_{j,i}^{EX}}{\sigma_{j,i}^{EX}}$.

Exporting industries have the option to direct their exports to the African market or to the global market (excluding Africa). The base price obtained by the industry for their total exports is a weighted sum of the prices obtained in each market (Equation 3). The FOB price paid by buyers in the export markets (Africa and the rest of the world excluding Africa) differs from the price received by the producer (base price), as margins and export taxes need to be added (Equations 4 and 5) :

$$PE_i = \frac{PE_i^{AF} * EX_{j,i}^{AF} + PE_i^{RM} * EX_{j,i}^{RM}}{EX_{j,i}} \quad (3)$$

$$(PE_i^{FOB})^{AF} = \left(1 + ttix_i^{AF}\right)\left[PE_i^{AF} + \sum\nolimits_{ij} PC_{ij} * tmrg_{(ij,i)}^{X}\right] \quad (4)$$

$$(PE_i^{FOB})^{RM} = \left(1 + ttix_i^{RM}\right)\left[PE_i^{RM} + \sum\nolimits_{ij} PC_{ij} * tmrg_{(ij,i)}^{X}\right] \quad (5)$$

where: PE_i: Price received for the exported product i (excluding export taxes); $(PE_i^{FOB})^{AF}$: FOB price of the exported product i to Africa (in local currency) (export demand price from Morocco to Africa = invoice price charged by Moroccan exporters to Africa); $\left(PE_i^{FOB}\right)^{RM}$: FOB price of the exported product i to the rest of the world excluding Africa (in local currency) (export demand price from Morocco to the rest of the world excluding Africa = invoice price charged by Moroccan exporters to the rest of the world excluding Africa); $ttix_i^{AF}$: Export tax rate on the exported products i to Africa; $ttix_i^{RM}$: Export tax rate on the exported products i to the rest of the world excluding Africa; $\sum_{ij} PC_{ij} * tmrg_{(ij,i)}^{X}$: Margin ij applied to export i

The external demand for exports from both regions (Africa and the rest of the world excluding Africa) depends on the global price and the customs tariffs applied to imports from Morocco:

$$EXD_i^{AF} = [EXD_i^{AF}]^O \left[\frac{e * PWX_i^{AF} (1 + [tmMM_i^{AF}]^0)}{(PE_i^{FOB})^{AF} (1 + tmMM_i^{AF})} \right]^{\sigma_i^{EXD\_AF}} \tag{6}$$

$$EXD_i^{RM} = [EXD_i^{RM}]^O \left[\frac{e * PWX_i^{RM} (1 + [tmMM_i^{RM}]^0)}{(PE_i^{FOB})^{RM} (1 + tmMM_i^{RM})} \right]^{\sigma_i^{EXD\_RM}} \tag{7}$$

$$PE_i^{FOB} = \frac{(PE_i^{FOB})^{AF} * EXD_i^{AF} + (PE_i^{FOB})^{RM} * EXD_i^{RM}}{EXD_i} \tag{8}$$

where: EXD_i^{AF}: African demand for exports of product i; EXD_i^{RM}: Global demand (excluding Africa) for exports of product i; $[EXD_i^{AF}]^O$: Export demand volume of product i from Africa, which is not affected by its relative export price but by other factors (changes in tastes, increase in the global population, etc.) (> 0); $[EXD_i^{AF}]^O$: Export demand volume of product i from the rest of the world excluding Africa, which is not affected by its relative export price but by other factors (changes in tastes, increase in the global population, etc.) (> 0); $\sigma_i^{EXD\_AF}$: Price elasticity of African demand for exports of product i; $\sigma_i^{EXD\_RM}$: Price elasticity of global (excluding Africa) demand for exports of product i; PWX_i^{AF}: Global price of exported product i to Africa (expressed in foreign currency); PWX_i^{RM}: Global price of exported product i to the rest of the world excluding Africa; $tmMM_i^{AF}$: Tariff rate applied by the African region on imports from Morocco; $tmMM_i^{RM}$: Tariff rate applied by the rest of the world (excluding Africa) on imports from Morocco; EXD_i: Total demand for exports of product i; PE_i^{FOB}: FOB price of exported product i (in local currency).

And finally, the supply in the export market (whether for the market) of each good must match the demand:

$$EXD_i^{AF} = \sum_j EX_{j,i}^{AF} \tag{9}$$

$$EXD_i^{RM} = \sum_j EX_{j,i}^{RM} \tag{10}$$

$$EXD_i = \sum_j EX_{j,i} \tag{11}$$

The behaviour of the importer is symmetrical to that of the exporter, as it is assumed that products imported from Africa are imperfect substitutes for products imported from the rest of the world, or, in other words, that the goods are heterogeneous in terms of their origin. The globally imported products are therefore composite goods, a combination of African goods and those from the rest of the world. The imperfect substitutability between the two is represented by a constant elasticity of substitution (CES) aggregation function (Equation 12):

$$IM_i = B_i^{IM} * \left[\beta_i^{IM} * (IM_i^{AF})^{-\rho_i^{IM}} + (1 - \beta_i^{IM}) * (IM_i^{RM})^{-\rho_i^{IM}} \right]^{-\frac{1}{\rho_i^{IM}}} \tag{12}$$

where: IM_i: Quantity of product i imported; IM_i^{AF}: Quantity of product i imported from Africa; IM_i^{RM}: Quantity of product i imported from the rest of the world excluding Africa; B_i^{IM}: Scale parameter (CES – imported from Africa and the rest of the world excluding Africa); β_i^{IM}: Share parameter (CES – imported from Africa and the rest of the world excluding Africa); ρ_i^{IM}: Elasticity parameter (CES – imported from Africa and the rest of the world excluding Africa) $-1 < \rho_i^{IM} < \infty$

Just as exporters seek to maximize their revenues, importers minimize their expenditures, subject to the CES aggregation function (Equation 11). The relative import demand functions are derived from the first-order optimality conditions:

$$IM_i^{AF} = \left[\frac{\beta_i^M}{1-\beta_i^M} * \frac{PM_i^{RM}}{PM_i^{AF}}\right]^{\sigma_i^{IM}} IM_i^{RM} \tag{13}$$

where: PM_i^{RM}: Price of product i imported from Africa (including all taxes and margins); PM_i^{AF}: Price of product i imported from the rest of the world (including all taxes and margins); σ_i^{IM}: Substitution elasticity (CES – imported from Africa and the rest of the world excluding Africa); $0 < \sigma_i^{IM} < \infty$.

