

# Analysis of the Factors Affecting Coffee Export in Cameroon: A Gravity Model Approach

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## ABSTRACT

This study investigates the factors affecting coffee exports in Cameroon. For this purpose, we employed the gravity model. Considering the sample characteristics, the model is estimated with the Poisson pseudo-maximum likelihood (PPML) method. The main material of the study is a panel data set covering the years 2001-2021 for ten countries, Cameroon's main coffee export partners. The findings show that the GDP of importing countries, coffee export prices, and bilateral investment treaties (BITs) positively influence exports, whereas distance, exchange rates, and Cameroon's GDP have negative impacts. The results highlight Cameroon's logistics infrastructure deficiencies and the significance of stable, high-quality production. The Cameroonian government should implement policies to improve production quality and efficiency by expanding agricultural extension services and offering farmers input and investment incentives to address these challenges. Additionally, improving port efficiency will necessitate the digitalization of operations, implementation of data-driven planning, and strategic infrastructure investments.

**Keywords:** Gravity Model, Exchange Rate, Export Price, FTAs, BITs.

## INTRODUCTION

The agricultural sector plays a crucial role in the economy of Sub-Saharan African countries (Senbet and Simbanegavi, 2017). It has a predominant place in the supply of food, employment for rural populations, raw materials, and foreign income and mainly contributes to the formation of the Gross Domestic Product (GDP). The contribution of agriculture to Cameroon's GDP was approximately 16.97% in 2021. In the same year, it was the leading employer, employing 42.82% of the total workforce, and served as one of the primary sources of foreign currency, contributing 18.63% to merchandise exports. (World Bank, 2024).

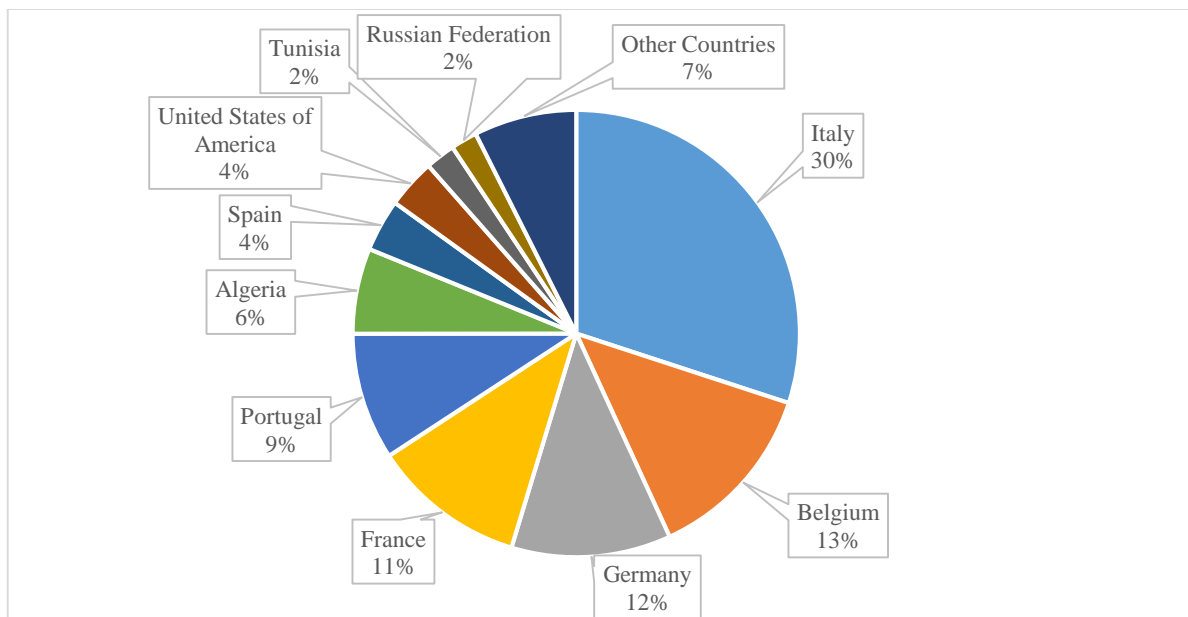
Coffee, along with cocoa and cotton, has played a decisive role in Cameroon's national economy (Kufa, 2010; René *et al.*, 2023). The coffee industry in Cameroon is an essential

