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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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

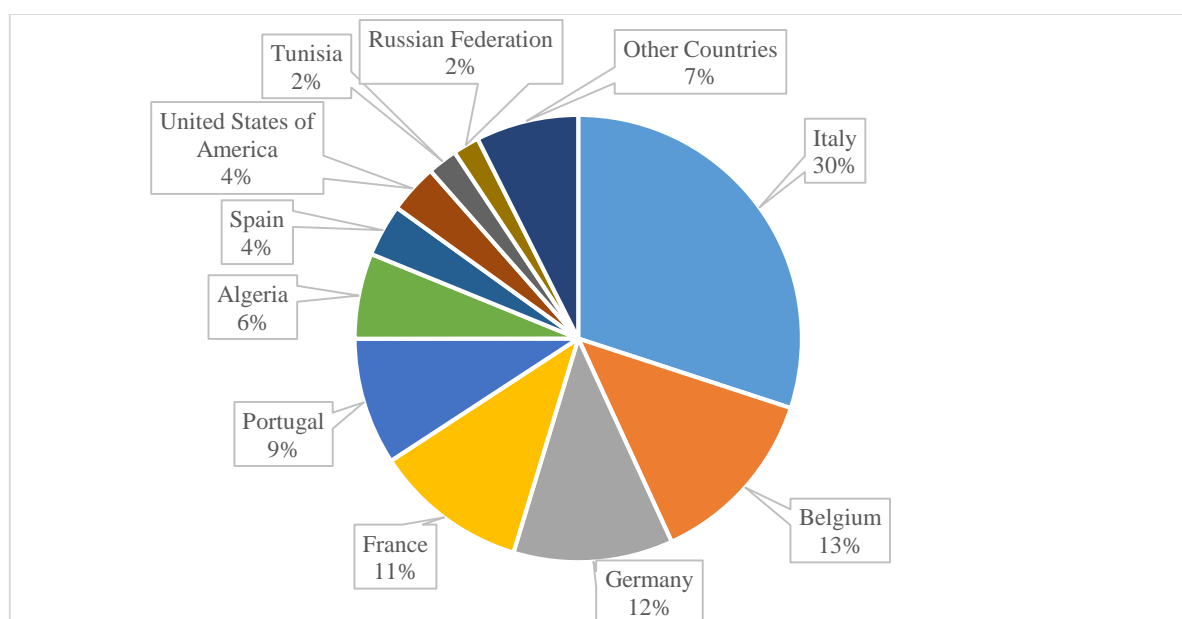44 illustrates the share of these countries in Cameroon's coffee exports.

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

48 Figure 2 presents the data for Cameroon's coffee production, exports, and export-to-

49 production ratio spanning from 2001 to 2021. The figure illustrates that Cameroon's ratio of

50 production to exports was generally above 80% during this period. Nevertheless, there is a

51 noticeable decrease in both the ratio of coffee exports to production and the amount of coffee
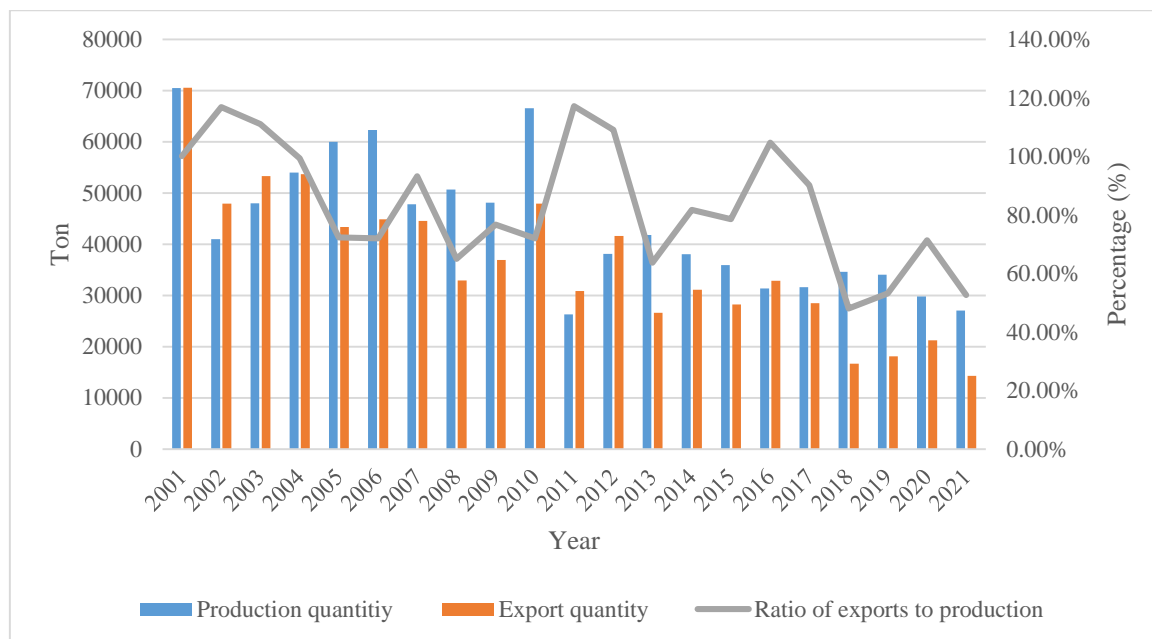
52 exports.