According to the algebra of CES aggregation functions: $\rho_i^{IM} = \frac{1+\sigma_i^{IM}}{\sigma_i^{IM}}$.

As previously explained, imported products are composite. The price of the composite is a weighted sum of the price paid for goods imported from Africa and the price paid for goods imported from the rest of the world excluding Africa (eq. 13). The price paid for the imported product from a market (African or rest of the world) is the global price, converted into local currency, plus import taxes and duties, margins, and national indirect taxes (eq. 14 and eq. 15):

$$PM_i = \frac{PM_i^{AF} * IM_i^{AF} + PM_i^{RM} * IM_i^{RM}}{IM_i} \tag{14}$$

$$PM_i^{AF} = (1 + ttic_i)\left[\left(1 + ttim_i^{AF}\right) * PM_{T_i}^{AF} + \sum_{ij} PC_{ij} * tmrg_{(ij,i)}\right] \tag{15}$$

$$PM_i^{RM} = (1 + ttic_i)\left[\left(1 + ttim_i^{RM}\right) * PM_{T_i}^{RM} + \sum_{ij} PC_{ij} * tmrg_{(ij,i)}\right] \tag{16}$$

where: PM_i: Price of imported product i (including all taxes and margins); $ttic_i$: Tax rate on product i; $ttim_i^{AF}$: Tariff rate on imports of product i from Africa; $ttim_i^{RM}$: Tariff rate on imports of product i from the rest of the world excluding Africa; $\sum_{ij} PC_{ij} * tmrg_{(ij,i)}$: Margin ij applied to product i; $PM_{T_i}^{AF}$: Import offer price from Africa to Morocco (including export tax: TEM_i^{AF}) (in local currency); $PM_{T_i}^{RM}$: Import offer price from the rest of the world to Morocco (including export tax: TEM_i^{RM}) (in local currency).

Foreign import supply as a function of the global price and the export tariffs to Morocco applied by the two regions (Africa and the rest of the world excluding Africa):

$$IMO_i^{AF} = \left[IMO_i^{AF}\right]^O \left[\frac{e * PWM_i^{AF}/\left[1 + teMM_i^{AF}\right]^O}{PM_{T_i}^{AF}/\left[1 + teMM_i^{AF}\right]}\right]^{-\sigma_i^{IMO\_AF}} \tag{17}$$

$$IMO_i^{RM} = \left[IMO_i^{RM}\right]^O \left[\frac{e * PWM_i^{RM}/\left[1 + teMM_i^{RM}\right]^O}{PM_{T_i}^{RM}/\left[1 + teMM_i^{RM}\right]}\right]^{-\sigma_i^{IMO\_RM}} \tag{18}$$

$$PM\_T_i = \frac{PM\_T_i^{AF} * IMO_i^{AF} + PM\_T_i^{RM} * IMO_i^{RM}}{IMOT_i} \tag{19}$$

where: IMO_i^{AF} : African import supply of product i; IMO_i^{RM}: Global (excluding Africa) import supply of product i; $\left[IMO_i^{AF}\right]^O$: Volume of import supply of product i from Africa, which is not affected by its relative import price but by other factors (changes in tastes, increase in the global population, etc.) (> 0).; $\left[IMO_i^{RM}\right]^O$: Volume of import supply of product i from the rest of the world excluding Africa, which is not affected by its relative import price but by other factors (changes in tastes, increase in the global population, etc.) (> 0); $teMM_i^{RM}$: Tariff rate applied by Africa on exports to Morocco; $teMM_i^{AF}$: Tariff rate applied by the rest of the world on exports to Morocco; PWM_i^{AF}: Global price of product i imported from Africa (expressed in foreign currency); PWM_i^{RM}: Global price of product i imported from the rest of the world excluding Africa (expressed in foreign currency); $\sigma_i^{IMO\_AF}$: Price elasticity of African import supply of product i; $\sigma_i^{IMO\_RM}$: Price elasticity of global (excluding Africa) import supply of product i; $IMOT_i$: Total import supply of product i; PM_T_i: Global import offer price (including export taxes) (in local currency).

And finally, the demand in the import market (whether for the market) for each good must match the supply:

$$IM_i^{AF} = IMO_i^{AF} \tag{20}$$

$$IM_i^{RM} = IMO_i^{RM} \tag{21}$$

$$IM_i = IMOT_i \tag{22}$$

Equations 1 to 22 represent the main ones to be added to the model; however, they are not the only ones. Table 10 in appendix 3 lists all the equations to be added, as well as those requiring modification in the original PEP 1.1 model. Additionally, appendix 4 provides the overall schema of the model for a clearer overview.

For public closure, public expenditure and tax rates are kept constant, and fiscal balance is achieved by adjusting the public deficit. This reflects Morocco's fiscal structure, where deficits play a key role in budgetary adjustments. For external closure, Morocco's fixed exchange rate is assumed to remain unchanged. The current account, though structurally in deficit, is relatively stable and treated as variable, with adjustments driven by shifts in the relative prices of imports and exports according to their elasticities.