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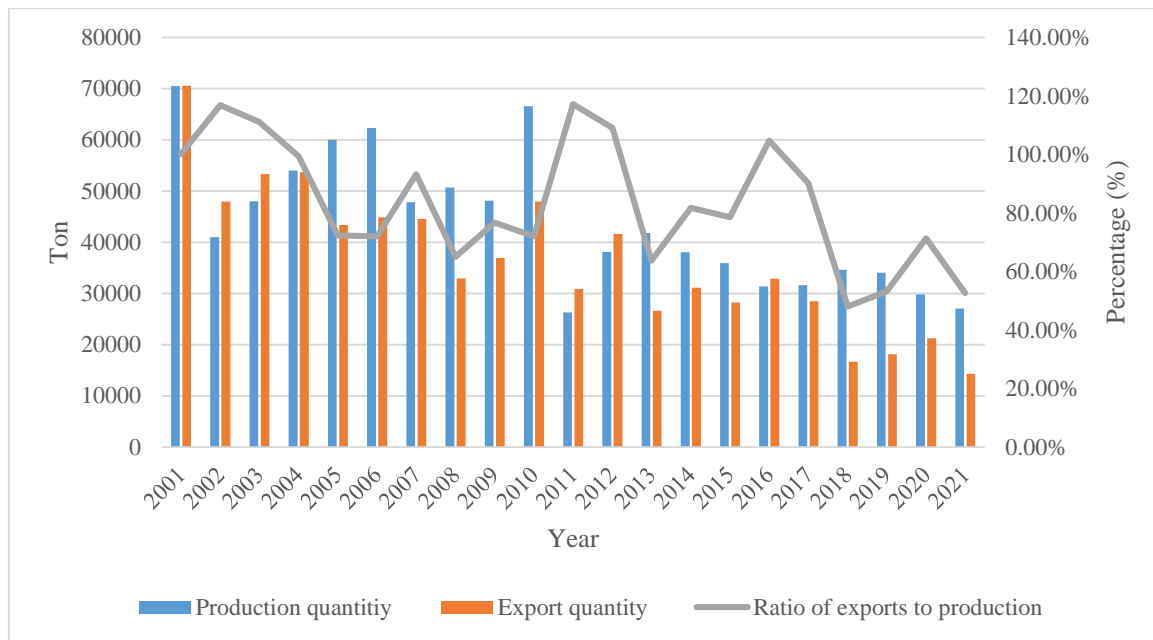
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32 source of income for many households from various aspects, including production, marketing,  
33 and distribution. An historical analysis of coffee production in Cameroon reveals that the past  
34 decade marked the lowest levels of production. Between 2011 and 2021, coffee production  
35 amounted to 33,527 tons on average, with approximately 1.5% of the arable land allocated for  
36 cultivation. In contrast, the peak of coffee production was observed in the 1980s, with  
37 production reaching 137,900 tons in 1984. During this peak, 5.7% of the arable land was  
38 allocated to coffee, making it the fourth largest agricultural product by land area (FAOSTAT,  
39 2024). Despite the decline in production, coffee continues to play a significant role in the  
40 Cameroonian economy due to its substantial contribution to exports. According to  
41 TRADEMAP (2024), coffee, tea, maté, and spices (code: 09) were Cameroon's 8th major export  
42 commodity category in 2001-2021. Coffee (code: 0901) constitutes 99.66% of this category.  
43 Cameroon directs 93% of its total coffee exports to its top ten coffee importers. Figure 1  
44 illustrates the share of these countries in Cameroon's coffee exports.



45 **Fig. 1.** Main Coffee Export Partners of Cameroon in 2001-2021 (TRADEMAP, 2024).

46 **Figure 2** presents the data for Cameroon's coffee production, exports, and export-to-  
47 production ratio spanning from 2001 to 2021. The figure illustrates that Cameroon's ratio of  
48 production to exports was generally above 80% during this period. Nevertheless, there is a  
49 noticeable decrease in both the ratio of coffee exports to production and the amount of coffee  
50 exports.  
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55 **Fig. 2.** Cameroon's coffee production, export, and export-to-production ratio between 2001 to  
 56 2021 (FAOSTAT, 2024).

57

58 The simultaneous decline in production and exports can be attributed to a combination of  
 59 many structural and cyclical problems. One of the most important is that coffee provides lower  
 60 returns than substitute crops, such as cocoa, for the farmers. A significant factor contributing to  
 61 the decline in farmers' revenue is the decrease in coffee export prices. Cameroon's real coffee  
 62 export price has declined by 24.53% over the past five years (2016-2021) compared with the  
 63 preceding sixteen-year period. Moreover, Cameroon's real coffee export price was 30% below  
 64 the world price in 2001-2021 (FAOSTAT, 2024; original calculations). The loss of income  
 65 leads producers to switch from coffee to cocoa cultivation or to forego the renewal of their  
 66 aging coffee trees (Shillie and Egwu, 2020). This change in production patterns may seem  
 67 suitable, given that opting for a more profitable alternative is likely to result in a favorable  
 68 impact on the total agricultural production value. Nonetheless, limiting the diversity within a  
 69 country's production and export portfolio raises risks due to factors such as plant diseases and  
 70 sector-specific global crises. Moreover, it renders investments made in established industries  
 71 ineffective for processing abandoned products. The income loss in coffee production stems  
 72 from export-related issues. Factors such as the limited popularity of Cameroonian origin in the  
 73 international market, the absence of a strategic marketing approach, fluctuating production,  
 74 concerns about product quality, high export taxes, and the insufficiency of dynamic promotional  
 75 initiatives collectively erode the competitiveness in exports (MINADER, 2009; GCP, 2016).  
 76 The low survival rate of export relationships could also be included among these factors. In

77 Cameroon, the probability of new exporters continuing their activities stands at 30 percent for  
78 the following year, decreasing to approximately 12 percent by the third year (World Bank,  
79 2016).

80 To alleviate the prevailing crisis within the coffee sector, the Cameroonian government is  
81 concentrating its efforts on increasing domestic consumption (VOA, 2019). Improving local  
82 consumption is crucial, not only to ensure access to essential consumer goods within society  
83 but also to safeguard producers against potential export crises. Although enhancing local  
84 consumption might boost supply through increased demand, the main driver of Cameroon's  
85 coffee industry development is the prioritization of exports. This is primarily because the price  
86 level incentivizing producers to engage in coffee production can be attained through exports.  
87 Besides, international trade is essential for economic growth (Karambakuwa and Nwadi,  
88 2020). It enhances productivity by driving firms to improve efficiency, while supporting  
89 economic development through the expansion of exports and imports (Kircicek and Ozparlak,  
90 2023).