Fig. 2. Cameroon's coffee production, export, and export-to-production ratio between 2001 to 2021 (FAOSTAT, 2024).

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

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

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

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

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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).

Methods

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

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

$$lnEX_{ij} = \beta_0 + \beta_1 lnGDP_i + \beta_2 lnGDP_j + \beta_3 DIST_{ij} + e_{ij}$$

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

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

$$lnEX_{ij} = \beta_0 + \beta_1 lnGDP_i + \beta_2 lnGDP_j + \beta_3 DIST_{ij} + \beta_4 lnRXP_i + \beta_5 lnER_{ij} + \beta_6 FTA_{ij} + \beta_7 BIT_{ij} + e_{ij}$$

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

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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(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:

$$EX_{ij} = exp[\beta_0 + \beta_1 lnGDP_i + \beta_2 lnGDP_j + \beta_3 DIST_{ij} + \beta_4 lnRXP_i + \beta_5 lnER_{ij} + \beta_6 FTA_{ij}$$
$$+ \beta_7 BIT_{ij}] + e_{ij}$$

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:

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

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(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
$lnGDP_i$	7.18	0.07	7.28	7.05
$lnGDP_j$	9.85	0.95	11.03	7.91
$lnDIST_{ij}$	8.51	0.27	9.17	8.20
$lnRXP_i$	0.52	0.20	0.91	0.17
$lnER_{ij}$	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

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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[a]	NBML[a]	OLS $ln(EX_{ij}+1)$
Constant	69.41878*** (11.59736)	58.74402*** (10.81458)	75.23906*** (15.07565)
$lnGDP_i$	-5.624733*** (1.430220)	-4.627639*** (1.523776)	-10.56881*** (2.059889)
$lnGDP_j$	1.497604*** (0.260985)	1.191910*** (0.152143)	2.016000*** (0.239863)
$lnDIST_{ij}$	-3.994570*** (0.542036)	-3.325517*** (0.359847)	-4.170305*** (0.585373)
$lnRXP_i$	0.629975* (0.337856)	1.087721*** (0.379283)	2.429299*** (0.606308)
$lnER_{ij}$	-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^2	0.61	0.50	0.43
N	210	210	210

229 [a]Robust standard errors are in parenthesis.
230 *, **, ***$P < 0.1$, $P < 0.05$, and $P < 0.01$, 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,

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319 2020). Contrary to the widely held assumption that FTAs boost exports, recent research on

320 coffee by Abafita and Tadesse (2021) has found no statistically significant relationship, as in

321 our study. They explain this by noting that coffee trade primarily flows from least developed

322 countries to more developed countries, while most regional trade agreements (RTAs) in their

323 study are intra-regional, which may diminish the impact of inter-regional RTAs on coffee trade.