4. Simulation and Result Analysis

This section analyses the impact of tariff removal between Morocco and Africa, presenting the corresponding simulation below:

$$ttim_i^{AF} = teMM_i^{AF} = tmMM_i^{AF} = ttix_i^{AF} = 0$$

In interpreting our results, we focus on the following five key areas: (1) Morocco's foreign trade, (2) factors of production, (3) sectoral production and the domestic market, (4) household living standards, and (5) the income and savings of households, businesses, and the government.

External trade. Imports

In this CGE model, the total import function (IM) adopted is constructed as a combination of different imports; it takes the form of a CES function, considering the regions (the AF region and the RM region). Thus, variations in total imports evolve in the same manner as those of regional imports from AF and RM.

Table 11: Variation in imports

Variation in % compared to baseline						
Code	ΔIM%	ΔPM	ΔIM_AF	ΔIM_RM	ΔPM_AF	ΔPM_RM
A00	2,12	-0,63	9,26	0,37	-3,93	0,23
A05	1,30	-0,12	5,19	0,34	-1,99	0,35
B00	1,48	-0,62	7,08	0,10	-3,25	0,07
CA0	2,55	-0,97	12,13	0,22	-5,30	0,17
CB0	2,10	-1,41	12,85	-0,50	-6,23	-0,13

Variation in % compared to baseline						
CC0	0,95	-0,84	6,63	-0,44	-3,51	-0,14
CED	0,46	-0,14	2,25	0,02	-1,02	0,08
CF0	1,09	-0,58	6,35	-0,21	-3,07	0,06
CGM	0,29	-0,23	2,14	-0,16	-1,14	-0,01
DE0	1,87	-0,39	7,30	0,53	-2,95	0,27
F00	1,38	-0,57	6,51	0,12	-2,99	0,06
G00	3,53	-1,01	13,43	1,12	-5,43	0,16
H00	1,45	-0,72	7,80	-0,10	-3,69	0,05
I00	1,86	-0,34	7,03	0,59	-2,77	0,29
J00	1,71	-0,40	6,88	0,44	-2,84	0,23
K00	1,89	-0,32	7,12	0,60	-2,78	0,31
L68	2,00	-0,28	7,22	0,72	-2,73	0,36
MN0	1,55	-0,48	6,69	0,29	-2,91	0,14
O84	1,56	-0,49	6,75	0,28	-2,95	0,14
PQ8	1,42	-0,36	5,79	0,34	-2,44	0,17
RS0	1,62	-0,21	5,79	0,59	-2,20	0,30

Source: authors using GAMS.

Table 11 shows that the impact of the African Continental Free Trade Area (AfCFTA) on Moroccan imports is generally positive, particularly in Agriculture (+2.12%), Textiles (+2.10%), Wholesale and Retail Trade (+3.53%), and Real Estate Activities (+2%) sectors. This is mainly due to a substantial decline in import prices.

The impacts of the AfCFTA on imports by regional origin are also positive. Imports from Africa increase across six sectors, particularly in Agriculture (+9.26%), Food Products (+12.13%), Textiles (+12.85%), and Wholesale and Retail Trade (+13.43%), resulting from the elimination of customs duties.

Moreover, imports from the Rest of the World (RM) show positive growth in 16 sectors. However, sectors such as Textiles, Wood and Paper Products, Pharmaceuticals, Mechanical and Electrical Industry, and Transport and Warehousing experienced slight shifts (respectively: -0.5%, -0.44%, -0.21%, -0.16%, and -0.10%) in favour of Africa.

External trade. Exports

The export function (EX) is assumed to be of the CET type to capture the behaviour of Moroccan producers who aim to maximize their total revenue considering the opportunities available in the local market (DS) and those in the external markets of Africa (EX_AF) and/or RM (EX_RM).

Table 12: Variation in production, exports, and local sales.

Variation in % compared to baseline										
Sectors	ΔEX	ΔDPE	ΔEX_AF	ΔEX_RM	ΔPE_AF	ΔPE_RM	ΔDD	ΔPD	ΔXST	ΔPT	ΔEXD
A00	0,56	0,92	5,55	-0,71	3,11	0,36	-0,22	0,53	-0,10	0,59	0,56
A05	-0,06	0,33	1,30	-0,40	0,85	0,20	0,09	0,48	0,00	0,36	-0,06
B00	2,35	1,21	11,68	-0,05	5,71	0,03	0,05	0,09	0,87	0,48	2,35
CA0	0,72	0,63	4,75	-0,30	2,50	0,15	-0,04	0,30	0,17	0,35	0,72
CB0	1,87	0,54	7,51	0,43	3,47	-0,21	-0,19	-0,29	0,86	0,05	1,87
CC0	11,9	4,94	51,30	0,96	22,42	-0,48	0,23	-0,48	1,74	0,06	11,91

Variation in % compared to baseline											
CED	1,76	0,21	5,78	0,75	2,47	-0,37	0,23	-0,02	1,71	0,18	1,76
CF0	6,03	2,43	26,49	0,61	12,12	-0,31	0,16	-0,12	1,79	0,36	6,03
CGM	0,04	0,30	1,41	-0,31	0,86	0,15	-0,42	0,12	-0,18	0,18	0,04
DE0	0,24	0,55	3,10	-0,47	1,78	0,24	0,09	0,49	0,11	0,48	0,24
F00	1,31	0,97	7,84	-0,35	4,03	0,18	-0,19	0,21	-0,16	0,23	1,31
G00	0,36	0,70	4,05	-0,57	2,30	0,29	0,24	0,60	0,06	0,55	0,36
H00	1,53	0,88	8,03	-0,13	4,00	0,07	-0,28	0,13	0,52	0,38	1,53
I00	0,31	0,71	4,00	-0,62	2,30	0,31	0,04	0,57	0,07	0,59	0,31
J00	-0,16	0,64	2,38	-0,80	1,59	0,40	-0,25	0,57	-0,24	0,60	-0,16
K00	0,37	0,81	4,57	-0,69	2,61	0,35	-0,02	0,63	0,01	0,63	0,37
L68	-0,36	0,61	1,68	-0,87	1,28	0,44	-0,07	0,75	-0,11	0,74	-0,36
MN0	0,49	0,81	4,91	-0,63	2,75	0,32	-0,24	0,41	-0,10	0,52	0,49
O84	-0,35	0,61	1,71	-0,87	1,29	0,44	-0,50	0,53	-0,50	0,53	-0,35
PQ8	-0,31	0,57	1,66	-0,80	1,23	0,40	-0,37	0,53	-0,38	0,53	-0,31
RS0	-0,17	0,43	1,45	-0,58	1,01	0,29	0,07	0,55	0,04	0,54	-0,17

Source: authors using GAMS.