91 Exports play a critical role in propelling the development of developing countries (Sanjuán-  
92 López & Dawson, 2010). Therefore, it is crucial to undertake more studies to identify the  
93 determinants exports in developing countries and to provide recommendations within this  
94 framework. The gravity model has been widely used in trade economics to elucidate the  
95 bilateral trade flows between countries. This model has been refined over the years, and scholars  
96 across the globe have extensively explored the various factors affecting the export of  
97 commodities. Among these factors, the exchange rate is frequently mentioned. Studies have  
98 shown that the impact of exchange rates on agricultural export flows can vary significantly  
99 depending on the country and sector in question (Abdullahi et al., 2021; Abdullahi et al., 2022;  
100 Yadav and Chattopadhyay, 2024). The effects of free trade agreements on exports have also  
101 been discussed in the literature, demonstrating that Free Trade Agreements (FTAs) facilitate  
102 increased export volumes by reducing trade barriers and fostering market access (Nsabimana  
103 and Tirkaso, 2020; Jagdambe and Kannan, 2020). Price is one of the key factors that shape  
104 demand for goods within a country. A decline in export prices typically leads to increased  
105 demand in importing countries, stimulating higher export volumes. Multiple works in the  
106 literature have reached similar conclusions (Yusiana et al., 2022, Phung and Nguyen, 2022).  
107 Recent researchs has investigated the effects of Bilateral Investment Agreements (BITs) on  
108 exports, demonstrating that these agreements significantly boost exports (Heid and Vozzo,  
109 2020; Xiong, 2022).

110 Despite the growing body of literature, research on sub-Saharan Africa remains limited.  
 111 Further research is needed to understand the factors driving strategic product exports and  
 112 develop strategies in this area. This study assists in filling this gap by employing the gravity  
 113 model to analyze factors affecting coffee exports in Cameroon. In its basic form, the gravity  
 114 model provides ideas about the impact of transportation costs and trade partners' income on  
 115 exports. However, this research extends the model by incorporating variables related to the  
 116 impact of international agreements and export price elasticity. These factors have received  
 117 limited attention in the literature regarding their impact on exports, particularly in developing  
 118 countries. This versatile framework enables us to conduct a comprehensive foreign trade  
 119 analysis for Cameroon, providing actionable findings to support policymakers in crafting and  
 120 refining strategies for more effective trade planning and development.

121  
 122 **MATERIAL AND METHODS**

123 **Material**

124 The main material of this study consisted of data obtained from international bodies. The  
 125 data set covers the period 2001-2021 and includes the ten countries to which Cameroon exports  
 126 the most in the relevant period. These countries are Italy, Belgium, Germany France, Portugal,  
 127 Algeria, Spain, the USA, Tunisia and Russian Federation, respectively. Information on the  
 128 variables included in the model is given in Table 1.

129  
 130 **Table 1.** Description of the Variables.

Variable*	Description*	Unit	Source	Expected Sign
$EX_{ij}$	The value of coffee** exports from Cameroon to country $j$	US\$, in 2015 Prices	TRADEMAP (2024), original calculations	N/A
$GDP_i$	Gross domestic product of Cameroon	US\$ per capita, in 2015 Prices	FAOSTAT (2024)	+
$GDP_j$	Gross domestic product of importing country $j$	US\$ per capita, in 2015 Prices	FAOSTAT (2024)	-/+
$DIST_{ij}$	The geographical distance between Cameroon and the importing country $j$	km	CEPII (2024)	-
$RXP_i$	The coffee export price of Cameroon	US\$, in 2015 Prices	TRADEMAP (2024), original calculations	-
$ER_{ij}$	Exchange Rate. This indicates how much of the Central African CFA Franc is required to purchase one unit importing countries' own money.	Central African CFA franc	FXTOP (2024)	-/+
$FTA_{ij}$	Free Trade Agreements between Cameroon and the importing country $j$	Dummy	CEPII (2024)	+
$BIT_{ij}$	Bilateral Investment Treaties between Cameroon and the importing country $j$	Dummy	UNCTAD (2024)	+

131 \* Here  $i$  represents Cameroon and  $j$  represents one of Cameroon's top ten trading partners.

132 \*\* "Product: 0901 Coffee, whether or not roasted or decaffeinated; coffee husks and skins; coffee substitutes  
 133 containing coffee in any proportion" (TRADEMAP, 2024).

134 **Methods**

135 This study analyzes the factors affecting coffee export in Cameroon. The gravity model is  
 136 used for this purpose. In recent decades, this model has become a widely used tool for  
 137 elucidating international trade determinants (Sharma *et al.*, 2023). The primary reason for this  
 138 is the model's ability to offer a comprehensive analysis of revealed trade data (Jadhav and  
 139 Ghosh, 2023). The gravity model of international trade elucidates bilateral trade flows by  
 140 incorporating the economic scale of the trading partners and the geographical distance that  
 141 separates them (Golovko and Sahin, 2021). Tinbergen's (1962) pioneering work established the  
 142 framework for this model, and subsequent early studies further developed and applied its  
 143 principles.

144 The gravity model in the logarithmic transformation of the variables, as commonly used in  
 145 the literature, can be expressed as follows:

$$146 \ln EX_{ij} = \beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 DIST_{ij} + e_{ij}$$

147 where,  $i$  represents Cameroon,  $j$  represents trading partners,  $EX_{ij}$  represents the value of  
 148 bilateral coffee exports from Cameroon to its trading partners,  $GDP_i$  represents the gross  
 149 domestic product of country  $i$ ,  $GDP_j$  represents the gross domestic product of the country  $j$ , and  
 150  $DIST_{ij}$  represents the geographical distance between Cameroon and its trading partners.