324 In the Cameroonian case, the most plausible explanation for the lack of a significant relationship

325 is the steady decline in coffee production since the FTAs came into force. Despite the

326 facilitation of bilateral trade, the continuous drop in production has prevented the Cameroonian

327 coffee sector from benefiting from these agreements. These findings imply that, the cornerstone

328 of increasing Cameroon's exports through international agreements is ensuring a steady and

329 consistent production flow. Additionally, the Cameroonian government should analyze existing

330 agreements and suggest strategic adjustments explicitly tailored to the coffee sector to

331 maximize the impact of FTAs.

332

333 **CONCLUSIONS**

334 Our study uncovered key insights into the underlying dynamics of Cameroon's coffee exports.

335 The most significant challenge is the negative impact of rising domestic demand for coffee,

336 driven by income growth, on export levels. However, if adequately managed through policies

337 aimed at increasing productivity, such as better access to credit and mechanization, this demand

338 could support domestic consumption and sustainable exports. Cameroon's logistical

339 inefficiencies, particularly when compared to its competitors, further constrain exports. On the

340 positive side, international agreements and focus on quality rather than price competition can

341 influence exports positively. To fully realize its potential, the Cameroonian government must

342 provide technical and financial support to producers, enhance efficiency at the Douala port, and

343 critically assess its international agreements to develop strategies that maximize their benefits.

344

345 **ACKNOWLEDGEMENTS**

348

349 **REFERENCES**

350 1. Abafita, J. and Tadesse, T. 2021. Determinants of global coffee trade: Do RTAs matter?

351   Gravity model analysis. *Cogent Econ. Financ.*, **9(1)**: 1892925.

2. Abdullahi, N. M., Shahriar, S., Kea, A. M., Abdullahi, Zhang, Q. and Huo, X. 2021. Nigeria's cocoa exports: A gravity model approach. *Cienc. Rural*, **51(11)**: e20201043.

3. Abdullahi, N. M., Zhang, Q., Shahriar, S., Irshad, M. S., Ado, A. B. and Huo, X. 2022. Examining the determinants and efficiency of China's agricultural exports using a stochastic frontier gravity model. *PLoS ONE*, **17(9):** e0274187.

4. AFCA 2024. African Fine Coffee Association (AFCA). About Cameroon. https://afca.coffee/portfolio-item/cameroon/ Accessed 25.01.2024.

5. Awah, P. C., Nam, H. and Kim, S. 2021. Short term forecast of container throughput: New variables application for the Port of Douala. *J. Mar. Sci. Eng.*, **9(7)**: 720.

6. Bikker, J. A. 1987. An international trade flow model with substitution: an extension of the gravity model. *Kyklos,* **40(3)**: 315-337.

7. Borojo, D. G., Yushi, J. and Miao, M. 2022. The impacts of economic policy uncertainty on trade flow. *Emerg. Mark. Financ. Trade*, **58(8)**: 2258-2272.

8. Burger, M., Van Oort, F. and Linders, G. J. 2009. On the specification of the gravity model of trade: zeros, excess zeros and zero-inflated estimation. *Spat. Econ. Anal.*, **4(2)**: 167-190.

9. CEPII 2024. The CEPII Gravity database. https://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele_item.asp?id=8 Accessed 28.08.2024

10. Diarra, G. and Tchapa, T. 2014. *Data Collection for Cargo Delays At the Port of Douala.* Mission Report, World Bank.

11. Eichengreen, B. and Irwin, D. A. 1995. Trade blocs, currency blocs and the reorientation of world trade in the 1930s. *J. Int. Econ.,* **38(1-2)**: 1-24.

12. Eshetu, F. 2024. Determinants of Ethiopian sesame and coffee exports to its major trade partners: application of the gravity model. *Cogent Soc. Sci.,* **10(1):** 2334114.

13. FAOSTAT 2024. Food and Agriculture Organization of the United Nations. http://www.fao.org/faostat/en/#home. Accessed 28.08.2024.

14. FXTOP 2024. https://fxtop.com/. Accessed 28.08.2024.

15. GCP 2016. *African Coffee Sector: addressing national investment agendas on a continental scale Cameroon Case Study.* Global Coffee Platform (GCP). https://www.globalcoffeeplatform.org/ Accessed 24.01.2024.

16. Ghazalian, P. L. 2019. Canada's beef exports: Border effects and prospects for market access. *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. 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