If a full trade liberalization policy is applied, involving the removal of import and export duties, total exports will rise in 14 sectors (Agriculture, Mining, Textiles, Textiles, Wood & Paper, Chemical, Pharmaceuticals, Mechanical & Electrical, Electricity & Gas, Construction, Wholesale & Retail Trade, Transport & Warehousing, Accommodation & Food, and Finance & Insurance) due to higher prices, while they will decline in 7 sectors: Fishing, Information & Communication, Real Estate, R&D & Professional Services, Public Administration, Education & Health, and Other Services (Table 12).

Typically, an increase in total exports should correspond to a decrease in domestic sales and vice versa. However, this relationship is observed in only nine sectors: Agriculture, Fishing, Food & Beverage, Textiles, Mechanical & Electrical, Construction, Transport & Warehousing, Finance & Insurance, and Other Services. In the remaining sectors (Mining, Wood & Paper, Chemical, Pharmaceuticals, Electricity & Gas, Wholesale & Retail Trade, Accommodation & Food, Information & Communication, Real Estate, R&D & Professional Services, Public Administration, and Education & Health) exports and domestic sales move in the same direction, both increasing or both decreasing. This is due to variations in total domestic production.

Trade has shifted significantly toward Africa in nearly all sectors (Table 12), except Textiles, Chemical, and pharmaceutical sectors. Although exports to Africa increased substantially (7.51%, 51.30%, 5.78%, 26.49%), these sectors show only modest growth in trade with the Rest of the World.

The Labour Market

Regarding the remuneration of production factors, the significant decline in labour's marginal productivity exerts downward pressure on wages (Table 13). Wages W(USK), W(MSK), and W(SK), associated with this productivity, increase modestly by 0.81%, 0.59%, and 0.49%, respectively (Table 15). The modest wage increases for moderately and highly skilled workers relative to low-skilled workers enhance their competitiveness, thereby reducing unemployment among these groups compared to unskilled workers, with average labour demand changes of +0.34% for unskilled, +0.51% for moderately skilled, and +0.59% for highly skilled workers. Migration from sectors F00, J00, O84, and PQ8 to other sectors results from decreased production in these sectors.

Table 13: Relative changes in the market and labour capital

Variation in% Compared to Baseline						
Sectors	$\mathrm{LD(usk, j)}$	$\mathrm{LD(Msk, j)}$	$\mathrm{LD(sk, j)}$	$\mathrm{DLD(KD, j)}$	Marginal productivity	Average productivity
A00	-0,05	0,13	0,21	-0,10	-0,05	-0,07
A05	0,00	0,17	0,25	-0,09	-0,04	-0,06
B00	0,92	1,10	1,18	0,76	-0,13	-0,20
CA0	0,24	0,41	0,49	0,13	-0,11	-0,16
CB0	0,90	1,08	1,16	0,79	-0,09	-0,13
CC0	1,81	1,99	2,07	1,69	-0,11	-0,17
CED	1,80	1,97	2,05	1,67	-0,12	-0,18
CF0	1,84	2,02	2,10	1,72	-0,10	-0,15
CGM	-0,13	0,05	0,13	-0,25	-0,10	-0,16
DE0	0,21	0,38	0,46	0,02	-0,18	-0,27
F00	-0,15	0,02	0,10	-0,23	-0,04	-0,06
G00	0,13	0,31	0,39	-0,01	-0,13	-0,19
H00	0,56	0,74	0,82	0,43	-0,10	-0,16
I00	0,14	0,31	0,39	0,01	-0,11	-0,17
J00	-0,19	-0,01	0,07	-0,32	-0,11	-0,17
K00	0,08	0,25	0,33	-0,14	-0,18	-0,27
L68	0,07	0,24	0,32	-0,11	-0,23	-0,34
MN0	-0,11	0,06	0,14	-0,30	-0,11	-0,16
O84	-0,61	-0,44	-0,36	-0,79	-0,05	-0,07
PQ8	-0,51	-0,34	-0,26	-0,70	-0,03	-0,04
RS0	0,08	0,25	0,33	-0,13	-0,16	-0,24

Source: authors using GAMS.

The rate of return on capital has increased markedly (+0.83%) compared to average wage growth for workers (+0.63%) (Table 15). Because capital supply is assumed exogenous, it can only be reallocated between sectors. The simulation indicates strong capital mobility from sectors A00, A05, CGM, F00, G00, J00, K00, L68, MN0, O84, PQ8, and RS0, with reductions ranging from -0.01% to -0.79%, to other sectors (table 13).

This reallocation is driven by higher total production in these sectors, primarily due to accelerated export demand in Wood & Paper Products (+11.91% exports, +1.74% production) and Pharmaceuticals (+6.03% exports, +1.79% production).

Domestic Demand

Sectoral production variations are driven by changes in domestic demand and its components: household consumption, intermediate demand, government consumption, investment, inventory changes, and margins. The removal of customs duties generally increases total domestic demand, primarily through significant rises in its components (C, CG, INV, ISTK, DI) (Table 14).