151 The basic structure of the gravity model has evolved in multiple ways to accommodate the  
 152 needs of researchers (Nawrot, 2023). In country- and product-specific studies, such  
 153 modifications yield empirical insights that not only enrich the literature but also assist  
 154 policymakers in formulating effective strategies. Therefore, we modified our model by  
 155 integrating variables linked to the primary factors behind the decline in Cameroon's coffee  
 156 exports, as outlined in the introduction. We tackled the problem of low export prices by  
 157 including variables such as the real export price and exchange rates. To address the issue of low  
 158 survival rates in export relationships, we included dummy variables related to free trade  
 159 agreements and bilateral investment treaties. The modified model is formulated as follows:

$$160 \ln EX_{ij} = \beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 DIST_{ij} + \beta_4 \ln RXP_i + \beta_5 \ln ER_{ij} + \beta_6 FTA_{ij} +$$

$$161 \beta_7 BIT_{ij} + e_{ij}$$

162 where,  $RXP_i$  is the coffee export price of Cameroon,  $ER_j$  is the exchange rate between  
 163 Cameroon and its trading partners,  $FTA_{ij}$  is the Free Trade Agreements between Cameroon and  
 164 its trading partners, and  $BIT_{ij}$  is the Bilateral Investment Treaties between Cameroon and its  
 165 trading partners.

166 Estimation of the gravity model is a problematic issue in most cases and has long been  
 167 debated by researchers. The primary cause behind this is the fluctuating nature of the bilateral  
 168 trade flows. Economic and political circumstances have the potential to either excessively boost  
 169 trade or entirely impede its occurrence. This phenomenon is especially evident in developing  
 170 economies or emerging sectors of a country. An example of this is Cameroon, which has not  
 171 traded with major coffee export partners for some years.

172 Zero trade flows create substantial econometric challenges, as the loss of observations in  
 173 log-linear transformations leads to information loss and biased results (Gómez-Herrera, 2013;  
 174 Borojo *et al.*, 2022). To simply solve the zero trade problem, removing these observations from  
 175 the data set (Bikker, 1987) and formulating the dependent variable as  $\ln(\text{Export}+1)$   
 176 (Eichengreen and Irwin, 1995; Guo, 2004) are commonly used. However, Santos Silva and  
 177 Tenreyro (2006) showed that these traditional methods lead to inconsistent estimates, especially  
 178 in cases where the heteroscedasticity problem exists, and suggested the Poisson Pseudo-  
 179 Maximum Likelihood (PPML) model for estimating gravity models. The use of the PPML  
 180 estimator in the gravity model has been criticized on the grounds that it may yield biased results  
 181 in situations where zero trade flows predominate and there is overdispersion (Burger *et al.*,  
 182 2009; Martínez-Zarzoso, 2013). Nevertheless, a substantial amount of research has shown that  
 183 PPML maintains its robustness, even in situations of frequent zero trade flows or overdispersion  
 184 (Santos Silva and Tenreyro, 2011, 2022; Ghazalian, 2019).

185 Due to its advantages, we used the PPML method for estimation. This model can be  
 186 estimated only when the dependent variable consists of integer count data. Hence, we rounded  
 187 the data in our dependent variable, which included fractional observations, to integer values.  
 188 Our gravity model to be estimated with PPML can be formulated as an exponential function as  
 189 follows:

$$190 \quad EX_{ij} = \exp[\beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 DIST_{ij} + \beta_4 \ln RXP_i + \beta_5 \ln ER_{ij} + \beta_6 FTA_{ij} \\ 191 \quad + \beta_7 BIT_{ij}] + e_{ij}$$

192 Given that the model is in exponential form, dummy variables are interpreted similarly to  
 193 semi-logarithmic models. In this study, the approach proposed by Halvorsen and Palmquist  
 194 (1980) was employed for interpreting dummy variables. Accordingly, whereas  $g$  represents the  
 195 relative effect, the percentage effect is calculated using the following formula:

$$196 \quad 100 * g = 100 * (e^\beta - 1)$$

197 To test the robustness of the estimation methodology, we employed alternative commonly  
 198 used estimators. These are the negative binomial maximum likelihood (NBML) model



199 proposed by Burger (2009) and the OLS with  $\ln(\text{Export}+1)$  modification. Since the negative  
 200 binomial model is categorized as an integer count model, we used same rounding modification  
 201 as the PPML for the dependent variable. In the findings section, we presented the outcomes  
 202 derived from these estimators along with PPML.

203  
 204 **RESULTS AND DISCUSSION**

205 Table 2 presents descriptive statistics of the variables included in the model. As FTA and  
 206 BIT are dummy variables, their means reflect their respective frequencies. FTAs, for instance,  
 207 account for 20% of the observations. Cameroon’s sole FTA with the countries in the dataset is  
 208 the agreement with the EU, which came into effect on August 14, 2014. However, as the CEPII  
 209 database registers agreements that take effect after July 1st in the following year, FTAs are  
 210 recorded from 2015 onwards. BITs account for 39% of the observations. Cameroon has BIT  
 211 agreements only with Italy, the USA, Belgium, and Germany, among the countries included in  
 212 the dataset for this study. Of these, only the BIT with Italy occurred during the observation  
 213 period, on April 1, 2004. The agreements with other countries came into force prior to the  
 214 observation period.