However, private consumption is not responsible for the decline in domestic demand for construction (F00), real estate (L68), education and health (PQ8), and public administration (O84). Household demand increases for these sectors by +0.44%, +0.08%, +0.22%, and +0.22%, respectively. In contrast, investment decreases for F00, L68, and O84 by -0.18%, -0.71%, and -0.51%, mainly due to a 0.15% reduction in state savings caused by a 1.22% drop in customs revenues (TPRCTS) (Table 15).

Investment concentration in F00 and L68 leads to declines in local sales (-0.19% and -0.07%) and production (-0.16% and -0.11%) in these sectors. The reduced production also lowers intermediate demand for F00 and L68 products by -0.07% and -0.03%. Finally, the decline in total domestic demand for PQ8 (-0.36%) results from lower public demand (CG, -0.52%), linked to the 1.22% decrease in tax revenues.

Table 14: Variation in total domestic demand and its components

Variation in% Compared to Baseline								
Sectors	ΔQ	ΔC	ΔIT	ΔINV	ΔCG	ΔPC	ΔXST	ΔDD
A00	0,14	0,23	0,13	-0,33	-0,35	0,35	-0,10	-0,22
A05	0,15	0,18	0,12	-	-	0,45	0,00	0,09
B00	0,68	0,54	0,71	-	-	-0,22	0,87	0,05
CA0	0,39	-	0,07	-	-	0,09	0,17	-0,04
CB0	0,88	1,20	0,64	0,84	-	-0,82	0,86	-0,19
CC0	0,53	1,06	0,48	0,65	-	-0,63	1,74	0,23
CED	0,44	0,70	0,35	0,14	-	-0,13	1,71	0,23
CF0	0,62	0,86	0,49	-	0,35	-0,35	1,79	0,16
CGM	0,04	0,68	-0,08	0,12	-	-0,11	-0,18	-0,42
DE0	0,16	0,27	0,06	-	-	0,45	0,11	0,09
F00	-0,16	0,44	-0,07	-0,18	-	0,20	-0,16	-0,19
G00	0,26	0,17	0,00	-	-	0,59	0,06	0,24
H00	0,43	0,73	0,32	-	-	-0,22	0,52	-0,28
I00	0,19	0,24	-0,29	-	-	0,49	0,07	0,04
J00	0,10	0,30	-0,10	-0,39	-	0,40	-0,24	-0,25
K00	0,08	0,18	0,02	-	-0,57	0,58	0,01	-0,02
L68	-0,02	0,08	-0,03	-0,71	-	0,72	-0,11	-0,07
MN0	0,06	0,40	0,07	-0,24	-	0,25	-0,10	-0,24
O84	-0,50	0,22	-	-0,51	-0,53	0,53	-0,50	-0,50
PQ8	-0,36	0,22	-0,34	-	-0,52	0,53	-0,38	-0,37
RS0	0,11	0,21	0,05	-0,52	-0,53	0,54	0,04	0,07

Source: authors using GAMS.

Wealth Created for Economic Agents

Finally, regarding the wealth created, the simulation clearly shows that the establishment of a free trade area (AfCFTA) does not manage to generate significant wealth, as shown in Table 15. Growth in GDP at basic prices is only 0.76%, and growth in GDP at market prices is 0.55%. The improvement in income for economic actors is almost negligible: 0.65% for households, 0.77% for firms, and only 0.05% for the government.

Table 15: Variation of some variables

Variation en %	ΔSG	ΔSROW	ΔDSH	ΔSF	ΔTPRCTS	ΔWusk	ΔWmsk	ΔWsk	ΔGDP_BP
	-0,15	-4,83	0,65	0,76	-1,22	0,81	0,59	0,49	0,76
Variation en %	ΔGDP_MP	ΔPIXGDP	ΔYG	ΔYF	ΔYH	ΔM	ΔX	ΔRK	
	0,55	0,76	0,05	0,77	0,65	0,93	0,80	0,83	

Source: authors using GAMS.

Conclusion

The ratification of the African Continental Free Trade Area (AfCFTA) agreement by 44 African countries on March 21, 2018, in Kigali generated significant optimism and paved the way for realizing the economic aspirations first envisioned at the inaugural OAU summit in May 1963. This initiative has established the largest trading bloc in the world, offering the potential to reshape Africa's economic landscape.

Proponents believe the AfCFTA will not only increase intra-African trade, which remains among the lowest globally—but also stimulate investment, industrial output, and economic diversification. However, sceptics emphasize a fundamental challenge: Africa's vast and heterogeneous nature complicates the creation of uniform trade rules. While several studies have assessed the potential impacts of the AfCFTA, only two focus on Morocco, those by Raouf et al., (2021) and Bouët et al., (2021), and neither investigates Morocco's trade potential through a gravity model approach.

This study aims to fill that gap by assessing Morocco's trade potential with AfCFTA member states and estimating the economic impact of establishing a free trade area. To achieve this, two complementary methodologies were employed: a gravity model to evaluate trade potential and a CGE model to simulate the effects of eliminating tariffs and duties between Morocco and African countries.

The findings suggest that if African countries traded according to benchmark potential, Morocco's exports and imports with the continent could be 72% and 65% higher, respectively, than current levels. These results highlight substantial untapped opportunities. However, CGE simulations indicate that the removal of tariffs would only raise Morocco's exports to and imports from Africa by 0.80% and 0.93%, respectively, a relatively modest effect.

Several structural factors explain this discrepancy. Inadequate infrastructure continues to hinder trade connectivity across the continent. Furthermore, trade theory highlights that robust trade growth depends on the complementarity of goods exchanged and effective technology transfer. These mechanisms are less impactful between economies with similar production structures, as is the case in many African nations. Likewise, the relatively uniform skill level of the labour force limits the potential for high-value-added trade.