215  
 216 **Table 2. Descriptive Statistics.**

Variables	Mean	Std. Dev.	Maximum	Minimum
$EX_{ij}$	5857.27	7658.47	52590.00	0.00
$\ln GDP_i$	7.18	0.07	7.28	7.05
$\ln GDP_j$	9.85	0.95	11.03	7.91
$\ln DIST_{ij}$	8.51	0.27	9.17	8.20
$\ln RXP_i$	0.52	0.20	0.91	0.17
$\ln ER_{ij}$	5.55	1.69	6.60	1.41
$FTA_{ij}$	0.20	0.40	1.00	0.00
$BIT_{ij}$	0.39	0.49	1.00	0.00

217  
 218 Table 3 shows the estimation results of the gravity model. Here, the PPML model is  
 219 employed as the base model for interpretation, while NBML and OLS models are added for  
 220 robustness check. Examination of the estimation results indicates that the estimators produce  
 221 largely consistent outcomes regarding both the direction and significance levels of the  
 222 relationships. The only difference is that the OLS method yields statistically significant results  
 223 for the  $FTA_{ij}$ .

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**Table 3. Estimation Results for Gravity Model.**

Variables	PPML <sup>a</sup>	NBML <sup>a</sup>	OLS $\ln(EX_{ij} + 1)$
Constant	69.41878*** (11.59736)	58.74402*** (10.81458)	75.23906*** (15.07565)
$\ln GDP_i$	-5.624733*** (1.430220)	-4.627639*** (1.523776)	-10.56881*** (2.059889)
$\ln GDP_j$	1.497604*** (0.260985)	1.191910*** (0.152143)	2.016000*** (0.239863)
$\ln DIST_{ij}$	-3.994570*** (0.542036)	-3.325517*** (0.359847)	-4.170305*** (0.585373)
$\ln RXP_i$	0.629975* (0.337856)	1.087721*** (0.379283)	2.429299*** (0.606308)
$\ln ER_{ij}$	-0.355475*** (0.098317)	-0.241735*** (0.065761)	-0.568053*** (0.104096)
$FTA_{ij}$	-0.170373 (0.228515)	-0.029155 (0.259557)	0.826028** (0.405091)
$BIT_{ij}$	0.430819*** (0.145855)	0.416284*** (0.131776)	0.605192** (0.291410)
Adjusted R <sup>2</sup>	0.61	0.50	0.43
N	210	210	210

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<sup>a</sup>Robust standard errors are in parenthesis.

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\*, \*\*, \*\*\*P &lt; 0.1, P &lt; 0.05, and P &lt; 0.01, respectively.

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The estimation results for our base model show that all variables, with the exception of FTA, are statistically significant. The GDP of importing countries has the highest positive impact of 1.50%, followed by Cameroon's real coffee export price at 0.63%. Additionally, the percentage impact of BITs is measured at 54%. The variable with the most substantial negative effect is Cameroon's GDP, with -5.62%. This is followed by distance and exchange rates with -3.99% and -0.35%, respectively.

The negative correlation between Cameroon's GDP per capita growth and coffee exports can be attributed to the increase in domestic purchasing power. This growth enables higher internal consumption, potentially reducing the volume of coffee available for export. Concrete signs of this relationship are evident in Cameroon. The per capita GDP increased by 24% during the study period, indicating growing domestic demand. This is further supported by the rise in coffee processing facilities, with 104 active plants reported by the National Cocoa and Coffee Board (NCCB, 2020). Since 99% of Cameroon's coffee exports are unroasted and only 5% of production is processed domestically (AFCA, 2024), these facilities predominantly serve the local market. Moreover, the negative relationship between income growth and agricultural product exports has also been previously documented (Abdullahi et al., 2022). This shift in demand aligns with the broader mechanism of income elasticity, which suggests that as incomes grow, domestic consumption can compete with exports. If managed well, this mechanism can produce positive results for coffee exports in the long term. Because sustainable production is a prerequisite for sustainable exports, and sustainable production is possible with alternative sales channels. Establishing a vibrant domestic market is essential, enabling producers to

253 engage in sales even when confronted with conditions detrimental to exports, such as  
254 international crises. Therefore, to safeguard against a potential decline in exports due to  
255 increased demand, it is essential to support producers with productivity-enhancing policies,  
256 such as facilitating access to agricultural credit, offering incentives for input use, and promoting  
257 mechanization.

258 Another variable that has a negative effect is distance. Each one percent increase in distance  
259 reduces export value by 3.99%. Although past studies reached results consistent with ours  
260 regarding the direction of the distance-export relationship, they differ in the magnitude of the  
261 effect. In the majority of the studies surveyed, the distance elasticity for coffee exports falls  
262 below the level estimated for Cameroon (Sadeghi et al., 2019; Abafita and Tadesse, 2021;  
263 Nguyen, 2022). Considering that the distance variable reflects the costs and risks in  
264 transportation, this finding may indicate Cameroon's logistical inefficiency in coffee. The  
265 inefficiency in the port of Douala, Cameroon's largest port, confirms our explanation. Douala's  
266 average dwell time for containers (19 days) differs negatively from other African ports such as  
267 Dar es Salam (12 days), Mombasa (11 days), and Durban (4 days) (Raballand *et al.*, 2012;  
268 Diarra and Tchapa, 2014; World Bank, 2016). Even more concerning, recent studies have  
269 demonstrated that Douala's container dwell time has exceeded 21 days (Awah *et al.*, 2021),  
270 placing it 340th out of 370 ports in the 2021 Container Port Performance Index (Worldbank,  
271 2022). The World Bank (2016) pointed to the sector's lack of proper regulation as the  
272 explanation for this situation. Furthermore, if we accept that this variable also indirectly  
273 expresses cultural distances like language differences and varying institutional frameworks  
274 between countries (Van Bergeijk and Brakman, 2010; Golovko and Sahin, 2021), the obtained  
275 coefficient can also be associated with marketing failure. The Cameroonian government must  
276 invest in intercity transportation infrastructure and enhance port efficiency to address logistics  
277 shortcomings. This requires digitalizing port operations, data-driven planning, and  
278 infrastructure upgrades. Additionally, expanding the network of asphalt roads is essential, not  
279 only to increase the efficiency of coffee transport but also to enhance the movement of goods  
280 and improve domestic mobility across the country.