Research by Vamvakidis (1998, 1999), Spilimbergo (1999), Puga & Venables (1998), and Venables (2003) suggests that regional integration among small economies yields fewer long-term benefits than strengthening trade relations with industrialized nations. They contend that South–North trade promotes "learning by doing" and facilitates technology transfer, thereby generating sustained productivity gains.

In conclusion, while AfCFTA offers opportunities, Morocco may benefit most from a balanced trade strategy, pursuing deeper African integration and reinforcing economic ties with key partners like France and Spain. Strategic investments in infrastructure, logistics, and sectoral diversification are essential to unlocking the full potential of continental trade. To maximize gains, trade liberalisation should be paired with labour market reforms, productivity enhancements, gender equality policies, and targeted support for vulnerable sectors. The critical role of exchange rate dynamics in Morocco's economic growth, indicating that ambitious trade strategies must be complemented by prudent macroeconomic management (El Baouchari & Raouf, 2024; El Hajoui et al., 2025; Otmani & Raouf, 2025).

Credit Authorship Contribution Statement

We, the authors of this article, commit to uphold the highest ethical standards throughout the publication process. We declare the following: Integrity and honesty: We affirm that all the work presented in this article is original and that we have not plagiarized or falsified any data. All sources used have been properly cited and referenced. Respect for copyright: We guarantee that this article is the result of our own work, and we have respected the copyrights of other authors by citing their works when appropriate.

Conflict of Interest Statement

The authors declare that they have no financial or personal conflicts of interest that could influence the results or interpretations presented in this article. No external funding sources were received for the conduct of this research.

Data Availability Statement

The data that support the findings of this study were obtained from the Centre d'Études Prospectives et d'Informations Internationales (CEPII), specifically the BACI International Trade Database (Conte et al., 2022). These data are openly available at CEPII's database repository: http://www.cepii.fr/CEPII/en/bdd_modele/bdd.asp.

Processed datasets and replication files generated during the study are available from the corresponding author upon reasonable request.

References

Abrego, L., Amado, M. A., Gursoy, T., Nicholls, G. P., & Perez-Saiz, H. (2019). The African Continental Free Trade Agreement: Welfare gains estimates from a general equilibrium model (IMF Working Paper No. 2019/124). International Monetary Fund. https://doi.org/10.5089/9781498314398.001

African Development Bank Group & African Development Bank. (2019). *African Economic Outlook 2019*. https://www.afdb.org/en/documents/document/african-economic-outlook-aeo-2019-107319

AFRISTAT. (2020). *Guide d'élaboration d'une matrice de comptabilité sociale*. UEMOA. https://www.uemoa.int/node/1781

Agbodji, A. E. (2014, July). *Construction d'une matrice de comptabilité sociale avec des branches et produits agricoles désagrégés pour le Togo* (AGRODEP Data Report No. 01). International Food Policy Research Institute (IFPRI). https://hdl.handle.net/10568/151269

Bezbiq, F., & Hefnaoui, A. (2020). La région MENA est-elle un moteur d'intégration pour Maroc? *Revue Internationale Des Sciences De Gestion, 2*(2). https://revue-isg.com/index.php/home/article/view/70

Bchir, M. H., Decreux, Y., Guérin, J.-L., & Jean, S. (2002). MIRAGE, un modèle d'équilibre général calculable pour l'évaluation des politiques commerciales. *Économie Internationale, 89-90*(1), 109-153. https://doi.org/10.3917/ecoi.089.0109

Bouët, A., Laborde Debucquet, D., Traoré, F., Ait Faraji, S., Darouich, N., Hamdaoui, F., & Tounsi, S. (2021). *L'intégration du Maroc à la Zone de Libre-Echange Continentale (ZLECAf): Scenarii d'impacts à l'horizon 2035 et politiques d'accompagnement* (DEPF Brief No. 26). Direction des Études et des Prévisions Financières (DEPF). http://www.abhatoo.net.ma/maalama-textuelle/developpement-economique-et-social/developpement-economique/commerce/libre-echange/l-integration-du-maroc-a-la-zone-de-libre-echange-continentale-zlecaf-scenarii-d-impacts-a-l-horizon-2035-et-politiques-d-accompagnement

Brada, J. C., & Mendez, J. A. (1983). Regional economic integration and the volume of intra-regional trade: A comparison of developed and developing country experience. *Kyklos, 36*(4), 589-603. https://doi.org/10.1111/j.1467-6435.1983.tb00004.x

Cheong, D., Jansen, M., & Peters, R.-H. (with Internationales Arbeitsamt & UNCTAD). (2013). *Shared harvests: Agriculture, trade, and employment*. International Labour Office, United Nations Conference on Trade and Development. https://unctad.org/fr/isar/publication/shared-harvests-agriculture-trade-and-employment

Chigeto, A. D., Jayamoham, M. K, & Ayeru, E. (2025). Do regional trade agreements promote intra-regional trade in the Global South? The case of Sub-Saharan Africa. *Foreign Trade Review*. https://doi.org/10.1177/00157325251319627

Conte, M., Cotterlaz, P., & Mayer, T. (2022). *The CEPII gravity database* (CEPII Working Paper No. 2022-05). CEPII Research Center. https://www.cepii.fr/PDF_PUB/wp/2022/wp2022-05.pdf

Depetris Chauvin, N., Ramos, M. P., & Porto, G. (2016, October 27). *Trade, growth, and welfare impacts of the CFTA in Africa*. https://hesso.tind.io/record/2006/files/Depetris-Chauvin_2017_trade_growth_welfare.pdf

Decaluwé, B., Lemelin, A., Maisonnave, H., & Rochibud, V. (2012). The PEP standard computable general equilibrium model single-country, static version. PEP-1-1, Partnership for Economic Policy (PEP), MPIA Research Network. https://www.pep-net.org/methods/macro-modeling/cge-models