281 Our estimation results show that every 1% decrease in the value of the Central African CFA  
282 franc reduces coffee exports by 0.35%. The effect of exchange rates on exports is quite  
283 controversial, both theoretically and empirically. The appreciation of a country's currency can  
284 weaken that country's competitiveness in the international market. Generally, an increase in the  
285 exchange rate reduces the comparative price of exports and increases foreign demand by

286 reducing the prices of domestic goods (Nugroho and Lakner, 2022). In reality, various factors  
287 tied to both the country and the sector play a role in determining the correlation between the  
288 exchange rate and export dynamics. Examining the case of Cameroon, we observe that its  
289 export price is approximately half of the global price, as previously noted. Given Cameroon's  
290 already highly competitive pricing, an appreciation of its currency may still yield a positive  
291 impact on the value of its exports. The literature also reflects on the relative nature of this  
292 situation. While a substantial body of evidence supports our study's conclusions (Irshad *et al.*,  
293 2018; Yadav and Chattopadhyay, 2024; Eshetu, 2024), there is also a significant volume of  
294 evidence with contradictory outcomes (Abdullahi *et al.*, 2021; Abafita and Tadesse, 2021;  
295 Nugroho and Lakner, 2022). The estimation results further indicate a positive and significant  
296 relationship between coffee export prices and export value. While this finding diverges from  
297 the literature (Phung and Nguyen, 2022), it aligns with our results for the exchange rate. Similar  
298 to the exchange rate, the general assumption is that competitive pricing boosts total exports.  
299 However, this no longer holds for Cameroon, which already offers highly competitive prices  
300 compared to the global market. Therefore, Cameroonian policymakers should prioritize quality-  
301 enhancing production policies that increase prices rather than focus on selling more products at  
302 competitive prices to boost income from coffee exports. This can be achieved by expanding  
303 agricultural extension and advisory services. In this way, the necessary technical support is  
304 provided to help traditional producers improve the quality of their products. Additionally,  
305 producers are informed about certified production techniques, such as organic farming, which  
306 offers high-price premiums. In this context, it is crucial to financially support and motivate  
307 producers who engage in certified production.

308 Our estimation results for international agreements revealed that FTAs have no statistically  
309 significant effect on coffee exports, whereas BITs have shown a positive effect. This finding is  
310 consistent with the literature, which provides evidence of positive relationships between exports  
311 and BITs (Heid and Vozzo, 2020; Xiong, 2022). However, this study represents the first  
312 documented case in the context of a developing country. It is not surprising that, irrespective of  
313 the development level of the countries, BITs and exports display similar effects. One of the  
314 most significant advantages of BITs is their capacity to facilitate foreign direct investment,  
315 which, as studies have demonstrated (Samantha and Haiyun, 2018; Sahoo and Dash, 2022),  
316 enhances exports in both developing and developed countries. Furthermore, BITs offer several  
317 additional benefits that can boost export volumes, including promoting trade in specialized  
318 intermediate inputs and mitigating risks through enhanced legal protections (Heid and Vozzo,

2020). Contrary to the widely held assumption that FTAs boost exports, recent research on coffee by Abafita and Tadesse (2021) has found no statistically significant relationship, as in our study. They explain this by noting that coffee trade primarily flows from least developed countries to more developed countries, while most regional trade agreements (RTAs) in their study are intra-regional, which may diminish the impact of inter-regional RTAs on coffee trade. In the Cameroonian case, the most plausible explanation for the lack of a significant relationship is the steady decline in coffee production since the FTAs came into force. Despite the facilitation of bilateral trade, the continuous drop in production has prevented the Cameroonian coffee sector from benefiting from these agreements. These findings imply that, the cornerstone of increasing Cameroon's exports through international agreements is ensuring a steady and consistent production flow. Additionally, the Cameroonian government should analyze existing agreements and suggest strategic adjustments explicitly tailored to the coffee sector to maximize the impact of FTAs.

## CONCLUSIONS

Our study uncovered key insights into the underlying dynamics of Cameroon's coffee exports. The most significant challenge is the negative impact of rising domestic demand for coffee, driven by income growth, on export levels. However, if adequately managed through policies aimed at increasing productivity, such as better access to credit and mechanization, this demand could support domestic consumption and sustainable exports. Cameroon's logistical inefficiencies, particularly when compared to its competitors, further constrain exports. On the positive side, international agreements and focus on quality rather than price competition can influence exports positively. To fully realize its potential, the Cameroonian government must provide technical and financial support to producers, enhance efficiency at the Douala port, and critically assess its international agreements to develop strategies that maximize their benefits.

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## REFERENCES

1. Abafita, J. and Tadesse, T. 2021. Determinants of global coffee trade: Do RTAs matter? Gravity model analysis. *Cogent Econ. Financ.*, **9(1)**: 1892925.

- 352 2. Abdullahi, N. M., Shahriar, S., Kea, A. M., Abdullahi, Zhang, Q. and Huo, X. 2021.  
353 Nigeria's cocoa exports: A gravity model approach. *Cienc. Rural*, **51(11)**: e20201043.
- 354 3. Abdullahi, N. M., Zhang, Q., Shahriar, S., Irshad, M. S., Ado, A. B. and Huo, X. 2022.  
355 Examining the determinants and efficiency of China's agricultural exports using a stochastic  
356 frontier gravity model. *PLoS ONE*, **17(9)**: e0274187.
- 357 4. AFCA 2024. African Fine Coffee Association (AFCA). About Cameroon.  
358 <https://afca.coffee/portfolio-item/cameroon/> Accessed 25.01.2024.
- 359 5. Awah, P. C., Nam, H. and Kim, S. 2021. Short term forecast of container throughput: New  
360 variables application for the Port of Douala. *J. Mar. Sci. Eng.*, **9(7)**: 720.
- 361 6. Bikker, J. A. 1987. An international trade flow model with substitution: an extension of the  
362 gravity model. *Kyklos*, **40(3)**: 315-337.
- 363 7. Borojo, D. G., Yushi, J. and Miao, M. 2022. The impacts of economic policy uncertainty on  
364 trade flow. *Emerg. Mark. Financ. Trade*, **58(8)**: 2258-2272.
- 365 8. Burger, M., Van Oort, F. and Linders, G. J. 2009. On the specification of the gravity model  
366 of trade: zeros, excess zeros and zero-inflated estimation. *Spat. Econ. Anal.*, **4(2)**: 167-190.
- 367 9. CEPII 2024. The CEPII Gravity database.  
368 [https://www.cepii.fr/CEPII/en/bdd\\_modele/bdd\\_modele\\_item.asp?id=8](https://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele_item.asp?id=8) Accessed  
369 28.08.2024
- 370 10. Diarra, G. and Tchapa, T. 2014. *Data Collection for Cargo Delays At the Port of Douala*.  
371 Mission Report, World Bank.
- 372 11. Eichengreen, B. and Irwin, D. A. 1995. Trade blocs, currency blocs and the reorientation of  
373 world trade in the 1930s. *J. Int. Econ.*, **38(1-2)**: 1-24.
- 374 12. Eshetu, F. 2024. Determinants of Ethiopian sesame and coffee exports to its major trade  
375 partners: application of the gravity model. *Cogent Soc. Sci.*, **10(1)**: 2334114.
- 376 13. FAOSTAT 2024. Food and Agriculture Organization of the United Nations.  
377 <http://www.fao.org/faostat/en/#home>. Accessed 28.08.2024.
- 378 14. FXTOP 2024. <https://fxtop.com/>. Accessed 28.08.2024.
- 379 15. GCP 2016. *African Coffee Sector: addressing national investment agendas on a continental*  
380 *scale Cameroon Case Study*. Global Coffee Platform (GCP).  
381 <https://www.globalcoffeeplatform.org/> Accessed 24.01.2024.
- 382 16. Ghazalian, P. L. 2019. Canada's beef exports: Border effects and prospects for market access.  
383 *Can. J. Agric. Econ.*, **67(1)**: 53-74.

- 384 17. Golovko, A. and Sahin, H. 2021. Analysis of international trade integration of Eurasian  
385 countries: Gravity model approach. *Eurasian Econ. Rev.*, **11(3)**: 519-548.
- 386 18. Gómez-Herrera, E. 2013. Comparing alternative methods to estimate gravity models of  
387 bilateral trade. *Empir. Econ.*, **44(3)**: 1087-1111.
- 388 19. Guo, R. 2004. How culture influences foreign trade: evidence from the US and China. *J.*  
389 *Socio-Econ.*, **33(6)**: 785-812.
- 390 20. Halvorsen, R. and Palmquist, R. 1980. The interpretation of dummy variables in  
391 semilogarithmic equations. *Am. Econ. Rev.*, **70(3)**: 474-475.
- 392 21. Heid, B. and Vozzo, I. 2020. The international trade effects of bilateral investment treaties.  
393 *Econ. Lett.*, **196**: 109569.
- 394 22. Irshad, M. S., Xin, Q. and Arshad, H. 2018. Competitiveness of Pakistani rice in international  
395 market and export potential with global world: A panel gravity approach. *Cogent Econ.*  
396 *Financ.*, **6(1)**: 1486690.
- 397 23. Jadhav, S. and Ghosh, I. 2023. Future Prospects of the Gravity Model of Trade: A  
398 Bibliometric Review (1993–2021). *Foreign Trade Rev.*, 00157325221140154.
- 399 24. Jagdambe, S. and Kannan, E. 2020. Effects of ASEAN-India Free Trade Agreement on  
400 agricultural trade: The gravity model approach. *World Dev. Perspect.*, **19**: 100212.
- 401 25. Kufa, T. 2010. Environmental sustainability and coffee diversity in Africa. *In Proceedings*  
402 *of the ICO world coffee conference* (pp. 26-28).
- 403 26. Kircicek, T. and Özparlak, G. 2023. The essential role of international trade on economic  
404 growth. *J. Econ. Financ. Account.*, **10(4)**: 191-202.
- 405 27. Karambakuwa, R. T. and Ncwadi, R. 2020. Trade structure as an enabler of economic growth  
406 in Africa. *Bus. Manag. Rev.*, **11(1)**: 120-130.
- 407 28. Martínez-Zarzoso, I. 2013. The log of gravity revisited. *Appl. Econ.*, **45(3)**: 311-327.
- 408 29. MINADER 2009. *Cameroon Coffe Sector Development Strategy 2010-2015*. Ministry of  
409 Agriculture and Rural Development of Cameroon (MINADER). Yaoundé, Cameroon.
- 410 30. Nawrot, K. A. 2023. Assessing the effects of trade regionalism in East Asia—evidence from  
411 augmented gravity models. *Appl. Econ.*, **55(12)**: 1285-1297.
- 412 31. NCCB 2022. National Cocoa and Coffee Board. Available online: [www.oncc.cm](http://www.oncc.cm). Accessed  
413 09.12.2022.
- 414 32. Nguyen, D. D. 2022. Determinants of Vietnam's rice and coffee exports: Using stochastic  
415 frontier gravity model. *J. Asian Bus. Econ. Stud.*, **29(1)**: 19-34.