Depetris Chauvin, N., Ramos, M. P., & Porto, G. (2018). *Trade, growth, and welfare impacts of the CFTA in Africa* (Working paper). International Household Survey Network. http://hesso.tind.io/record/2006/files/Depetris-Chauvin_2017_trade_growth_welfare.pdf

El Alaoui, A. (2020). *Modèle d'équilibre général calculable: Présentation théorique et application empirique*. L'Harmattan. https://doi.org/10.3917/har.elal.2020.01

El Baouchari, N., & Raouf, R. (2024). Impact of health on labour productivity in Morocco: Insights from dynamic ARDL and KRLS techniques. *Journal of Global Sustainability and Development, 1*(1), 7-25. https://doi.org/10.57017/jgsd.v1.i1.01

El Hajoui, Y., Raouf, R., Ez-Zetouni, A., & El Baouchari, N. (2025). The impact of liberalisation on women's economic participation and the incidence of gender equality on Morocco's economy: A gender-sensitive CGE model analysis. *Journal of Applied Economic Sciences, 20*(1), 101-121. https://doi.org/10.57017/jaes.v20.1(87).07

Elbadawi, I. (1997). The impact of regional trade and monetary schemes on intra Sub-Saharan Africa trade. In A. Oyejide, I. Elbadawi, & P. Collier (Eds.), *Regional integration and trade liberalization in Sub-Saharan Africa* (pp. 210-255). Macmillan.

Fiess, N. M., Aguera, P. M. A., Calderon, C., Jensen, L., Gaskell, J. C., Keyser, J. C., Nielsen, H. S., Portugal, A., & Signoret, J. E. (2018). *Deepening regional integration to advance growth and prosperity*. World Bank Group. https://documents.worldbank.org/pt/publication/documents-reports/documentdetail/491781560455916201/deepening-regional-integration-to-advance-growth-and-prosperity

Fodha, M., & Le Maitre, P. (2007). *Transition démographique, chômage involontaire et redistribution intergénérationnelle: Simulations dans un cadre d'équilibre général à générations imbriquées* (Documents de travail du Centre d'Economie de la Sorbonne v07011). Université Panthéon-Sorbonne (Paris 1), Centre d'Economie de la Sorbonne. https://halshs.archives-ouvertes.fr/halshs-00144652

Foroutan, F., & Pritchett, L. (1993). Intra-Sub-Saharan African trade: Is it too little? *Journal of African Economies, 2*(1), 74-105. https://doi.org/10.1093/oxfordjournals.jae.a036775

Frankel, J. A., & Romer, D. (1999). Does trade cause growth? *The American Economic Review, 89*(3), 379-399. https://doi.org/10.1257/aer.89.3.379

Gbetnkom, D. (2013). Intégration régionale et potentialité commerciale dans la CEMAC: Une évaluation par le modèle de gravité. *Techniques Financières et Développement, 111*(2), 89-103. https://doi.org/10.3917/tfd.111.0089

Geda, A., & Seid, E. H. (2015). The potential for internal trade and regional integration in Africa. *Journal of African Trade, 2*(1-2), 19-50. https://doi.org/10.1016/j.joat.2015.04.001

Geda, A., & Yimer, A. (2023). The trade effects of the African Continental Free Trade Area: An empirical analysis. *The World Economy, 46*(2), 328-345. https://doi.org/10.1111/twec.13362

Gnimassoun, B. (2019). L'intégration de l'UEMOA est-elle pro-croissance? *Revue D'économie Politique, 129*(3), 355-390. https://doi.org/10.3917/redp.293.0355

High Commission for Planning. (2019). *Activité, emploi et chômage*. https://www.hcp.ma/Activite-emploi-et-chomage-premiers-resultats-annuel--2019_a3030.html

High Commission for Planning. (2022). *National accounts*. https://applications-web.hcp.ma/DCN2022/Accueil.html

Karingi, S., & Mevel, S. (2012). *Deepening regional integration in Africa: A computable general equilibrium assessment of the establishment of a continental free trade area followed by a continental customs union* [Conference paper]. Purdue University, Center for Global Trade Analysis, Global Trade Analysis Project. https://ideas.repec.org/p/ags/pugtwp/332288.html

Khellaf, A. (2015). *Politique budgétaire et développement humain au Maroc: Une analyse en équilibre général calculable dynamique et en microsimulation* [Doctoral dissertation, FSJES Agdal, Rabat].

Kibala Kuma, J. (2018). *Économétrie appliquée: Recueil des cas pratiques sur EViews (Régression linéaire simple et multiple)*. https://hal.science/cel-01771168

Laporte, B. (1998). Contraintes structurelles, politiques nationales et coopération régionale: Déterminants des échanges entre les pays d'Afrique de l'Ouest? *Canadian Journal of Development Studies / Revue Canadienne d'études Du Développement, 19*(1), 97-116. https://doi.org/10.1080/02255189.1998.9669739

Leamer, E. E., & Stern, R. M. (1970). *Quantitative international economics*. Allyn and Bacon. https://doi.org/10.4324/9781315127897

Mage-Bertomeu, S. (2006). Les modèles d'équilibre général appliqués à la politique commerciale: Développements récents. *Revue d'économie politique, 116*(3), 357-381. https://doi.org/10.3917/redp.163.0357

Marouani, M. A. (2004). *Effets de l'accord d'association avec l'Union européenne et du démantèlement de l'accord multifibres sur l'emploi en Tunisie : Une analyse en équilibre général intertemporel* (Working Paper No. DT/2004/01). DIAL (Développement, Institutions et Mondialisation). https://ideas.repec.org/p/dia/wpaper/dt200401.html

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica, 71*(6), 1695-1725. https://doi.org/10.1111/1468-0262.00467

Mendez-Parra, M., Agarwal, P., Luke, D., Vutula, N., ElAidi, I., Parshotam, A., Iacovou, E., & Chapman, F. (2025). *Impact of geopolitical dynamics on global trade: The case of the African automotives sector*. ODI Global. https://www.odi.org/publications/impact-of-geopolitical-dynamics-on-global-trade-the-case-of-the-african-automotives-sector

Milgram, J. (2003). *La ZLE avec l'UE est-elle la meilleure option pour le Maroc et la Tunisie? Une simulation à l'aide d'un modèle calculable d'équilibre général* (Cahier No. 82).

Millogo, A. (2012, January 23). *Estimation du potentiel de commerce dans l'Union du Maghreb Arabe par un modèle gravitationnel*. http://www.abhatoo.net.ma/maalama-textuelle/developpement-economique-et-social/developpement-economique/commerce/commerce-exterieur/estimation-du-potentiel-de-commerce-dans-l-union-du-maghreb-arabe-uma-par-un-modele-gravitationnel

Mureverwi, B. (2016). *Welfare decomposition of the Continental Free Trade Area* [Conference paper]. Purdue University, Center for Global Trade Analysis, Global Trade Analysis Project. https://ideas.repec.org/p/ags/pugtwp/332732.html

Naudet, J. D. (1993). *Modélisation des flux d'échanges extérieurs internationaux (1970-1990) et analyse des modèles d'ouverture en Afrique de l'Ouest* (Document de travail No. 13). OCDE, BAD, CILSS.

Ngepah, N., & Udeagha, M. C. (2018). African regional trade agreements and intra-African trade. *Journal of Economic Integration, 33*(1), 1176-1199. https://doi.org/10.11130/jei.2018.33.1.1176

Nitsch, V. (2002). Honey, I shrunk the currency union effect on trade. *The World Economy, 25*(4), 457-474. https://doi.org/10.1111/1467-9701.00443

Ortega, F., & Peri, G. (2014). Openness and income: The roles of trade and migration. *Journal of International Economics, 92*(2), 231-251. https://doi.org/10.1016/j.jinteco.2013.11.008

Otmani, Z., & Raouf, R. (2025). Exploring the Nexus Between Economic Growth and Exchange Rate in Morocco. In N. Tsounis & A. Vlachvei (Eds.), *Advances in Applied Macroeconomics. ICOAE 2024. Springer Proceedings in Business and Economics* (pp. 471-491). Springer. https://doi.org/10.1007/978-3-031-76658-9_26

Ouellet, E., Belley-Ferris, I., & Leblond, S. (2005, August). *Guide d'économétrie appliquée pour Stata: Pour ECN 3950 et FAS 3900*. Université de Montréal. https://sceco.umontreal.ca/public/FAS/sciences-economiques/Documents/3-ressources_services/ressouces_documentaires/econometrie/GuideEconometrieStata.pdf

Puga, D., & Venables, A. J. (1998). Trading arrangements and industrial development. *The World Bank Economic Review,* 12(2), 221–249. https://doi.org/10.1093/wber/12.2.221

Raouf, R., Dahane, H., & El Baouchari, N. (2021). *Impact of AfCFTA implementation on the Moroccan economy: A CGE modeling assessment*. 24th Annual Conference on Global Economic Analysis (Virtual Conference). Global Trade Analysis Project (GTAP). https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=6221

Reilly, W. J. (1929). *Methods for the study of retail relationships* (University of Texas Bulletin Monograph No. 4, 2944). https://repositories.lib.utexas.edu/bitstreams/ad404fad-2cd2-4762-8347-f204ae147530/download

Rose, A. K. (2002). Honey, the currency union effect on trade hasn't blown up. *The World Economy, 25*(4), 475-479. https://doi.org/10.1111/1467-9701.00444

Sandrey, R., Jensen, H. G., & Sandrey, R. (2015). *The Continental Free Trade Area: A GTAP assessment*. Tralac. https://www.tralac.org/publications/article/7287-the-continental-free-trade-area-a-gtap-assessment.html

Santos Silva, J. M. C., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics, 88*(4), 641-658. https://doi.org/10.1162/rest.88.4.641

Saygili, M., Peters, R., & Knebel, C. (2018). *African Continental Free Trade Area: Challenges and opportunities of tariff reductions* (UNCTAD Blue Series Papers No. 82). United Nations Conference on Trade and Development. https://ideas.repec.org/p/unc/blupap/82.html

Spilimbergo, A., Londoño, J. L., & Székely, M. (1999). Income distribution, factor endowments, and trade openness. *Journal of Development Economics*, 59(1), 77–101. https://doi.org/10.1016/S0304-3878(99)00006-1

Tinbergen, J. (1962). *Façonner l'économie mondiale: Suggestions pour une politique économique internationale*. Twentieth Century Fund. https://repub.eur.nl/pub/16826

Turkson, E., Oduro, A. D., Baffour, P. T., & Quartey, P. (2023). Regional integration and non-tariff barriers to intra-Sub-Saharan Africa trade. *The World Economy, 46*(2), 396-414. https://doi.org/10.1111/twec.13365

Vamvakidis, A. (1998). Regional integration and economic growth. *The World Bank Economic Review*, 12(2), 251–270. https://doi.org/10.1093/wber/12.2.251

Vamvakidis, A. (1999). Regional trade agreements or broad liberalization: Which path leads to faster growth? *IMF Staff Papers*, 46(1), 42–68. https://doi.org/10.2307/3867634

Vanzetti, D., Peters, R., & Knebel, C. (2017). *Non-tariff measures: Lifting CFTA and ACP trade to the next level* (UNCTAD Blue Series Papers No. 78). United Nations Conference on Trade and Development. https://ideas.repec.org/p/unc/blupap/78.html

Vanzetti, D., Peters, R., & Knebel, C. (2018). *Non-tariff measures: Lifting CFTA and ACP trade to the next level* (UNCTAD Research Paper No. 14). United Nations Conference on Trade and Development.

World Trade Organization. (2024). *WTO data portal*. https://data.wto.org/