- 416 33. Nsabimana, A. and Tirkaso, W. T. 2020. Examining coffee export performance in Eastern  
417 and Southern African countries: Do bilateral trade relations matter? *Agrekon*, **59(1)**: 46-64.
- 418 34. Nugroho, A. D. and Lakner, Z. 2022. Effect of globalization on coffee exports in producing  
419 countries: A dynamic panel data analysis. *J. Asian Financ. Econ. Bus.*, **9(4)**: 419-429.
- 420 35. Phung, Q. D. and Nguyen, T. C. 2022. An Analysis of Factors Impacting Vietnam's Coffee  
421 Exports: An Approach from the Gravity Model. *J. Asian Financ. Econ. Bus.*, **9(8)**: 1-6.
- 422 36. Raballand, G., Refas, S., Beuran, M. and Isik, G. 2012. *Why Does Cargo Spend Weeks in*  
423 *Africa: Lessons from Six Countries*. World Bank.
- 424 37. René, N., Luc, N. N., Bergaly, K. C. and Daniel, G. 2023. Economic performance of certified  
425 cocoa-based agroforestry systems in Cameroon. *Environ. Dev. Sustain.*, **25(5)**: 3843-3865.
- 426 38. Sadeghi, P., Hosseini, S. S. and Moghaddasi, R. 2019. Analyzing Iran's Export Market  
427 Potential Using Gravity Model: Evidence from Date Market. *J. Agric. Sci. Technol.*, **21(4)**:  
428 773-783.
- 429 39. Sahoo, P. and Dash, R. K. 2022. Does FDI have differential impacts on exports? Evidence  
430 from developing countries. *Int. Econ.*, **172**: 227-237.
- 431 40. Sanjuán- López, A. I. and Dawson, P. J. 2010. Agricultural exports and economic growth in  
432 developing countries: A panel cointegration approach. *J. Agric. Econ.*, **61(3)**: 565-583.
- 433 41. Santos Silva, J. M. C. and Tenreyro, S. 2006. The log of gravity. *Rev. Econ. Stat.*, **88(4)**:  
434 641-658.
- 435 42. Santos Silva, J. M. C. and Tenreyro, S. 2011. Further simulation evidence on the  
436 performance of the Poisson pseudo-maximum likelihood estimator. *Econ. Lett.*, **112(2)**: 220-  
437 222.
- 438 43. Santos Silva, J. M. C. and Tenreyro, S. 2022. The log of gravity at 15. *Port. Econ. J.*, **21(3)**:  
439 423-437.
- 440 44. Samantha, N. P. G. and Haiyun, L. 2018. Does Inward Foreign Direct Investment Promote  
441 Export? Empirical Evidence from Sri Lanka. *Bus. Econ. Res.*, **8(3)**: 1-18.
- 442 45. Senbet, L. W. and Simbanegavi, W. 2017. Agriculture and structural transformation in  
443 Africa: An overview. *J. Afr. Econ.*, **26(suppl\_1)**: 3-10.
- 444 46. Sharma, P., Rohatgi, S. and Jasuja, D. 2023. Scientific mapping of gravity model of  
445 international trade literature: A bibliometric analysis. *J. Scientometr. Res.*, **11(3)**: 447-57.
- 446 47. Shillie, P. N. and Egwu, M. J. B. 2020. Value Added Agriculture: An Analysis of Economic  
447 Relations in the Coffee Value Chain in the North West Region of Cameroon. *Ulus. Ekon.*  
448 *İşlet. Polit. Derg.*, **4(2)**: 281-296.



- 449 48. Tinbergen, J. 1962. *Shaping the world economy. Suggestions for an international economic*  
450 *policy*. New York: Twentieth Century Fund.
- 451 49. TRADEMAP 2024. <https://www.trademap.org>. Accessed 28.08.2024
- 452 50. Van Bergeijk, P. A. and Brakman, S. 2010. *The comeback of the gravity model, the gravity*  
453 *model in international trade: Advances and applications*. Cambridge University Press.
- 454 51. VOA 2019. Cameroon Aims to Drink, Produce More Coffee. VOANEWS AFRICA.  
455 <https://www.voanews.com/a/cameroon-aims-to-drink-produce-more-coffee/4881136.html>
- 456 52. World Bank 2016. *Cameroon Country Economic Memorandum Markets, Government, and*  
457 *Growth*. Report No: 110907-CM.
- 458 53. World Bank 2022. *The Container Port Performance Index 2021: A Comparable Assessment*  
459 *of Container Port Performance*. World Bank, Washington, DC. License: Creative Commons  
460 Attribution CC BY 3.0 IGO.
- 461 54. World Bank 2024. World Development Indicators.  
462 <https://databank.worldbank.org/source/world-development-indicators>. Accessed  
463 28.08.2024.
- 464 55. Xiong, T. 2022. The effect of bilateral investment treaties (BITs) on the extensive and  
465 intensive margins of exports. *Q. Rev. Econ. Financ.*, **84**: 68-79.
- 466 56. Yadav, A. K. and Chattopadhyay, U. 2024. Determinants of India's cotton export  
467 performance: An empirical analysis. *Int. Econ.*, **179**: 100521.
- 468 57. Yusiana, E., Hakim, D. B., Syaukat, Y., & Novianti, T. (2022). Analysis of factors  
469 influencing Thai rice trade based on Gravity model. *IOP Conf. Ser.: Earth Environ. Sci.*,  
470 **951**: 012039
- 471